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An Investigation of Students' Interactivity in the Classroom and within Learning Management System to Improve Learning Outcomes

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Abstract

This study developed a conceptual framework on interactivity in the classroom, interactivity within Learning Management System (LMS), student engagement and satisfaction as four key underlying factors that will enhance learning outcomes. Furthermore, the study investigates interactivity in the classroom and within LMS with respect to student engagement, student satisfaction and its impact on educational learning outcome. Data were collected using a structured questionnaire. Based on the survey data from 178 respondents, SEM was employed to assess the model. We also experimentally assessed the relationship between the variables of the model by employing SEM method. However, the findings indicate that high interactivity in the classroom has a positive influence on student engagement and student satisfaction towards improving student learning outcomes. Also, the study shed more light on the moderate level of interactivity within the LMS by the student and pointed out which areas should be improved. The result further indicates the importance of interactivity in the educational environment and points to the need for more interactivity in the learning space of educational institutions.

Key words: *classroom; interactivity; learning outcomes; Learning Management System; university.*

Introduction

The level of student involvement indicates the time students spend on learning activities, and their willingness to establish relationships with peers and faculty, as well

as their enthusiasm towards activities offered by the department and institution to help in educational development (du Preez & Barnes, 2012). Since the use of LMSs in the early 1990's, LMSs have become an integral part of student's learning experience, teacher training experience and institutional community plan (Dahlstrom et al., 2014). However, the exponential increase in the use of the Internet and education technology has caused interactivity among students to be one of the key elements of technology development (Violante & Vezzetti, 2015).

The emerging field of interactivity needs a constant development, especially new ways of students' interaction, engagement and performance. One of the main foci of the teaching and learning process in recent years has been to observe students' activities within the LMSs and in the classroom, to intervene on student retention through the help of good data-driven decision making and knowledge sharing (Wei et al., 2015). The main purpose of interactivity is that learners should have an interested awareness, to support collaboration through learner's performance, validity of learning resources, recognition of undesirable learning behaviour, recognition of learner's emotional state (Atif et al., 2013).

This reflects that many researchers have been working tirelessly on getting students to engage and participate in activities that occur within the learning environment. However, many issues have sprung up that need to be addressed. This study examines how interactivity vehicles can help improve students' engagement and satisfaction with their learning outcomes through participating in the learning - teaching process.

Literature Review

Interactivity in the Classroom

Recently, the theory of interactivity has been seen as one of the pedagogical problems in the classroom (Blasco-Arcas et al., 2013). The interaction between teachers and students is considered as one of the determining factors that can influence academic outcomes. When a constructive relationship is established between the teachers and the students, students become more active and cooperative in their studies. However, Moore (1989) and Agudo-Peregrina et al. (2014) categorize interactivity in the classroom into two groups:

> *Interactivity that involves learners and content of the study. This type of interactivity is a self-regulated and directed interaction that helps structure and change learner's perspective. This includes internal didactic conversation, television program and information from textbooks. Interactivity can be based on communication among learners. This type of interactivity can either include one learner, two or more learners or a group of learners and it might include the presence of a tutor or not.*
>
> *Interactivity is a characteristic of instructor-learner's relations. The relationship between the teacher and a student affects the quality of motivation and engagement of learning outcomes in the classroom (da Luz, 2015). This type of interactivity helps the teacher to evaluate students, make student participate in both skilled and unskilled activities, and also to counsel, motivate and support students.*

According to Guzmán et al. (2010), the teacher must inspire learners, help them to participate in class through gathering some suggestions from them to promote discussion and resolve issues among them. In the classroom, interactivity motivates students to learn, participate and to suggest ideas to instructors and other students. Also, the interactivity in the classroom depends on the student's learning outcomes through student motivation, parental involvement, behaviours, teacher motivation, skills and technology enhancement activities. Interactivity in the classroom, therefore, can be linked with interactive teaching and interactive learning (Guzman et al., 2013).

Interactivity also supports this learning and teaching interactive approach in the classroom. Interactive teaching emphasizes the teacher's changing strategy to motivate students, which means that the teacher uses different learning styles of the students based on his/her educational experience to produce new knowledge and new method of teaching (Pozdeeva & Obskov, 2015). Interactive learning is focused on learners' active participation with alternatives to identify their learning goal, to be familiar with the available resources and to make the right decisions to motivate their approach to learning. This level of interactivity, either through interactive learning or teaching, depends to a great extent on some factors such as communication models that the educational practices designed, decision-making on curricular elements or the teaching activity itself.

Interactivity within Learning Management System

Learning Management Systems, learners and teachers play essential roles in the new form of learning process, which is described by various terms attributed to LMS, such as platforms, e-learning portals, content management systems (CMS), and so on. Currently, there are many of them, so it is not easy to figure out the best portal that will help students achieve their target learning outcomes. Instructors who strive for good interactive collaborative e-learning environment apply LMS tools to their courses to maximize interactivity.

Park (2015) describes interactivity as the interaction between technology and characteristics of human social practices. It connects learner-mediated technology with learners, teacher, and their social activities. Rodriguez-Ardura and Meseguer-Artola (2016) divide interactivity within LMS into two categories: 1. Interactivity can be defined as feature-oriented approach. This approach may be followed by the number and type of interactive elements in the LMS environment, including real-time feedback, network interactions or images. 2. Interactivity on LMS can also be defined based on a perceptual approach of communication among learners/instructors, that is, when there is mutual communication within the institution, recognized control as well as cognitive susceptibility among learners and instructors.

According to Andersson and Hatakka (2010), interactivity is the intercommunication between technical applications and humans or interaction between humans. Interactivity motivates students to learn, pay more attention, participate, contribute

and exchange information with instructors and co-learners. Moreover, interactivity in LMS will influence students' learning outcomes by improving their attitude towards learning. The interactivity within the LMS helps learners to explore and learn more about the course and therefore becomes a crucial element in improving students' engagement. Students' interactivity within the LMS also affects learners' perceived way of communication within the LMS. Although students' interactivity within LMS is expected to have a significant impact, that possibly affects student engagement either in a positive or negative way.

Research Model

This study uses a conceptual framework to identify important concepts of interactivity that are built on students' engagement, satisfaction and their influence on student learning outcomes. This helps us in proposing that students' perception of interactivity in the classroom and within the LMS stimulates students' engagement and satisfaction, in due course leading to improved learning outcomes, as shown in Figure 1.

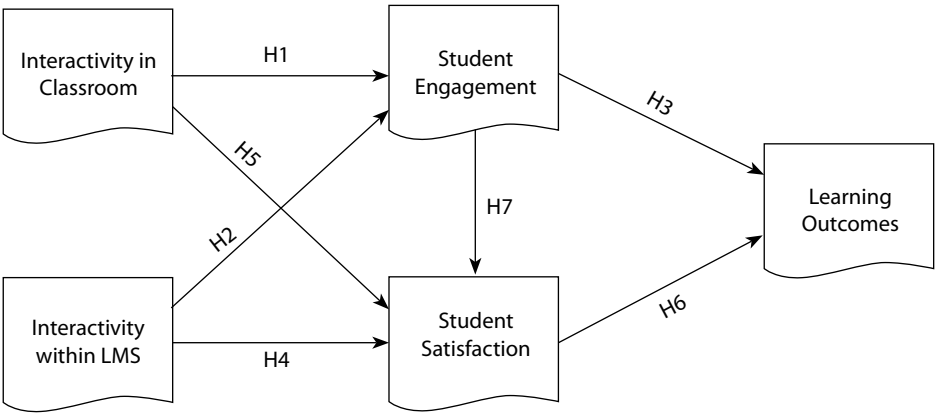


Figure 1. Conceptual Framework

As mentioned earlier, the objective of promoting two-way communication is to develop the level of classroom interactivity between students or increase interactivity within LMS among and between students, including the teacher as the major influential agent of engagement within the education sector (Blasco-Arcas et al., 2013). Interactivity is designed as an important element in the learning process. It stimulates students to participate in the classroom through active involvement in learning, and to develop a behavioural participation in LMS to support learning activities. The purpose of student engagement is to improve students' learning outcomes and student satisfaction, as well as engage them in the learning process. The student who is actively engaged in the learning process helps the teacher to change the teaching style; that is, to modify and assess it in order to meet the students' needs.

Student Engagement, Interactivity and Learning Outcomes

Student engagement is known as an opportunity to activate a minority of students who are mainly disadvantaged by socioeconomic shortcomings (Taylor & Parsons, 2011). In recent times, the concept of student engagement has expanded its perspective through behavioural, psychological, socio-cultural and holistic perspectives (Kahu, 2013). As a result, most researchers now see student engagement as a multidimensional concept that involves several factors. For example, Finn and Zimmer (2012) divided levels of engagement into four different parts which include academic, social, cognitive and affective engagement. The academic engagement deals with behaviours that relate to the learning process; e.g. completion of orders, attention and participation in academic activities. Social engagement is related to student behaviour regarding the class rules such as punctuality and effective interaction with fellows and teachers. Cognitive engagement is related to perceiving the level of student efforts associated with complex issues.

There are also other issues such as attitudes, completion of difficult tasks, and study of resources. Conclusively, affective engagement is the degree to which students are emotionally involved in the learning community. Therefore, the relationship between learning analytics, learning outcomes and students' involvement is important because it can be used to determine the student level of interactivity, individual performance of students and students at risk. This educational process is expected to be more open and adaptable to a new group of learners and it will prepare them for new technology, offer them personalized learning and support services to meet the world educational standard.

Barkley (2009) stated that dedicated students are more immersed in academic tasks, collaboration and use of higher level thinking skills in the problem solving and information analysis. Other skills that can be proposed to improve student engagement include active learning outcomes, while interactivity and critical thinking include comprehension, discussion board, reflective-focused and project-based assessment (Martin & Ndoye, 2016). To implement these techniques either in the classroom or within the LMS, it was necessary to offer collaborative learning opportunities, encourage reflection, assess student progress, provide feedback, and engage students in real world activities. Therefore, we hypothesize:

H1 - The interactivity in the classroom will positively influence student engagement.

H2 - The interactivity within LMS will positively influence student engagement.

H3 - Student engagement will have a positive impact on learning outcomes.

Student Satisfaction, Interactivity and Learning Outcomes

Student satisfaction is an important factor in measuring the quality of learning approach. It is believed to be a vital portion of the learning process (Duong, 2015). Satisfaction of students is an important issue that should be taken into account when evaluating their effectiveness in a course. However, student satisfaction is an important

concept that always leads to a higher degree of motivation, learning achievement and excellent learning outcomes from which it can be inferred that there are several elements that are influenced by student satisfaction in the classroom and online environment. According to Stojanovska et al. (2015), habits, interests and attitudes, the relationship between teachers and colleagues, environmental factors related to the classroom, the use of technology as well as content presentation and educational media are more subjective factors influencing student satisfaction. Croxton (2014) proposed a framework on social cognitive theory, interaction equivalence and social integration theory as an important element for increasing the possibility of creating a noble learning environment.

According to Bolliger and Martindale (2004), there are three main factors of student satisfaction: instructor, technology and interactivity. Other components are communicating with all other course components, course management issues, course websites and course management systems. Also, others include some other important constructs: recognition of technical limitations and limited access to work and self-efficacy, social skills, system quality, multimedia command, social interaction, academic and technical skills, motivation, time, resources, roles and responsibilities, delayed feedback from lecturers, limited technical support, high technology dependence and low student performance and satisfaction. Therefore, we propose the following hypotheses:

H4 – The interactivity within learning management system will positively influence student satisfaction.

H5 – The interactivity in the classroom will positively influence student satisfaction.

H6 – The student engagement will positively influence student satisfaction.

H7 – Student satisfaction will positively influence learning outcomes.

Research Methods

Participants and Data Collection

The research model was tested using SmartPLS 3.0. Partial least squares regression analysis was used, which is one of the appropriate tools to test a small sample size model, and it is also capable of analysing formative indicators. A total of 250 questionnaires were distributed among first year undergraduate students enrolled in an Introduction to Information Technology Course during the academic year 2016/2017 in Cyprus International University, and 178 responses were returned.

Measurements

The questionnaire was designed and tested. Participants were asked to assess the terminology, clarity of instructions, and response format. Based on preliminary tests, we adjusted a few items to increase understanding and clarity. The validity and reliability of constructs were measured and evaluated during development. The 21 items were used to measure the constructs that were included in the model and each

of the constructs was adapted from previous studies, as shown in Table 1. The scale of the items was measured with a 5-point Likert scale. The Interactivity in the classroom and Interactivity within LMS were measured using an instrument developed by Siau, Sheng, and Nah (2006). Interactivity in the classroom is measured by the degree at which the teacher shares the information with the students and asks for their participation, as a result of getting a deeper and more detailed learning.

Interactivity within LMS is measured by the degree of instigating and facilitating communication between learners and various learning objects in an online learning environment. Student engagement was measured using scales from an Irish survey of student engagement (2013), which illustrates the extent to which students actively engage and interact with the content of a course and other students in the course. Student satisfaction scale was adopted from Gray and DiLoreto (2016) to show the overall satisfaction scales, while learning outcomes scale was adopted from Lixun (2013) and it evaluates outcome-based learning programme for undergraduate English classes.

Analysis and Results

Measurement Model

Anderson and Gerbing (1988) suggested that the evaluation of the output of the structural model is achieved by the evaluation of the measurement model and the interpretation of the results of the structural model (Two-stage SEM approach). The partial least squares analysis model was used to test the internal consistency, the composite reliability, the extracted average variance, the convergent validity, and the discriminant validity (Fornell & Larcker, 1981).

The values of the internal consistency and composite reliability of all structures greater than 0.60 and 0.70 at thresholds are considered to be experimental adjustments, and composite reliability values of 0.70 and 0.90 must be satisfied (Hair Jr. et al., 2014). However, this indicates that the constructs used had good reliability, as shown in Table 1. Convergent validity was tested by both the value of AVE and cross loadings values.

The results of AVE values suggested by Fornell and Larcker (1981), Hair et al. (2010) and Urbach and Ahlemann (2010) must be greater than an acceptable level of 0.50, which indicates that this research has very good convergent validity. The discriminant validity is tested by comparing the square root of each AVE construct with the correlation of all constructs (Hair et al., 2010). Therefore, the value of the total square root of AVE is higher than the correlation of all structures using the Fornell-Larcker criterion, indicating that the result of discriminant validity was obtained, and Table 2 shows the results of discriminant validation.

Table 1

Constructs, analysis result of item and measurement model

Constructs and items	Items	Outer Loading (>. 60)	α >= .7	rho_A	CR (>. 70)	AVE (>. 50)
Interactivity in the classroom: Cronbach's alpha = 0.83			0.82 8	0.840	0.886	0.662
I interact during lessons.	INT_C1	0.721				
I am engaged in the classroom.	INT_C2	0.878				
I participate in classroom discussions.	INT_C3	0.850				
I suggest/give opinion to questions in the classroom.	INT_C4	0.796				
Interactivity within LMS: Cronbach's alpha = 0.82			0.816	0.809	0.809	0.863
I interact during online lessons.	INT_L1	0.594				
I am engaged in online activities.	INT_L2	0.823				
I participate in online discussions.	INT_L3	0.871				
I suggest/give opinion to online questions.	INT_L4	0.824				
Student engagement: Cronbach's alpha=0.80			0.802	0.813	0.884	0.717
I ask questions in class or LMS.	SE_01	0.781				
I work hard to master a difficult concept in the classroom.	SE_02	0.896				
I work hard to master a difficult concept in LMS.	SE_03	0.859				
Student satisfaction: Cronbach's alpha= 0.73			0.732	0.762	0.832	0.556
I am satisfied with my overall experience in this course.	SS_01	0.841				
I am satisfied with the level of student interaction that occurred in the course.	SS_02	0.769				
I am satisfied with the classroom course content.	SS_03	0.746				
I am satisfied with the online course content.	SS_04	0.607				
Learning outcomes: Cronbach's alpha = 0.86			0.861	0.865	0.896	0.590

Constructs and items	Items	Outer Loading (>. 60)	α >= .7	rho_A	CR (>. 70)	AVE (>. 50)
The interactivity within LMS contributes to my understanding of the course content.	LO_1	0.796				
The recommended reading materials /texts in the classroom are helpful.	LO_2	0.705				
The recommended reading materials /texts within LMS are helpful.	LO_3	0.780				
The learning tasks in the classroom enhanced my understanding of the content.	LO_4	0.792				
The learning tasks in the classroom enhanced my understanding of the content.	LO_5	0.794				
The learning tasks within LMS enhanced my understanding of the content.	LO_6	0.735				

Table 2

Discriminant validity

	Interactivity in the classroom	Interactivity within LMS	Learning outcome	Student engagement	Student satisfaction
Interactivity in the classroom	0.814				
Interactivity within LMS	0.308	0.785			
Learning outcome	0.667	0.289	0.768		
Student engagement	0.594	0.251	0.599	0.847	
Student satisfaction	0.648	0.173	0.740	0.528	0.746

Confirmatory Analysis

Very good fit model indices must exceed the optimal levels recommended by Henseler et al. (2014), who suggested that the RMS theta value must be lower than 0.12 for a well-fitting model. Lohmöller (1989) suggested that the closer the Normal Fit Index (NFI) to 1.0, the more acceptable the model fit is. Also, the Standardized Root Mean Square Residual (SRMR) value should be lower than 0.10. Thus, the values provided in Table 3 show that the structure model fits the criteria.

The structure model is also determined and evaluated through coefficient of determination. R^2 must be greater than or equal to 0.67 for a well-fitted model, 0.33 for an average and 0.19 for a weak model (Chin, 1998a, 1998b). As shown in Table 4, predictive relevance, Q^2, must be lower than 0 (Geisser, 1975; Stone, 1974). The effect size, f^2, between 0 and 0.3 shows weak effect, moderate effect is >= 0.5, and strong effect is >= 0.8. If the value is greater than 0.8, it has a very strong effect size (Cohen et al., 2013), and path coefficients scale must be significant (Hair et al., 2011; Mohamadali, 2012).

Table 3
The model fits summary

	Saturated Model	Estimated Model
SRMR	0.079	0.083
d_ULS	1.425	1.586
d_G	0.713	0.736
Chi-Square	481.051	489.923
NFI	0.720	0.714

Table 4
Summary of R^2

Variables	R Square
Learning outcome	0.608
Student engagement	0.357
Student satisfaction	0.454

The path coefficients of the research model are shown in Table 5, with the majority of the paths being significant in the expected direction with the exception of two paths that combine interactivity within LMS with student engagement, and interactivity within LMS with student satisfaction. The results indicated that interactivity in the classroom was strongly associated with student engagement and student satisfaction. Hypotheses H1 and H5 were supported.

Also, student engagement was positively related to student satisfaction and learning outcome, and student satisfaction was strongly related to learning outcomes. This confirmed hypotheses H3, H6 and H7. Contrary to our predictions, interactivity within LMS related to student engagement and student satisfaction, hence hypotheses H2 and H4 were not supported by the data.

Table 5

Path coefficients of the structural model

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Interactivity in the classroom –> student engagement	0.571	0.570	0.060	9.433	0.000
Interactivity in the classroom –> student satisfaction	0.528	0.531	0.078	6.734	0.000
Interactivity within LMS –> student engagement	0.075	0.085	0.068	1.103	0.270
Interactivity within LMS –> student satisfaction	-0.046	-0.039	0.080	0.581	0.561
Student engagement –> learning outcome	0.289	0.288	0.069	4.224	0.000
Student engagement –> student satisfaction	2.723	0.226	0.225	0.083	0.006
Student satisfaction –> learning outcome	0.587	0.591	0.062	9.454	0.000

Discussion and Conclusion

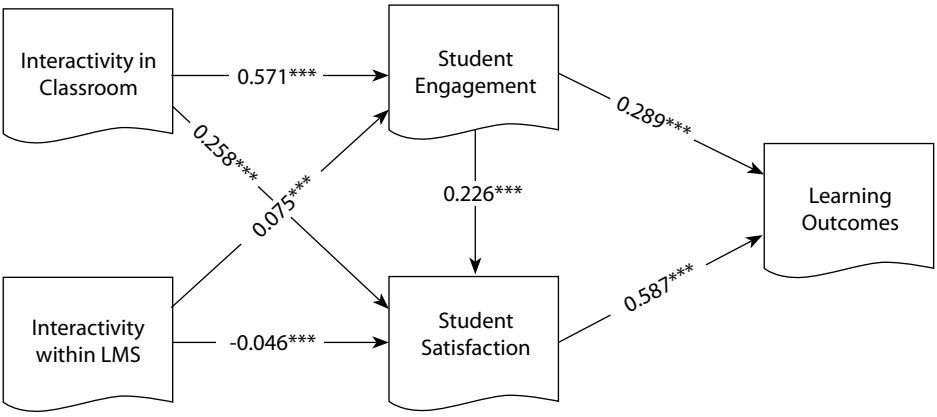
The main purpose of interactivity among students in the class or within LMS is to help increase student engagement, and their feedback will help promote learning outcomes. However, this study investigated the impact of interactivity in the classroom and interactivity within LMS on engagement, satisfaction, and learning outcomes. In relation to the model of student interactivity in learning as well as the existing empirical research done on it (Gray & DiLoreto, 2016), we developed a conceptual framework in which we suggested that student interactions within LMS and in the classroom have led to student engagement. When students are satisfied, it definitely increases learning outcomes. We tested the concept model on a sample of 178 first-year undergraduate students enrolled in an Introduction to Information Technology Course during the academic year 2016/2017 in Cyprus International University. The results of empirical research strongly support the proposed model that serves as a new trend of current research.

Firstly, in Table 1, the descriptive analysis of results shows that the mean values of all constructs are greater than the acceptable level of 0.50 (Alumran et al., 2014), which means that students' perception of interactivity in the classroom implies a high level of the constructs and influences the learning outcomes. This also shows that student interactivity in the classroom facilitates many factors of learning and significantly improves their learning outcomes.

Secondly, additional data analysis for structural model to enable corresponding connections was used to understand more about the processes from interactivity in

the classroom to learning outcomes. The results of the model show that interactivity plays an important role in explaining student engagement and student satisfaction in improving learning outcomes. By engaging in classroom activities and participating in classroom dialogue students work hard to master the difficult concept in the classroom and within LMS. This is because student involvement in many activities such as interaction with others, answering questions in the classroom, discussion and giving suggestion in the classroom contributes to the vital role of increasing interactions among students through this process. Therefore, it can be an improvement in their learning outcomes as well.

Also, student interaction in many activities makes students satisfied with the overall experiences that they get during the programme, and increases their level of interaction that occurred in the course, at the same time increasing educational learning outcomes as well. At the same time, the learning tasks in the classroom and within LMS enhanced the student understanding of the content, which can help improve student engagement and satisfaction. These results strongly prove interactivity will promote engagement in educational sectors. It will also improve learning outcomes in order to reduce inequality in institutions of higher learning and promote overall student experience in the educational learning process, as shown in Figure 2.



Levels of significance: ***p<. 01

Figure 2. Results of the structural equation model

However, the results of this research indicate that interaction within LMS and in the classroom with respect to student engagement and student satisfaction improve learning outcome. As students participate and engage in classroom activities, it is easier for them to get actively involved in the learning process and boost their courage to contribute more to difficult concepts of knowledge. Student satisfaction and engagement have proven to be an essential part of student learning outcomes, as indicated by the results which are similar to those of Gray and DiLoreto (2016), which showed that there is a positive correlation between engagement, satisfaction and learning outcomes.

Finally, it is also important to highlight some implications associated with the model. The results of interactivity within LMS have shown that there is a need for improvement for students who are engaged but are not satisfied with the use of LMS for their online discussion, with interaction with other students online and also giving some suggestions while they are online. This is because there are internal factors that always influence the use of LMS, such as pedagogical beliefs relating to LMS, competence level and attitude towards the use of LMS (Asiri et al., 2012). Therefore, improving the use and engagement of LMS in universities should be the main theme of an educational consortium to improve learning outcomes in this particular area.

Also, the sample was used for undergraduates of the institution with small sample size. This does not have a significant effect on the analysis. However, we cannot rule out other potential effects of the results of a small sample. Therefore, a promising path for further research should be to better define the factors relating to interactivity within LMS and in the classroom in order to test the proposed framework using internal and external factors related to interactivity. This study is not only advantageous for students' interactivity in institutions, but also has a greater effect on students' learning outcomes. In addition, judging from the results, we found a weak significant support for the impact of engagement on student satisfaction. However, more research is needed to understand the link between student interactivity, student engagement and student satisfaction.

In summary, the results of this study suggest that interactivity in the classroom, student engagement and satisfaction are considered useful as factors for improving learning outcomes. Our findings suggest that interaction in the use of LMS should be improved based on the fact that the LMS is the new target in the educational system, which means that stakeholders need to work hand in hand to improve the use of LMS and regard it as technology to be used in the near future.

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Istraživanje o interaktivnosti studenata u učionici i interaktivnosti studenata u sustavu za upravljanje učenjem s ciljem poboljšanja ishoda učenja

Sažetak

U ovom istraživanju izrađen je konceptualni okvir o interaktivnosti studenata u učionici, interaktivnosti studenata u sustavu za upravljanje učenjem, sudjelovanju studenata u nastavi i njihovu zadovoljstvu nastavom. To su bila četiri ključna čimbenika koja vode boljim ishodima učenja. Nadalje, istraživanjem se ispitala i interaktivnost u učionici i interaktivnost u sustavu za upravljanje učenjem s obzirom na sudjelovanje studenata u nastavi, njihovo zadovoljstvo nastavom i utjecaju koji sve navedeno ima na obrazovne ishode. Podaci su prikupljeni s pomoću strukturiranog upitnika i utemeljeni na obradi podataka dobivenih od 178 ispitanika. Za procjenu modela primijenjena je SEM metoda. Također smo eksperimentalno procijenili i vezu među varijablama unutar modela s pomoću SEM metode. Međutim, rezultati pokazuju da velika količina interaktivnosti u učionici ima pozitivan utjecaj na sudjelovanje studenata u nastavi i na njihovo zadovoljstvo, a da to sve vodi boljim ishodima učenja. Istraživanje je također razjasnilo i umjerenu interaktivnost među studentima u sustavu za upravljanje učenjem te istaknulo područja koja je potrebno doraditi. Taj rezultat pokazuje i važnost interaktivnosti u obrazovnom okruženju i ističe potrebu za većim stupnjem interaktivnosti u okruženju za učenje u obrazovnim institucijama.

Ključne riječi*: učionica, interaktivnost, ishodi učenja, sustav za upravljanje učenjem, sveučilište*

Uvod

Razina sudjelovanja učenika u nastavi pokazuje koliko studenti vremena provedu u obrazovnim aktivnostima, njihovu spremnost na suradnju s kolegama i fakultetom, kao i njihov entuzijazam za aktivnosti koje nude fakultetski odsjek i obrazovna

institucija kako bi im pomogli u akademskom napretku (Du Preez i Barnes, 2012). Od rane upotrebe sustava za upravljanje učenjem u ranim 1990-im sustavi za upravljanje učenjem postali su sastavnim dijelom iskustva učenja kod studenata, edukacije nastavnika i plana akademske zajednice (Dalstrom i sur., 2014). Međutim, sve veći porast u upotrebi interneta i obrazovne tehnologije zahtijeva od studenata interaktivnost, kao ključni element tehnološkoga napretka (Violante i Vezzetti, 2015).

To novo područje koje zahtijeva interaktivnost potrebno je neprestano razvijati i pronalaziti načine na koje će se razvijati interakcija između studenata, njihovo sudjelovanje i uspješnost u radu. U posljednje vrijeme jedan je od glavnih fokusa procesa učenja i poučavanja jest proučavanje aktivnosti studenata u sustavu za upravljanje učenjem i njihovih aktivnosti u učionici, kako bi se moglo utjecati na njihovo što veće zadržavanje znanja putem donošenje odluka s pomoću dostupnih podataka i dijeljenjem znanja (Wei i sur., 2015). Glavni je cilj interaktivnosti da studenti budu svjesno zainteresirani, da se među njima potiče suradnja, proučavanje nastavnih materijala, prepoznavanje nepoželjnih oblika ponašanja i emocionalnoga stanja studenata (Atif i sur., 2013).

Sve to odražava činjenicu da mnogi istraživači naporno rade na načinima na koje će studente potaknuti na rad i sudjelovanje u aktivnostima koje se odvijaju u sklopu sustava za upravljanje učenjem. Međutim, pojavili su se mnogi problemi koje je potrebno riješiti. Ovo istraživanje ispituje kako interaktivnost može pomoći u razvoju veće razine sudjelovanja studenata i njihova zadovoljstva ishodima učenja sudjelovanjem u nastavnom procesu.

Pregled literature

Interaktivnost u učionici

U posljednje vrijeme na teoriju interaktivnosti gleda se kao na pedagoški problem u učionici (Blasco-Arcas i sur., 2013). Interakcija između nastavnika i studenata smatra se odlučujućim čimbenikom koji utječe na akademske ishode. Kada se između nastavnika i studenata uspostavi konstruktivan odnos, studenti postaju aktivniji i spremniji na suradnju u procesu učenja. Međutim Agudo-Peregrina i sur. (2014) model interaktivnosti koji je predložio Moore (1989) dijele u dvije kategorije:

> *Interaktivnost koja uključuje učenika i sadržaj učenja. Ta vrsta interaktivnosti samoregulirana je i usmjerena interakcija koja pomaže strukturirati i promijeniti perspektivu učenika. Uključuje didaktičke razgovore, TV emisije i informacije iz udžbenika.*
>
> *Interaktivnost se može temeljiti na komunikaciji između učenika. Ta vrsta interaktivnosti može biti unutar jednoga učenika, između dvoje ili više učenika ili između skupine učenika, a može i ne mora nužno uključivati prisutnost nastavnika.*
>
> *Interaktivnost je karakteristika odnosa između nastavnika i učenika općenito. Njihov odnos utječe na razinu motivacije i sudjelovanje učenika u radu, kao i na ishode učenja u razredu (da Luz, 2015). Ta vrsta interaktivnosti pomaže nastavniku da procijeni*

učenike, navede ih na sudjelovanje u jednostavnim i kompleksnim aktivnostima. Također nastavniku pomaže da savjetuje učenike i motivira ih.

Kako navode Guzman i sur. (2010), nastavnik mora nadahnjivati učenike, pomoći im da sudjeluju u radu uvažavanjem njihovih prijedloga, poticanjem dijaloga i rješavanjem probleme. U razredu interaktivnost motivira učenike na učenje, sudjelovanje i dijeljenje ideja s nastavnikom i drugim učenicima. Također, interaktivnost u razredu ovisi i o ishodima učenja pojedinoga učenika putem njegove motivacije, sudjelovanja roditelja u obrazovnom procesu, ponašanja, motivacije nastavnika, primjene vještina i tehnologije u nastavnim aktivnostima. Interaktivnost u razredu se, dakle, može povezati s interaktivnim poučavanjem i interaktivnim učenjem (Guzman i sur., 2013).

Interaktivnost također ide u prilog interaktivnom pristupu učenju i poučavanju u razredu. Interaktivno poučavanje naglašava sposobnost nastavnika da promijeni nastavnu strategiju kako bi motivirao učenike, što znači da se nastavnik koristi različitim stilovima učenja svojih učenika na temelju vlastitog nastavnog iskustva i vodi stvaranju novoga znanja i primjeni novih nastavnih metoda (Pozdeeva i Obskov, 2015). Interaktivno učenje usmjereno je na aktivno sudjelovanje učenika u nastavi i pruža im mogućnosti prepoznavanja ciljeva učenja, upoznavanja s dostupnim resursima i pomaže im da donesu pravu odluku o tome kako poboljšati svoj pristup učenju. Ta razina interaktivnosti ili putem interaktivnog učenja ili poučavanja, uvelike ovisi o nekim čimbenicima kao što su komunikacijski model koji se u nastavi primjenjuje, donošenje odluka o kurikulskim elementima ili samoj nastavnoj aktivnosti.

Interaktivnost u sustavu za upravljanje učenjem

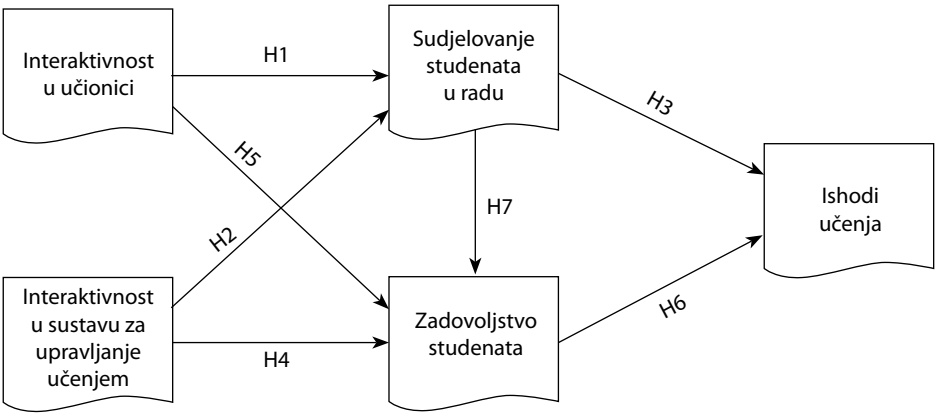
Sustav za upravljanje učenjem, učenici i nastavnici imaju važne uloge u novom obliku procesa učenja, uz koji se vežu različiti termini poput platforme, portala za e-učenje, sustava za upravljanje sadržajima (CMS) itd. Trenutno postoji puno takvih sustava pa nije lako odlučiti koji je portal najbolji i koji će im pomoći ostvariti zacrtane ishode učenja. Nastavnici koji teže dobrom interaktivnom i suradničkom e-učenju koriste se sustavima za upravljanje učenjem u svojoj nastavi kako bi interaktivnost podigli na najvišu moguću razinu.

Park (2015) opisuje interaktivnost kao interakciju između tehnologije i karakteristika ljudske društvene prakse. Povezuje tehnologiju koju učenici upotrebljavaju s drugim učenicima, nastavnikom i u društvenom djelovanju. Rodriguez-Ardura i Meseguer-Artola (2016) dijele interaktivnost unutar sustava za upravljanje učenjem na dvije kategorije: 1. Interaktivnost se može definirati kao pristup usmjeren na obilježja. U sklopu toga pristupa nalaze se brojni i raznovrsni interaktivni elementi sustava za upravljanje učenjem, uključujući povratnu informaciju u stvarnom vremenu, slike i interakciju unutar mreže. 2. Interaktivnost u sustavu za upravljanje učenjem može se definirati na temelju perceptualnog pristupa komunikaciji između učenika/nastavnika; tj. kada u ustanovi postoje međusobna komunikacija, kontrola i kognitivni utjecaji između nastavnika i učenika.

Kako navode Andersson i Hatakka (2010), interaktivnost je međusobna komunikacija između aplikacije i čovjeka ili interakcija između ljudi. Interaktivnost motivira učenike na učenje, usmjeravanje pažnje, sudjelovanje, davanje i razmjenjivanje informacija s nastavnicima i drugim učenicima. Štoviše, interaktivnost u sustavu za upravljanje učenjem utjecat će na ishode učenja učenika tako što će kod njih poboljšati stav prema učenju. Interaktivnost u sustavu za upravljanje učenjem pomaže učenicima da istraže i naučei nešto više o samome kolegiju/predmetu i tako postaje ključnim elementom u njihovu sudjelovanju u nastavi. Interaktivnost učenika u sustavu za upravljanje učenjem također utječe na način na koji oni percipiraju oblik komunikacije u sustavu. Iako se smatra da njihova interaktivnost u sustavu ima značajan utjecaj, ona može na njihovo sudjelovanje u nastavi utjecati i na pozitivan i na negativan način.

Model istraživanja

U ovom se istraživanju koristio konceptualni okvir kako bi se prepoznale bitne odrednice interaktivnosti koje se temelje na sudjelovanju studenata u radu i njihovu zadovoljstvu, kao i njihov utjecaj na ishode učenja. To nam je pomoglo da shvatimo kako način na koji studenti percipiraju interaktivnost u učionici i u sustavu za upravljanje učenjem njih ujedno i potiče na sudjelovanje u radu i stvara u njima osjećaj zadovoljstva, što vodi boljim obrazovnim ishodima, kako se može vidjeti na Prikazu 1.



Prikaz 1. Konceptualni okvir

Kako je već prije spomenuto, proces promicanja dvosmjerne komunikacije jest povećati stupanj interaktivnosti u učionici između studenata ili povećati interaktivnost u sustavu za upravljanje učenjem među studentima, uz uključivanje nastavnika kao glavnog promicatelja sudjelovanja studenata u nastavi u cijelom obrazovnom sektoru (Blasco-Arcas i sur., 2013). Interaktivnost se smatra ključnim elementom u procesu učenja. Ona potiče studente na sudjelovanje u radu putem aktivnog pristupa učenju te ih potiče da razviju odgovarajući obrazac ponašanja kada rade u sustavu za upravljanje učenjem. Sudjelovanje u radu kod studenata bi trebalo poboljšati ishode

učenja i njihovo zadovoljstvo te ih potaknuti na suradnju u procesu učenja. Student koji aktivno sudjeluje u procesu učenja ujedno pomaže i nastavniku da promijeni stil poučavanja; tj. pomaže nastavniku da promijeni i procijeni stil poučavanja kako bi što bolje odgovarao potrebama studenata.

Sudjelovanje studenata u nastavi, interaktivnost i ishodi učenja

Sudjelovanje učenika u nastavi ujedno je i prilika da se potakne na rad i manji broj studenata koji dolaze iz nepovoljnog socioekonomskog okruženja (Taylor i Parsons, 2011). U posljednje vrijeme se pojam sudjelovanja u nastavi mijenja putem biheviorističke, psihološke, sociokulturološke i holističke perspektive (Kahu, 2013). Kao rezultat toga većina istraživača sada smatra da je sudjelovanje studenata u nastavi višedimenzionalni pojam koji uključuje nekoliko čimbenika. Na primjer, Finn i Zimmer (2012) podijelili su razine sudjelovanja u nastavi na četiri kategorije: akademsko, socijalno, kognitivno i afektivno sudjelovanje. Akademsko se sudjelovanje odnosi na ponašanja povezana s procesom učenja; npr. izvršavanje obaveza i odredaba, pažnja i sudjelovanje u akademskim aktivnostima. Socijalno sudjelovanje povezano je s ponašanjem studenata u vezi s pravilima rada, kao što su točnost i učinkovita interakcija s kolegama i nastavnicima. Kognitivno sudjelovanje odnosi se na uočavanje truda koji studenti ulažu u složene probleme.

Također postoje i drugi problemi kao što su stavovi, izvršavanje teških zadataka i proučavanje izvora. Na kraju, afektivno sudjelovanje je mjera do koje su studenti emocionalno uključeni u zajednicu za učenje. Stoga je veza između analitike učenja, ishoda učenja i sudjelovanja studenata u nastavi važna jer se s pomoću nje može odrediti razina njihove interaktivnosti, pojedinačni uspjeh i rizična skupina studenata. Takav bi obrazovni proces trebao biti otvoreniji i prilagodljiviji novoj skupini učenika i on će ih pripremiti za novu tehnologiju, pružiti personalizirano učenje i podršku kako bi ostvarili svjetske obrazovne standarde.

Barkley (2009) je navela da su predani studenti zaokupljeni akademskim zadacima, suradnjom i da upotrebljavaju vještine razmišljanja višega reda u rješavanju problema i analizi informacija. Ostale vještine koje bi mogle pomoći u većem sudjelovanju studenata u nastavi su aktivni ishodi učenja, a interaktivnost i kritičko razmišljanje uključuju razumijevanje, raspravu i ocjenjivanje koje je reflektivno i koje se temelji na radu na projektima (Martin i Ndoye, 2016, 2016). Kako bi se te tehnike provele ili u učionici ili u sustavu za upravljanje učenjem, bilo je neophodno osigurati situacije u kojima se primjenjuje suradničko učenje, potiče refleksija, ocjenjuje napredak studenata, daje povratna informacija te uključuje studente u rad u stvarnim aktivnostima. Stoga smo stvorili sljedeće hipoteze:

H1 – Interaktivnost u učionici pozitivno **će** utjecati na sudjelovanje studenata u nastavi.

H2 – Interaktivnost studenata u sustavu za upravljanje učenjem pozitivno **će** utjecati na sudjelovanje studenata u nastavi.

H3 – Sudjelovanje u nastavi imat **će** pozitivan utjecaj na ishode učenja.

Zadovoljstvo studenata, interaktivnost i ishodi učenja

Zadovoljstvo studenata važan je čimbenik u mjerenju kvalitete pristupa učenju. Smatra se da je ono i ključan dio procesa učenja (Duong, 2015). Zadovoljstvo studenata važno je pitanje koje se mora uzeti u obzir kod procjenjivanja uspješnosti studenata u nekom kolegiju. Međutim, zadovoljstvo studenata važan je pojam koji uvijek vodi većoj motivaciji, dostignućima u učenju i izvrsnim ishodima učenja, iz čega se može zaključiti da postoji nekoliko elemenata na koje utječe zadovoljstvo studenata u učionici i u *online* okruženju. Kako smatraju Stojanovska i sur. (2015), navike, interesi i stavovi, veza između nastavnika i kolega, čimbenici povezani s učioničkim okruženjem, upotreba tehnologije, prezentacija sadržaja i obrazovni mediji subjektivni su čimbenici koji utječu na zadovoljstvo studenata. Croxton (2014) je predložio okvir koji uključuje socijalno-kognitivnu teoriji, uravnotežene interakcije i teoriju socijalne integracije kao važan element za stvaranje pouzdanog okruženja za učenje.

Prema Bolligeru i Martindaleu (2004), postoje tri glavna čimbenika zadovoljstva studenata: nastavnik, tehnologije i interaktivnost. Ostale su komponente: komunikacija s ostalim sastavnicama kolegija, pitanja vezana uz provedbu kolegija, mrežna stranica i sustav upravljanja kolegijem. Drugi autori također spominju i druge važne konstrukte kao što su: prepoznavanje tehničkih ograničenja i ograničen pristup sustavu, samoučinkovitost, socijalne vještine, kvaliteta sustava, poznavanje multimedija, društvena interakcija, akademske i tehničke vještine, motivacija, vrijeme, resursi, uloge i odgovornost, kasnija povratna informacija od predavača, ograničena tehnička podrška, visoka ovisnost o tehnologiji, slab uspjeh studenata i zadovoljstvo studenata. Stoga predlažemo sljedeće hipoteze:

H4 – Interaktivnost u sustavu upravljanja učenjem pozitivno **će** utjecati na zadovoljstvo studenata.
H5 – Interaktivnost u učionici pozitivno **će** utjecati na zadovoljstvo studenata.
H6 – Sudjelovanje studenata u radu pozitivno **će** utjecati na njihovo zadovoljstvo.
H7 – Zadovoljstvo studenata pozitivno **će** utjecati na ishode učenja.

Metode istraživanja

Sudionici i prikupljanje podataka

Model istraživanja testiran je s pomoću SmartPLS 3.0 paketa. Koristila se parcijalna regresija metodom najmanjih kvadrata. To je jedan od alata pogodnih za testiranje modela malih uzoraka i također može analizirati formativne indikatore. Ukupno je podijeljeno 250 upitnika studentima prve godine koji su upisali kolegij *Uvod u informacijsku tehnologiju* tijekom akademske godine 2016./2017. na Ciparskom međunarodnom sveučilištu. Vraćeno je 178 ispunjenih upitnika.

Mjerenja

Upitnik je izrađen i nakon toga testiran. Sudionici su trebali procijeniti terminologiju, jasnoću uputa i način davanja odgovora. Na temelju preliminarnih testova prilagodili

smo nekoliko tvrdnji kako bi se povećali razumijevanje i jasnoća. Tijekom izrade izmjerene su i evaluirane valjanost i pouzdanost konstrukata. Koristila se 21 tvrdnja za mjerenje konstrukata koji su uključeni u model i svaki je od tih konstrukata prilagođen iz prijašnjih istraživanja, kako pokazuje Tablica 1. Skala tvrdnji izmjerena je s pomoću Likertove skale od 5 stupnjeva. Interaktivnost u učionici i Interaktivnost u sustavu za upravljanje učenjem izmjerene su s pomoću instrumenta koji su izradili Siau, Sheng i Nah (2006). Interaktivnost u učionici izmjerena je s pomoću načina na koji nastavnik dijeli informacije sa studentima i poziva ih na sudjelovanje u radu, kao rezultat dubljeg i detaljnijeg učenja.

Interaktivnost u sustavu upravljanja učenjem mjeri se s pomoću toga koliko se potiče i omogućava komunikacija između studenata i različitih zadataka u *online* okruženju za učenje. Sudjelovanje studenata izmjereno je s pomoću skala istraživanja o sudjelovanju studenata u nastavi (2013) provedenoga u Irskoj, a koje pokazuje u kojoj su mjeri studenti aktivno uključeni i u kojoj mjeri sudjeluju u interakciji sa sadržajem kolegija i s drugim studentima toga kolegija. Skala zadovoljstva studenata preuzeta je od Graya i DiLoreta (2016) za prikaz razine ukupnoga zadovoljstva, a skala ishoda učenja preuzeta je od Lixuna (2013) i procjenjuje program učenja u nastavi na dodiplomskom studijskom programu koji se temelji na ishodima.

Analiza i rezultati

Model mjerenja

Anderson i Gerbing (1988) smatraju da se evaluacija rezultata strukturalnog modela postiže evaluacijom modela mjerenja i interpretacijom rezultata strukturalnog modela (dvostupanjski SEM pristup). Parcijalna analiza metodom najmanjih kvadrata testira unutarnju pouzdanost, kompozitnu pouzdanost, ekstrahiranu prosječnu varijancu, konvergentnu valjanost i diskriminantnu valjanost (Fornell i Larcker, 1981).

Vrijednosti unutarnje konzistencije i kompozitne pouzdanosti svih struktura koje su veće od 0,60 i 0,70 na granici smatraju se eksperimentalnim prilagodbama, a vrijednosti kompozitne pouzdanosti od 0,70 i 0,90 moraju biti dobivene (Hair ml. i sur., 2014). To upućuje na činjenicu da su konstrukti koji su se koristili imali dobru pouzdanost, kako se može vidjeti u Tablici 1. Konvergentna pouzdanost testirana je i s pomoću AVE vrijednosti i vrijednosti presječnih opterećenja.

Rezultati AVE vrijednosti koje su predložili Fornell i Larcker (1981), Hair i sur. (2010) i Urbach i Ahlemann (2010) moraju biti veće od prihvatljive vrijednosti od 0,50, što pokazuje da ovo istraživanje ima vrlo dobru konvergentnu valjanost. Diskriminantna valjanost testirana je s pomoću usporedbe kvadratnog korijena svakog AVE konstrukta s korelacijom svih konstrukata (Hair i sur., 2010). Stoga je vrijednost ukupnog kvadratnog korijena AVE veća od korelacije svih struktura kada se primjenjuje kriterij Fornella i Larckera, što pokazuje da je dobiven rezultat diskriminantne valjanosti. Tablica 2 pokazuje rezultate diskriminantne validacije.

Tablica 1

Tablica 2

Konfirmatorna analiza

Vrlo dobri indeksi prilagodbe modela moraju prijeći optimalne razine koje su preporučili Henseler i sur. (2014). Oni smatraju da theta vrijednost mora biti niža d 0,12 da bi model imao dobru prilagodbu. Lohmöller (1989) smatra da što je indeks normalne prilagodbe bliži vrijednosti 1,0, to je prilagodba modela prihvatljivija. Također, standardizirani rezidual korijena sredine kvadrata trebao bi biti niži od 0,10. Dakle, vrijednosti prikazane u Tablici 3 pokazuju da strukturni model odgovara kriterijima.

Strukturni model se također određuje i evaluira prema koeficijentu determinacije. R^2 mora biti veći ili jednak 0,67 da bi model imao dobru prilagodbu; 0,33 da bi imao prosječnu prilagodbu i 0,19 ako je model slab (Chin, 1998a, 1998b). Kako je prikazano u Tablici 4, prediktivna relevantnost, Q^2, mora biti manja od 0 (Geisser, 1975; Stone, 1974). Veličina učinka, f^2, između vrijednosti 0 i 0,3 pokazuje slab učinak, vrijednost >=0,5 pokazuje umjereni učinak, a vrijednost >=0,8 pokazuje jak učinak. Ako je vrijednost veća od 0,8, onda je veličina učinka jako velika (Cohen i sur., 2013), a skala koeficijenata putanje mora biti značajna (Hair i sur., 2011; Mohamadali, 2012).

Tablica 3 i 4

Koeficijenti putanje modela istraživanja prikazani su u Tablici 5. Većina putanja značajna je u očekivanome smjeru, osim dviju putanja koje kombiniraju interaktivnost u sustavu za upravljanje učenjem sa sudjelovanjem studenata u nastavi i interaktivnost u sustavu za upravljanje učenjem sa zadovoljstvom studenata. Rezultati su pokazali da je interaktivnost u učionici jako povezana sa sudjelovanjem studenata u nastavi i sa zadovoljstvom studenata. Potvrđene su hipoteze H1 i H5.

Također, sudjelovanje studenata u nastavi u pozitivnoj je vezi sa zadovoljstvom studenata i ishodima učenja, a zadovoljstvo studenata jako je povezano s ishodima učenja. To potvrđuje hipoteze H3, H6 i H7. Suprotno našim očekivanjima, povezanost interaktivnosti u sustavu za upravljanje učenjem sa sudjelovanjem studenata u nastavi i sa zadovoljstvom učenika nije uočena, pa tako hipoteze H2 i H4 nisu potvrđene dobivenim podacima.

Tablica 5

Rasprava i zaključak

Interaktivnost među studentima u učionici ili u sustavu za upravljanje učenjem trebala bi pomoći u povećanju razine sudjelovanja studenata u nastavi i dolaženja do njihove povratne informacije, kako bi se unaprijedili ishodi učenja. Međutim, ovo istraživanje bavi se utjecajem interaktivnosti u učionici i interaktivnosti u sustavu za upravljanje učenjem na sudjelovanje u nastavi, zadovoljstvo i ishode učenja. U vezi s modelom interaktivnosti studenata u učenju i s postojećim empirijskim istraživanjima

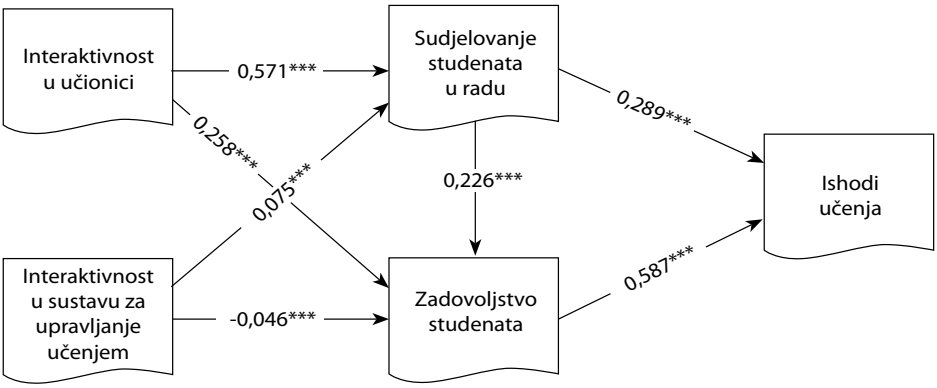
koja su o tome provedena (Gray i DiLoreto, 2016), mi smo razvili konceptualni okvir u kojemu predlažemo da interakcija studenata u sustavu za upravljanje učenjem i u učionici vodi većem sudjelovanju studenata u nastavi. Kada su studenti zadovoljni, ostvaruju i bolje ishode učenja. Testirali smo konceptualni model na uzorku od 178 studenata prve godine dodiplomskog studija koji su upisali kolegij *Uvod u informacijsku tehnologiju* tijekom akademske godine 2016./2017. na Ciparskom međunarodnom sveučilištu. Rezultati empirijskog istraživanja uvelike idu u prilog predloženome modelu koji se može uzeti kao novi trend u aktualnim istraživanjima.

Kao prvo, u Tablici 1 deskriptivna analiza rezultata pokazuje da su srednje vrijednosti svih konstrukata veće od srednje vrijednosti (Alumran i sur., 2014), što znači da ono što studenti misle o interaktivnosti u učionici, upućuje na visoku razinu konstrukata i utječe na ishode učenja. To također pokazuje da interaktivnost studenata u učionici olakšava mnoge čimbenike učenja i znantno poboljšava njihove ishode učenja.

Kao drugo, koristila se dodatna analiza podataka u strukturalnom modelu da bi se uočile odgovarajuće korelacije i kako bi se došlo do boljih spoznaja o procesima u nastavi, od interaktivnosti u učionici do ishoda učenja. Rezultati modela pokazuju da interaktivnost ima važnu ulogu u tumačenju sudjelovanja studenata u nastavi i zadovoljstva studenata poboljšanim ishodima učenja. Sudjelovanjem u nastavnim aktivnostima i dijalogu u nastavi studenti naporno rade kako bi savladali teške pojmove, i u učionici i u sustavu za upravljanje učenjem. Sudjelovanjem u takvim aktivnostima i interakcijom s kolegama, odgovaranjem na pitanja u učionici, putem rasprave i davanja prijedloga u učionici, studenti ostvaruju bolju interakciju s drugim studentima. To dovodi i do ostvarivanja boljih ishoda učenja.

Isto tako interakcija studenata u mnogim aktivnostima povećava njihovo zadovoljstvo cjelokupnim iskustvom koje stječu u kolegiju i povećava se stupanj interakcije u njemu. Istodobno zadaci u učionici i u sustavu za upravljanje učenjem povećavaju njihovo razumijevanje sadržaja, što može dovesti do većega sudjelovanja studenata u nastavi i njihova zadovoljstva. Ti rezultati uvelike dokazuju da interaktivnost potiče sudjelovanje u obrazovnom sektoru. Isto tako će poboljšati ishode učenja kako bi se smanjila nejednakost u institucijama visokog obrazovanja i kako bi se poboljšalo cjelokupno iskustvo studenata u obrazovnom procesu, kako pokazuje Prikaz 2.

Međutim, rezultati ovog istraživanja upućuju na poboljšanja u ishodima učenja putem interakcije unutar sustava za upravljanje učenjem i u učionici i u određivanju razine sudjelovanja studenata u nastavi i zadovoljstva studenata. Kada sudjeluju u nastavnim aktivnostima u učionici, studenti se lakše aktivno uključuju u nastavu i postaju hrabriji u davanju svog doprinosa učenju o težim pojmovima. Zadovoljstvo studenata i njihovo sudjelovanje u nastavi neizostavan su dio ishoda učenja, kako pokazuju rezultati slični onima koje su dobili Gray i DiLoreto (2016), koji su pokazali da postoji pozitivna korelacija između sudjelovanja u nastavi, zadovoljstva i ishoda učenja.



Prikaz 2. Rezultati modela stukturnih jednadžbi

Na kraju, važno je istaknuti neke implikacije povezane s modelom. Rezultati interaktivnosti u sustavu upravljanja učenjem pokazali su da postoji potreba za poboljšanjem kod studenata koji sudjeluju u aktivnostima, ali nisu zadovoljni upotrebom sustava za upravljanje učenjem u *online* raspravama, *online* interakcijom s drugim studentima i davanjem prijedloga u *online* okruženju. To je zbog toga što unutarnji čimbenici uvijek utječu na upotrebu sustava za upravljanje učenjem. Ti čimbenici su: pedagoška uvjerenja o tim sustavima, kompetentnost i stavovi prema sustavima za upravljanje učenjem (Asiri i sur., 2012). Stoga bi poboljšana primjena tih sustava na sveučilištima trebala biti glavnom temom obrazovnog konzorcija kako bi se poboljšali ishodi učenja u tom području.

Također, uzorak studenata dodiplomskog studija bio je malen, no to nije značajno utjecalo na analizu. Ipak, ne možemo isključiti druge moguće utjecaje rezultata dobivenih na malom uzorku. Stoga bi u budućim istraživanjima trebalo bolje definirati čimbenike koji se odnose na interaktivnost u sustavu za upravljanje učenjem i u učionici, kako bi se testirao predloženi okvir s pomoću unutarnjih i vanjskih čimbenika povezanih s interaktivnošću. Ovo istraživanje nije samo bitno zbog interakcije studenata u institucijama, već ima i veći učinak na ishode učenja. K tomu, sudeći prema rezultatima, našli smo slabu značajnu podršku činjenici da sudjelovanje u nastavi utječe na zadovoljstvo studenata. Međutim, potrebna su daljnja istraživanja kako bi se bolje razumjela veza između interaktivnosti studenata i njihova sudjelovanja u nastavi i njihova zadovoljstva.

Ukratko, rezultati ovog istraživanja pokazuju da su interaktivnost u učionici, sudjelovanje studenata u nastavi i njihovo zadovoljstvo važni čimbenici u poboljšanju ishoda učenja. Naši rezultati pokazuju da bi se interakcija u upotrebi sustava za upravljanje učenjem trebala poboljšati na temelju činjenice da su takvi sustavi novi trend u obrazovnom sustavu, što znači da bi glavni dionici trebali zajedničkim naporima poboljšati način njihove primjene i smatrati ih tehnologijom koja će se koristiti u bliskoj budućnosti.