College Students' Computer Self-efficacy, Intrinsic Motivation, Attitude, and Satisfaction in Blended Learning Environments

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Abstract. The purpose of this study was to examine the relationships between students' computer self-efficacy, intrinsic motivation, attitude, and satisfaction in blended learning environments. The participants were 239 college students enrolled at Hubei University in China. A survey including four existing instruments was used for data collection. The results of structural equation modeling analysis suggested students' attitudes toward online and face-to-face classes were the most influential toward to satisfaction in blended learning environments. Higher levels of intrinsic motivation were seen to be influential toward satisfaction in blended learning environments. Computer self-efficacy was seen to influence intrinsic motivation and attitudes, but not found to influence satisfaction in blended learning environments.

Keywords: Blended learning · Computer self-efficacy · Intrinsic motivation · Attitude · Satisfaction

1 Introduction

Blended learning (BL) is a learning approach that utilizes a combination of online and face-to-face learning processes [1]. Although various advantages of BL are widely acknowledged [2–5], insufficient levels of student satisfaction have been noted among the literature as being a negative aspect of BL [6]. As a result, researchers have focused on student satisfaction in BL environments [6, 7]. Among the related studies, Wu, Tennyson, and Hsia [8] identified students' computer self-efficacy, interaction, performance expectations, system functionality, content features, and learning climate were important factors determining students' satisfaction in BL environments. Wu *et al.* [8] also suggested other determinants might influence students' satisfaction in BL environments which have not yet

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been explored. Accordingly, our research focused on students' satisfaction in BL environments by exploring two new factors: intrinsic motivation and attitude.

2 Related Work

2.1 Intrinsic Motivation

Intrinsic motivation relates to participation and engagement that is derived from personal interest and enjoyment [9]. Intrinsic motivation has also been noted as being internationally regulated, and associated with one's inherent satisfaction [10]. Ryan and Deci [11] stated, "because intrinsic motivation results in high-quality learning and creativity, it is especially important to detail the factors that engender versus undermine it." Generally speaking, students' motivation to learn was found to be enhanced in BL environments [12]. However, few studies have focused more specifically on students' intrinsic motivation in BL environments. Consequently, this study includes intrinsic motivation as a research variable.

2.2 Computer Self-efficacy

Computer self-efficacy has been defined as, "judgment of one's capability to use a computer" [13]. In other words, computer self-efficacy refers to the level of conviction someone has in their ability to be effective. Computer self-efficacy has been found to be a significant predictor of students' satisfaction in BL environments [14, 15], however, Wu *et al.* [8] found computer self-efficacy only provided an indirect relationship to student satisfaction. Therefore, conflicting results have been documented for this variable. In an effort to provide clarity on this issue, computer self-efficacy was included as a research variable in this study.

2.3 Attitude

An attitude, as it relates to this study, refers to an affective response toward the performance of some type of BL related behavior [16]. Research has suggested that students' attitudes toward the computer plays an important role in BL environments [17, 18]. Students' attitudes have also been suggested to be particularly important in online learning environments, as one's attitude influences technology acceptance and participation [19, 20]. Despite previous investigation of students' attitudes in BL environments, few research has individually explored the influence of attitude toward the online and face-to-face components of BL separately. Therefore, students' attitudes toward the online and face-to-face BL environments were included as variables in this study.

2.4 Research Model and Hypotheses

Figure 1 illustrates the research model and corresponding hypotheses for exploring the relationships between students' motivation, computer self-efficacy, attitude, and

satisfaction in a BL environment. Nine research hypotheses are show in Fig. 1, the tenth hypothesis is not shown, as it relates to gender influence toward the research model. The ten research hypotheses are as follows:

H1: Computer self-efficacy will positively influence intrinsic motivation.
H2: Computer self-efficacy will positively influence online attitude.
H3: Computer self-efficacy will positively influence BL satisfaction.
H4: Intrinsic motivation will positively influence online attitude.
H5: Intrinsic motivation will positively influence face-to-face attitude.
H6: Intrinsic motivation will positively influence BL satisfaction.
H7: Online attitude will positively influence face-to-face attitude.
H8: Online attitude will positively influence BL satisfaction.
H9: Face-to-face attitude will positively influence BL satisfaction.
H10: Males will show higher levels of computer self-efficacy, intrinsic motivation, attitudes, and BL satisfaction than females.

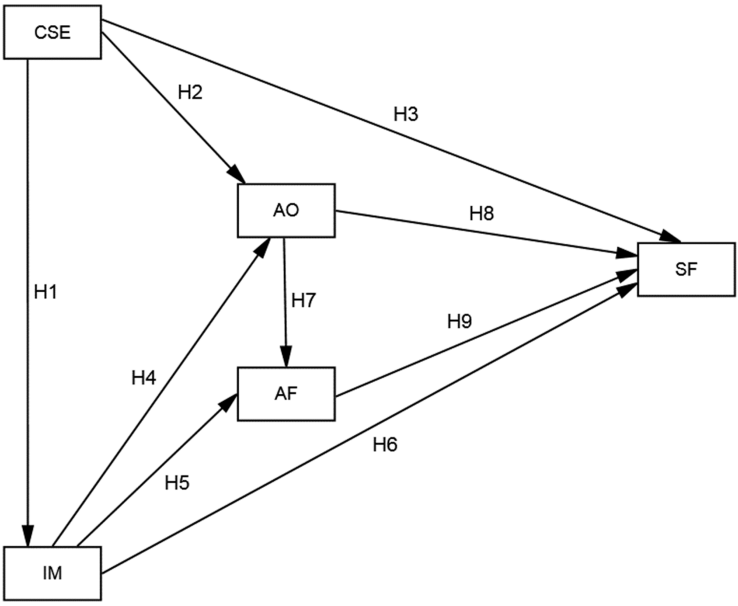

Fig. 1. Research model and hypotheses *Note:* CSE (Computer self-efficacy); IM (Intrinsic motivation); AO (Online attitude); AF (Face-to-face attitude); SF (Satisfaction).

3 Method

3.1 Participants

Participants of this study were purposely selected based on enrollment in college-level courses utilizing a common online platform for BL, Ruanko, which is the learning management system of the Hubei University of Education. 367 online surveys were sent

to the targeted participants. 251 surveys were returned. 12 participant responses were omitted due to incompleteness. This left 239 valid responses for statistical analysis. The majority of participants were between 18 and 20 years of age. The female-to-male ratio was about 4-to-6.

3.2 Instrumentation

The computer self-efficacy, intrinsic motivation, attitude, and satisfaction (CMAS) survey included 43 items. All items were adopted from existing instruments. The computer self-efficacy (CSE) scale was a single construct adopted from Compeau and Higgins' [13] instrument. The intrinsic motivation (IM) scale was a single construct adopted from Pintrich and Groot's [21] instrument. The attitude scales were two constructs adopted from Akkoyunlu and Yılmaz-Soylu's [22] instrument. The two constructs of the attitude scale included online learning attitude (AO) and face-to-face attitude (AF). The satisfaction (SF) scale was adopted from So and Brush's [4] instrument. All survey items were measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

3.3 Data Collection and Analysis

Before administering the survey, approval was granted from teachers to distribute collect data from their BL course students. All participations were voluntary and anonymous. The survey was administered online at the end of the fall semester of 2016. In order to administer the survey in the participants' native language, all items were parallel translated into Chinese by two researchers. Then, the complete CMAS survey was assessed by a bilingual educational technology expert to ensure content validity of the translation. Based on the expert's comments, some items were revised to improve overall readability. The data was imported into Microsoft Excel. Then, Statistical Product and Service Solutions (SPSS) was used for *t*-test analysis. Meanwhile, the sample size of this study is more than 5 times per variable, so Analysis of Moment Structures (AMOS) was suitable for data analysis [23]. Confirmatory factor analysis (CFA) and correlation analysis tests were used to analyze the research model.

4 Results

The results of this study are presented in two stages. First, an overview of the CMAS survey construct validity and reliability is provided. Then, analyses relating to the research model hypotheses are discussed.

4.1 Validity and Reliability

As shown in Table 1, all constructs' composite reliability (CR) coefficients were greater than 0.9 and all the average variance extracted (AVE) were greater than 0.5. These results indicate that all constructs of the CMAS survey have more than satisfactory convergent

validity [24–26]. Table 2 showed the square root of all AVEs were above 0.50 [27] and larger than the respective correlation coefficients [25], which validate discriminant validity for the CMAS survey constructs. In addition, as for the multi-collinearity, despite the correlation coefficient between SF & IM, SF & AO, and SF & AF being higher than 0.8, their *t* values were 6.23, 7.52, and 6.63, respectively. In addition, their variance inflation factor (VIF) scores were 3.13, 3.00, and 3.05, respectively. When all *t* values are above 2 and all VIF scores are below 10, multi-collinearity makes no difference [28].

Table 1. Validity and reliability analysis.

Constructs	Item	Mean	SD	CR	AVE	*a*
CSE	10	3.74	0.86	0.928	0.567	0.923
IM	9	3.80	0.87	0.956	0.707	0.955
AO	6	3.55	1.01	0.958	0.793	0.958
AF	7	3.82	0.93	0.964	0.794	0.964
SF	11	3.72	0.86	0.968	0.735	0.968

Table 2. Correlation analysis.

Constructs	CSE	IM	AO	AF	SF
CSE	0.753[a]				
IM	0.640**	0.841[a]			
AO	0.589**	0.773**	0.891[a]		
AF	0.536**	0.777**	0.766**	0.891[a]	
SF	0.578**	0.831**	0.840**	0.831**	0.857[a]

Notes: [a] square root of the AVE; ** $p < 0.01$.

Table 3. Fit measures for the research model.

Fit index	This study	Recommended value
Chi-squared (χ^2)	0.73	–
Degree of Freedom (df)	2	–
$\chi^{2/}$df	0.36	≤5.00
Goodness of Fit Index (GFI)	1.00	≥0.90
Adjusted Goodness of Fit Index (AGFI)	0.99	≥0.90
Root Mean Square Error of Approximation (RMSEA)	0.00	≤0.08

Furthermore, Table 1 shows all Cronbach's alpha (*a*) values were greater than 0.9, which indicate the CMAS survey has high levels of reliability. Accordingly, the CMAS survey is a valid and reliable instrument.

4.2 Analysis of the Research Model

AMOS was used to explore causal relationships between constructs of the research model. As shown in Table 3, the results indicate that the model has a more than satisfactory level of fit. Figure 2 illustrates the relationships of constructs in the research model. The results indicate that all hypothesized relationships were significant except for one. No significance influence was identified between CSE and SF.

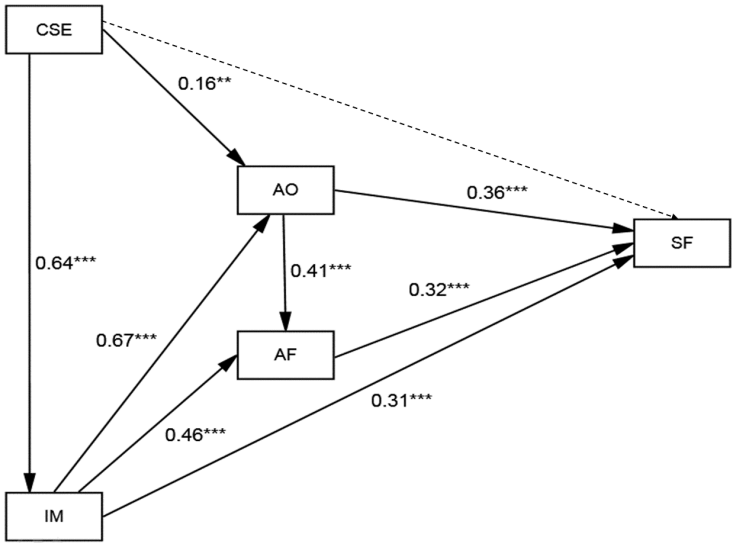

Fig. 2. Relationships between research model constructs *Notes:* ** $p < 0.01$; *** $p < 0.001$.

CSE was found to significantly influence IM and AO, however, CSE showed no direct effect on SF. The results indicated students with higher levels of CSE tended to also possess higher levels of IM and AO. Thus, H1 and H2 were supported; H3 was rejected.

IM was found to significantly influence AO, AF, and SF. These results indicate higher levels of IM influences both types of student attitudes and SF. Thus, H4, H5, and H6 were all supported. In regards to students' attitudes, AO was found to significantly influence AF, and both AO and AF were found to significantly influence SF. Thus, H7, H8, and H9 were all supported.

4.3 Analysis of Gender Influence

As shown in Table 4, male students showed significantly higher levels of IM and SF than female students. As for the constructs of CSE, AO, and AF, no significant difference was observed between genders, however, male students showed higher scores in all these aspects. Thus, H10 was partially supported.

Table 4. Analysis of gender influence on the research model constructs.

Constructs	Male		Female		*t*
	Mean	SD	Mean	SD	
CSE	3.86	0.88	3.59	0.82	2.47
IM	3.92	0.92	3.65	0.77	2.44*
AO	3.67	1.04	3.39	0.95	2.13
AF	3.87	0.98	3.75	0.86	1.00
SF	3.81	0.95	3.61	0.73	1.73**

Notes: * $p < 0.05$; ** $p < 0.01$.

5 Discussion and Conclusion

The purpose of this study was to explore the relationships between college students' computer self-efficacy, intrinsic motivation, attitude, and satisfaction in the context of the self-blend model of BL. The results of this study showed that students' attitudes toward online and face-to-face classes were the most influential variable that related to students' satisfaction in the BL environment. Higher levels of intrinsic motivation were also seen to be positively influential toward students' satisfaction. Computer self-efficacy was seen to influence intrinsic motivation and attitudes, however, computer self-efficacy was not found to directly influence satisfaction.

The results imply that instructors should consider students' attitudes in both environments, as students' attitudes were most influential toward satisfaction in BL. Furthermore, instructors should apply more emphasis toward students' attitudes toward the online components of the BL, as this aspect was seen to be the strongest relationship to students' satisfaction. In regards to the previous inconsistencies among computer self-efficacy research, our results were aligned to Wu *et al.* [8] findings which suggested computer self-efficacy only acted as a mediator of satisfaction.

Gender was seen to provide influence on the variables of intrinsic motivation and satisfaction within this sample of participants. However, no significant difference was found on either computer self-efficacy or perspective of students' attitudes, as hypothesized in the research model. These results indicate that instructors may need to consider specifically encouraging female students' in order to ensure females and males obtain the same levels of satisfaction in the self-blend model of BL environments.

It should be noted that this study only focused on the relationships between college students' computer self-efficacy, intrinsic motivation, attitude, and satisfaction in BL. In order to completely capture the dynamics of blended learning, future research should explore other related variables such as socioeconomic status and cultural background in a BL context.

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References

1. Garrison, D.R., Kanuka, H.: Blended learning: Uncovering its transformative potential in higher education. Internet High. Educ. **2**, 95–105 (2004)
2. Singh, H.: Building effective blended learning programs. Educ. Technol. **43**(6), 51–54 (2003)
3. Osguthorpe, R.T., Graham, C.R.: Blending learning environments: definitions and directions. Q. Rev. Distance Educ. **3**, 227–233 (2003)
4. Yang, H., Wang, S.: Cases on Online Learning Communities and Beyond: Investigations and Applications. Information Science Reference/IGI Global, Hershey (2012)
5. Yang, H., Wang, S.: Cases on e-Learning Management: Development and Implementation. Information Science Reference/IGI Global, Hershey (2012)
6. So, H.J., Brush, T.A.: Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: relationships and critical factors. Comput. Educ. **51**, 318–336 (2008)
7. Abrantes, J.L., Seabra, C., Lages, L.F.: Pedagogical affect, student interest, and learning performance. J. Bus. Res. **60**, 960–964 (2007)
8. Wu, J.H., Tennyson, R.D., Hsia, T.L.: A study of student satisfaction in a blended e-learning system environment. Comput. Educ. **1**, 155–164 (2010)
9. Deci, E.L., Ryan, R.M.: Intrinsic Motivation and Self-determination in Human Behavior. Plenum, New York (1985)
10. Ryan, R.M., Deci, E.L.: Self-determination theory and facilitation of intrinsic motivation, social development, and well-being. Am. Psychol. **55**, 68–78 (2000)
11. Ryan, R.M., Deci, E.L.: Intrinsic and extrinsic motivations: classic definitions and new directions. Contemp. Educ. Psych. **25**, 54–67 (2000)
12. Chao, C.Y., Chen, Y.T., Chuang, K.Y.: Exploring students' learning attitude and achievement in flipped learning supported computer aided design curriculum: a study in high school engineering education. Comput. Appl. Eng. Educ. **4**, 514–526 (2015)
13. Compeau, D.R., Higgins, C.A.: Computer self-efficacy: development of a measure and initial test. MIS Q. **19**, 189–211 (1995)
14. Lim, C.K.: Computer self-efficacy, academic self-concept, and other predictors of satisfaction and future participation of adult distance learners. Am. J. Distance Educ. **2**, 41–51 (2001)
15. Holley, D., Oliver, M.: Student engagement and blended learning: portraits of risk. Comput. Educ. **3**, 693–700 (2010)
16. Ajzen, I., Fishbein, M.: Understanding Attitudes and Predicting Social Behavior. Prentice Hall, New Jersey (1980)
17. Lu, Y., Zhou, T., Wang, B.: Exploring Chinese users' acceptance of instant messaging using the theory of planned behavior, the technology acceptance model, and the flow theory. Comput. Hum. Behav. **1**, 29–39 (2009)
18. Teo, T.: Assessing the computer attitudes of students: an Asian perspective. Comput. Hum. Behav. **4**, 1634–1642 (2008)
19. Mitchell, A., Honore, S.: Criteria for successful blended learning. Indust. Commer. Train. **3**, 143–149 (2007)
20. Dahalan, N., Hassan, H., Atan, H.: Student engagement in online learning: learners attitude toward e-mentoring. Procedia-Soc. Behav. Sci. **67**, 464–475 (2012)
21. Pintrich, P.R., De Groot, E.V.: Motivational and self-regulated learning components of classroom academic performance. J. Educ. Psych. **1**, 33–40 (1990)
22. Akkoyunlu, B., Yılmaz-Soylu, M.: Development of a scale on learners' views on blended learning and its implementation process. Internet High. Educ. **1**, 26–32 (2008)

23. Bentler, P.M., Chou, C.P.: Practical issues in structural modeling. Sociol. Methods Res. **16**(1), 78–117 (1987)
24. Gefen, D., Straub, D.W.: A practical guide to factorial validity using PLS-graph: tutorial and annotated example. Commun. Infor. Syst. **5**, 91–109 (2005)
25. Chin, W.W.: The partial least squares approach to structural equation modeling. In: Marcoulides, G.A. (ed.) Modern Methods for Business Research, pp. 298–336. Erlbaum, New Jersey (1998)
26. Shevlin, M., Miles, J.N.: Effects of sample size, model specification and factor loadings on the GFI in confirmatory factor analysis. Pers. Indiv. Differ. **1**, 85–90 (1998)
27. Fornell, C.D., Larcker, F.: Evaluating structural equation models with unobservable variables and measurement errors. J. Marketing Res. **2**, 39–50 (1981)
28. Chatterjee, S., Hadi, A.S.: Regression Analysis by Example. Wiley, New York (2000)