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ORIGINAL RESEARCH PAPER

The mediating role of academic engagement in the relationship between social support and student satisfaction in online learning environments

A. Taghizade*[*,1], A. Akbari Balootbangan[2]

[1] *Department of Educational Sciences, Farhangian University, P.O. Box14665-889, Tehran, Iran*
[2] *Department of Psychology and Counseling, Farhangian University, P.O. Box14665-889, Tehran, Iran*

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* Corresponding author
A.Taghizade@cfu.ac.ir
(+98936) 4882375

ABSTRACT

Background and Objectives: Perceived social support is a critical factor in enhancing academic engagement and satisfaction in online learning environments. However, the mechanisms through which social support influences satisfaction, particularly the mediating role of distinct dimensions of academic engagement, remain underexplored. So, the current study seeks to develop and test a structural model that explores how academic engagement, specifically its affective and behavioral components, mediates the relationship between perceived social support and satisfaction among master's students enrolled in online learning environments within Iranian higher education institutions.

Materials and Methods: A total of 391 master's students from several universities in Iran participated in this study through an online survey conducted in April 2024. Participants completed validated Persian versions of three instruments: the Online Social Support Questionnaire, the Online Student Engagement Questionnaire, and the Satisfaction with E-learning Scale. Structural equation modeling (SEM) was employed to assess the fit of the hypothesized structural model. Bootstrapping procedures (5,000 resamples) were subsequently used to test the significance of the indirect (mediating) effects.

Findings: The results revealed that social support had a significant positive direct effect on satisfaction (β = 0.37, $p < 0.01$). Additionally, social support significantly predicted both affective engagement (β = 0.90, $p < 0.001$) and behavioral engagement (β = 0.92, $p < 0.001$). Both affective engagement (β = 0.41, $p < 0.001$) and behavioral engagement (β = 0.25, $p < 0.05$) positively influenced satisfaction. Mediation analyses confirmed that affective engagement (β = 0.37, 95% CI [0.26, 0.64]) and behavioral engagement (β = 0.23, 95% CI [0.05, 0.57]) partially mediated the relationship between social support and satisfaction, with affective engagement demonstrating a stronger mediating effect. The proposed structural model exhibited good fit to the data (CMIN/df = 3.34, CFI = 0.92, RMSEA = 0.07, SRMR = 0.05).

Conclusions: Perceived social support enhances e-learning satisfaction both directly and indirectly through academic engagement. Affective engagement mediates this relationship more strongly than behavioral engagement, highlighting the critical role of emotional connection, particularly in collectivist cultural contexts. To enhance student satisfaction, eLearning environments should be deliberately designed to cultivate supportive interpersonal dynamics and foster meaningful academic engagement alongside active participation.

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
73	2	4

مقاله پژوهشی

نقش میانجی مشغولیت تحصیلی در رابطه میان حمایت اجتماعی و رضایت‌مندی دانشجویان در محیط‌های یادگیری آنلاین

عباس تقی زاده*[1]، افضل اکبری بلوط بنگان[2]

[1] گروه آموزش علوم تربیتی، دانشگاه فرهنگیان، کد پستی ۸۸۹-۱۴۶۶۵، تهران، ایران
[2] گروه آموزش روان‌شناسی و مشاوره، دانشگاه فرهنگیان، کد پستی ۸۸۹-۱۴۶۶۵، تهران، ایران

چکیده

پیشینه و اهداف: حمایت اجتماعی ادراک‌شده یکی از عوامل حیاتی در افزایش مشغولیت تحصیلی و رضایت‌مندی فراگیر در محیط‌های یادگیری آنلاین محسوب می‌شود. بااین‌حال، سازوکارهایی که از طریق آن‌ها حمایت اجتماعی بر رضایت‌مندی تأثیر می‌گذارد، به‌ویژه نقش واسطه‌ای ابعاد متمایز مشغولیت تحصیلی هنوز به طور کافی بررسی نشده است؛ بنابراین، پژوهش حاضر باهدف تدوین و آزمون یک مدل ساختاری انجام شد تا نقش میانجی مؤلفه‌های عاطفی و رفتاری مشغولیت تحصیلی در رابطه میان حمایت اجتماعی ادراک‌شده و رضایت‌مندی دانشجویان کارشناسی‌ارشد شاغل به تحصیل در محیط‌های یادگیری آنلاین در مؤسسات آموزش عالی ایران مورد کاوش قرار گیرد.

روش‌ها: در این پژوهش، ۳۹۱ نفر از دانشجویان کارشناسی‌ارشد چندین دانشگاه در ایران از طریق یک پیمایش برخط که در فروردین‌ماه سال ۱۴۰۳ انجام شد، شرکت کردند. شرکت‌کنندگان سه ابزار را تکمیل نمودند: پرسش‌نامه حمایت اجتماعی در محیط‌های یادگیری آنلاین، پرسش‌نامه مشغولیت تحصیلی در محیط‌های یادگیری آنلاین، و پرسش‌نامه رضایت‌مندی از یادگیری الکترونیکی. برای ارزیابی برازش مدل ساختاری مفروض از مدل‌یابی معادلات ساختاری (SEM) استفاده شد. سپس، به‌منظور آزمون معناداری اثرات غیرمستقیم (واسطه‌ای)، از روش بوت‌استرپ (با ۵۰۰۰ بازنمونده) بهره گرفته شد.

یافته‌ها: نتایج به‌دست‌آمده نشان داد که حمایت اجتماعی دارای اثر مستقیم مثبت و معنادار بر رضایت‌مندی فراگیر است (β =۰/۳۷ ، p < ۰/۰۱). افزون بر این، حمایت اجتماعی به طور معناداری هم مشغولیت عاطفی (β =۰/۹۰ ، p < ۰/۰۰۱) و هم مشغولیت رفتاری (β =۰/۹۲ ، p < ۰/۰۰۱) را پیش‌بینی می کند. هر دو مؤلفه مشغولیت عاطفی (β =۰/۴۱ ، p < ۰/۰۰۱) و مشغولیت رفتاری(β =۰/۲۵ ، p < ۰/۰۵) تأثیر مثبتی بر رضایت‌مندی داشتند. تحلیل میانجی نشان داد که مشغولیت عاطفی (β =۰/۳۷)، باfاصله اطمینان ۹۵٪ (۰/۲۶، ۰/۶۴) و مشغولیت رفتاری (β =۰/۲۳)، باfاصله اطمینان ۹۵٪ (۰/۰۵، ۰/۵۷) به طور جزئی رابطه میان حمایت اجتماعی و رضایت‌مندی را میانجیگری می‌کنند که در این میان مشغولیت عاطفی دارای اثر میانجیگری قوی‌تری است. مدل ساختاری پیشنهادی از برازش مطلوبی (CMIN/df = ۳/۳۴، CFI = ۰/۹۲، RMSEA = ۰/۰۷، SRMR = ۰/۰۵) با داده‌ها برخوردار بود.

نتیجه‌گیری: حمایت اجتماعی ادراک‌شده به طور مستقیم و همچنین به واسطه مشغولیت تحصیلی، رضایت‌مندی از یادگیری الکترونیکی را افزایش می‌دهد. مشغولیت عاطفی این رابطه را باقدرت بیشتری نسبت به مشغولیت رفتاری واسطه‌گری می‌کند که حاکی از نقش حیاتی پیوند عاطفی، به‌ویژه در بافت‌های فرهنگی جمع‌گرا، است. به‌منظور افزایش رضایت‌مندی دانشجویان، باید محیط‌های یادگیری الکترونیکی با طراحی هدفمند، به‌گونه‌ای ساماندهی شوند که پویایی‌های میان‌فردی حمایت‌کننده و نیز مشغولیت تحصیلی معنادار را در کنار مشارکت فعال، پرورش دهند.

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* نویسنده مسئول
A.Taghizade@cfu.ac.ir
۰۹۳۶-۴۸۸۲۳۷۵

Introduction

The widespread integration of digital tools into education, coupled with the forced transition to remote learning during the COVID-19 pandemic, has permanently reshaped higher education. What once served as a substitute for in-person instruction has now become a lasting and essential mode of academic delivery [1]. This evolution has pushed certain psychological and pedagogical concepts to the forefront of educational research, as institutions seek to better understand and enhance the conditions that foster meaningful online learning experiences [2]. Within this context, student satisfaction continues to be regarded as a

fundamental marker of quality in e-learning environments. It captures both the cognitive judgments and emotional responses of learners regarding the degree to which their academic expectations and personal needs are fulfilled [3].

In light of persistent concerns tied to online learning, such as social isolation, student disengagement, and higher dropout rates, identifying what drives satisfaction has become an urgent priority for educators and researchers alike [2]. A central factor influencing how students evaluate their satisfaction in online learning is their level of academic engagement. Across higher education, engagement is widely regarded as a key predictor of academic achievement and degree completion. When students fail to engage meaningfully with their studies, the consequences often include lower academic performance, as well as reduced retention and graduation rates at the institutional level [4]. Early identification of learners who may be disengaging or are at risk of dropping out is therefore a critical task, one that demands a solid grasp of the engagement construct and its underlying dimensions [5–7]. Underlying this concern is the growing awareness that many students feel a heightened sense of isolation and marginality in online academic settings, conditions that can further weaken their connection to the learning process [8].

Alongside the focus on engagement, social support has increasingly been recognized as a critical element in shaping how students navigate and experience online learning. In e-learning environments, where learners must often grapple with unfamiliar technologies, manage complex platforms, and acquire course content with limited real-time access to instructors or peers, the presence of support becomes particularly vital. Encouragement and assistance received from family members, peers, and educators can contribute meaningfully to learners' motivation, academic self-confidence, and overall satisfaction, ultimately enhancing their performance in virtual settings [9]. Beyond these direct effects, social support also plays a role in strengthening students' self-esteem, which can translate into greater commitment and sustained effort in academic tasks. Some scholars suggest that this support influences achievement and satisfaction indirectly, by shaping the degree to which students engage with their learning [10]. It is important to note, however, that the nature of social support in online courses may differ considerably from what is typically observed in face-to-face classrooms.

The absence of physical presence and non-verbal cues, combined with the asynchronous rhythm of much online communication, can shift how learners perceive and interpret supportive behaviors. These contextual differences highlight the need to examine social support specifically within e-learning settings, where the quality and frequency of interaction diverge from those found in conventional social networks or traditional classrooms [11]. Although a substantial body of research has sought to link social support to various online learning outcomes [12–13], a more nuanced understanding requires distinguishing between two related but distinct forms of support: general emotional support and what may be termed educational support. The latter refers to the provision of informational and practical assistance that directly aids the learning process, such as when an instructor clarifies a difficult concept or classmates share relevant resources.

This type of support helps reduce obstacles to completing academic tasks, fosters a sense of ease with digital tools, and promotes both active participation and self-directed learning [14]. Although scholarly attention to the factors

that shape the quality of online education, particularly social support, student engagement, and satisfaction, has grown considerably in recent years, several important gaps persist in the literature. First, while previous studies have generally confirmed positive relationships among these variables [15], relatively few have explored the underlying processes through which social support contributes to learner satisfaction [3]. Second, despite theoretical arguments positioning engagement as a potential mediator between contextual conditions and academic outcomes, empirical evidence examining this mediating role, especially with attention to distinct forms of engagement such as affective and behavioral dimensions, remains limited within the context of online learning. Third, graduate students, who often navigate unique academic and personal circumstances in virtual settings, have been largely overlooked in this line of inquiry. Finally, little research has investigated these dynamics in collectivist cultural environments such as Iran, where interpersonal connections and emotional ties may carry particular weight in shaping educational experiences and perceptions. In light of these gaps, the current study seeks to develop and test a structural model that explores how academic engagement, specifically its affective and behavioral components, mediates the relationship between perceived social support and satisfaction among master's students enrolled in online learning environments within Iranian higher education institutions. By doing so, the research aims to generate practical insights that can inform the design of more supportive online learning environments, ultimately fostering greater engagement and higher levels of student satisfaction.

Review of the Related Literature

Social support and satisfaction

Broadly understood as the assistance and reassurance individuals draw upon when confronting challenging circumstances [16], social support has long been recognized as a factor closely tied to psychological health and overall well-being [17–19]. Early conceptualizations tended to frame it primarily in terms of interpersonal exchanges and observable behaviors [17], but more recent studies have expanded this lens to include e-learning environments [20–21]. Drawing on Self-Determination Theory, researchers have observed that in online educational settings, instructors are particularly well-positioned to support learners' needs for autonomy and competence, while peers often contribute more substantially to satisfying the need for relatedness [22]. Although social support may not always offer direct solutions to academic difficulties, it plays an indispensable role in addressing learners' psychological needs, reducing feelings of isolation, and enhancing satisfaction in virtual learning contexts [21][23]. Despite its recognized importance, the study of social support within e-learning environments remains relatively underexplored [11][24]. Early efforts, such as those by Weng et al., drew attention to its relevance for technology acceptance in education, revealing the distinct contributions of peers, supervisors, and family members [24]. In a similar vein, Hsu et al. found that social support can bolster learners' resilience, deepen cognitive engagement, and contribute to more meaningful educational experiences online [11]. While these studies underscore the value of social support, they tend to approach it as a unified construct, offering limited insight into how its various dimensions may function differently within the

context of online learning. Based on the above empirical evidence, H1 is formulated as follows:

H1. Higher education students' social support has a positive effect on their satisfaction.

Social support and learning engagement

The central role of engagement in shaping educational outcomes has been consistently emphasized across both face-to-face and online learning contexts [25–27]. As Bergdahl and colleagues observed, engagement in digitally mediated environments differs in meaningful ways from what occurs in traditional classrooms, largely due to technological features such as real-time interaction and the absence of nonverbal cues, factors that call for renewed theoretical and empirical examination [28]. From the standpoint of the self-system motivational perspective, engagement is understood to emerge from students' ongoing interactions with their learning environment [7]. It is therefore considered responsive to contextual shifts and is characterized by the energy, focus, and sustained effort learners invest in academic tasks [6]. Within this motivational framework, engagement is conceptualized as a multidimensional construct encompassing behavioral, cognitive, social, and affective components [6][29]. Given that the present study centers on the behavioral and affective dimensions of engagement, each is described in greater detail below. Behavioral engagement refers to the extent to which students take part in academic activities, demonstrate appropriate conduct, and refrain from behaviors that disrupt the learning process [30]. Affective engagement, by contrast, concerns students' emotional responses to their learning experiences, including feelings of enjoyment, interest, and connection as well as their attitudes toward classmates, course content, and the broader educational context [31–32]. This dimension has previously been captured through indicators such as joy, pleasure, excitement, and the sense of rapport students perceive with instructors and peers [33]. In a related vein, Hernandez et al. define social support as any form of assistance or help extended to an individual by others, noting that positive relationships are often built around the exchange of such support. Within educational settings, the primary sources of this support tend to be teachers, classmates, and family members. Their findings indicate that social support exerts a meaningful positive influence on university students' academic engagement [34]. Support from guardians, in particular, has been shown to help students remain engaged in their studies and achieve stronger academic outcomes [35]. Moreover, the presence of supportive relationships with both peers and educators increases the likelihood that adolescents will exhibit higher levels of behavioral engagement in the classroom [36]. Among these sources, the support provided by teachers, particularly when perceived as accessible and reliable, appears to play an especially critical role in sustaining and nurturing students' academic engagement over time [37]. In summary, hypothesis H2 and H3 are proposed as following:

H2. Higher education students' social support has a positive effect on higher education students' Affective engagement.

H3. Higher education students' social support has a positive effect on their Behavioral engagement.

Student engagement and learner satisfaction

Among the most frequently cited indicators of quality in online education is student satisfaction, widely regarded as a fundamental component of effective and successful learning experiences [38–39]. Generally defined,

academic satisfaction refers to learners' assessment of the extent to which their expectations, needs, and personal goals have been fulfilled throughout their educational journey [40]. A growing body of research has drawn attention to the positive association between satisfaction and both academic performance and student engagement [41-42]. With specific regard to the relationship between engagement and satisfaction, empirical studies have consistently pointed to a positive directional link. In an investigation involving 347 university students, Gao et al. found that both playfulness and emotional engagement contributed significantly to learners' satisfaction, suggesting that a well-designed and stimulating online platform can enhance students' overall contentment with their courses.

Notably, emotional engagement emerged as a mediating variable between several platform-related factors such as perceived usefulness, ease of use, and interactivity and satisfaction. This finding implies that students' emotional responses are shaped by their perceptions of the learning environment. Interestingly, the same study reported that cognitive engagement did not exert a significant influence on satisfaction, indicating that learners may derive greater fulfillment when their engagement is effectively and emotionally anchored rather than purely intellectual [43]. Further support for the engagement-satisfaction link comes from Yousaf et al., who examined the role of course evaluation and digital platforms in shaping online learning experiences. Drawing on data from 652 university students, their findings confirmed a meaningful relationship between engagement and satisfaction [44]. In a related study, Fisher et al. observed, based on a sample of 348 students, that both blended and flipped learning approaches enhanced participants' perceptions of engagement, academic performance, and satisfaction. of particular interest was the finding that engagement within flipped learning contexts directly contributed to satisfaction, even in cases where students did not perceive noticeable gains in performance [45].

Taken together, these studies offer compelling evidence that student engagement and satisfaction are closely intertwined. They also suggest that specific dimensions of engagement, particularly emotional engagement, may serve as mediating mechanisms through which various forms of support influence learners' satisfaction in online settings. Nevertheless, relatively few studies have systematically examined how the affective and behavioral dimensions of engagement function as mediators in the relationship between perceived social support and overall satisfaction with online learning. In view of this research gap, we set out to examine these relationships and hypothesize the following:

H4. Higher education students' Affective engagement has a positive effect on their satisfaction.

H5. Higher education students' Behavioral engagement has a positive effect on their satisfaction.

H6. Affective engagement plays a mediating effect in the relationship between higher education students' social support and their Satisfaction.

H7. Behavioral engagement plays a mediating effect in the relationship between higher education students' social support and their Satisfaction.

Proposed structural model

Based on these hypotheses generated from the above literature review, our proposed structural model is presented in Figure 1.

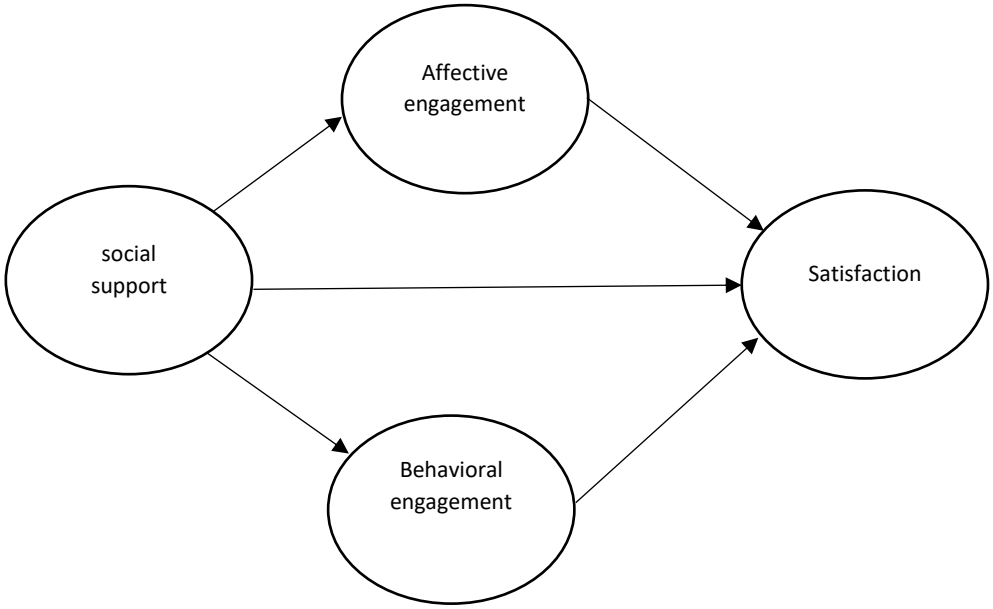

Fig. 1: Hypothesized Structural Model

Method

Participants

The present investigation employed an exploratory design, utilizing structural equation modeling to examine the complex interrelationships among perceived social support, affective engagement, behavioral engagement, and satisfaction within the context of online learning. This methodological approach is particularly well-suited for research aimed at developing a more nuanced understanding of specific phenomena, especially in situations where the researcher exercises limited control over data collection procedures and the variables of interest emerge from naturally occurring educational settings [46].

Data collection for the study was conducted in April 2024, using an online survey administered to graduate students across several universities in Iran. These universities provided a variety of programs in the humanities, engineering, and basic sciences. In addition to their online programs, they also provided in-person courses. Initially, 397 master's students were recruited using a convenience sampling method, considering factors such as availability, voluntary participation, and active engagement in online courses. After removing outliers, the sample was refined to 391 participants. Before data gathering, participants were informed about the study's objectives, with an emphasis on the confidentiality and anonymity of their responses. They were also made aware that they could withdraw from the research at any time without any consequences.

Data collection was carried out via an online survey. The minimum required sample size for this study was determined using the Soper sample size calculator for structural equation modeling [47]. Considering an anticipated effect size of 0.3, a desired statistical power level of 0.80, 4 latent variables, 22 observed variables, and a probability level of 0.05, the calculator indicated a minimum sample size of 240-260 respondents. The final sample of 391 participants exceeded this threshold, confirming its adequacy for subsequent SEM analysis [47]. The demographic distribution of the participants is detailed in Table 1.

Table 1: Demographic characteristics of participants

Variable	Subcategory	Frequency	%
Gender	Female	129	33%
	Male	262	67%
Year of Study	First-year student	102	26%
	Second-year student	156	40%
	Third-year student and above	133	34%
Age Range	22–26	121	31%
	27–31	113	29%
	32–36	78	20%
	37–41	47	12%
	42–46	20	5%
	47–51	12	3%
Field of Study	Engineering	211	54%
	Social sciences and humanities	180	46%

It should be noted that all universities involved in this research operated under a nationally standardized instructional design framework for the development and delivery of their online courses. This model incorporates both synchronous and asynchronous modes of instruction, with course content and learning activities delivered through the Moodle platform. Multimedia learning materials, along with formative and summative assessment tools such as quizzes and assignments, are developed by subject matter specialists with the aim of fostering student engagement and monitoring academic progress. In addition, real-time interactive sessions are facilitated through BigBlueButton, allowing for live communication and immediate feedback between instructors and learners.

Instruments

Online Social Support Questionnaire

To evaluate learners' social support in online courses, the 15-item self-report questionnaire, developed by the researchers and adapted from five previously validated instruments [24,52,53], assesses the students' perceived educational and emotional social support in online courses. Items are rated on a 5-point Likert scale (1=strongly disagree, 5=strongly agree), with higher scores indicating higher perceived social support. The instrument evaluates the social support provided by family, peers, and teachers and was adapted by Taghizade et al. to fit the Iranian educational context [54]. For this research, educational social support items were used (9 items). These items are rated on a 5-point Likert scale, where higher scores indicate greater levels of perceived educational social support. In this study, the reliability of the Online Social Support was established with a Cronbach's alpha value of 0.92.

Online Student Engagement Questionnaire

To evaluate learners' engagement in online courses, the OSEQ [55] was used as the main questionnaire. It comprises 16 self-report items measuring four types of engagement (cognitive, behavioral, social, and affective engagements). Each item is rated on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = moderately agree, 4 = agree, and 5 = strongly agree), and higher scores indicate higher engagement levels. For this research, affective and behavioral engagement, which consists of 8 five-point, Likert-type items, adapted by Taghizade et al. to fit the Iranian educational context, was employed [56]. This adaptation involved necessary cultural and linguistic modifications to ensure its suitability and effectiveness. The reliability of this culturally adapted version was confirmed in the study, as

evidenced by a high Cronbach's alpha value of 0.86 (affective engagement) and 0.81 (behavioral engagement).

Satisfaction with e-learning

The Learner Satisfaction Survey (LSS), developed by Chang [57], was utilized to evaluate students' satisfaction with e-learning. This survey has undergone various validations in different contexts. For instance, Taghizade et al. translated it into Farsi and validated its reliability for use in the Iranian educational context [58]. The current study also used this translated version. The LSS comprises 25 items that assess four types of interaction (learner-content, learner-instructor, learner-learner, and learner-technology) as well as overall satisfaction. In this study, general satisfaction items were used (5 items). These items are rated on a 4-point Likert scale, where higher scores indicate greater levels of satisfaction. In this study, the reliability of the LSS was established with a Cronbach's alpha value of 0.90.

Data analysis

The SPSS software (version 27) was utilized to provide a descriptive analysis of the data. For the path analysis and model fit assessment, the AMOS module (Version 26) was employed. To evaluate the overall fit of the model, several recommended indices were calculated in this study: Chi-Square Minimum per degree of freedom CMIN /df, the goodness of fit index (GFI), the adjusted goodness of fit index (AGFI), the normed fit index (NFI), the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA), the Root-mean-square residual (RMR), and Incremental Fit Index (IFI) [48].

Based on recommended thresholds in the literature, the acceptable level for the model fit indicators in the current study were defined as follows: CMIN/DF between 3 and 5, GFI > 0.90, AGFI > 0.80, [49]; RMSEA between 0.05 and 0.08, CFI between 0.90 and 0.95, and RMR < 0.05 [50]; and an adequate level for IFI [51]. To assess the significance of indirect effects in mediation models, bootstrapping procedures were employed using 5,000 resamples drawn from the original dataset. This approach generates bias-corrected confidence intervals for each estimated indirect effect, with mediation considered statistically significant when the resulting interval does not include zero.

Results and Findings

Preliminary analyses

Table 2 presents the means, standard deviations, skewness, kurtosis, and correlations between all research variables. The results indicate that all measures met the standard for univariate normality, with skewness and kurtosis values ranging from -0.17 to -0.44, which fall within the acceptable range of -1.96 to +1.96 at a significance level of .05 [49]. The Durbin–Watson statistic (1.76) fell within the acceptable range of 1.5–2.5, indicating no significant autocorrelation, while VIF (<5) and tolerance (>0.2) values indicated no substantial multicollinearity [49]. These findings indicate that the prerequisites for SEM were met.

Measurement model

The confirmatory factor analysis of the overall measurement model revealed a satisfactory model fit (CMIN /df =663/203= 3.27, p<0.000; IFI = 0.93; GFI = 0.86; AGFI=0.83; NFI=0.90; CFI=0.93; RMSEA = 0.07; RMR = 0.05). The results showed that the factor loadings of the latent variables (social support, affective engagement, behavioral engagement, and satisfaction) in the measurement model ranged from 0.53 to 0.86, all of which are well above the acceptable threshold of 0.30 as suggested by Kline [48].

Table 2: Descriptive statistics for focal variables

Factors	Mean	SD	Skewness	Kurtosis	TOL	VIF	1	2	3	4
1. Social Support	2.89	0.88	-0.31	-0.43	0.31	3.24	1			
2. Affective Engagement	2.95	0.93	-0.31	-0.17	0.36	2.80	0.67**	1		
3. Behavioral Engagement	3.01	0.88	-0.37	-0.29	0.34	2.92	0.68**	0.64**	1	
4. Satisfaction	2.87	0.94	-0.25	-0.44	-	-	0.73**	0.73**	0.72**	1

p < .05; ***p* < .01; *SD* = Standard Deviation; *TOL* = Tolerance; *VIF* = Variance Inflation Factor

The construct validity was evaluated by analyzing both convergent and discriminant validity. Convergent validity was assessed using average variance extracted (AVE). In this analysis, the AVEs of all the constructs were above the threshold of 0.50, indicating good convergent validity [49]. Discriminant validity was also assessed to ensure that the constructs are distinct from one another. According to Fornell and Larcker, discriminant validity is demonstrated when the square root of the AVE for each construct exceeds the correlations between that construct and other constructs, indicating that all constructs in the model have achieved discriminant validity, confirming the uniqueness of each construct in the measurement model [59]. Furthermore, construct reliability was assessed using composite reliability (CR) and Cronbach's alpha, indicating satisfactory reliability for all six observed variables, with values exceeding the 0.70 threshold [48] (Table 3).

Structural model

We analyzed the structural model to investigate the research hypotheses. As hypothesized, the structural model offered a good fit to the data (CMIN /df =681/204= 3.34, p<0.000; IFI = 0.92; GFI = 0.86; AGFI=0.83; NFI=0.90; CFI=0.92; RMSEA = 0.07; RMR = 0.05). As shown in Figure 2, the findings indicated that increasing social support had a positive effect on improving students' satisfaction (β = 0.37, p = 0.01), which confirmed our first research hypothesis (i.e., H1). The findings also showed that increasing students' social support had a positive and significant effect on increasing affective engagement (β = 0.90, p = 0.000), which confirms the second hypothesis (i.e., H2). Moreover, the results of the analysis showed that increasing students' social support had a positive effect on increasing behavioral engagement (β = 0.92, p =0.000). So, the third hypothesis of the study, i.e., H3, was also confirmed.

Also, the results of the analysis showed that increasing students' affective engagement had a positive effect on increasing satisfaction (β = 0.41, p =0.000). So, the fourth hypothesis of the study, i.e., H4, was also confirmed. Also, the results of the analysis showed that increasing students' behavioral engagement had a positive effect on increasing satisfaction (β = 0.25, p =0.02). So, the fifth hypothesis of the study, i.e., H5, was also confirmed. Table 4 demonstrates the summary of the direct, indirect, and total effects of the proposed relationships.

Table 3: The measurement model

Constructs	α	CR	AVE	1	2	3	4
1. Social Support	0.92	0.92	0.56	(0.75)			
2. Affective Engagement	0.86	0.86	0.61	0.67	(0.78)		
3. Behavioral Engagement	0.81	0.82	0.54	0.68	0.64	(0.73)	
4. Satisfaction	0.90	0.90	0.65	0.73	0.73	0.72	(0.81)

Note: The square roots of AVEs from observed variables are on the diagonal and within parentheses; off-diagonal numbers are correlations among observed variables. **α** = Cronbach alpha; **CR** = Composite Reliability; **AVE** = Average Variance Extracted

Table 4: The summary of direct, indirect, and total effects

Hypotheses	Proposed relationship			Direct effect	Indirect effect	Total effect
H1	Social support	→ Satisfaction		.37	0.60	.97
H2	Social support	→ Affective engagement		.90	-	.90
H3	Social support	→ Behavioral engagement		.92	-	.92
H4	Affective engagement	→ Satisfaction		.41	-	.41
H5	Behavioral engagement	→ Satisfaction		.25	-	.25
H6	Social support	→ Affective engagement	→ Satisfaction	.37	.37	.74
H7	Social support	→ Behavioral engagement	→ Satisfaction	.37	.23	.60

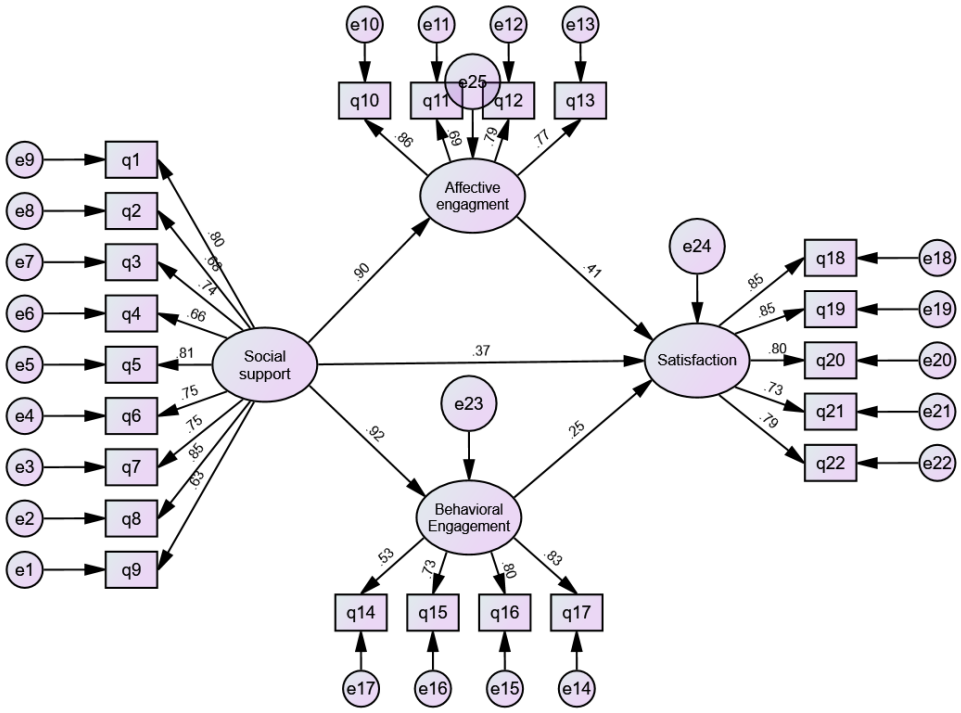

Fig. 2: Final empirical structural model

Mediation analyses

To examine whether affective and behavioral engagement function as mediators in the relationship between perceived social support and student satisfaction, a bootstrapping procedure with 5,000 resamples was conducted. This analytical strategy was selected based on recommendations in recent methodological literature, which advocate for bootstrapping as a particularly robust approach to testing mediation, especially in studies involving relatively large sample sizes [60].

The results showed that the standardized direct effect of social support on satisfaction

was β = 0.37, p = 0.01. The indirect effect of social support on students' satisfaction with the mediating role of affective engagement was β= 0.37, wherein the CI was between the range of 0.26–0.64, and the 95% CI did not include zero. Moreover, the indirect effect of social support on students' satisfaction with the mediating role of behavioral engagement was β= 0.23, wherein the CI was between the range of 0.05–0.57, and the 95% CI did not include zero. This result indicates that the indirect effect between social support and satisfaction through affective and behavioral engagements is significant. After including affective and behavioral engagements as intermediate variables, the association between social support and satisfaction was reduced, but it still remained significant. This shows that affective and behavioral engagements partially mediated the effect of social support on satisfaction; hence, hypotheses H4 and H5 were supported. The indirect effect of social support on satisfaction through affective and behavioral engagements was significant. Thus, considering the confirmation of the research hypotheses and the significant effects of the research variables on each other, it can be concluded that the proposed research model was approved as the final model (see Fig. 2).

Discussion

The primary objective of this research was to examine whether academic engagement, specifically its affective and behavioral dimensions, mediates the relationship between perceived social support and satisfaction with online learning among master's students. Analysis of the data confirmed all seven hypotheses proposed in the study, demonstrating both direct and indirect pathways through which the variables of interest are interconnected.

Taken together, these findings contribute to theoretical understandings of how engagement functions within digital learning contexts while also offering practical implications for the design and facilitation of online educational experiences that foster student satisfaction. First, the results confirmed that social support has a positive and significant direct effect on students' satisfaction (H1: β = 0.37, p < 0.01). This finding is consistent with previous studies that have underscored the value of supportive interpersonal exchanges, especially those involving instructors and fellow students, in shaping learners' satisfaction within online educational settings [15] [61]. By fostering a sense of belonging and alleviating the isolation often experienced in digitally mediated environments, social support contributes meaningfully to the maintenance of student satisfaction [62]. Second, social support was found to significantly predict both affective engagement (H2: β = 0.90, p < 0.001) and behavioral engagement (H3: β = 0.92, p < 0.001). These findings are in line with the self-system motivational perspective, which holds that when contextual conditions are supportive, students' engagement is strengthened through the satisfaction of fundamental psychological needs, namely, autonomy, competence, and relatedness [63–64]. Within online learning environments, where physical distance can leave students feeling disconnected, the presence of social support becomes an especially valuable resource, one that encourages both active participation and positive emotional involvement in academic tasks. Third, both affective engagement (H4: β = 0.41, p < 0.001) and behavioral engagement (H5: β = 0.25, p < 0.05) were found to positively influence satisfaction.

These results align with earlier research establishing engagement as a significant

predictor of both satisfaction and academic achievement in higher education contexts [15][30][65]. Affective engagement captures the emotional bonds students form with their learning experiences, fostering greater intrinsic motivation and genuine enjoyment of academic tasks. Behavioral engagement, by contrast, is reflected in the effort learners invest, their persistence in the face of challenges, and their active involvement in course activities, each of which contributes to a more rewarding and meaningful educational journey [66]. The mediation analyses revealed that affective engagement (H6: $\beta = 0.37$, 95% CI [0.26, 0.64]) and behavioral engagement (H7: $\beta = 0.23$, 95% CI [0.05, 0.57]) partially mediated the relationship between social support and satisfaction. Taken together, these findings point to a dual role for social support in shaping student satisfaction, operating both directly and indirectly through its influence on engagement. This mediating pathway finds theoretical support in engagement-mediated models of academic success, which contend that contextual variables shape educational outcomes largely by shaping how students engage with their learning [67]. Consistent with this perspective, recent investigations into online and blended learning environments have reported comparable patterns, with engagement functioning as a bridge between supportive conditions and favorable academic results [15].

The observation that affective engagement exerted a stronger mediating influence than its behavioral counterpart may reflect the particular salience of emotional connection in shaping how social support translates into satisfaction within the Iranian cultural setting. This pattern could be understood in light of the collectivist orientation that characterizes Iranian society, where interpersonal ties and emotional bonds carry considerable weight [68]. In such a context, the support individuals receive from others may contribute to satisfaction less by prompting observable actions and more by nurturing positive emotional experiences and reinforcing a sense of belonging. From a methodological perspective, the application of bootstrapping techniques with 5,000 resamples yielded reliable estimates of the indirect effects under investigation, with confidence intervals confirming the statistical significance of the proposed mediation pathways. This analytical approach is extensively endorsed in the methodological literature as a preferred strategy for testing mediation within structural equation modeling frameworks, particularly in situations involving non-normal data distributions or models of considerable complexity [69–70].

Conclusions

The present research adds to the expanding scholarly conversation surrounding student engagement and satisfaction in online learning contexts through the empirical examination of a mediation model linking social support, affective and behavioral engagement, and satisfaction. The results offer confirming evidence that social support functions as a significant predictor of both engagement and satisfaction, while also revealing that engagement operates as a central mechanism through which support exerts its influence on learners' overall contentment. Taken together, these findings carry important implications for the design of digital learning environments, highlighting the value of cultivating supportive interpersonal dynamics and deliberately fostering conditions that encourage meaningful student engagement.

While the present study employed rigorous analytical procedures, several limitations should be considered when interpreting its

findings. First, the use of cross-sectional survey data introduces certain constraints inherent to this methodological approach. Reliance on self-reported measures raises the possibility of response bias, as participants may not always accurately recall or articulate their experiences [71]. Future research would benefit from incorporating both subjective and objective indicators, alongside qualitative methods such as interviews, to develop a more nuanced understanding of the relationships identified here [72]. Second, the cross-sectional design precludes any definitive claims about causal direction. To establish causality and trace how these dynamics unfold over time, longitudinal or experimental designs would be necessary [73]. Third, the sample was restricted to graduate students enrolled in Iranian institutions, which may limit the extent to which findings can be generalized to other educational levels or cultural settings.

Based on the findings and limitations of the present study, several suggestions for future research can be offered. Replicating this work across diverse populations and national contexts would help clarify whether and how cultural factors moderate the observed relationships. In addition, future investigations might extend the scope of inquiry by examining other facets of engagement such as cognitive and agentic dimensions as well as additional outcome variables including academic performance and student retention. Exploring the potential moderating influence of individual differences, such as learners' self-regulation abilities or digital literacy, could also offer valuable insights into the conditions under which support and engagement most effectively contribute to positive outcomes. In sum, this research highlights the central role that social support and academic engagement play in shaping students' satisfaction with online learning. By cultivating supportive relationships and fostering meaningful engagement, educators and institutions can contribute to the creation of online learning environments that are not only more satisfying for students but also more conducive to their academic success.

Authors' Contribution

Author 1 conceptualized and designed the research, supervised the overall process, and prepared the initial draft of the manuscript. Author 2 was responsible for data collection and execution of the study. Both authors collaborated on revising and editing the final version. All authors have read and approved the submitted manuscript.

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Conflicts of Interest

There are no conflicts of interest to declare.

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AUTHOR(S) BIOSKETCHES

Abbas Taghizade is an assistant professor at Farhangian University, Iran. He has authored numerous scientific papers in journals and conferences. His research interests include instructional design, e-learning, AI applications in education, and social network analysis.

Taghizade, A., Assistant Professor, Department of Educational Sciences, Farhangian University, P.O. Box14665-889, Tehran, Iran.

A.Taghizade@cfu.ac.ir

Afzal Akbari Balootbangan is an assistant professor at Farhangian University, Iran. He has contributed numerous scholarly papers to academic journals and conferences. His research interests include educational psychology, psychometrics, and related fields such as assessment and evaluation, psychological measurement, and research methodology in educational settings.

Akbari Balootbangan, A., Assistant Professor, Department of Psychology and Counseling, Farhangian University, P.O. Box14665-889, Tehran, Iran.

Akbariafzal@cfu.ac.ir

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