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Effects of Perceived Teacher Support on Student Behavioral Engagement in the Blended Learning Environment: Learning Experience as a Mediator

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Abstract: Blended learning (BL) has been widely adopted to improve students' academic achievements in higher education. However, its success relies mainly on student engagement, which plays an essential role in active learning and provides a rich understanding of students' experiences. The study utilized three self-designed scales—the Teacher Support Scale, Student Engagement Scale, and Student Learning Experience Scale—to gauge and examine the impact and relationship between perceived teacher support, student behavioral engagement, and the intermediary role of learning experiences. A cohort of 899 college students undertaking the obligatory College English course through BL modes across five Chinese universities actively participated by completing a comprehensive questionnaire. The results showed significant correlations between perceived teacher support, learning experience, and behavioral engagement. Perceived teacher support significantly predicted students' behavioral engagement, with socio-affective support exerting the most substantial predictive effects. All predictive effects were partially mediated by learning experience (learning mode, online resources, overall LMS-based learning, interaction with their instructor and peers, and learning outcome). The influence of perceived teacher support on behavioral engagement differed between students who reported the most positive (vs. negative) learning experiences. Suggestions for further research are offered for consideration.

Keywords: Student engagement; Teacher support; Learning experience; Blended learning environment

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1. Introduction

Blended learning (BL) has become an emerging instructional norm [1], especially during the COVID-19 pandemic. Compared with online learning, BL is believed to introduce innovative activities more effectively [2] while maintaining the traditional educational objectives and values of higher education [3] and encouraging more active forms of learning.

Widely seen as a proxy of educational quality [4], student engagement has been used to evaluate whether BL has been successfully implemented and provides a more profound understanding of students' learning experience [5,6]. Student engagement denotes a wide range of behaviors, from enthusiastically posing questions to simply responding to social media updates (seen as a form of disengagement by Cents-Boonstra *et al.* [7]). It is positively associated with persistence, degree completion, and satisfaction [8-12]. It is also related to better attendance [13], in-class performance [14], self-efficacy [15], and self-regulation [16,17]. Further, it positively affects desired social and academic outcomes [18,19]. Overall, student engagement is a desirable aim that may be achieved by creating an effective BL environment.

Students' prior academic achievement, peer relationships, self-efficacy, motivation, and perceptions of the learning environment can all affect their intellectual engagement [6,20-23]. In all these respects, teachers are key agents whose role in promoting academic activities and fostering interactions and interpersonal relationships among students should not be neglected [24,25]. Particular curricular and pedagogic approaches may evoke "discomforting emotions" [26], while instructors can promote student growth both socially and psychologically [27] by caring for learners' well-being, embracing their ideas, valuing their academic efforts, and fostering motivation [28-30]. The value of instructor support for student engagement in traditional classroom settings and online collaborative learning environments has been widely acknowledged [31-34] while earlier meta-analyses have reviewed the links between students' perceptions of instructor support, their learning engagement, and academic outcomes [35,36]. Nevertheless, knowledge of how teacher support might influence learners' behavioral engagement in the BL environment remains insufficient [37]. Moreover, earlier research into teacher support and students' learning engagement has considered online or traditional face-to-face learning. Therefore, the implications of their findings for BL environments require further verification.

Although the ability of BL to provide a flexible learning pace and integrate multimedia resources are among its many advantages [38], students' experiences of BL differ widely. They will likely impact the link between teacher support and student engagement [33]. On the one hand, students' learning experiences may influence their willingness to undertake online tasks [39] and to engage in the BL environment [6]. On the other hand, their value judgments of a course may be influenced by the quality of the course itself, their interactions with fellow students, the instructor(s), the course content, and the user-friendliness of any learning management systems (LMSs) used to deliver it [40]. Earlier studies showed that more positive learning experiences were linked to higher self-efficacy among students engaged in technology-enhanced learning [33] and may enhance satisfaction and engagement [41].

In this study, we hypothesized that students' overall experience of learning modes, online resources, LMSs, interactions with instructors and peers, and learning outcomes might mediate the relationship between their perceptions of teacher support and their engagement in learning (H1, H2, and H3). Furthermore, although BL plays a positive role in promoting effective instruction and is widely used in China [42], most research has not differentiated between students with different learning experiences. However, one study found that BL did not improve the learning efficacy of all students [43]. We thus hypothesized that students with highly positive or negative learning experiences would vary in terms of how perceived teacher support influenced their engagement (H4).

Based on our literature review and current pedagogical practices in China, we investigated the perceived affordances [44] of teacher support for students' behavioral engagement, including different experiential aspects of learning as a mediating variable. These included learning mode, online resources, LMS-based learning, interaction with instructor and peers, and learning outcomes. This broad coverage enabled us to consider pedagogical implications for enhancing students' behavioral engagement in BL-based instruction.

2. Conceptual frameworks

2.1. Blended learning environment

BL typically involves carefully selecting and integrating online and offline pedagogical designs [3]. Combining lectures, self-paced learning, online discussions, and LMS-based interactions maximizes the effectiveness of traditional in-person and online learning/teaching initiatives [45]. As for the specific modes of delivery on a BL course, Baragash and Al-Samarraie [46] classified them into F2F ("face-to-face"), LMS ("learning management system"), and WBL ("web-based learning") modes. In the present study, the BL environment mainly comprised the F2F and LMS modes since these were used most frequently by the course teachers.

2.2. Students' behavioral engagement in the BL environment

Although student engagement has been studied for decades, it continues to elude a uniform definition and is typically understood from behavioral, psychological, social, and integrative research perspectives. For example, Kuh [12] approached learning engagement as students' participation in academic activities. Coates [47] argued that student engagement should be measured in academic and non-academic contexts relevant to the student experience. The integrative perspective is now particularly widespread among researchers. For instance, Tao *et al.* [27] synthesized the various schools of thought and took a multidimensional perspective toward engagement, classifying it into behavioral, cognitive, and emotional subtypes [48]. Behavioral engagement refers to the situational involvement of learners in task-related activities [49] and includes behaviors such as effort, persistence, and task completion [27]. Cognitive engagement is interpreted as students' psychological investment in learning [50] and contains an emotional component referring to students' positive attitudes toward academics and school [51].

Although this three-dimensional typology has been widely used to analyze student engagement in the F2F and LMS-based learning modes, each dimension differs, and measurement is based on different indicators. In the current study, behavioral engagement was based on existing theoretical interpretations, such as the Student Engagement Scale (SES) used in higher education [52,53] and subscales derived from the Australasia Survey of Student Engagement (AUSSE) [54]. In the present research, we measured student engagement by considering self-effort (i.e., task completion, active learning, and persistence) and interaction between students and their instructor/peers via discussion and collaboration in the LMS-based and F2F learning modes.

2.3. Student perceptions of teacher support in the BL environment

Definitions of teacher support vary. It may refer to how instructors effectively empower students instrumentally, informationally, emotionally, or via assessment, which fits the broader social support model [55]. It has also been described as multiple teaching behaviors that favor autonomy, competence, and relatedness [30]. Nevertheless, it is widely recognized that teachers can provide both instructional-instrumental and socio-affective support [56]. Socio-affective support is related to intrapersonal or interpersonal dimensions that meet students' psychological needs [57] and foster meaningful instructor-student relations by transmitting teachers' trust in their student's abilities and scaffolding their learning [13].

In contrast, instructional-instrumental support belongs to the academic dimension. Studies of teacher support in BL environments have demonstrated that student-centered learning is best served by transforming the in-person presentation of content into the online form so that sufficient interactive learning activities can be integrated into the F2F class [58,59]. It is crucial to structure out-of-class activities carefully so students can plan and manage their learning [60]. Accordingly, in the present study, socio-affective support was measured regarding feedback quality and emotional empowerment. In contrast, instructional-instrumental support was understood as front-end course design and learning facilitation strategies. Front-end course design refers to scheduling

learning tasks, pace-setting, provision of objectives and explanations, and orientation. Learning facilitation strategies comprised pedagogical behaviors such as offering resources, giving direct guidance, and facilitating academic activities.

2.4. Student learning experiences in the BL environment

Compared to traditional classroom instruction, students' learning experiences in BL contexts are enriched by combining F2F, web-based, and mobile learning. As summarized by Batista and Gavilan [41], the principal characteristics of BL experiences involve presence, self-learning, distance, and ubiquity. Accordingly, our measurement of students' learning experiences in this study focused on how they perceived the BL-based course, including the learning mode, online resources, overall LMS-based learning, interaction with their instructor and peers, and learning outcomes.

Defining the critical variables described above, a theoretical framework was developed for the associations between students' perceived teacher support and their learning engagement. It was hypothesized that perceptions of teacher support might predict increased behavioral engagement, as mediated by their experiences of the BL environment. Specific hypotheses were as follows:

(1) H1: Student perceptions of teacher support, behavioral engagement, and learning experiences were positively correlated.
(2) H2: Student perceptions of teacher support significantly impact students' behavioral engagement.
(3) H3: Student learning experience would significantly mediate the link between their perceptions of teacher support and their behavioral engagement.
(4) H4: The relationship between perceived teacher support and behavioral engagement would vary among students with the most positive (vs. negative) learning experiences.

3. Methodology

3.1. Participants

The participants in this study were undergraduate students in five Chinese universities that offered compulsory College English courses via BL modes. In December 2022, a self-report questionnaire was completed by 911 students, with 12 responses excluded for incomplete or incorrect answers, leaving a sample of 899 responses (a completion rate of 98.7%).

Table 1 shows the information of the participants. The male and female respondents accounted for 32% and 68% of the sample respectively. They ranged in age from 17 to 24 (Mean [M] = 19.27, Standard deviation [SD] = 0.919). Their College English Test 4 (CET4) scores were between 62 and 678 (M = 513, SD = 59).

Table 1. Descriptive statistics for the sample

Information	Minimum	Maximum	Mean	SD
Age	17	24	19.27	0.92
Grade	1	5	3.42	1.05
CET4	62	678	513.27	59.24

3.2. Research instruments

3.2.1. Teacher Support Scale (TSS)

The TSS was developed from an initial pool of items based on an explicit conceptualization of teacher support

in the BL context. After expert reviews of the target construct, the items were tested on a heterogeneous sample. An independent *t*-test of high and low groups was then conducted, and the correlations between the item scores and total scores were calculated. Finally, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were utilized to confirm the scale's reliability and validity. The original TSS contained six subscales: course design, providing direct guidance, facilitating academic activities, offering resources, providing helpful feedback, and emotional empowerment. However, after the less reliable items had been removed, the following three subscales remained (**Table 2**): course design (five items covering orientation, online-offline synergy, and pacing of instruction), learning facilitation strategies (eleven items involving strategies for navigating and facilitating online and offline learning), and socio-affective support (ten items measuring feedback quality and emotional empowerment). The scale's three-factor structure revealed good construct validity [$\chi^2/df = 2.36$, root mean square error of approximation (RMSEA) = 0.052, comparative fit index (CFI) = 0.935, Tucker–Lewis index (TLI) = 0.928, standardized root mean square residual (SRMR) = 0.032]. A high Cronbach's alpha coefficient of 0.99 was recorded (KMO = 0.833; $P < 0.05$), and the split-half reliability was 0.99 ($P < 0.1$).

Table 2. Exploratory factor analysis of the TSS (N = 400)

Item	Factor loading			Commonality
	F1 Course design	F2 Learning facilitation strategies	F3 Socio-affective support	
Bridge F2F and online learning	0.88			0.82
Set appropriate instruction pace	0.80			0.81
Clarify course tasks and objectives	0.71			0.78
Present learning expectations	0.59			0.76
Offer orientation	0.67			0.82
Offer resources		0.63		0.74
Offer scaffolding		0.64		0.74
Offer guidance		0.73		0.79
Give explanation		0.82		0.84
Foster independent learning		0.93		0.83
Promote cooperative learning		0.87		0.87
Cultivate cooperative awareness and ability		0.68		0.80
Offer due time to construct knowledge		0.81		0.75
Know students' difficulties		0.76		0.84
Urge students to learn		0.89		0.73
Differentiate instruction		0.66		0.80
Acknowledge efforts			0.76	0.70
Express confidence in students			0.69	0.77
Provide encouragement			0.98	0.87
Expect high			0.93	0.82
Give helpful feedback on progress			0.91	0.88
Give effective feedback on online performance			0.69	0.81
Be ready to help			0.64	0.81

Table 2 (Continued)

Item	Factor loading			Commonality
	F1 Course design	F2 Learning facilitation strategies	F3 Socio-affective support	
Trace and respond to students' learning			0.72	0.80
Provide regular assessment			0.81	0.80
Provide helpful evaluation			0.58	0.78
Characteristic value after rotation	1.30	18.47	0.97	
The proportion of variance explained	5.00	71.02	3.72	

Note: Loads below 0.4 are hidden.

3.2.2. Student Engagement Scale (SES)

The Student Engagement Scale (SES), adapted from existing learning engagement questionnaires, included 17 items with two subscales: self-effort (nine items, sample item: "I take the initiative to study and complete online learning tasks without supervision") and interactive engagement (eight items, sample item: "I am always active and engaged when collaborating with my classmates on tasks").

The factor analysis results (**Table 3**) supported the scale's two-factor structure and the reliability of the subscales, which explained 75.64% of the total variance, with a correlation coefficient of 0.80. The construct validity was within the limits of acceptability [$\chi^2/df = 3.30$, RMSEA = 0.068, CFI = 0.925, TFI = 0.914, SRMR = 0.032]. The Cronbach's alpha coefficient for the whole scale was 0.983 (the values for the two sub-scales were 0.98 and 0.97), and the split-half reliability was 0.99 ($P < 0.1$).

Table 3. Exploratory factor analysis of SES ($n = 400$)

Item	Factor loading		Commonality
	F1 Individual efforts	F2 Interactive engagement	
Effort in online learning tasks	0.88		0.74
Effort in preparation work	0.89		0.77
Effort in learning and coping with exams	0.95		0.77
Initiative in online learning	0.93		0.78
Initiative in information searching	0.55		0.69
Motivation to learn	0.82		0.82
Persistence in face of difficulty	0.86		0.85
Working hard in face of difficulty	0.78		0.81
Persistence in the face of disinterest	0.72		0.75
Seeking help from the instructor		0.53	0.77
Regular online discussion with the instructor		0.74	0.75
Regular F-2-F discussion with the instructor		0.65	0.72
Active collaboration with classmates		0.66	0.75
LMS-based peer interaction		0.91	0.71
Readiness to share with classmates		0.85	0.70

Table 3 (Continued)

Item	Factor loading		Commonality
	F1 Individual efforts	F2 Interactive engagement	
Readiness to engage in F-2-F peer interaction		0.71	0.73
Seeking help from peers		0.94	0.75
Characteristic value after rotation	11.95	0.91	
Proportion of variance explained	70.26	5.29	

Note: Loads below 0.4 are hidden.

3.2.3. Student Learning Experience Scale (SLES)

The SLES items were derived from the Students' Blended Learning Course Experience Scale, with minor modifications [61]. Again, the adapted version (**Table 4**) demonstrated high validity ($\chi^2/df = 4.40$, RMSEA = 0.08, CFI = 0.962, TFI = 0.925, SRMR = 0.02) and reliability, with a Cronbach's alpha coefficient of 0.94 ($P < 0.01$).

All items in the three scales above were rated on a 6-point Likert scale ranging from 1 to 6 (1 = strongly disagree; 2 = disagree; 3 = slightly disagree; 4 = slightly agree; 5 = agree; 6 = strongly agree). Before answering the scale items, respondents were required to report their demographic information, including gender, grade level, academic performance, etc.

Table 4. Exploratory factor analysis of SLES ($n = 400$)

Item	Factor analysis	Commonality
	F1	
Online resources	0.90	0.80
Overall LMS-based learning	0.90	0.81
Interaction with their instructor and peers	0.88	0.77
Learning outcome in the test	0.91	0.83
Learner-controlled pace	0.89	0.79
Characteristic value after rotation	4.00	
Proportion of variance explained	80.01	

Note: Loads below 0.4 are hidden.

3.3. Data analysis

The valid questionnaire data were inputted into the SPSS program (IBM, v. 21.0) to check for common method bias and conduct descriptive statistical analysis of the variables, including correlation, mediation, and regression analysis.

4. Results

4.1. Common method bias test

We conducted Harman's single-factor test on all items to check whether the self-report data had incurred some common methodological bias. Three factors with characteristic roots of > 1 were identified. The first common factor explained 37.13% of the total variance, lower than the critical value of 40%, excluding obvious standard

method bias.

4.2. Comparison of differences in gender, grade level, and academic performance

The *t*-test and one-way ANOVA results showed that gender and grade level were not significantly associated with students' perceived teacher support, learning experiences, and behavioral engagement ($P > 0.05$). However, the student's college entrance examination English scores were significantly correlated with their behavioral engagement [f (4, 898), $P = 0.02$] and perceived teacher support [f (4, 898), $P = 0.02$]. The post-test results showed that students whose English scores in the college entrance examinations were above 100 displayed more behavioral engagement and perceived teacher support. In addition, the CET-4 score was associated with significant differences in students' perceived levels of teachers' learning facilitation strategies [f (3, 898), $P = 0.04$]. This was corroborated by the post-test results showing that students who did not pass CET-4 felt that their English teacher had deployed fewer learning or facilitating strategies than those who passed the course.

4.3. Descriptive statistics and correlation analysis

The mean, SD, and Pearson correlation results for each major variable are shown in **Table 5**. The overall level of students' perceived teacher support was relatively high (M = 5.03), with the highest support seen in learning facilitation strategies, followed by socio-affective support and course design. The overall level of students' behavioral engagement was 4.95, with self-effort (M = 5.01) scoring higher than interactive engagement (M = 4.89). The mean and SD for learning experience were also relatively high (M = 4.90). Among all the learning experience variables, the respondents favored online resources (M = 5.00) but were less satisfied with the course's effects on their test performance (M = 4.73). These initial results showed that students' behavioral engagement was significantly and positively correlated with teacher support and learning experience, allowing us to test our assumptions further.

Table 5. Descriptive statistics and correlations for each variable and sub-dimension ($n = 899$)

		1	2	3	4	5	6	7	8
1	Student engagement	1							
2	Individual efforts	0.98**	1						
3	Interactive engagement	0.97**	0.89**	1					
4	Teacher support	0.89**	0.87**	0.86**	1				
5	Course design	0.79**	0.77**	0.78**	0.89**	1			
6	Learning facilitation strategies	0.82**	0.80**	0.79**	0.97**	0.80**	1		
7	Socio-affective support	0.89**	0.87**	0.87**	0.97**	0.80**	0.90**	1	
8	Learning experience	0.89**	0.82**	0.88**	0.83**	0.80**	0.76**	0.82**	1
	M	4.95	5.01	4.89	5.03	4.85	5.15	5.01	4.90
	SD	0.86	0.86	0.91	0.84	0.95	0.82	0.89	0.94

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$

Responses with the highest and lowest learning experience scores (i.e., those within the highest or lowest 27% of values) were included in the sample *t*-test, which suggested that teacher support and student engagement differed significantly between the two groups (**Table 6**).

Table 6. Differences in perceived teacher support and behavioral engagement among different learners

	Students with the lowest scores for learning experience		Students with the highest scores for learning experience		*t*
	M	**SD**	**M**	**SD**	
Teacher support	4.14	0.76	5.87	0.29	33.55***
Course design	3.87	0.80	5.73	0.60	29.36***
Learning facilitation strategies	4.32	0.85	5.91	0.28	28.29***
Socio-affective support	4.05	0.80	5.88	0.31	33.68***
Student engagement	3.99	0.64	5.78	0.20	42.49***
Individual effort	4.04	0.72	5.92	0.22	39.79***
Interactive engagement	3.87	0.64	5.33	0.48	28.81***

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$

4.4. The mediating effect of students' learning experiences

To test the mediating effect of learning experiences, the SPSS PROCESS macro was utilized to perform bootstrapping with 5000 repeated samples. Gender, grade level, college entrance examination English scores, and CET-4 scores were set as the control variables, learning experience as the mediating variable, and students' behavioral engagement (self-effort & interactive engagement) as the dependent variable. Perceived teacher support in the areas of course design, learning facilitation strategies, and socio-affective support was set as the independent variable.

The results indicated that the total effect of teacher support and learning experience on the students' behavioral engagement was significant ($\beta = 0.83$, SE = 0. 04, $t = 17.24$, $P < 0.001$), accounting for 84% of the total variance in students' behavioral engagement. As shown in **Figure 1**, student perceptions of teacher support significantly predicted their learning experience ($\beta = 0.80$, $P < 0.001$) and behavioral engagement ($\beta = 0.35$, $P < 0.001$). These results showed that learning experience partially mediated the relationship between perceived teacher support and behavioral engagement.

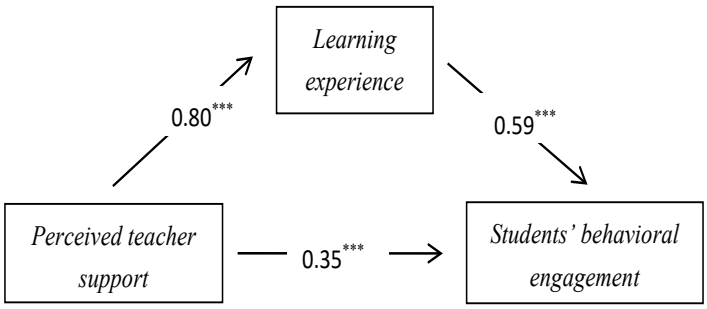

Figure 1. Mediation model of the linkages between perceived teacher support, students' behavioral engagement, and learning experience

As to the influence that different dimensions of teacher support may have on students' behavioral engagement, socio-affective support ($\beta = 0.90$, $P < 0.001$) was the most important dimension, followed by learning facilitation strategies ($\beta = 0.71$, $P < 0.001$), and course design ($\beta = 0.63$, $P < 0.001$). Therefore, our results suggest that compared to learning facilitation strategies and course design, socio-affective support was the strongest predictor of students' behavioral engagement. The breakdown of these mediating effects (**Table 7**) showed that learning

experience accounted for 57.33% of the total effect at a 95% confidence interval [0.20, 0.44].

Table 7. The mediating effect of learning experience on teacher support and students' behavioral engagement

Model	Effect type	Effect size	SE	95% CI	Relative effect
Teacher support - learning experience - student engagement	Total effect	0.57	0.04	[0.49, 0.64]	-
	Direct effect	0.24	0.06	[0.13, 0.38]	42.67%
	Indirect effect	0.33	0.06	[0.20, 0.44]	57.33%

4.4.1. Learning experience mediates the link between course design and students' behavioral engagement

Regression analysis showed that the students' perceptions of supportive course design significantly predicted both students' self-effort (β = 0.60, P < 0.001) and interactive engagement (β = 0.61, P < 0.001) at a similar level. Accordingly, a mediating model (**Figure 2**) was constructed with students' self-effort and interactive engagement as the dependent variables. As shown in **Table 8**, students' learning experience accounted for 89.34% of the total effect on self-effort at a 95% CI [0.49, 1.12] and 95.54% on interactive engagement (95% CI, [0.52, 1.14]).

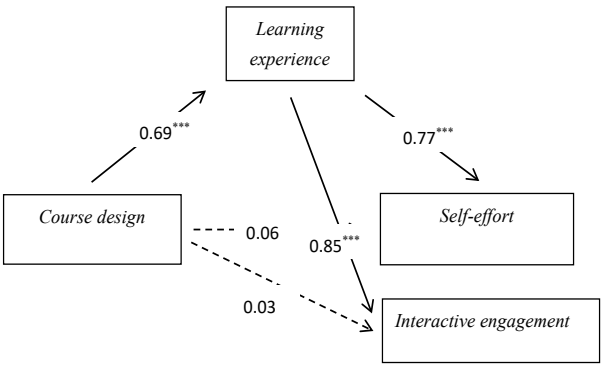

Figure 2. Mediation model of the linkages between course design and behavioral engagement

Table 8. The mediating effect of learning experience on the link between course design and students' behavioral engagement

Dependent variable	Model	Effect type	Effect size	SE	95%CI	Relative effect
Self-effort	Course design - learning experience - self-effort	Total effect	0.87	0.20	[0.51, 1.26]	-
		Direct effect	0.09	0.13	[-0.08, 0.42]	10.67%
		Indirect effect	0.78	0.16	[0.49, 1.12]	89.34%
Interactive engagement	Course design - learning experience - interactive engagement	Total effect	0.86	0.19	[0.51, 1.21]	-
		Direct effect	0.04	0.09	[-0.10, 0.28]	4.46%
		Indirect effect	0.82	0.16	[0.52, 1.14]	95.54%

4.4.2. Learning experience mediates the link between learning facilitation strategies and students' behavioral engagement

The regression analysis showed that the students' perceptions of learning facilitation strategies significantly predicted both their self-effort (β = 0. 70, $P < 0.001$) and (less powerfully) their interactive engagement (β = 0. 65, $P < 0.001$). The mediation model shown in **Figure 3** was constructed by taking students' self-effort and interactive engagement as the dependent variables. As presented in **Table 9**, experience accounted for 59.20% of the total effect on self-effort at a 95% CI [0.22, 0.50) and 81.71% of the effect on interactive engagement (95% CI [0.33, 0.55]).

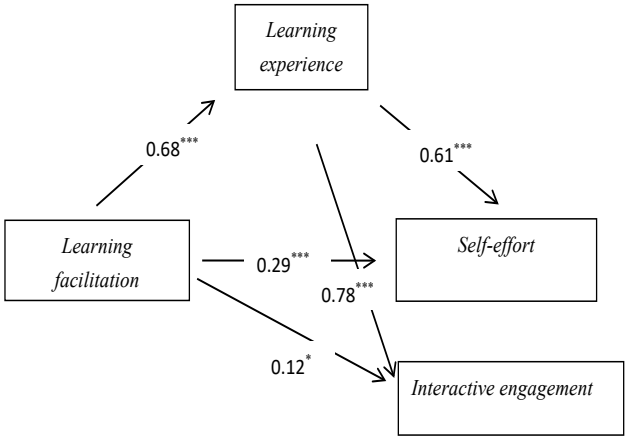

Figure 3. Mediation model of the linkages between perceived learning facilitation strategies and behavioral engagement

Table 9. The mediating effect of learning experience on perceptions of teachers' learning facilitation strategies and students' behavioral engagement

Dependent variable	Model	Effect type	Effect size	SE	95% CI	Relative effect
Self-effort	Facilitation strategies -experience - effort	Total effect	0.60	0.06	[0.48, 0.72]	-
		Direct effect	0.25	0.08	[0.11, 0.42]	40.80%
		Indirect effect	0.36	0.07	[0.22, 0.50]	59.20%
Interactive engagement	Facilitation strategies -experience - interactive engagement	Total effect	0.54	0.06	[0.41, 0.66]	-
		direct effect	0.10	0.05	[0.01, 0.23]	18.23%
		indirect effect	0.44	0.06	[0.33, 0.55]	81.77%

4.4.3. Learning experience mediates the link between socio-affective support and students' behavioral engagement

The regression results demonstrated a significant predictive effect of students' perceptions of the socio-affective support provided by teachers on both students' self-effort (β = 0.88, $P < 0.001$) and interactive engagement (β = 0.84, $P < 0.001$). Perceived socio-affective support predicted students' self-effort more powerfully than their interactive engagement. The mediation model (**Figure 4**) set students' self-effort and interactive engagement as the dependent variables. **Table 10** shows that learning experience accounted for 26.52% of the total effect on self-effort (95% CI; [0.00, 0.39]), and 52.26% of the effect on interactive engagement at a 95% CI [0.25, 0.55]). Additionally, **Table 10** shows that the indirect effect of socio-affective support on self-effort was marginally significant. However, its direct effect accounted for 73.48% of the total effect. The mediating effects

of learning experience on the linkages between the other dimensions of teacher support and students' behavioral engagement were all significant at a 95% confidence interval [0.20~1.02, 0.44~2.23].

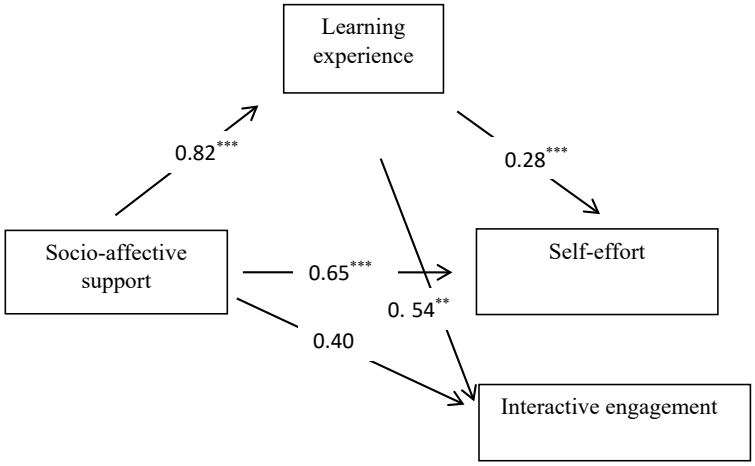

Figure 4. Mediation model of the linkages between socio-affective support and students' behavioral engagement

Table 10. The mediating effect of learning experience on student perceptions of teachers' socio-affective support and students' behavioral engagement

Dependent variable	Model	Effect type	Effect size	SE	95% CI	Relative effect
Self-effort	Socio-affective support - learning experiences - self-effort	Total effect	0.79	0.05	[0.71, 0.89]	-
		Direct effect	0.58	0.12	[0.37, 0.83]	73.48%
		Indirect effect	0.21	0.10	[0.00, 0.39]	26.52%
Interactive engagement	Socio-affective support - learning experiences - interactive engagement	Total effect	0.73	0.04	[0.64, 0.81]	-
		Direct effect	0.35	0.07	[0.18, 0.48]	47.74%
		Indirect effect	0.38	0.07	[0.25, 0.55]	52.26%

4.4.4. The predictive effects of perceived teacher support on the behavioral engagement of students with the most positive/negative learning experiences

To investigate whether the influence of teacher support on behavioral engagement differed among student groups with the most positive/negative learning experience, multiple linear regression was employed to analyze the specific impact of course design, teachers' learning/facilitation strategies, and socio-affective support on the two dimensions of students' behavioral engagement. Among those students with the most negative learning experiences (i.e., the bottom 27% of the total sample in the "learning experience" dimension), socio-affective support and course design were two variables that significantly predicted both dimensions of students' behavioral engagement (self-effort and interactive engagement), as was shown in **Table 11**. The R^2 was 0.54, indicating they explained 54% of the variance in self-effort and interactive engagement (socio-affective support = 53.1%; interactive engagement = 52.6%).

Table 11. Regression model of the relationship between perceived teacher support and behavioral engagement among students with negative learning experiences

Student engagement	B	SE	*β*	*t*	*R*
Self-effort					
Affective-social support	0.55	0.07	0.69	8.02***	0.74
Course design	0.22	0.10	0.14	2.22*	
Interactive engagement					
Affective-social support	0.45	0.06	0.67	7.82***	0.74
Course design	0.23	0.08	0.17	2.78**	

Among those students with extremely positive learning experiences (i.e., those who scored among the highest 27% of the total sample in the "learning experience" dimension), self-effort was significantly predicted by socio-affective support and course design (R^2 = 0.14, explaining 14% of the variance in self-effort; 8.5% explained by socio-affective support). Meanwhile, socio-affective support was the only variable that significantly predicted students' interactive engagement, explaining 24% of the variance (**Table 12**).

Table 12. Regression model of the relationship between perceived teacher support and behavioral engagement among students with positive learning experiences

Student engagement	B	SE	*β*	*t*	*R*
Self-effort					
Socio-affective support	0.16	0.04	0.27	3.85***	0.38
Course design	0.18	0.05	0.31	3.98***	
Social engagement					
Socio-affective support	0.38	0.05	0.50	7.62***	0.49

5. Discussion

This study has demonstrated significant correlations between teacher support, students' learning experience, and behavioral engagement in the context of BL. The results suggest that students' learning experiences may vary according to the level of teacher support they perceive, resulting in higher or lower levels of behavioral engagement. Based on this, we further investigated the internal interaction mechanism between variables.

5.1. Relation between teacher support and students' behavioral engagement

As the study revealed a significant association between perceived teacher support and behavioral engagement among Chinese university students, the predictive effects of the instructor's course design, learning facilitation strategies, and socio-affective support on students' self-effort and interactive engagement were further verified. The students' perceptions of their teachers' socio-affective support—followed by their strategies for learning facilitation—had the strongest predictive effects among the three types of teacher support. In other words, the more socio-affective support, learning facilitation strategies, and course design effectiveness that students perceived the instructor was providing, the more behaviorally engaged students would become. This closely accords with previous studies suggesting that teachers' affective support [34] and positive relationships

with students [37] are most crucial to the engagement and success of learners. Santos *et al.* [62] even established multilevel models showing how students' socio-emotional competencies predicted their engagement.

Moreover, just as self-determination theory (SDT) predicts, the interaction between individual students and environmental factors can generate three forms of motivation: intrinsic motivation, extrinsic motivation, and nonmotivation. SDT claims that every individual action is shaped by three fundamental psychological needs: autonomy, competence, and relatedness [63]. When these psychological needs are adequately addressed by the teacher's pedagogical design, students will feel more self-efficacy and more sense of being challenged and cared for, thus motivating them to participate in academic activities [64]. To pursue success, students who take up a goal-orientated approach focusing on performance and mastery exhibit greater perseverance and are more willing to engage in academic learning. Such students are also relatively more concerned about their instructors' feedback on their in-class performance, which they perceive as more beneficial than LMS-based evaluations [30].

Learning facilitation strategies such as the flexible coordination of academic activities, the provision of adequate F2F interaction, and the delivery of authentic learning opportunities can facilitate students to complete tasks, persevere in their learning, and interact more actively, as previous studies attest. For instance, F2F classes should address the pedagogical objectives of cultivating students' higher-order skills, their ability to interact with others, and improving their academic involvement [65]. Teachers who are perceived as supportive prioritize their students' questions or needs. They encourage students to discuss their progress and provide feedback on teaching and assessment methods, promoting a safe environment for learners to participate actively or explore constantly [28]. Another critical feature of supportive teaching is encouraging students to decide independently and choose their problem-solving strategies [66]. Supportive teachers encourage students to participate actively in classroom activities, face difficulties without fear, persevere, and show enthusiasm for learning [35]. Efforts to build students' autonomy are often reciprocated by greater enthusiasm from learners, such as asking questions out of sheer interest [7] rather than gaining bonus grades from the instructor. Moreover, pedagogical strategies such as peer feedback, group discussions, and ice-breaking often help to facilitate peer interaction [67].

Lastly, results from this study suggest that the vital role played by course design elements, such as activity framing and online interaction, in engaging students' self-effort should not be neglected. This supports earlier studies [40] that show the impact of ineffective course design on student motivation. While structuring learning activities, providing necessary in-class guidance, "facilitating the learning process in their practice" [68], "evaluating courses from a student learning perspective in order to become aware of pedagogical needs for which BL might offer solutions" [1], teachers should enable learners to access, navigate freely, and share the free flow of voices [69]. Our underlining of the importance of course design also reflects Bhagat *et al.*'s contention [61] that LMS-based courses must provide enough opportunities for both the instructor and peers to share synchronous or asynchronous feedback.

It is believed that a consistent flow of tasks before and after class is key to ensuring that students work hard. For example, whether a test is scheduled before or after an F2F class will impact students' initiatives in accessing LMS-based learning, potentially discouraging/encouraging them from devoting more time to pre-class learning tasks. Instructors must address students' concerns rather than repeat online content in F2F classes while allowing them to perform, practice, and present in class. Presentations encourage students to study more purposefully outside class to avoid the possible embarrassment that might be caused by their poor in-class performance. Ultimately, students may come to cherish their F2F learning sessions, hoping teachers can provide more opportunities for improvisational individual performances.

5.2. Learning experience mediates the relationship between teacher support and students' behavioral engagement

The current study confirmed that perceived teacher support was significantly correlated with students' learning experience, which was also associated with behavioral engagement. Moreover, students' learning experience partly mediated the link between teacher support and students' behavioral engagement. Thus, through the partial mediation of students' learning experience, teacher support can fully affect students' behavioral engagement in BL environments. Indeed, when learners feel supported by teachers, they report greater satisfaction with the curriculum [41]. Their self-efficacy will be enhanced [32], and their internal and external motivation will increase [70], directly leading to increased academic satisfaction [71]. One longitudinal study has confirmed that students' perceptions of positive emotional support from teachers are associated with finding learning more fun and greater commitment to learning. Such results are consistent with the reported impacts of teacher support on students' engagement in traditional teaching contexts and on adult learners' engagement in online environments [14]. When students sense their teachers' concern, trust, and respect, their emotions and self-evaluations become more positive [26], enabling them to show greater psychological resilience and learning vitality and focus more on academic tasks [37]. Our findings thus offer further evidence that improving students' learning experiences will enhance the effectiveness of BL courses [61].

5.3. Group differences in perceived teacher support and students' behavioral engagement

This current study also revealed that gender or grade level had no significant associations with the other variables, a result inconsistent with previous studies of online education. For instance, Kleynhans *et al.* [72] found that students' learning experience and online collaborative participation differed significantly by gender, with male students showing slightly more engagement than females. However, our results confirm the significant relationships between students' academic performance, learning experience, perceived level of teacher support, and behavioral engagement reported by other studies [36,68].

Moreover, we found that students' perceptions of teacher support influenced their behavioral engagement differently depending on whether their learning experiences were positive or negative. One finding is that learning facilitation strategies exert no significant predictive power on students' behavioral engagement with either the most positive or negative learning experiences. That is to say, despite the great value provided by pedagogical strategies [68,69], these have different effects on students based on their learning experiences. If such learning experiences are highly positive or negative, teachers should concentrate on socio-affective support and course design to improve their students' behavioral engagement.

One interesting finding from this study was the discrepancy between the students with the most positive (vs. negative) learning experiences regarding how perceived course design effectiveness was associated with interactive engagement. While course design may significantly predict the interactive engagement of students with the most negative learning experiences, it may not influence students whose learning experience has been particularly positive. For this latter group, socio-affective support has an overwhelmingly decisive role in encouraging interaction with the instructor or their peers in a way that eclipses the effects of course design, as perceived by the students.

6. Conclusion

This paper reports the mediating role of university students' learning experience in the relationship between the support they perceive from their teacher and their behavioral engagement. Teachers who provide multi-dimensional support to their learners improve the latter's psychology and improve their experience in aspects

such as self-efficacy, motivation, fun, and emotional attachment. This promotes student engagement in learning as measurable by task completion, persistence, and interaction. Nevertheless, the particular role of teacher support in affecting students' behavioral engagement is partially mediated by their learners' learning experience.

Our study of BL environments found that students' behavioral engagement was strongly correlated with their perceptions of teacher support. Likewise, the effects of students' perceived teacher support have a direct impact on the students' learning experience (with regards to their level of satisfaction with the online platforms and resources, as well as their perceptions about the advantages of blended learning such as learner-controlled pace, the academic benefits), will be mediated in its predicative impacts on how much students devote their efforts to autonomous study and interactive activities in their learning process.

Further, the behavioral engagement of the undergraduates in our sample had nothing to do with their gender or grade level, suggesting that these demographic characteristics are unconnected to students' learning experience, attitudes towards the teacher, or behavioral and academic engagement. However, variables such as the student's perception of teacher support, learning experience, and behavioral engagement were significantly correlated with academic performance. Our findings indicate the need for better teaching methods to improve students' behavioral engagement. Teachers should design appropriate ways of facilitating learning while providing students with sufficient instructional-instrumental and socio-affective support to develop self-efficacy and gain positive learning experiences.

Nevertheless, the limitations of this study should be highlighted. Firstly, as a cross-sectional study, it lacks the longitudinal data that would enable the causal relationship between variables to be accurately inferred. Secondly, using self-report measures of all variables only among the students without other triangular confirmations may not provide sufficiently accurate data. Accordingly, in follow-up studies, we propose to examine whether the mechanism underlying learners' perceived teacher support, learning experience, and behavioral engagement will likely change over time. We will also use additional data sources, such as the evaluation of teacher support and students' behavioral engagement from the teachers' point of view, to minimize any deviations in measuring these constructs.

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