Interactivity Factors and Student Engagement in the use of Emerging Technologies in Higher Education

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https://doi.org/10.24191/ajue.v20i3.27850

Received: 25 May 2024
Accepted: 2 July 2024
Date Published Online: 28 October 2024
Published: 28 October 2024

Abstract: The global COVID-19 pandemic witnessed unprecedented challenges in all aspects of our lives, including higher education. One of the key challenges is that lessons are delivered almost on the fly, with both lecturers and students adjusting to the flow of the lessons. A popular solution adopted in teaching and learning at all levels is integrating various emerging technologies, including Google Classroom and Team Meeting, live streaming, and cloud platforms. Using the six learning types (acquisition, inquiry, discussion, practice, collaboration, and production) based on Laurillard's (2012) Conversational Framework, this quantitative study examined to what extent emerging technologies and interactivity factors have impacted student learning engagement in the context of online classrooms. Hence, this quantitative study entails a survey questionnaire to obtain insights into the phenomena of emerging technologies as teaching and learning tools and their impact on student learning engagement from students' perspectives. 103 undergraduate students were selected randomly at the Faculty of Education from a public university in Selangor. The study used descriptive and inferential statistical analysis to answer the research questions. The study's outcome demonstrated that student learning engagement was not affected by gender, the discipline of research or CGPA. Student and content factors were more associated with student learning engagement than instructor factors. Multiple regression analysis indicated that student and content factors contributed significantly to student learning engagement. However, instructor factors, emerging technologies and online platforms did not impact student learning engagement in the online classroom. This study implies that higher learning institutions should pay more attention to student and content factors while designing online lessons. Emerging technologies, online platforms and instructor factors are supposed to support online learning, but they are not the determining factors for the success of online learning.

Keywords: Content factors, Emerging technologies, Instructor factors, Online learning, Online platforms, Student factors, Student learning engagement,

1. Introduction

There are varying definitions of student engagement in the literature; however, several common concepts and factors are evident across all the definitions. It is generally agreed that the notion of engagement stemmed from Astin's (1984) research on student involvement in the 1980s (Abdul Aziz, 2017). In his theory, Astin proposed that student involvement refers to 'how students spend their time in college and how various institutional actors, processes, and opportunities facilitate development' (Harper, 2009, p. 4). This concept has been further expanded by other researchers such as Hu and Kuh (2002). They described student learning engagement as 'the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes' (p. 4). Other researchers, such as Barkley (2010), define student engagement as "a process and a product that is experienced on a continuum and results from the synergistic interaction between motivation and active learning" (p. 9). Another definition refers to the level of curiosity, attention, passion, and motivation that students display while learning (Student-Engagement, 2016). In summary, student engagement comprises elements such as participation, effort, enthusiasm, attention, awareness, and contribution (Marzano & Pickering, 2011).

Some of the characteristics that lead to student engagement are the teacher's planning and methodology of instruction. Student engagement occurs when they are able to answer the following four essential questions: (1) how they feel, (2) how interested they are, (3) how important is what they are learning, and (4) how successful they could be in doing what they are learning (Marzano & Pickering, 2011). However, Schlechty focused on student engagement and pointed out four factors affecting student engagement: attention, commitment, persistence, and meaning in assigned work (Schlechty, 2011). On the other hand, Harris (2011) stated that student engagement usually focuses on student behaviour and academic achievement, yet other factors also denote student engagement, such as attendance, school activities participation, assignment completion, and earned school credits.

2. Literature Review

This study aims to develop an instructional framework for emerging technologies for teaching and learning in the 21st century classrooms. The assessment shall consider the role of learners and their engagement with the content and instructors by adopting Lear, Ansorge, and Steckelberg (2010) Interactivity/Community Process Model for the online education environment framework. By determining students' level of engagement in the virtual environment, this study will shed light on the effectiveness of emerging technologies as a Virtual Learning Management System for higher education in Malaysia amidst the post-pandemic era. The findings of this study have implications towards understanding the outcomes of the online learning experience that can contribute to the formulation of relevant policies and strategies for the implementation of emerging technologies in the Malaysian higher education context.

Moore (1993) identified three types of interaction inherent in effective online courses: (1) learner-to-learner interaction, (2) learner-to-instructor interaction, and (3) learner-to-content interaction. Similarly, Lear et al. (2010) found that interactions with peers, instructors, and content help online learners become active and more engaged in their courses. Given that this study aims to assess the effectiveness of emerging technologies as a teaching and learning tool in higher education classes, a framework incorporating Moore's and Lear et al.'s types of interactions to indicate engagement will be used as a guide.

2.1 Learner-to-Learner Engagement

Learner-to-learner interaction is extremely valuable for online learning and leads to student engagement. Building activities that enhance engagement is essential to prevent online students from experiencing potential boredom and isolation in the learning environment. These activities assist students in feeling connected and can create a dynamic sense of community. Revere and Kovach (2011) and Banna et al. (2015) found that traditional technologies for engaged learning, such as discussion boards, chat sessions, blogs, wikis, group tasks, or peer assessment, have served well in promoting student-to-student

interaction in online courses. It is highly recommended to use web-based applications, such as Twitter feeds, Google applications, or audio and video technology like Wimba Collaboration Suite, to improve engagement in online courses. In a survey of 3,800 students, Shea, Fredericksen, Pickett, Pelz, and Swan (2001) found that when a greater percentage of the course grade was based on discussions, students were more satisfied than they thought they learned more. Learners felt that they had more interaction with their peers and instructors. Meanwhile, Banna et al. (2015) suggested using videoconferencing or chatting in synchronous activities and discussion boards in asynchronous activities to enhance student-to-student interaction. The utilization of social media in online courses provides an opportunity to improve engagement through social interaction (Everson, Gundlach, & Miller, 2013; Tess, 2013).

2.2 Learner-to-Instructor Engagement

Previous studies suggest that good learner-to-instructor interaction leads to higher student engagement in online courses (Dixson, 2010; Gayton & McEwen, 2007). The use of multiple student-instructor communication channels may be highly related to student engagement. It is recommended that online instructors pay special attention to student-instructor interactions because they may affect learning outcomes (Dixson, 2010; Gayton & McEwen, 2007). The authors found that good rapport and collaboration between students and instructors in an interactive and cohesive environment, including group work and constructive feedback, are essential for students' engagement, resulting in successful learning outcomes. Students often contact instructors about assignments, course materials, and grades. Still, to be more effective, online instruction should include opportunities for students to interact with one another and instructors pertaining to what makes their learning meaningful. In addition, Gayton and McEwen (2007) propose that instructors' presence in online courses is required to initiate and encourage students' active engagement. At the same time, online instructors should be minimally active in the discussions, especially when the online courses are purposely designed to promote student engagement. This approach allows for more meaningful learning outcomes to transpire. Dixson (2010) and King (2014) agree that there must be cooperation and collaboration between students and instructors in online courses to increase online students' engagement.

Research has found that rapport and collaboration between students and instructors in an interactive environment are important. King (2014) found that students rated thorough and timely instructor feedback on their work as most valuable so that they can make improvements to their learning process. Instructor visibility through mini videos and screencasting is also said to bring many pedagogical benefits. In two separate studies, Dixson (2010) and King (2014) stressed that consistent interaction with students at the individual and group levels helps set academic expectations among students. Instructor assessment of student work and participation using a stated grading policy, providing summative feedback, and posting grades within a specified time frame can be highly beneficial. Revere and Kovach (2011) and Robinson and Hullinger (2008) suggest the use of new but well-established technologies, such as discussion boards, chat sessions, blogs, wikis, group tasks, Twitter, Skype, YouTube, and Ning networks, to foster student engagement through course design and technology integration. These technologies are also used for effective social networking activities in active online learning to increase student engagement.

2.3 Learner-to-Content Engagement

Learner-to-content engagement is the process of intellectually interacting with the content, which can change a learner's understanding and perspectives (Moore, 1993). Abrami, Bernard, Bures, Borokhovski, and Tamim (2011) state that student-to-content interaction can occur while watching instructional videos, interacting with multimedia, and searching for information. Both synchronous and asynchronous delivery are seen as effective options that help students engage better with critical content (Banna et al., 2015). Online instructors are advised to invest sufficient time searching for scholarly reading and interactive instructional materials and designing well-thought-out assessments to encourage student-to-content engagement (Abrami et al., 2011; Banna et al., 2015). Real-world application of projects that

enhance subject mastery and critical thinking skills is one of the strategies for fostering learner-to-content engagement. Such materials are authentic and highly relatable, built from real-world examples (Britt, 2015). Making the content come alive through suitable technology will also help enhance students' engagement and focus on the content (Revere & Kovach, 2011). Nevertheless, online instructors should be meticulous and critical in choosing materials and content they wish to use to engage students with their lessons. Online students should not merely be given a list of resources. Instead, instructors should design authentic activities that provide ample opportunities for student participation, strategic communication, and student-to-student and student-to-instructor discussions.

2.4 Conceptual Framework

In brief, this study adopts Lear et al.'s (2010) distance education online environment interactivity/community-process model. The model represents the variables and constructs involved in students' engagement with online learning. It shows the relationship and flow between interactivity, instructional technologies, and the engaged learner. They found interactivity and instructional technologies correlated to learner engagement. The conceptual framework of this study is presented as follows (Figure 1).

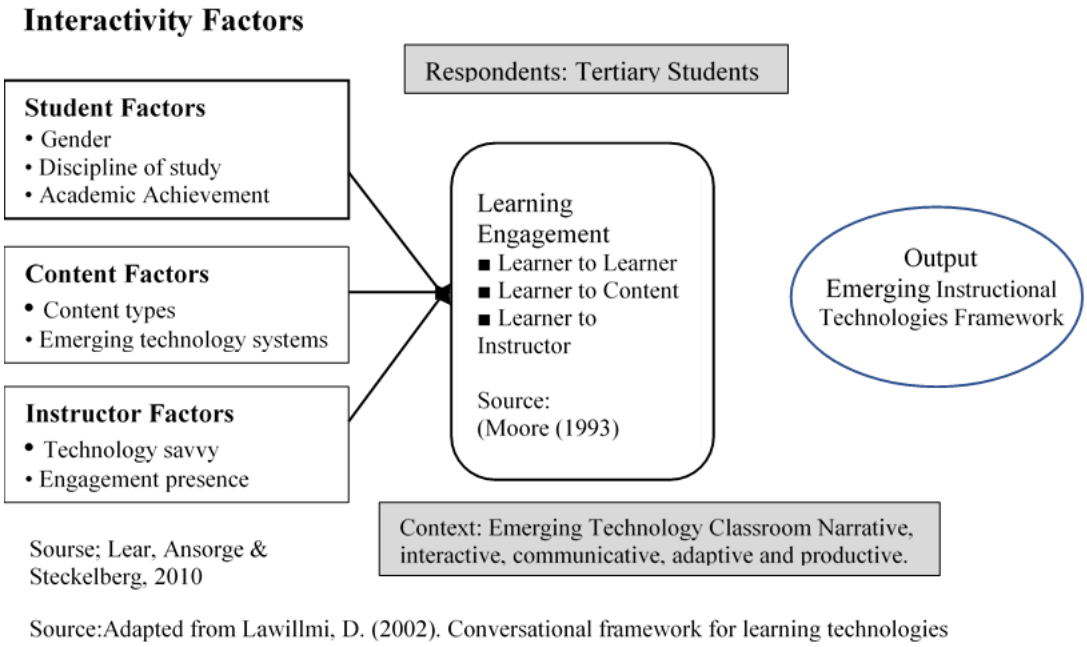

Fig. 1 Emerging Instructional Technologies Framework for Higher Education. From "Interactivity/Community Process Model for the Online Education Environment," by J. L. Lear, C. Ansorge, and A. Steckelberg, 2010, Journal of Online Learning and Teaching, 6, p. 74.

Based on the literature reviewed above, it can be seen that the conceptual framework (Figure 1) is adapted from the conversation framework from Laurillard (2002) alongside Lear et al.'s (2010) distance education online environment interactivity/community-process model:

- There are three independent variables of interactivity factors: student factors, instructor factors, and content factors. The student factors consist of gender, discipline of study, and academic achievement. The content factors consist of two constructs: content types and emerging technology

systems. The instructor factors consist of two constructs: technology savvy and engagement presence.

- The dependent variable identified is the students' learning engagement, which consists of three dimensions: learner-to-learner, learner-to-content, and learner-to-instructor. The interactivity factors are deemed to impact the students' learning engagement in the contexts of emerging technology classrooms, where different types of learning, such as narrative, interactive, communicative, adaptive, and productive, will be employed.

Accordingly the research objectives of the study are as follows: (1) to examine if there are any significant differences in a student's learning engagement concerning gender, discipline of study and academic achievement, and (2) to investigate to what extent student factors, content factors and instructor factors have contributed to learning engagement in the context of using emerging technologies in the classroom.

3. Research Methodology

3.1 Research Design

In this study, the data collection process involved a quantitative approach via a survey questionnaire to examine respondents' perceptions of student engagement with emerging technologies in the post-pandemic teaching and learning process. The quantitative approach views data from a descriptive-correlational perspective to determine students' perspectives of emerging technologies and examine if there are any significant differences in students' learning engagement concerning gender, the discipline of study and academic achievement. Besides that, the quantitative aspect is intended to shed light on the extent to which student factors, content factors, and instructor factors have contributed to learning engagement in the context of the use of emerging technologies in the classroom.

3.2 Sampling and Population

This study was conducted at the Faculty of Education at a public university in Selangor, Malaysia. The university selected is a comprehensive university focusing on teaching and learning. The population of this study comprises undergraduate students at the Faculty of Education. The selected respondents were required to answer the survey questionnaires. A total of 103 undergraduate students have been selected to participate in this study. These students were chosen from the disciplines of social sciences. The selection of the participants was based on the criteria that their lecturers have used certain emerging technologies such as Google Classroom or Microsoft Team as a virtual additional classroom in the teaching and learning process since the March 2020 semester. The sample was selected based on the cluster or group of learning, and then systematic random sampling was used to select the samples from the clusters or groups that have been identified.

3.3 Instrumentation

The study involved the use of a survey questionnaire developed by the researchers based on the National Survey of Student Engagement (NSSE) from Indiana University. This questionnaire was designed to assess the extent to which students engage in emerging technologies in teaching learning in 21st-century classrooms and how the class interactivity factors have impacted student engagement in higher education. The original questionnaire consists of four general themes: academic challenge, learning with peers, experiences with faculty, and campus environment. These items were adapted to suit the survey using online virtual platforms such as Google Classroom and Teams, employed in the selected university for effective teaching and learning in higher education. Additional items were added to gauge the impact of interactivity factors on student engagement in the context of using emerging technologies in the classroom. Overall, the

questions cover various aspects of the relationship between interactivity factors (student factors, instructor factors, content factors) and students' learning engagement in emerging technology classrooms. Literature related to interactivity factors and student learning engagement was reviewed to conceptualise the items for this research instrument.

A pilot test was conducted to refine the quantitative instruments before final data collection. The validity of the adapted questionnaire was validated by a panel of two experts in the field of educational research. The reliability of the instrument was established by conducting a pilot study with approximately 30 tertiary students from the same university. The pilot test showed that the Cronbach Alpha values for all the dimensions of the items were at excellent levels, as illustrated in Table 1 below:

Table 1: Reliability Index for All the Dimensions in the Research Instrument

Variable	No of Item	Cronbach Alpha	Decision
Emerging Technologies used in online distance learning	20	.898	Very good
Platform Used in Online Distance Learning	36	.752	Good
Perspectives of Emerging Technologies as a viable Teaching and Learning tool	34	.898	Very good
Learner-to-Learner	10	.836	Very good
Learner-to-Instructor	10	.894	Very good
Learner-to-Content	9	.924	Excellent
Student Engagement	8	.921	Excellent

3.4 Data Collection and Data Analysis

The quantitative data were collected using survey questionnaires in the form of closed-ended questions from 103 undergraduate students from the selected university. The main aim of the questionnaires was to examine students' perceptions of emerging technologies and their perceptions of interactivity factors and learning engagement. The Google form was used to collect quantitative data from the respondents through WhatsApp and email. The demographic factors data collected via survey questionnaires were analysed using descriptive statistics such as Mean and Standard Deviation. Besides, an inferential statistical analysis such as a t-test or Analysis of Variance (ANOVA) was used to determine student engagement based on demographic factors such as gender, the discipline of study and academic achievement. To assess the relationship between the interactivity factors (student factors, instructor factors and content factors) that have impacted student engagement, Pearson Product Moment Correlation and Multiple Regression were employed.

4. Findings and Discussion

4.1 Demographic Analysis

Demographic analysis shows that the information from 103 undergraduate students in the last semester includes their gender, age, ethnicity, discipline of study, and the average number of hours spent each day in an ODL class.

Table 2: Frequency of demographic data of gender, age, ethnicity, discipline of study and average number of hours spend each day in ODL class (n=103)

Item	Frequency	Percentage
Gender		
Male	32	31.1
Female	71	68.9
Age		
19-24 years old	103	100.0
25-31 years old	0	0
Ethnicity		
Malay	96	93.2
Chinese	0	0
Indian	0	0
Others	7	6.8
Discipline of study		
Humanities and Social Sciences	48	46.6
Business and Management	2	1.9
Science and Technology	53	51.5
Academic achievement (CGPA) last semester		
CGPA < 2.1	0	0
CGPA 2.1 – 2.5	3	2.9
CGPA 2.6 – 3.0	2	1.9
CGPA 3.1 – 3.5	54	52.4
CGPA > 3.5	44	42.7
The average number of hours spend each day in an ODL class		
Less than 1 hour	6	5.8
1 – 2 hours	18	17.5
3 – 6 hours	61	59.2
7 – 10 hours	16	15.5
11 – 15 hours	2	1.9
The average number of hours spend each day in an ODL class		
Less than 1 hour	6	5.8
Total	**103**	**100.0**

The participants' demographic information is demonstrated in Table 2. In terms of gender, there were 71 female respondents (68.9%) and 32 male respondents (31.1%) who responded to the questionnaire. The data showed that most of the respondents were female. There were 103 respondents aged between 19-24 (100%) and 0 respondents aged between 25-31. A total of 96 respondents were Malay, which brought a value of 93.2%, followed by other ethnic groups, with a total of only 7 respondents, contributed to 6.8% of

the total respondents. The result showed that most respondents were studying in the humanities and social sciences (48 (46.6%). In contrast, others were in science and technology 53 (51.5%), and 2 respondents were from the business and management discipline (1.9%). Table 1 also demonstrated a total of 54 respondents achieved a CGPA of 3.1- 3.5, with a percentage of 52.4%. Another 44 respondents attained a CGPA of 3.5 and above, with a rate of 42.7%. 3 respondents (2.9%) achieved a CGPA of 2.1-2.5, and 2 respondents achieved a CGPA of 2.6 – 3.0 with a percentage of 1.9%. However, none of the respondents got a CGPA lower than 2.1. That sums up the total number of 103 respondents. Table 1 also shows the average hours spent daily in an ODL class. 61 respondents spent 3-6 hours each day in an ODL class, bringing the value to 59.2%. Besides, the findings show that 18 respondents spent 1-2 hours each day in an ODL class, with a percentage of 17.5%. 16 respondents spent 7-10 hours (15.5%), 6 respondents spent less than 1 hour per day (5.8%), and 2 respondents spent 11-15 hours a day contributed to 1.9% of the total respondents.

4.2 Differences in student learning engagement concerning gender, the discipline of study and academic achievement

The following research question was whether female and male students differ in their learning engagement. An independent sample t-test was conducted to answer this question, and the result is shown in Table 3.

Table 3: Independent sample t-test of the students' learning engagement with gender (n=103)

Gender	N	Mean	Std. Deviation	T	p-value
Male	32	4.42	1.13	-.061	.951
Female	71	4.43	1.00		

Levene's Test (F=1.712, P=.194)

The finding in Table 3 shows that the t value = -.061, df= 101, P > .05. This result indicates that there was no significant difference between male and female students in terms of learning engagement. The Levenes test further confirmed that variance was homogeneous between male and female students. Hence, the result was valid. It aligned with a finding by Cha, Kim and Kim (2022), who discovered that gender did not play a significant role in students' perspective toward online learning (p.53).

Table 4: ANOVA of the students' learning engagement with the disciplines of study (n=103)

Discipline of study	N	Mean	SD	F	P-value
Business & Management	2	5.00	.00	1.60	.21
Science & Technology	53	4.57	1.02		
Humanities & Social Science	48	4.25	1.02		
Total	103	4.43	1.02		

This research question also seeks to determine whether students from different disciplines of study differ significantly in their learning engagement. An ANOVA test was conducted, and the result was presented in Table 4 (F value = 1.595, df = 2, 100, p>.05). The result indicated no significant difference among the students from the three different disciplines of study. In other words, the students from the three disciplines of study did not show any significant levels of learning engagement. This finding has been supported by a study by Cha, Kim and Kim (2022), which found that overall perspectives towards online classes did not differ significantly by their majors in the study (p. 53).

Table 5: ANOVA of the students' learning engagement with academic achievement (CGPA) (n=103)

CGPA	N	Mean	SD	F	P-value
CGPA < 2.1	0	0	0	.20	.89
CGPA 2.1 – 2.5	3	4.71	.315		
CGPA 2.6 – 3.0	2	4.69	1.149		
CGPA 3.1 – 3.5	54	4.46	1.076		
CGPA > 3.5	44	4.36	.989		
Total	103	4.43	1.02		

Lastly, this research question aims to determine whether academic achievement (CGPA) differs significantly in learning engagement. An ANOVA test was conducted, and the result in Table 5 (F value = .20, df = 3, 99, P > .05) indicated that there was no significant difference in the aspect of students' learning engagement among the students with different academic achievement (CGPA). This finding was supported by a study by Riaz, Batool, Naeem, and Qayyum (2021), which discovered no substantial variance among the CGPA groups concerning classroom engagement learning and online teaching.

4.3 Contribution of student factors, content factors and instructor factors to learning engagement in the context of the use of emerging technologies in the online classroom

A Pearson Product Moment Correlation test was conducted to examine whether there is a relationship between student, content, and instructor factors and student learning engagement when using emerging technologies in the classroom.

Table 6: Correlation between student factors, content factors and instructor factors and learning engagement in the context of the use of emerging technologies in the classroom (n=103)

Variables		Students learning engagement
Student factors	Pearson Correlation	.478**
	Sig. (2-tailed)	.000
	N	103
Instructor factors	Pearson Correlation	.435**
	Sig. (2-tailed)	.000
	N	103
Content factors	Pearson Correlation	.501**
	Sig. (2-tailed)	.000
	N	103

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

The correlation result shows a moderate positive relationship between student factors and students' learning engagement, with r=.478 and p<.01 (Table 6). This result aligned with a study from Miao, Chang and Ma (2022), which showed a significant effect of student-student on students' learning engagement in online environments. The interaction between the students was highly beneficial to the overall online learning experience and one of the key drivers of student engagement.

The same correlation test between instructor factors and student learning engagement also showed a moderate and positive relationship between instructor factors and student learning engagement in the context of the use of emerging technologies in the classroom, with r=.435 and p<.01. In fact, one of the essential components in boosting student learning engagement has been identified as teacher-student interactions, which seems to urge instructors and institutions to place more significant importance on this specific role of instructors. A study by Groves et al. (2015) also found that the quality of student

relationships with their teachers was the most determining factor affecting student engagement (Delfino, 2019, p. 3).

Besides, the correlation result also showed that there was a moderate and positive relationship between content factors and student learning engagement, with r=.501 and p<.01. It was aligned with a study from Kumar, Saxena and Baber (2021), which discovered that both the learning content and website content provided in the online study environment were crucial factors of e-learning quality which have positively influenced e-learning quality and student satisfaction. The interaction with the course material has been connected to the quality of the course material, which in turn influences student's learning engagement. When learners are exposed to high-quality content, they are more likely to be engaged in learning. It was clear that content factors have the most vital link, followed by student factors and the least correlated factor with student learning engagement was identified as the instructor factors.

Table 7: Multiple regression of student factors, content factors and instructor factors contributed to learning engagement in the context of the use of emerging technologies in the classroom (n=103)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.92	.82		-1.11	.267
	Content factors	.62	.21	.33	2.9	.004
	Student factors	.58	.25	.27	2.3	.026
	Instructor factors	.06	.25	.03	.22	.828

a. Dependent Variable: Student Engagement
b. R=.554, R^2=.307, Adjusted R^2= .286, F = 14.632, p < .05
c. Predictors: (Constant): content factors, student factors, instructor factors

A multiple linear regression was conducted to predict which of the three interactivity factors has contributed the most to student learning engagement in the context of using emerging technologies in the classroom. Table 7 shows the model summary, which identified that R = .554 indicated a correlation between the observed (independent variable) and predicted student learning engagement (dependent variable) values. R square=.307 showed the proportion of variance in the student learning engagement (dependent variable) that can be predicted by the three independent variables (student factors, content factor and instructor factor). This value indicated that 30.7% of the variance in student learning engagement was contributed by these three interactivity factors, namely student factors, content factors and instructor factors.

The coefficient value for content factors was .33. Hence, for every unit increase in content factors, the researcher expected a .33-point increase in student learning engagement. This was statistically significant at t= 2.9, p<.01. The finding of this research is consistent with the prior findings by Pham, Le and Do (2021), who discovered that course content has a positive effect on students' online learning outcomes. The quality of the course material has been linked to interaction with the material, which in turn influences student satisfaction. Learners are likely to be engaged and successful when exposed to high-quality content. This is because when students find their coursework engaging, they are more motivated to participate in and take active responsibility for their education.

Table 8: Multiple regression of emerging technologies, online platforms, student factors, content factors and instructor factors to student learning engagement in the context of the use of emerging technologies in the classroom (n=103)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.01	1.56		-.65	.518
	Content factors	.62	.21	.33	3.0	.004
	Student factors	.58	.25	.27	2.3	.024
	Emerging technologies	.61	.11	.05	.58	.561
	Instructor factors	.06	.25	.030	.22	.828
	Online platforms	-.06	.78	-.01	-.08	.937

a. Dependent Variable: Student Engagement
b. Predictors: (Constant): Emerging Technologies, Online Platforms, Student Factors, Content Factors, Instructor Factors
c. R=.557, R^2=.310, Adjusted R^2= .274, F = 8.707, $p < .05$

Next, the coefficient value for the student factor was .27. For every unit increase in student factors, a .27 point was expected to increase student learning engagement. This was confirmed statistically with the results of t= 2.3, p<.05. The result aligned well with the study conducted by Leslie (2019), who found positive responses were gained through the learning activities which promote student-to-student engagement (as cited in Wahid, Rahmat, Dzuradeen and Kadir, 2020). To keep online students from getting bored and feeling alone in their learning environment, it's important to create activities that keep them interested. For example, Banna et al. (2015) suggested using videoconferencing or chatting in synchronous activities and discussion boards in asynchronous activities because they can enhance student-to-student interaction (Martin & Bolliger, 2018, p. 209). These activities help students feel connected and can help to build a strong sense of community.

However, Table 7 inferred that the instructor factor (t = .22, p>.050) was not a significant predictor for student learning engagement. This was aligned with a study by Weerasinghe, Ramberg and Hewagamage (2012), who found that students in online discussions could engage in deep and meaningful learning, even when the facilitator (teacher) was not involved in the discussions. Successful engagement is achievable even without teacher or facilitator interactions as long as students have the motivation, regulation skills, and willingness to engage with peers.

Overall, the multiple regression analysis has indicated a significant contribution of the two above-mentioned variables of student factors and content factors (R2 = .307, F (3, 99) = 14.632, $p < .05$). Thus, both content factors and student factors can be reliably used to predict the student learning engagement in the context of the use of emerging technologies in the classroom.

Multiple linear regression was conducted to predict which of the five factors has contributed most to student learning engagement in the context of using emerging technologies in the classroom. Table 8 shows the model summary, which identified that R = .557 indicates a correlation between the observed value and predicted values for student learning engagement. R square=.31 stated the proportion of variance in the student learning engagement (dependent variable), which can be expected from the five independent variables (emerging technologies, online platforms, student factors, content factor and instructor factor). This value indicated that 31% of the variance in student learning engagement was contributed by these five factors: emerging technologies, online platforms, student factors, content factors and instructor factors.

Table 8 showed that the coefficient for content factors was .33. So, for every unit increase in student factors, a .33 point was expected to increase student learning engagement. This was confirmed with t= 3.0, p<.01 statistically. A study by Pham, Le and Do (2021) found that course content positively affects students'

online learning outcomes. This is due to interesting course learning material. Hence, students are more likely to participate and take charge of their learning. Next, the result also shows that the coefficient value for student factors was .27. For every unit increase in student factors, a .27 point was expected to increase student learning engagement. This was confirmed with $t= 2.3$, $p<.05$ statistically. Research studies by He (2013) discovered that students interacted more actively with their peers than their instructors (as cited in Mutalib, Halim and Yahya, 2016).

However, Table 13 inferred that the online platform ($t = -.079$, $p>.050$) was not a significant predictor for student learning engagement. This was aligned with research done by Wut and Zu (2021), who found that online classrooms create restrictions for providing feedback, posting additional questions, and requesting clarifications on issues. One of the respondents in their study also stated that they could verbally raise questions immediately after class during face-to-face lectures. Still, now they have to think about how to put their questions in e-mails or deliberately make appointments with the teachers. As a result, the students were hesitant to express their opinions openly and directly with their instructors.

Table 8 also shows that instructor factors ($t = .22$, $p>.050$) were not a significant predictor for student learning engagement in online learning. Research conducted by Rahman, Omar, Fatzel and Isa (2022) also found that learner-instructor interaction did not significantly predict student satisfaction and student-perceived learning in ODL. Other than instructor factors, emerging technologies ($t = .58$, $p>.050$) were also not a significant predictor for student learning engagement. A study by Chen, Chen, Wang and Huang (2020) found that almost all of the teachers (93.3%) believed that when online teaching's real-time interaction was reduced, they had difficulty perceiving students' status and getting timely feedback (p.12). Their study stated that the streamer in a live streaming platform didn't care much about what the viewer was doing. Still, in a formal teaching environment, teachers and students must perceive each other, making the lack of body language and eye contact a severe concern in the LVS-based class (p.13). Overall, the multiple regression analysis has indicated a significant contribution of the two above-mentioned variables ($R^2 = .310$, $F (5, 97) = 8.707$, $p <.05$) to student learning engagement. Thus, The multiple regression models in Tables 7 and 8 have further confirmed that both content factors and student factors can be reliably used to predict student learning engagement in the context of using emerging technologies in the classroom.

5. Conclusion

Because they have fewer opportunities to interact with the institution, online learners must be engaged for learning to be successful. Thus, it is crucial to provide a variety of avenues for student participation in the virtual classroom. The goal of engagement strategies is to facilitate positive learning experiences for students. Examples of active learning opportunities include collaborative group projects, student-led presentations and discussions, resource sharing, course assignments with practical components, and the incorporation of case studies and reflections. According to Meyer (2014), Banna et al. (2015), and Britt (2015), there is a significant difference between a low and high level of student success in online learning. This is because high levels of student engagement are attributed to the considerable effort that students put forth, which is necessary for their cognitive development and their ability to create knowledge.

6. Co-Author Contribution

The first co-author was responsible for proofreading and writing the literature review and theoretical underpinnings. The second and third co-authors were responsible for putting the paper together, writing the introduction and methodology chapter, and overseeing its overall flow and coherence. The fourth and fifth co-authors were responsible for data collection, analyses, and proofreading of the article.

7. Acknowledgement

The research team would also like to express their gratitude to the Faculty of Education, Universiti Teknologi MARA and the Faculty of Education, Languages & Psychology, SEGI University Research

Management Centre, Universiti Teknologi MARA (UiTM), for supporting this research under the matching grant scheme with the Project Code [Ruj: 100-TNCPI/PRI 16/6/2 (039/2023)].

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