Influences of Gender, Major and Age Differences on Student Engagement in Blended Learning Environment

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Abstract. Digital technology has transformed teaching and learning, blended learning (BL) has become ubiquitous. Student engagement (SE), which consists of behavioural, cognitive and emotional engagement, is a prerequisite for successful implementation of BL. To effectively enhance SE in BL, influences of gender, age and major on student engagement in BL should be investigated. This article used SPSS 26 to conduct independent T-test and one-way ANOVA analyses to identify influences of gender, age and major on SE. Superstar platform is incorporated to create a BL environment, which is popular in Chinese higher education. Findings show that: it is not statistically significant in behavioural engagement (BE) between male students and female students. Male students have higher average levels of CE and EE than female students. Students from liberal arts or science do not have significant differences in BE, CE and EE. Students among different ages have significant difference in emotional engagement, and do not have significant differences in behavioural or cognitive engagement.

Keywords: gender differences · age differences · major differences · student engagement · blended learning

1 Introduction

In recent years, Blended learning (BL) has become normal due to the development of digital technology, which is the thoughtful fusion of face-to-face and online learning experiences (Garrison & Vaughan, 2008). Student engagement (SE) matters in tertiary education today as it is likely to produce positive learning outcomes for students and have an important impact on student satisfaction, in-depth learning, and perseverance [4, 8, 10, 11, 16]. SE in BL environment has attracted many scholars' attention [1, 9, 19]. However, SE in BL may vary across gender, age and major, which is neglected by most researchers. This article reports on an investigation in a tertiary institution in China, which analysed data from a survey of SE in BL environment in order to answer these questions: What can we learn about gender, age and major differences in student engagement in BL?

Ralph Tyler's research on the connection between time spent learning and SE grabbed scholars' attention 70 years ago [12]. Since then, there has been a significant evolution and expansion of SE research [18]. In recent years, it has received a lot of research [2, 3, 8, 9, 15, 17, 19]. We may claim that successful students are more likely to be those who are engaged in their studies. Many scholars (Bond et al., 2020; [7] Christenson et al., 2012; [11, 17] Halverson & Graham [8] agreed that SE emphasis on academic engagement in a course environment and that it has three interrelated dimensions: behavioural, emotional, and cognitive.

The degree to which students actively participate in learning activities is how these scholars describe student behavioural engagement [6, 11, 18]. According to Schindler et al. [18], Kahu [11], and Kuh [12], behavioural engagement indicators include interaction with peers, instructors, and staff as well as time and effort invested in learning activities [6, 11, 12, 18]. Next, student cognitive engagement refers to how much time and effort students put into learning and mastering material [6, 18]. The main indicators of cognitive engagement are motivation to learn [18], perseverance to overcome obstacles in the classroom and meet or exceed requirements [6, 12, 18], deep processing of information [6, 11, 18] Last but not least, student affective reactions to learning are referred to as student emotional engagement [6, 18]. A sense of belonging to a learning community and attitudes, interests, and values toward learning are examples of emotional engagement indicators [6, 11, 18].

Though numerous research has emphasized the significance of students' engagements in higher education, the literature has shown relatively few studies that examine engagement levels based on a student's gender, age, or major. In order to resolve this issue, this research has been conducted. By identifying the differences of students' BE, CE and EE in different gender, ages, majors, it can be a good foundation to intervene and enhance SE, which can be more accurate and efficient.

2   Engagement Scale

The items in this instrument revolving around three engagement dimensions are cited frequently by experts in this field. Teng & Wang [19] designed this questionnaire, which was adapted Nelson Laird & Kuh [13], Moreira et al. (2020) about student engagement measurement in blended learning environment in higher education. Teng & Wang [19] carefully chose the five most easily identified student engagement indicators according to the engagement dimension from the corpus of 243 studies and based on the teaching characteristics of English language courses. This questionnaire was also revised by a psychologist expert, was trialed by the expert and the researchers. Teng & Wang [19] stated the T-test showed that the survey is scientific and valid. In addition, a reliability analysis was conducted to test the inter-consistency and the result revealed the Cronbach's Alpha in three dimensions of student engagement, with behavioural engagement, cognitive engagement and emotional engagement 0.939, 0.960, 0.939 respectively, which proved its good reliability [19].

Table 1. Results of Reliability Statistics (by the author)

Constructs	Cronbach's Alpha	Results
BE (pre)	0.914	Acceptable
CE (pre)	0.839	Acceptable
EE (pre)	0.894	Acceptable
BE (post)	0.931	Acceptable
CE (post)	0.879	Acceptable
EE (post)	0.892	Acceptable

3 Reliability Test of Instrumentation

Reliability testing is a method to assess the stability and consistency of an instrument used to measure a concept. It also helps to assess the "quality" of a measure over time and across all of the instrument's various elements.

The internal consistency reliability coefficient of the instrument was assessed using the Cronbach's Coefficient Alpha (α) reliability analysis process using SPSS version 26. According to Sumintono and Widhiarso (2014), the Cronbach Alpha, which assesses the interaction between "persons" and "items," has an "Excellent" reliability score of + 0.96 logit. The coefficient of reliability value, in theory, lies between 0.00 and 1.00.

Cronbach's Coefficient Alpha (α) reliability analysis approach was used to measure the following instruments of variables. Table 1 shows that results of BE, CE and EE are acceptable, which ensure the reliability of instrumentation.

4 Findings and Analysis

4.1 Gender Differences on BE, CE and EE

The grouping statistics table (Table 2) shows that there is little difference between the average BE of male and female, which is very close, 3.2478 and 3.2409 respectively. there are differences in CE and EE. The average CE and EE of male are higher than that of female. The average CE and EE of male are 3.2089 and 3.1962 respectively, the average CE and EE of female are 3.0885 and 3.0954 respectively.

According to independent samples test formula: $t = \dfrac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$, Table

3 shows the result, Levine homogeneous variance test shows that the significance probabilities of the three variables are 0.001, 0.000 and 0.003 respectively, which are less than 0.05. "Equal variables not assumed" should be assumed. There is no significant difference in BE between male students and female students, p = 0.878 > 0.05, while there is a significant difference in CE and EE, p is 0.013 in CE and p is 0.044 in EE, p < 0.05. Male students have higher average levels of CE and EE than female students.

Table 2. Group Statistics of Gender Differences in BE, CE and EE (by the author)

	Gender	N	Mean	Std. Deviation	Std. Error Mean
BE	Male	490	3.2478	0.72301	0.03266
	Female	373	3.2409	0.59882	0.03101
CE	Male	490	3.2089	0.78753	0.03558
	Female	373	3.0885	0.64064	0.03317
EE	Male	490	3.1962	0.78519	0.03547
	Female	373	3.0954	0.68113	0.03527

Table 3. Gender Differences in BE, CE and EE (by the author) Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Mearns					95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
BE	Equal variances assumed	10.303	0.001	0.150	861	0.881	0.00691	0.04619	-0.08375	0.09757
	Equal variances not assumed			0.153	854.871	0.878	0.00691	0.04504	-0.08148	0.09530
CE	Equal variances assumed	16.350	0.000	2.409	861	0.016	0.12046	0.05000	0.02231	0.21860
	Equal variances not assumed			2.476	857.199	0.013	0.12046	0.04864	0.02499	0.21593
EE	Equal variances assumed	9.030	0.003	1.978	861	0.048	0.10084	0.05099	0.00077	.20092
	Equal variances not assumed			2.016	846.397	0.044	0.10084	0.05002	0.00267	0.19902

Table 4 Major Differences in BE, CE and EE (by the author)

	Liberal arts or science	N	Mean	Std. Deviation	Std. Error Mean
BE	Liberal arts	409	3.2738	0.64740	0.03201
	science	454	3.2187	0.69271	0.03251
CE	Liberal arts	409	3.1650	0.70881	0.03505
	science	454	3.1495	0.74879	0.03514
EE	Liberal arts	409	3.1624	0.73935	0.03656
	science	454	3.1438	0.74751	0.03508

4.2   Major Differences on BE, CE and EE

According to independent samples test formula, the grouping statistics table (Table 4) shows that students from liberal arts have slightly higher mean levels of BE, CE and EE than students from science. Liberal arts students' BE, CE and EE are 3.2738, 3.1650 and 3.1624 respectively, while science students' BE, CE and EE are 3.2187, 3.1495 and 3.1438 respectively.

In the independent samples test (Table 5), Levine homogeneous variance test shows that the significance probabilities of the three variables are 0.200, 0.291 and 0.845 respectively, which are higher than 0.05. Therefore, "Equal variables assumed" should be considered. There is no significant difference in BE, CE and EE between liberal arts students and science students, as Sig. (2-tailed) are all higher than 0.005, which are 0.229, 0.755 and 0.714 respectively. Therefore, students from liberal arts or science do not have significant differences in BE, CE and EE.

Table 5. Major Differences in BE, CE and EE (by the author) Independent Samples Test

		Levene's Test for Equality of Variances					t-test for Equality of Mearns	95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference Lower Upper	
BE	Equal variances assumed	1.644	0.200	1.204	861	0.229	0.05515	0.04579 -0.03472 0.14501	

(*continued*)

Table 5. (*continued*)

		Levene's Test for Equality of Variances					t-test for Equality of Mearns	95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference Lower Upper	
	Equal variances not assumed			1.209	859.831	0.227	0.05515	0.04563 -0.03440 0.14470	
CE	Equal variances assumed	1.115	0.291	0.312	861	0.755	0.01553	0.04977 -0.08216 0.11323	
	Equal variances not assumed			0.313	858.883	0.754	0.01553	0.04963 -0.08188 0.11295	
EE	Equal variances assumed	0.038	0.845	0.367	861	0.714	0.01862	0.05070 -0.08083 0.11812	
	Equal variances not assumed			0.367	853.525	0.713	0.01862	0.05067 -0.08083 0.11807	

4.3 Age Differences on BE, CE and EE

The ANOVA test result in BE and CE are not significant, in which $[F_{(5, 825)} = 1.725, p > 0.05]$ and $[F_{(5, 825)} = 1.795, p > 0.05]$ respectively. However, the ANOVA test result in EE is significant in below table, with $[F_{(5, 825)} = 2.6385, p < 0.05]$. Therefore, students among different ages have significant difference in emotional engagement, and do not have significant differences in behavioural or cognitive engagement (Table 6).

Table 6 ANOVA of age differences on BE, CE and EE (by the author)

		Sum of Squares	df	Mean Square	F	Sig
BE	Between Groups	3.846	5	0.769	1.725	0.126
	Within Groups	367.930	825	0.446		
	Total	371.776	830			
CE	Between Groups	4.737	5	0.947	1.795	0.111
	Within Groups	435.537	825	0.528		
	Total	440.274	830			
EE	Between Groups	7.207	5	1.441	2.638	0.022
	Within Groups	450.717	825	0.546		
	Total	457.924	830			

5   Conclusions

In conclusions, male and female students do not differ significantly in BE ($p = 0.878 > 0.05$), but there is a significant difference in CE and EE ($p = 0.013$ and 0.044, respectively, $p < 0.05$). In comparison to female students, male students score higher on average in CE and EE. This demonstrates the differences in attitudes, levels, and cognitive techniques for learning between male and female students. Male college students' learning engagement scores are fairly comparable to those of female college students in learning behaviour.

In terms of major and age difference, there are no notable differences between science or liberal arts students in BE, CE, and EE. While there are not many differences in behaviour or cognitive involvement across students of different ages, there are considerable disparities in emotional engagement. No matter liberal arts or science students, what supports them to study is their enthusiasm and interest in learning, their attention to academic performance, but there is no significant connection with their learning majors.

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