The Impact of Online Learning Activities on Student Learning Outcome in Blended Learning Course

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Abstract

The aim of the study was to determine the impact of online learning activities to the learning outcomes of students who participated in the blended learning course. Interactive activities are considered, in this study, include teacher - student interaction, student - student interaction, student - content interaction, and student - technology interaction. The undergraduate student participated in the blended learning course which using formative assessment to evaluate student learning outcomes by the combination of different learning activities through a learning management system. The quantitative results obtained when implementing learning analytics data from the system through using regression analysis showed that the students interact effectively with learning activities in the course have better results. Quantitative analytical results indicate that student – student interaction has a greater impact on student learning outcomes. These learning activities used for interactive activities as suggestions for teachers to design and implement learning activities for blended learning courses.

Keyword learning outcomes, online learning activities, learning analytics, blended learning

1. Introduction

One of the goals of information technology application in education reform is to improve the student learning outcomes. The results of student learning are a criteria evaluation accomplishing academic goals of the learner. Up to now, there are two often ways to evaluate student performances: summative assessment and formative assessment. The formerly estimated results through scores at the end of the course or evaluation forms, the later estimated results in the process student learning, to consider many aspects. When implementing the blended learning course, a question always arises for teachers is how to design learning activities for learners to get the best results? Not easy to have a template for every course which applied to the different learning objects. Recent studies have focused on studying and understanding the relationship between factors affecting learning outcomes, especially in blended learning environments (Ellis, Pardo, & Han, 2016). Zachris (Zacharis, 2015) conducted a data analysis of learners participating in the LMS-system Moodle, by observing that 29 variables and found out reading and posting messages, content creation contribution, quiz efforts and the number of files viewed are four factors which are 52% affect the academic performance of students. Aspects covered include pedagogical (Lou, Bernard, & Abrami, 2006; Means, Toyama, Murphy, Bakia, & Jones, 2009), learning content, learning tools, the motivation of students, teacher quality, student satisfaction (Abdous & Yen, 2010). Garrison (Garrison & Cleveland-Innes, 2005) studied the effect of the acquired ability to the learning outcomes, given that people have a good feeling about the interaction with the instructor and other students tend to achieve the higher academic achievement than students without a good feeling about the interaction. Russo (Russo & Benson, 2005) showed that the correlation between the perception of students with interactive participation and scores. Morris (Morris, Finnegan, & Wu, 2005) when analyzing the correlation between online learning activities to learning outcomes, says regularly interacting with the course content, to spend more time participating in seminars Comments that affect learning outcomes.

When participating in the blended learning course, students use most of the time through the online activities or interacting with the LMS system, so the study results often depend on many different factors. The previous studies have shown interactive activities is one of the factors that affect learning outcomes of students (Kayode & Teng, 2014; Kent, Laslo, & Rafaeli, 2016; Wei, Peng, & Chou, 2015). However, to clarify interactive activities that most significantly affect the results of student learning is still important questions to find the answer.

The objective of the study was to determine the specific interactive activities and the extent of its impact on student learning outcomes in the blended learning course. In addition to, we proposed assessment model and forecast results of learners through the learning activities and suggested approaches in the course design help students obtain the best results.

2. Related literature

2.1. The impact of online interaction on student learning outcome

Chou (Chou, Peng, & Chang, 2010) has defined active interaction in online learning activities including the types of interaction: the learner -self, learner- learner, learner - instructor, learner -content, and learner interface. The learning activities in the course is a combination of forms of interaction between the subjects involved in the teaching and learning activities include: student-content, student-instructor, and student-student interaction (Gradel & Edson, 2010). Popular LMS systems currently provide essential tools that allow interactive activities in the course, such as forums, message, online forms of assignments, exercises in wiki format, virtual classroom, etc. These tools also assist teachers in tracking and monitoring the student learning process, such as status submitted assignments reports, the frequency of access statistics, activity logs on the system. There have been many studies propose solutions to make interactive activities effectively support the learning process of students. Evans and colleagues (Evans & Sabry, 2003) implemented three interactive activities: the pace control, self-assessment, interactive simulation of his research and time of using the system is a factor affecting student results. The results of their study showed that students with better results and need less time learning when interacting more with the system. However, the research no conducted with other interactive forms. Similarly, according to research results (Damianov, Kupczynski, & Calafiore, 2009), there is a positive influence in the direction of time spent online and the results calculated by the scores of students, especially students in the group above average. Contrary to the judgment of Eom (Eom, Wen, & Ashill, 2006) showed that there was no relationship between other forms of interaction to the learning outcomes of students. Early research found out interactive activities online in the blended learning course have an impact on student learning outcomes.

In this study, we examine the influence of interactive forms of student - teacher interaction, student - student interaction, student - content interaction, and student - technology interaction to learning outcomes. There are some reasons: i) there is a variety of interactive activities but can classify into four groups of above mention interaction, based on the participants. ii) LMS systems support tools and mean to implement the relevant operation effects mentioned above. iii) Clarifying the impact of interactive form to student performance based on previous studies have shown these types of interactions mentioned above can affect the student learning outcomes.

2.1.1 The student-teacher interaction

Student - teacher interaction is a key activity in the traditional teaching method when the teachers play a central role. With blended learning environment, learners play the central role, interaction between teacher and students become more flexible in many different forms. Kang and colleagues (Kang & Im, 2013), said that the interactive activities between teachers and students have an impact on learning outcomes of students when implementing learning activities such as learning assistance, and social intimacy, communication and instructional Q & A, instructor presence, Instructional support. Liu (Liu, 2016)

suggested using video blogging class to assist students in achieving good results for some kind of special courses for the oral training course.

2.1.2 The student - student interaction

Blended learning environment allows students to have more favorable conditions of time, space to perform the interactive operation. With the supported technology, the forms of interaction between the students in the course are increasingly diverse and more efficient. The previous studies have shown that this kind of interaction student - student that affect learning outcomes. The online learning activities different to be tested to determine whether the effects of this interaction. Dawson and colleagues (Dawson, E, & Tan, 2008) indicate that interaction via discussion forums is 80% of interaction in online learning environments. However, studies have not mentioned the influence of activities through the forum on learning outcomes. Schrire (Schrire, 2006) suggests that students obtain better academic results when participating in discussions with each other rather than proceed with the teacher. Song (Song & SW, 2011) examined the interaction through discussion measured by the number of postings and log-in with academic results and showed no correlation between the number of scores posted to results. Besides, in this study, the authors implemented only in the asynchronous interactive type.

Similarly, Macfadyen (Macfadyen & Dawson, 2010) constructed regression model that results showed a tight correlation between the study results to the number of forum posts, the number of completed assignments. Kent (Kent et al., 2016) analyzed the quantitative data based on the number of post and view of the 231 students in online discussion activities. Considering the role of teamwork, Mitchell (Mitchell & Honore, 2007) noted that working groups have a positive impact on learning outcomes of students. Consider factors influenced by social networks, Sparrowe (Sparrowe, Liden, Wayne, & Kraimer, 2001) suggests that social networks have a direct impact on the final learning outcomes of learners. However, Kayode (Kayode & Teng, 2014) review the impact of the interaction on learning outcomes, with interactive activities including reading the contents of the blog, interacting with other learners, and engaging in the blog context with 342 students participated in the experiment. The results showed that this form of interaction between the students together no significant impact on student learning outcomes.

2.1.3. The student - content interaction

With the support tools, learning content design is increasingly diverse in forms and ways to communicate the sense of excitement generated for learners to learn. Moallem (Moallem, 2003) stated that "it became clear that developing an online course that encourages student exploration and reflection required much more thinking, time, and effort than had been predicted." (p.99). Anderson (Anderson, 2003) also stated that "Content, having only volition ascribed to it by humans, is the most flexible of actors, "willing" to undertake any combination and quantity of interaction" (p. 3). Lee (Lee & Bonk, 2016; Sim & Hew, 2010) shows that the impact of experience using blogs to the learning outcomes of students. Yang (Yang, Quadir, Chen, & Miao, 2016) developed Col framework model proposed by Garrison and colleagues (Garrison & Vaughan, 2008) develop blog content course, and online presence shows there impact on academic performance. Similarly, video blog in the course content is also used to improve the efficiency of learning (Liu, 2016). Asterhan (Asterhan & Hever, 2015) showed a positive effect on the content reads to the learning outcomes, which are also shown in the study by Ramos (Ramos & Yudko, 2008) when they analyzed correlation keep the number of pages viewed, discussion posts, discussion reads to the learning outcomes of students. Nandi (Nandi, Hamilton, Harland, & Warburton, 2011) also showed that the number of posts increases in the time students have to submit assignments or take exams, students have better academic results time more online during the course.

2.1.4. The student – technology interaction

LMS systems to help design and develop the course in the form of blended or online learning easier and more convenient. Through providing learning activities such as lessons, forum, quiz, wikis, surveys help students easily interact with the learning environment. Steel and colleagues (Steel, Keppell, Gerbic, & Housego, 2010) showed that the relationship between the frequency of the LMS system access (via counting the number of clicks) affect student scores. Wei and colleagues (Wei et al., 2015) have examined the impact of the interaction via the LMS tools. Data of 381 undergraduate students through analysis of the results of assignments form (online discussion, exam, group project) and the data access (access time, the number of posts, the time to read the document), the research results show that the relative activity this can affect their academic performance. Notice that the LMS system or technological factors play a major role in promoting the interactive learning activities. Nick Z. Zacharis (Zacharis, 2015) have demonstrated the Wiki edit learning activities, content creation contribution, mail messages read, and assignments submitted quiz engagement affect 10% to 27% of the learning outcomes of students in the blended learning courses when considering 29 online Activities.

2.2. LMS supports the implementation of learning activities enhance learning efficiency

Using the LMS system to support the process of teaching and learning in the form of e-learning, blended learning in which focused on learner is being applied and widely deployed in the higher education establishments. Through the LMS system, students easy access to in rich course materials and lectures are presented in such as documents, presentations, pdf files, audio, and video, links. Besides the learning content, the LMS system also provides tools to design learning activities to support interaction. We shall classify the types of learning activities that LMS systems currently popular Blackboard, Moodle, and Sakai is supporting activities to bind to interact in Table 1.

Table 1. Learning activities that popular LMS supports

Interaction type	Learning activities	Examples
Student - Teacher interaction	Virtual Classroom via Adobe Connect integration or BigblueButton integration, Open Meetings integration, Quiz,	(Liu, 2016); (Arslan, 2014); (Beatty & Gerace, 2009); (Joksimović, Gašević, Loughin, Kovanović, & Hatala, 2015); (Çardak & Selvi, 2016);(McBrien, Jones, & Cheng, 2009)
Student - Student interaction	Discussion Forum, Chat, Wiki, Workshop, Group assessment, Messages, Blog	(Nandi et al., 2011); (Grant, 2016); (Joksimović et al., 2015); (Çardak & Selvi, 2016); (Richardson, 2010);(Tambouris, Zotou, & Tarabanis, 2014) (Dawley, Un, Klinger, Berger, & Schmidt, 2007)
Student – Content interaction	Lesson, Assignment, Glossary, Quiz, SCORM Package, Survey, Links	(Crampton, Ragusa, & Cavanagh, 2012);(Joksimović et al., 2015); (Çardak & Selvi, 2016)

2.3 Research questions

Studies on the impact of interactive activities in blended learning course to learning outcomes showed that the types of interactions are affecting the results of the learners. However, up to now, there are not many studies clearly identify the degree of impact of interactive forms of learning results. Besides determining the impact factors, the design guidelines, deploy interactive activities to best effectively to the learning outcomes have not been many results. In order to fill the gap, the research is conducted to answer two questions:

1. Determine the level of the impact of different types of interaction to learning outcomes in blended learning courses with variety learning activities?
2. Where forms of interaction in groups have a significant role in the student - student interaction that impact learning results of the team or not?

3. Methods

3.1. Sample

68 undergraduate students participating in two courses that had the same subject. In each class, the students were divided into groups to perform group activities, the student can self-selection and the formation of groups, each having from 4 to 6 members.

3.2. Design and Procedure

Test course length three credits and implemented within fifteen weeks. In each week, students must attend two classes in the form of face-to-face (F2F), other learning activities to be applied in the online and hands-on lab. We designed two learning activities types of interaction: interaction between teacher and students, the interaction among the students via LMS Moodle.

3.2.1. Interactive learning activities between teacher and students

Online learning

Beside the teaching activities in the form of F2F in the classroom, teachers also spent a certain amount of time for online teaching activities. In the model, we used BigBlueButton tool (Zafar et al., 2003) which was integrated with Moodle LMS systems to implement the online course. For this activity, interactive activities between teacher and students focused on answering question issues related to projects, assignments. In working time, students could use the "raise my hand" function to express their opinions directly. In the experiment course, the online teaching activities focused on guiding students to use frameworks for developing web applications.

Online question & answer system

In the teaching process, teachers need to understand the student's feedback about the learning section. During the period of an online learning section, the teacher cannot answer all the questions of the students; so many students who want to ask or demand the response will not be answered. In addition, to fully collect honest feedbacks from students is not easy because not all of their problems will be responded to the teacher if their identification is clear. So that we built a tool that allows students to ask questions while they are participating in an online learning section. With this software, students easily ask questions; submit their feedback in an anonymous state to their teacher who is teaching online. The issue is shown in public for all students who are participating in the online learning session; the members can vote for interesting or the most concerned questions. The teacher does not need to answer all the questions; he can select to answer the most concerned questions.

3.2.2. Interactive learning activities among students

The implemented interactive learning activities among students in the course were: Group exercise, Wiki document, peer group assessment, forums.

Group assignment activities

The students selected the other members of the class to form working groups at the beginning of the course. As for students who could not form the working groups themselves, teachers randomly assigned students into different groups. These groups remained stable until the end of the course. The teacher announced the content and requirements of group exercises for teams to select to conduct during the course progress. In our experiment, each group consisted of 5 to 6 students; each group must do at least three group exercises to complete the course.

Peer group assessment activities

Exercises are implemented by groups. Each group of 5 to 6 members needs to select a project; its execution time is

approximately four to five weeks. Project performance evaluation is conducted through three phases: (1) The members of the group perform a self-assessment based on their level of contribution to the group work, the members of the group will carry out the self-classification levels A, B, C, D respectively. (2) The groups will discuss and conclude a final assessment for each member of the group, with the consensus of the whole group through the minutes of the discussions, with each member's certification.

The result of peer assessment is considered as valid if each student of the group has different levels of evaluation. It can be understood that it is not acceptable if a group has the same assessment level at A, B, C or D for its members. This is quite natural because almost there are not equal contributions of all members for the group work. (3) Results of group exercises are reported offline in the class, where teacher evaluates their project performance by giving scores with the criteria outlined in the project requirements. The students of the other groups will fill out a rating list of the groups after hearing all presentations.

Wiki activities

This activity is implemented by groups. The groups write a document to study about the specific content of the course. Members of the group work together to build the document that will be evaluated by the teacher and other groups in the class. This activity uses the Moodle workshop tool allowing students to participate online and to see the process of doing their group's exercise from the start until the finish. In the experimental course, we asked groups of students to write a studying document about a framework for developing Web-based applications.

Forum activities

Each course has a forum for students to exchange related matters of the course. It is also a place where the official information is exchanged between students and teachers and among students on course issues. The level of forum participation is a criterion to assess the student's attendance level.

Course Grading

Giving scores did the evaluation of student's completion of the course. Currently, according to the regulations of the university, student assessment results by the score at the end of the course consist of two parts. Part one, the learning outcomes of students making learning activities including individual implementation exercises, group exercises, tests, and exams. Part two, the attendance of the students involved in learning activities: there is full participation of learning activities online and offline deployed or not? Students were evaluated according to a scale of 10, in which the proportion of component scores was calculated by learning activities such as: attending to LMS, assignments, projects, mid-term exam, and the final exam. In particular, the necessary activities required students to attend were two of the three individual assignments, two of the three projects, 01 mid-term exams, and the final exam. We build weighting of evaluation based on two principles. 1) The scientific training committee of university regulations weight for a final exam, it is from 50% to 70% of total grade. 2) The teacher can himself construct the weight for the remaining points, which are from 30% to 50% of total points. In this study, we propose the weight of final exam is 55%. With 45% of evaluation for other activities, we evaluate students through the implementation of learning activities: personal assessment, peer group assessment, wiki projects.

3.3. Instrumentation

Students need to participate in learning activities designed for each week and take part in the final exam period prescribed by the subject. The activities including the following main activities: 1) Access the data resource which updates by teacher each week. 2) Join forums discuss the subject. 3) Take individual exercise per week (experiment course includes 03 individual assignments). 4) Participate in a project team to perform in teams to evaluate cross-use tool workshop. 5) Contract materials in wiki project. 6) Test between semesters in the form online through the LMS system. 7) Join some online lessons via video conference. 8) FAQ during face to face class through online Q & A system.

Data were collected from actual Reported from the database of system logs. The data attributes are adopted from previous

studies (Joksimović et al., 2015; Wei et al., 2015; Zacharis, 2015) including data attributes related to interactive activities such as student -teacher, student - student, student - content, and student - technology. In our experiment, an interaction is measured by one view or post of the students on LMS system.

Analyzing results, the interaction data is collected after the end of the course. It includes the file number of the view for six weeks, the number of interactions with five exercises which include three individual assignments and two group exercises, one wiki activity, one workshop activity, one forum to discuss, and one online test.

To examine the relationship between interaction in group activities and the group learning outcomes, we examine a correlation between the total number of interactive activities through active engagement in the form of groups including wikis, workshops, and quizzes impact group learning outcomes.

4. Results

4.1. The correlation between interactive activities and learning outcomes

A correlation matrix in Table 2 showed that the listed explanatory variables are correlated to the academic performance of students. Correlation coefficients strongly affect the learning outcomes of these activities is the interaction between students with students through workshops learning activity (r = 2.85, p <0.05). Other interactive activities are also quite tight correlation, for example, student -student interaction in the form of wikis and discussion forum (r = 0:32, p <0.01). The related explanatory variables correlate with academic results are included in the model to consider the impact of interactive activities to learning outcomes.

Table 2. Correlation coefficients between learning result and learning activities

	R1	STF	SCF	STA	SCA	wiki	workshop	forum	quiz
R1	1	.163	.176	-.031	.014	.085	.285*	.105	-.159
STF		1	.604**	.099	.212	.273*	.080	.276*	.029
SCF			1	.230	.154	.215	.099	.157	-.138
STA				1	.171	.097	.155	-.052	-.111
SCA					1	.137	.049	.166	.111
wiki						1	.216	.328**	.005
workshop							1	.213	-.121
forum								1	.234

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

4.2. Regression models predicting learning outcomes related to interactive activities

Results correlation coefficient between student - content interaction through assignment activities on results is the lowest (r = 0.014, p = 0.05), should be removed from the model.

4.2.1. The relationship between student-teacher interaction and learning outcomes

The results of the correlation matrix between the student-teacher interaction through view/post course materials (STF variable) and learning outcomes (R1 variable) showed in Table 3. The value of R2 in the cubic model ($R^2 = 0.33$), the model log ($R^2 = 0.33$) was the highest of ability to explain two most powerful model for the relationship between the STF and R1. Here we choose the form of a log-linear model for relations between the STF and R1.

Table 3. Model Summary and Parameter Estimates for STF variable

Dependent Variable: R1

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.025	1.658	1	66	.202	6.369	.073		
Logarithmic	.033	2.248	1	66	.139	6.124	.444		
Quadratic	.025	.826	2	65	.442	6.310	.095	-.001	
Cubic	.033	.735	3	64	.535	5.804	.394	-.042	.001
Power	.035	2.424	1	66	.124	5.661	.088		
Exponential	.028	1.887	1	66	.174	5.928	.015		

The independent variable is STF.

Similarly, based on our review model student-teacher interaction, a relationship between assignment activities (STA variable) and learning outcomes (R1 variable) showed in Table 4. The cubic model was selected to explain the relationship between the STA and R1 by R^2 in the cubic model ($R^2 = 0.08$) shows the ability to explain the relationship between the STA and R1.

Table 4. Model Summary and Parameter Estimates for STA variable

Dependent Variable: R1

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.002	.156	1	66	.694	7.020	-.042		
Logarithmic	.001	.042	1	66	.839	6.587	.115		
Quadratic	.009	.283	2	65	.754	6.160	.261	-.024	
Cubic	.080	1.846	3	64	.148	1.419	3.025	-.497	.024
Power	.004	.258	1	66	.613	5.883	.054		
Exponential	.000	.023	1	66	.880	6.560	-.003		

The independent variable is STA.

4.2.2. The relationship between student - content interaction and learning outcomes

Table 5 showed correlation matrix results between student-content interaction through activities view/post course materials (SCF variable) and study results. The value of R^2 in the quadratic model ($R^2 = 0.068$) and the cubic model ($R^2 = 0.082$) are the highest of ability to explain the most powerful two models for the relationship between SCF and R1. The quadratic model is chosen to consider the relationship between the STF and R1.

Table 5.Model Summary and Parameter Estimates for SCF variable

Dependent Variable: R1

Equation	Model Summary	Parameter Estimates

	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.015	1.026	1	66	.315	6.483	.103		
Logarithmic	.045	3.089	1	66	.083	6.337	.552		
Quadratic	.068	2.371	2	65	.101	5.790	.555	-.046	
Cubic	.082	1.910	3	64	.137	5.090	1.263	-.203	.008
Power	.057	3.953	1	66	.051	5.860	.118		
Exponential	.024	1.637	1	66	.205	6.001	.025		

The independent variable is SCF.

4.2.3. The relationship between student - student interaction and learning outcomes

Table 6, 7, and 8 showed results correlation coefficient matrix between student- student interaction activities to learning results (R1) through wiki activity (wiki variable), the workshop activity (workshop variable), and discussion activity (forum variable). The linear model was selected to explain the relationship between the workshop activity ($R^2 = 0.079$) and discussion ($R^2 = 0.011$) with the study results. A log-linear model was chosen to explain to select the relationship between a wiki activity ($R^2 = 0.054$).

Table 6. Model Summary and Parameter Estimates for Wiki variable

Dependent Variable: R1

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.007	.441	1	66	.509	6.679	.012		
Logarithmic	.054	3.797	1	66	.056	6.215	.379		
Quadratic	.016	.514	2	65	.600	6.530	.042	.000	
Cubic	.125	3.051	3	64	.035	5.876	.262	-.011	9.387E-005
Power	.067	4.776	1	66	.032	5.715	.081		
Exponential	.012	.769	1	66	.384	6.283	.003		

The independent variable is wiki.

Table 7.Model Summary and Parameter Estimates for Workshop variable

Dependent Variable: R1

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.079	5.690	1	66	.020	5.888	.057		
Logarithmic	.070	4.943	1	66	.030	5.305	.590		
Quadratic	.081	2.871	2	65	.064	6.053	.028	.001	
Cubic	.081	1.887	3	64	.141	6.005	.043	.000	1.739E-005
Power	.077	5.519	1	66	.022	4.792	.119		
Exponential	.081	5.787	1	66	.019	5.428	.011		

The independent variable is workshop.

Table 8. Model Summary and Parameter Estimates for Forum variable.

Dependent Variable: R1

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.011	.741	1	66	.392	6.637	.004		
Logarithmic	.001	.055	1	66	.815	6.685	.035		
Quadratic	.011	.365	2	65	.696	6.639	.003	8.584E-007	
Cubic	.015	.316	3	64	.814	6.542	.014	.000	4.239E-007
Power	.001	.044	1	66	.834	6.341	.006		
Exponential	.011	.724	1	66	.398	6.274	.001		

The independent variable is forum.

4.2.4. Regression model predicting learning outcomes related to interactive activities

A multiple regression model included the variables likely explanations for the study results include: Log (STF), Quadratic (SCF), Cubic (STA), Log (Wiki), Workshop, Forum. Sig value on Table 9 allows us to be able to trust regression model included the variables mentioned above can explain the results of student learning.

Table 9. Coefficients[a] of variables in regression model between R1 and factors

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	5.291	.632		8.378	.000		
log_stf	.848	.778	.151	1.091	.280	.741	1.349

qua_scf	-.004	.012	-.048	-.320	.750	.629	1.590
cub_sta	-.001	.001	-.095	-.700	.487	.759	1.317
log_wiki	.711	.494	.190	1.439	.155	.809	1.236
forum	-.002	.004	-.059	-.444	.658	.800	1.249
workshop	.049	.025	.241	1.926	.059	.903	1.107

a. Dependent Variable: R1

From the results in Table 9, can use the general model to predict the results of student learning as: *R1 = 5.291+ 0848 * log (STF) + 0711 * log (wiki) + 0049 * workshop - 0001 * cubic (STA) - 0.002 * forum - 0.004 * quadrics (SCF).*

4.3. The correlation between the active interactive group and learning results

The results considering the relationship between interactive activities in groups to study results in Table 10. It surprisingly not reflect the interaction between the activities of the group for learning outcomes (as a group) while the small R^2 value (R^2 = 0.04).

Table 10. Coefficients[a] of interaction variable and group result

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	8.362	.786		10.646	.000		
	INTERACTION	-.003	.003	-.211	-.747	.469	1.000	1.000

a. Dependent Variable: R2

5. Discussion

5.1. Answers to research questions

This study evaluated the impact of the interaction through the learning activities in blended learning course to student learning outcomes. The learning activities are implemented based learning activities tools which popular LMS systems currently supported. Answering to questions determine the impact of the interaction types to learning outcomes in blended learning courses varied deploy collective action, results showed quantitative analysis; interactive activities are affecting the academic performance of students. The statistical results can indicate that the impact of the kind of interactive on learning results can be ranked from high to low level of student-student, student-teacher, student-content. In which the influence of student activities - student interaction have a significant impact on learning outcomes (0.71) in the linear regression model to predict student results. Obviously, learning outcomes of students in blended learning environment depends on many factors, so interactive online elements account for only a small percentage, this represents a multiple regression model in predicting the outcome. Additionally regression model is not a linear.

The student - teacher interaction affects learning outcome is not significant when the regression model of the student-teacher variables is not linear models that are log model. Obviously, the interaction between students and teachers increasingly changing both manner and frequency in blended learning. It poses a challenge in the design of the course, the

environment and tools to support interaction between students and teacher.

Student - content interaction without much impact on learning outcomes (lower proportion of regression model 0004). Results are consistent with the results of recent studies (Joksimović et al., 2015; Wei et al., 2015; Zacharis, 2015) where those results also showed the impact of the student - content interaction is lower than other types of interactions. In contrast to the statement of Kayode (Kayode & Teng, 2014), the research results show that this kind of interaction between student - content has the greatest impact on learning outcomes. It can be explained by the learning activities in each trial was designed and built differently, there is no uniformity in the type and frequency of use of interactive activities during key deployment learn.

Answers to study questions whether interactive group forms that affect the significant in this kind of interaction or not? The results showed that not lead to a conclusion that interactive in a group has a significant role in group results. When considering the relationship between perceived team learning and group project scores, Turel (Türel, 2016) also showed no relation between them.

5.2. Implication

These research findings showed that online learning activities blended learning course that impacts on student learning outcomes. Each type of interaction with different levels of impact on learning outcomes through learning activities is carried out in the course. It also poses a challenge for the design and implementation of learning activities blended learning course when the interaction depends on the learning activities are designed without an available prototype. In this study, we have carried out to implement the common learning activities to demonstrate the types of interactions are the most popular: student- teacher, student-content, and student-student. Assuming that, if the course does not have some learning activities, such as wikis, forums, the results of assessing the impact of learning activities to learning outcomes will be different. It is a research question need to looking for possible answers. According to findings, student-student interaction, has the greatest impact on learning outcomes, this can be considered as suggestions for the construction of the course activities support more interactive styles. When analyzing the types of interaction in distance education, Bernard (Bernard et al., 2009) also pointed out that student - student interaction is the highest percentages in other interactions. Those findings also showed that student-teacher and student-content interaction not significantly impact on learning results. It revealed that student-centered in the blended learning model, lecturer role as orientation and guidance instead of imparting knowledge in the traditional teaching model.

Together with supporting diversified assessment types, teachers should have enough formative assessments to ensure that students maintain their concentration during the course. Student interacted with the system less and only accessed it when required. In our opinion, to maintain the interaction with learning activities, it is necessary to provide enough assessments in courses.

The results of data analysis collected from LMS based on learning analytics method (Phillips, Maor, Preston, & Cumming-Potvin, 2012) when analyzing the impact of interaction types to the student learning outcomes, although need further research, can be used as a critical approach. One of the difficulties encountered when approaching this method is popular LMS systems today, yet provides many learning analytics tools. It is a challenge for the development of LMS systems, where learning analytics more becomes an important role.

5.3. Limitation

There are some limitations in this research, firstly, the number of samples collected is limited. In addition, learning activities deployed mainly use the LMS available tools. Secondly, besides the number and frequency of learning activities much less implemented. On the other hand, this study only focused on the common types of interactions. Also, the classification of learning activities to interactive forms in this research is being conducted qualitative.

6. Conclusion

There are many factors affect the student learning outcomes in the blended learning course. Find out the specific factors and considering the extent of its impact on learning outcomes is an intricate problem. This paper conducted to examine how interactive types and interactive factors impact on student learning outcomes. Research has developed the chain of online learning activities reflect the operational interaction between actors: student - teacher, student - content, student - student and student - technology. The findings indicate that the online learning activities in the blended learning model that affect student learning outcomes, in which the student - student interaction is the significant impact on student results. Based on analysis of these factors, this study proposes a model to assess the incidence of the learning outcomes based on interactive learning through learning activities.

The limitations of the study pose a challenge in the future research. Whether we can develop a model that predict academic performance of students through interactive activities? In other words, whether the course with variety online interactive activities that support learners better or not? Learning analytics has a genuinely efficient method of evaluating the learning process of students and provide information-oriented faculty, the course designed to build or not? The role of the LMS system in the collection and analysis of objective data of students participating in the model instead of the survey polls subjective? Despite limited results, this research can be viewed as a suggestion in the construction of model evaluation, forecasting learning outcomes-based learning activities in blended learning.

7. References

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