International Review of Research in Open and Distributed Learning

Student Engagement, Community of Inquiry, and Transactional Distance in Online Learning Environments: A Stepwise Multiple Linear Regression Analysis

Seyfullah Gökoğlu, Fatma Gizem Karaoğlan Yılmaz et Ramazan Yılmaz

Volume 25, numéro 4, novembre 2024

URI : https://id.erudit.org/iderudit/1114574ar
DOI : https://doi.org/10.19173/irrodl.v25i4.7660

Aller au sommaire du numéro

Éditeur(s)

Athabasca University Press (AU Press)

ISSN

1492-3831 (numérique)

Découvrir la revue

Citer cet article

Gökoğlu, S., Karaoğlan Yılmaz, F. & Yılmaz, R. (2024). Student Engagement, Community of Inquiry, and Transactional Distance in Online Learning Environments: A Stepwise Multiple Linear Regression Analysis. *International Review of Research in Open and Distributed Learning*, *25*(4), 107–127. https://doi.org/10.19173/irrodl.v25i4.7660

Résumé de l'article

This study explored the complex dynamics of student engagement, community of inquiry, and transactional distance in online learning environments. The study analyzed 1,281 participants' responses to identify the factors contributing to online learning outcomes. The research highlighted the crucial role that transactional distance and community of inquiry play in shaping students' behavioral engagement and provided insight into their significant impact on participants' learning experience. Through a stepwise multiple linear regression analysis, the research uncovered the complex relationships among these variables, thereby providing valuable insights for educators and institutions aiming to enhance the online learning experience. The results have significant implications for educational practitioners and policymakers, including practical strategies to increase student engagement and foster a lively community of inquiry in online learning environments. Ultimately, this research is a valuable resource for all those involved in online education, to help them understand the key factors that contribute to successful online learning experiences.

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 25, Number 4

November – 2024

Student Engagement, Community of Inquiry, and Transactional Distance in Online Learning Environments: A Stepwise Multiple Linear Regression Analysis

Seyfullah Gökoğlu, Fatma Gizem Karaoğlan Yılmaz, and Ramazan Yılmaz
Bartin University, Turkey

Abstract

This study explored the complex dynamics of student engagement, community of inquiry, and transactional distance in online learning environments. The study analyzed 1,281 participants' responses to identify the factors contributing to online learning outcomes. The research highlighted the crucial role that transactional distance and community of inquiry play in shaping students' behavioral engagement and provided insight into their significant impact on participants' learning experience. Through a stepwise multiple linear regression analysis, the research uncovered the complex relationships among these variables, thereby providing valuable insights for educators and institutions aiming to enhance the online learning experience. The results have significant implications for educational practitioners and policymakers, including practical strategies to increase student engagement and foster a lively community of inquiry in online learning environments. Ultimately, this research is a valuable resource for all those involved in online education, to help them understand the key factors that contribute to successful online learning experiences.

Keywords: student engagement, transactional distance, community of inquiry, online learning, regression analysis

Student Engagement, Community of Inquiry, and Transactional Distance in Online Learning Environments: A Stepwise Multiple Linear Regression Analysis

Interest in the factors contributing to successful online learning has increased with its rapid growth. Numerous studies have examined various factors influencing online learning outcomes (Çebi, 2023; Yilmaz, 2017; Yu, 2022). The most researched factors that impact online learning outcomes are learner characteristics, support, motivation, satisfaction, participation, self-efficacy, engagement, interaction, and presence (Eom et al., 2006; Joksimović et al., 2018; Kauffman, 2015; Kucuk & Richardson, 2019; Kuo et al., 2013; Mitchell et al., 2021; Muilenburg & Berge, 2005; Shea & Bidjerano, 2009; Wu, 2016; Zilka et al., 2018). Among these factors, presence, interaction, and engagement are especially important in online learning environments, as they contribute to developing a sense of community and create opportunities for meaningful learning experiences.

Engagement refers to active involvement and participation in learning activities (Kucuk & Richardson, 2019). It is commonly recognized as crucial for achieving successful learning outcomes in traditional and online settings (Joksimović et al., 2018; Karaoglan-Yilmaz et al., 2022; Vaughan, 2010). Previous research has shown that student engagement influenced satisfaction, motivation, and learning outcomes in online learning environments (Baloran et al., 2021; Li et al., 2022; Natarajan & Joseph, 2022; Setyawati et al., 2022; Tadesse & Edo, 2020; Zapata-Cuervo et al., 2023). Presence refers to the perception of a sense of connection and being there in online learning environments (McCreery et al., 2013). It is important for students to feel a sense of presence to in order to actively engage in their courses (Shea & Bidjerano, 2009; Zilka et al., 2018). Presence is closely related to student satisfaction and positively impacts learning outcomes in online environments (Hajibayova, 2017). Interaction refers to the communication and collaboration among students and instructors in online learning environments (Starr-Glass, 2013). Interaction is essential for creating a supportive and collaborative online learning community (Oyarzun et al., 2018). Despite the abundance of research on these factors, there is still a need to further investigate their interrelationships and impact on student learning outcomes in order to enhance the design and implementation of online learning.

Student Engagement in Online Learning

Student engagement (SE) in online learning is a multifaceted concept encompassing various aspects, such as cognitive, behavioral, and emotional engagement. Cognitive engagement involves the mental effort and investment in learning activities, including critical thinking, problem-solving, and deep information processing (Xiao et al., 2021). Behavioral engagement refers to active participation and involvement in online discussions, completing assignments on time, and consistent attendance (Bond et al., 2020). Emotional engagement relates to the affective aspects of learning, including interest, enthusiasm, and a sense of belonging in the online learning community (Xiao et al., 2021).

Research has indicated that SE strongly predicted academic achievement and learning outcomes in online learning. Students actively engaged in online courses tended to have higher satisfaction, motivation, and perseverance levels when facing challenges (Dewan et al., 2019; Sun et al., 2019; Xiao et al., 2021). Moreover, engaged students were more likely to develop a sense of belonging and connection with their

peers and instructors, leading to a richer and more meaningful learning experience (Bond & Bergdahl, 2022; Sun et al., 2019).

Understanding the importance of SE in online learning is crucial for educators and instructional designers to create effective and engaging learning environments. Given the significance of engagement in online learning, educators and instructional designers can develop strategies to promote and support SE. By fostering cognitive engagement, instructors can encourage critical thinking and problem-solving skills in their students, leading to a deeper understanding and application of course material. Behavioral engagement can be promoted through clear expectations for participation, timely feedback on assignments, and opportunities for interactive activities. Emotional engagement can be nurtured by creating a supportive and inclusive online learning community where students feel valued and connected.

Community of Inquiry in Online Learning

Presence in an online learning community is a key component of the community of inquiry (CoI) framework. The CoI is a theoretical model highlighting the importance of three types of presence in facilitating meaningful learning experiences in online learning environments: cognitive, teaching, and social (Swan et al., 2009). Cognitive presence refers to how learners can construct and confirm meaning through reflection, discourse, and exploration of ideas. Teaching presence relates to the design, facilitation, and direction of instruction in online courses, including instructional strategies, feedback, and support provided by instructors. On the other hand, social presence focuses on the interaction and sense of belonging among participants in an online learning community (Garrison, 2007).

Cognitive presence plays a crucial role in enhancing online learning experiences. It is centered on constructing understanding through critical thinking, reflection, and discourse (Harb & Krish, 2020). In online learning, cognitive presence empowers learners to actively engage in knowledge construction and confirm meaning through discussions and exploration of ideas. Research has demonstrated that cognitive presence significantly impacted learning outcomes and SE in online learning environments (Doo et al., 2023). When students were encouraged to analyze and evaluate information critically, they were more likely to develop a deeper understanding of the course material and its practical application (Liu et al., 2022). Educators can foster a culture of inquiry by nurturing cognitive presence, promoting intellectual engagement, and empowering students to think critically and creatively (Hambali et al., 2022).

Teaching presence is a crucial component of the CoI framework, pivotal in facilitating meaningful learning experiences in online environments. It encompasses the design, facilitation, and direction of instruction in online courses, including instructional strategies, feedback, and support provided by instructors. Research has shown that teaching presence significantly influenced SE and learning outcomes in online learning environments (Zhao & Sullivan, 2017). Effective teaching presence provides students with clear instructions and guidance, and creates a supportive and collaborative online learning community (Richardson et al., 2016). When instructors actively facilitate online discussions, provide timely feedback on assignments, and offer support and encouragement, students are more likely to feel connected, motivated, and engaged in their learning (Shea et al., 2010).

In addition to cognitive and teaching presence, social presence plays a significant role in the success of online learning. Social presence is crucial for fostering a sense of community and belonging among participants in an online learning environment (Mayne & Wu, 2011). It involves the ability of learners to project themselves socially and emotionally, and to establish personal and meaningful connections with peers and instructors. Previous research has highlighted the importance of social presence in online learning, showing that it positively influenced student satisfaction, motivation, and overall learning outcomes (Lee & Pillai, 2022; Luthfiarini & Susandari, 2022; Supardi & Ashari, 2021; Xue et al., 2023). Students who feel a strong sense of social presence are more likely to engage actively in discussions, collaborate with their peers, and develop a supportive learning community. This, in turn, leads to a more enriched and meaningful learning experience for all participants.

Educators can create online learning environments that promote active engagement and meaningful learning experiences by understanding and applying the CoI framework. This can be achieved by fostering cognitive presence through stimulating and challenging discussions, and providing opportunities for reflection and critical thinking. Furthermore, instructors can enhance teaching presence by facilitating clear communication and timely feedback on student work. Additionally, instructors can cultivate social presence by promoting student interactions and creating a sense of community through group discussions and collaborative projects.

Transactional Distance in Online Learning

Interaction plays a crucial role in reducing transactional distance (TD) in online learning environments. Moore's theory defines TD as the psychological and communication gap that learners may experience in a distance learning setting (Moore, 1993). It is influenced by factors such as the level of interaction with technology, peers, content, and instructors (Weidlich & Bastiaens, 2018). When TD is high, learners may feel isolated, disconnected, and lacking motivation and engagement (Fabian et al., 2022). However, when interaction is increased, TD can be minimized, and learners are more likely to feel connected, supported, and engaged in the learning process (Dharmadjaja & Tiatri, 2021).

In online learning, various interaction types play crucial roles in facilitating effective learning experiences. These interaction types include the student-to-interface, to content, to instructor, to student, and to the learning environment. The student-to-interface interaction encompasses the engagement and interaction of students with the learning platform or interface. It involves the navigation of the online learning environment, access to course materials, and the utilization of digital tools for learning. The ease of interaction with the interface can significantly impact SE and satisfaction with the online learning experience (Alhih et al., 2017). Content interaction involves the active engagement of students with the course materials, resources, and multimedia components (Martin & Bolliger, 2018). Students need to interact meaningfully with the content to comprehend and apply the concepts effectively. Well-structured and interactive course materials can foster SE and promote a deeper understanding of the subject matter (Picciano, 2002). The interaction between instructors and students is a fundamental component of online learning. Effective instructor interaction includes clearly communicated expectations, timely feedback on assignments, and active facilitation of discussions and activities. Instructor interaction is pivotal in guiding and supporting students, influencing their motivation, connection to the learning community, and overall satisfaction with the learning experience. Research has shown that interaction between the student and the

instructor was the most significant factor in predicting the students' perceived learning outcomes in an online learning environment (Kang & Im, 2013). Additionally, the lack of interaction between instructors and students is one of the most outstanding disadvantages of online teaching environments, making students feel isolated (Saraç & Doğan, 2022). Peer-to-peer student interaction is valuable for creating a collaborative and supportive online learning community. Group discussions, collaborative projects, and peer feedback mechanisms foster a sense of belonging and encourage active participation, leading to enriched learning experiences. Research has shown that peer feedback mechanisms, such as those applied in higher education contexts, have been frequently used as instructional methods to improve essay performance and student perceptions (Huisman et al., 2018). Additionally, studies have highlighted the positive effects of peer tutoring on interaction behaviors, particularly in inclusive physical education settings, emphasizing the social benefits of peer interactions (Klavina & Block, 2008). The interaction between students and the online learning environment significantly influences the effectiveness of online learning. Research has shown that the quality and quantity of student-learning environment interaction has impacted students' motivation, engagement, and overall learning outcomes (van Popta et al., 2017). Therefore, it is crucial for educators and instructional designers to understand the role of student-learning environment interaction in online learning and to create environments that facilitate meaningful interactions.

Relationship Among SE, CoI, and TD

The relationships among SE, CoI, and TD in online learning are complex and multifaceted. SE in online learning has been identified as a critical factor influencing the effectiveness of online education (Meyer, 2014). It has been found that the quality and quantity of SE can significantly impact students' motivation, persistence, and overall success in online learning environments (Hu, 2011). Moreover, the CoI model has been used to explore how online communication and discourse can facilitate higher-order thinking skills, closely related to SE (Vaughan & Garrison, 2006). The CoI model emphasizes the importance of cognitive, social, and teaching presence in fostering meaningful learning experiences and SE in online settings (Pardales & Girod, 2006). Additionally, peer interactions have been recognized as an integral component of SE, with studies showing that peer interactions have significantly impacted students' learning engagement and task efficiency (Moon & Ke, 2020). It is important to note that SE is not only limited to academic interactions but also extends to social interactions and family connections, which have been identified as supporting factors in student success and engagement (Buyarski et al., 2011). Moreover, the influence of SE on learning achievement and the different dimensions of SE, including behavioral, emotional, and cognitive engagement, have been studied, highlighting the multifaceted nature of SE in online learning (Febrinzky, 2020; Ramadhani & Wulandari, 2019). Overall, the relationship among SE, CoI, and TD in online learning are intricate and interconnected, encompassing cognitive, social, and emotional dimensions of student interactions and experiences.

There have been few studies on the relationship among SE, CoI, and TD. For example, Kucuk and Richardson (2019) analyzed the effects of CoI on SE. They found that cognitive and teaching presence significantly affected emotional engagement, while social presence did not. Cognitive presence also significantly affected cognitive and behavioral engagement. Doo et al. (2021) investigated the structural relationships between TD and learning engagement in a large university class using flipped learning. They found that TD had a significant positive impact on learning engagement. Xiaoxing and Deris (2022)

investigated the impact of students' perceptions of the teaching presence, social presence, and cognitive presence in the CoI on SE in online discussions. They found that teaching, social, and cognitive presence had a statistically significant impact on SE. Students' perceptions of teaching presence directly and indirectly impacted their engagement.

There is a need for an in-depth examination of the relationships among these concepts, which are important for online learning. This study aimed to examine the relationships among SE, TD, and CoI using stepwise multiple linear regression analysis. The research questions (RQ) were as follows:

1. How do transactional distance and community of inquiry predict students' engagement?
2. How do transactional distance and community of inquiry predict students' behavioral engagement?
3. How do transactional distance and community of inquiry predict students' emotional engagement?
4. How do transactional distance and community of inquiry predict students' cognitive engagement?

Methodology

Research Design

We used the correlational survey design, one of the quantitative research methods, to determine the multiple relationships among SE, CoI, and TD. The correlational survey design is preferred for studies determining the change between two or more variables and the degree of change (Karasar, 2020). We tested the structural relationships among SE, CoI, and TD using stepwise multiple linear regression (SMLR) analysis. SMLR is a statistical technique used to select the most relevant variables from a larger set of potential predictors to build a regression model. This technique helps to eliminate irrelevant or redundant variables and focuses on variables with the strongest relationship with the dependent variable. SMLR helps improve the accuracy and interpretability of the regression model by iteratively adding and removing variables based on their statistical significance.

Participants

The study sample consisted of 1,418 undergraduate students studying at a state university in Turkey. Second-year (sophomore), third-year (junior), and fourth-year (senior) students studying in 30 different departments under eight faculties voluntarily participated in the study. First-year students were excluded from the sample because they had low distance education experience. Participants in the study were 42.1% (n = 597) second-year, 41.3% (n = 585) third-year, and 16.6% (n = 236) fourth-year students. Female students accounted for 53.9% of the sample (n = 765) and 46.1% (n = 653) were male. The sample included students between the ages of 19 and 29. Students took various courses via distance education, in periods ranging from one semester to eight. Table 1 shows the participants' demographic information.

Table 1

Demographics of the Participants

Faculty	Department	Gender (*n*)	Age (years)	Distance education course experience (*n*)
Education	Educational Sciences, Mathematics and Science Education, Special Education, Primary Education, Turkish and Social Sciences Education, Foreign Languages Education	M: 63 F: 183	Mean: 21.17 *SD*: 1.53	Mean: 1.76 *SD*: .69
Fine Arts and Design Faculty	Traditional Turkish Arts, Graphic Design, Ceramic and Glass	M: 26 F: 40	Mean: 21.72 *SD*: 1.81	Mean: 1.75 *SD*: .46
Economics and Administrative Sciences Faculty	Banking and Finance, Economy, Business Administration, Political Science and Public Administration, International Relations, International Trade and Logistics	M: 76 F: 76	Mean: 20.90 *SD*: 1.55	Mean: 1.71 *SD*: .61
Theology	Philosophy and Religious Sciences, Islamic History and Arts, Basic Islamic Sciences	M: 85 F: 168	Mean: 21.62 *SD*: 1.40	Mean: 1.74 *SD*: .52
Engineering and Architecture	Computer Engineering, Food Engineering, Civil Engineering, Mechanical Engineering, Landscape Architecture	M: 163 F: 85	Mean: 21.43 *SD*: 1.62	Mean: 1.78 *SD*: .60
School of Civil Aviation	Aviation Management	M: 84 F: 85	Mean: 20.62 *SD*: 1.05	Mean: 1.72 *SD*: .54
Sport Sciences	Education of Coaching, Physical Education and Sports Teacher Training, Sports Management	M: 121 F: 83	Mean: 21.39 *SD*: 1.58	Mean: 1.69 *SD*: .58
Tourism	Gastronomy and Culinary Arts, Tourism Guidance, Tourism Management	M: 35 F: 45	Mean: 21.12 *SD*: 1.67	Mean: 1.78 *SD*: .60

Data Collection

Data were collected with an inventory consisting of three scales (CoI, TD, and SE) and a demographics section. We used a CoI scale to measure students' perceptions of social presence, cognitive presence, and teaching presence in online learning environments. Arbaugh et al. (2008) developed the scale and Öztürk (2012) adapted it into Turkish. The scale's construct validity was examined with confirmatory factor

analysis. As a result, the fit indices were χ^2 (Chi-Square Goodness) = 996.25 (SD = 524, $p < .001$), χ^2/SD = 1.90, RMSEA (Root Mean Square Error of Approximation) = .081, S-RMR (Standardized Root Mean Square Residual) = .072, NNFI (Non Normed Fit Index) = .80, CFI (Comparative Fit Index) = .81, GFI (Goodness of Fit Index) = .70, and AGFI (Adjusted Goodness of Fit Index) = .66. Cronbach's alpha coefficient of the scale was .97.

We used a SE scale to measure students' behavioral, cognitive, and emotional engagement in online learning environments. Sun and Rueda (2012) developed the scale, and Ergün and Koçak Usluel (2015) adapted it into Turkish. The scale's construct validity was tested with first- and second-level confirmatory factor analyses. Goodness of fit values were found as $\chi^2(84, n = 393) = 453.93, p < .000$; RMSEA = .072, S-RMR = .059, GFI = .89, AGFI = .86, CFI = .96, NNFI = .96, and IFI = .96. The Cronbach's alpha coefficient of the scale, which consisted of behavioral (five items), cognitive (eight items), and affective commitment (six items) factors, was calculated as .90. This value indicates high internal consistency (Cronbach, 1951).

We used a TD scale to measure students' perceptions of TD in online learning environments. Zhang (2003) developed the scale and Yılmaz and Keser (2015) adapted it into Turkish. The construct validity of the scale was examined using confirmatory factor analysis. The analysis results for the five-factor model were $\chi^2(357)$ = 2360.91, (SD = 655, p = .000); χ^2/SD = 3.60, RMSEA = .086, RMR = .11, SRMR = .086, GFI = .74, AGFI = .71, IFI = .93, CFI = .93, NFI = .90, and NNFI = .92. Cronbach's alpha coefficient of the scale was .92.

The research data were gathered by printing the inventory and administering it using paper and pencil. Ethical permissions were obtained for the research before the data collection process. Then, instructors in 30 different departments were interviewed and informed about the research and the data collection process. Instructors told their students they could fill in the data collection tool voluntarily. In addition, we placed a short informative text about the research and researcher information on the top of the inventory. The participants completed the inventory in about 15 minutes, and the data collection process took 25 days.

Data Analysis

In this study, a total of 1,281 participants completed the survey, and prior to analysis, necessary statistical assumptions were verified. The data was analyzed using descriptive statistics such as frequency, percentage, and correlation. SMLR was also used. To identify outliers in the multivariate data, we computed the Mahalanobis distance which resulted in the removal of 13 outliers from the dataset. We then assessed the normality assumptions by examining the histogram and skewness/kurtosis values. We found that they were within the acceptable range of -1 to +1, confirming a normal distribution. A multivariate scatter diagram was employed to check for multivariate normality, and the assumption was found to be met. Furthermore, this normality test also provided some insights regarding multicollinearity. We computed bivariate correlation coefficients between predictor variables to examine multicollinearity in multiple regression analysis. The results indicated no issues (.70, .75, .78). Investigations into autocorrelation issues and model suitability were conducted through the application of the Durbin-Watson test, Cook's Distance, VIF, and tolerance.

Findings

Descriptive Statistics

In this research, data pertaining to SE, TD, and CoI were collected. Descriptive statistics derived from students' responses to these variables are presented in Table 2.

Table 2

Descriptive Statistics

Scale	Number of items	Minimum score	Maximum score	$\overline{X}$	*SD*	$\overline{X}$ /k	Skewness	Kurtosis
SE scale	19	19.00	95.00	66.42	15.11	3.5	-.170	-.241
TD scale	38	50.00	190.00	130.11	24.98	3.42	-.055	.031
CoI scale	34	34.00	136.00	101.74	20.55	2.99	-.388	-.072

According to Table 2, the average SE scale score of participants was 66.42 (3.5 out of 5), the TD scale score was 130.11 (3.42 out of 5), and the CoI scale score was 101.74 (2.99 out of 4). From this point of view, it was concluded that the scores for SE, TD, and CoI scales were situated at a moderate level.

Correlations Among Scales

Examination of relationships among SE, TD, and CoI scales involved computing Pearson correlation coefficients.

Table 3

Correlations Among SE, TD, and CoI Scales

Scale		SE	TD	CoI
SE scale	*r*	-		
TD scale	*r*	.75**	-	
CoI scale	*r*	.70**	.78**	-

Note. ** indicates correlation is significant at the .01 level (2-tailed).

Based on the data presented in Table 3, it can be concluded that there was a positive, strong relationship among SE-TD, SE-CoI, and CoI-TD. The correlation coefficients were found to be SE-TD ($r = .75$, $p < .01$), SE-CoI ($r = .70$, $p < .01$), and CoI-TD ($r = .78$, $p < .01$). As per Pallant's (2001) classification, a correlation coefficient of $r = .10$ to $.29$ indicates a small relation, $r = .30$ to $.49$ indicates a moderate relation, and $r = .50$ to 1.0 indicates a strong relation. Therefore, the findings suggested that the relationship among SE-TD, SE-CoI, and CoI-TD was strong and positive.

Regression Analysis Results for Variables Predicting SE

Predictors of SE were identified using SMLR; the results are summarized in Table 4.

Table 4

Stepwise Regression Analysis for Variables Predicting SE

Model	Variable	B	Standard Error	β
1	(Constant)	7.749	1.501	
	TD scale	.451	.011	.75**
	$R = .75$, $R^2 = .56$, $F(1, 1266) = 1584.047$, $p = .000$			
2	(Constant)	3.681	1.488	
	TD scale	.305	.017	.50**
	CoI scale	.227	.021	.31**
	$R = .77$, $R^2 = .59$, $F(2, 1265) = 919.938$, $p = .000$			

Note. ** indicates correlation is significant at the .01 level (2-tailed).

Table 4 displays two models that significantly predicted SE. Upon examining Model 1, TD accounted for 56% of the total variance in SE ($R = .75$, $R^2 = .56$, $F(1, 1266) = 1584.047$, $p = .000$). Taken together, in Model 2, TD and CoI explained 59% of the total variance in SE ($R = .77$, $R^2 = .59$, $F(2, 1265) = 919.938$, $p = .000$). Examining the regression coefficients associated revealed that TD ($\beta = .75$, $p < .01$) and CoI ($\beta = .31$, $p < .01$) significantly contributed to SE. The results suggest that, based on the findings, TD emerged as the most crucial predictor of SE.

Results for Regression Analysis Predicting Students' Behavioral Engagement

Predictors of students' behavioral engagement were identified using SMLR, and the results of the analysis are summarized in Table 5.

Table 5

Stepwise Regression Analysis for Variables Predicting Students' Behavioral Engagement

Model	Variable	B	Standard error	*B*
1	(Constant)	5.164	.448	
	TD scale	.102	.003	.65**
	$R = .65$, $R^2 = .42$, $F(1, 1266) = 904.033$, $p = .000$			
2	(Constant)	4.630	.460	
	TD scale	.083	.005	.52**
	CoI scale	.030	.007	.16**
	$R = .65$, $R^2 = .43$, $F(2, 1265) = 469.253$, $p = .000$			

Table 5 illustrates two models that significantly predicted students' behavioral engagement. In Model 1, TD accounted for 42% of total variance in students' behavioral engagement ($R = .65$, $R^2 = .42$, $F (1, 1266) = 904.033$, $p = .000$). Taken together, in Model 2, TD and CoI explained 43% of total variance in students' behavioral engagement ($R = .65$, $R^2 = .43$, $F (2, 1265) = 469.253$, $p = .000$). Analysis of the regression coefficients indicated that TD ($\beta = .65$, $p < .01$) and CoI ($\beta = .16$, $p < .01$) significantly contribute to students' behavioral engagement. Findings suggested that TD was the most crucial predictor of students' behavioral engagement.

Results for Regression Analysis Predicting Students' Emotional Engagement

Predictors of students' emotional engagement were identified using SMLR, and results of analysis are summarized in Table 6.

Table 6

Stepwise Regression Analysis for Variables Predicting Students' Emotional Engagement

Model	Variable	B	Standard Error	β
1	(Constant)	-5.889	.828	
	TD scale	.187	.006	.64**
	$R = .64$, $R^2 = .41$, $F (1, 1266) = 890.487$, $p = .000$			
2	(Constant)	-7.323	.843	
	TD scale	.135	.010	.47**
	CoI scale	.080	.012	.23**
	$R = .66$, $R^2 = .43$, $F (2, 1265) = 482.537$, $p = .000$			

Table 6 showcases two models that significantly predicted students' emotional engagement. Specifically, in Model 1, TD accounted for 41% of total variance in students' emotional engagement ($R = .64$, $R^2 = .41$, $F (1, 1266) = 890.487$, $p = .000$). Taken together, in Model 2, TD and CoI explained 43% of total variance in students' emotional engagement ($R = .66$, $R^2 = .43$, $F (2, 1265) = 482.537$, $p = .000$). Analysis of the regression coefficients revealed that TD ($\beta = .64$, $p < .01$) and CoI ($\beta = .23$, $p < .01$) significantly contributed to students' emotional engagement. Findings suggested that TD was the most crucial predictor of students' emotional engagement.

Results for Regression Analysis Predicting Students' Cognitive Engagement

Predictors of students' cognitive engagement were identified using SMLR, and results of analysis are summarized in Table 7.

Table 7

Stepwise Regression Analysis for Variables Predicting Students' Cognitive Engagement

Model	Variable	B	Standard error	β
1	(Constant)	9.282	.787	
	TD scale	.200	.008	.60**
	$R = .60$, $R^2 = .35$, $F(1, 1266) = 694.981$, $p = .000$			
2	(Constant)	6.374	.830	
	TD scale	.117	.012	.35**
	CoI scale	.087	.010	.32**
	$R = .63$, $R^2 = .39$, $F(2, 1265) = 409.552$, $p = .000$			

Table 7 illustrates two models that significantly predicted students' cognitive engagement. In Model 1, TD accounted for 35% of total variance in students' cognitive engagement ($R = .60$, $R^2 = .35$, $F(1, 1266) = 694.981$, $p = .000$). Taken together, in Model 2, TD and CoI explained 39% of total variance in students' cognitive engagement ($R = .63$, $R^2 = .39$, $F(2, 1265) = 409.552$, $p = .000$). Analysis of the regression coefficients indicated that TD ($\beta = .60$, $p < .01$) and CoI ($\beta = .32$, $p < .01$) significantly contributed to students' cognitive engagement. Findings suggested that TD was the most crucial predictor of students' cognitive engagement.

Discussion and Conclusions

This study examined the structural relationships among student engagement, transactional distance, and community of inquiry in online learning environments through multiple linear regression analysis. This revealed significant findings regarding the relationships among these constructs, including significant and high relationships among SE and CoI, SE and TD, and CoI and TD. The findings indicated that TD and CoI contributed significantly to SE. Specifically, the regression coefficients suggested that TD and CoI play important roles in predicting SE. These findings were in line with previous research that emphasized the importance of building a strong CoI to reduce TD and increase SE (Chatterjee & Parra, 2022; Li et al., 2023; Themeli & Bougia, 2016; Vaughan, 2010). Analysis of the prediction of SE in our first research question determined that TD and CoI made a major contribution. Regarding our second, third, and fourth research questions, we analyzed our predictions according to sub-dimensions of SE. As a result, relatively lower prediction coefficients were obtained. The effects of TD and CoI on behavioral engagement and emotional engagement were found to be higher than on cognitive engagement. This suggests that instructional interventions related to TD and CoI will have a greater effect on students' behavioral and emotional engagement.

Transactional distance, which was the most important determinant of students' SE, highlights the importance of minimizing the psychological and communication gaps between instructors and students in online learning (Karaoglan-Yilmaz et al., 2022; Moore, 2018). By reducing TD, educators can create a more conducive and engaging learning environment for students, ultimately lead to higher levels of engagement

and satisfaction with the online learning experience. Moreover, the positive contribution of CoI to SE emphasizes the importance of collaborative and interactive learning experiences in online environments (Li et al., 2023). Building a strong sense of CoI and fostering meaningful interactions between students and instructors can improve SE as well as overall learning outcomes.

The findings of this study underscored the critical roles of TD and CoI in shaping SE in online learning environments. By recognizing the importance of these factors, educators and instructional designers can implement targeted strategies to reduce TD, develop a strong sense of CoI, and increase SE in online learning. These strategies may include leveraging technology to facilitate meaningful interactions, encouraging collaborative activities, and providing students with adequate support and feedback. Furthermore, the study supports the need for ongoing research and practical interventions aimed at optimizing online learning experiences and maximizing SE.

It should be acknowledged that the study has some limitations. First, the study was conducted with undergraduate students studying at a university in Turkey. Future studies could examine the validity of our results by including participants from different universities, or participants of different ages and educational levels (e.g., adults, high school students). Finally, cross-cultural studies could be conducted to compare the results.

Overall, the findings contribute to the growing body of knowledge on effective online learning practices and provide valuable implications for educators, instructional designers, and educational policy makers who aim to create engaging and effective online learning environments. By addressing TD and CoI factors, institutions can strive to create enriching and supportive online learning experiences that promote student engagement, satisfaction, and academic achievement.

References

Alhih, M., Ossiannilsson, E., & Berigel, M. (2017). Levels of interaction provided by online distance education models. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(6), 2733–2748. https://doi.org/10.12973/eurasia.2017.01250a

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., & Swan, K. P. (2008). Developing a community of inquiry instrument: Testing a measure of the Community of Inquiry framework using a multi-institutional sample. *The Internet and Higher Education, 11*(3-4), 133–136. https://doi.org/10.1016/j.iheduc.2008.06.003

Baloran, E. T., Hernan, J. T., & Taoy, J. S. (2021). Course satisfaction and student engagement in online learning amid COVID-19 pandemic: A structural equation model. *Turkish Online Journal of Distance Education*, *22*(4), Article 4. https://doi.org/10.17718/tojde.1002721

Bond, M., & Bergdahl, N. (2022). Student engagement in open, distance, and digital education. In O. Zawacki-Richter & I. Jung (Eds.), *Handbook of open, distance and digital education* (pp. 1–16). Springer. https://doi.org/10.1007/978-981-19-0351-9_79-1

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International Journal of Educational Technology in Higher Education*, *17*(1), 2. https://doi.org/10.1186/s41239-019-0176-8

Buyarski, C. A., Bloom, J. L., Murray, J. E., & Hutson, B. L. (2011). Engaging families in supporting their students: An appreciative approach. *Journal of College Orientation, Transition, and Retention*, *19*(1), Article 1. https://doi.org/10.24926/jcotr.v19i1.2779

Çebi, A. (2023). How e-learning readiness and motivation affect student interactions in distance learning? *Education and Information Technologies, 28*, 2941–2960. https://doi.org/10.1007/s10639-022-11312-0

Chatterjee, S., & Parra, J. (2022). Undergraduate students engagement in formal and informal learning: Applying the community of inquiry framework. *Journal of Educational Technology Systems*, *50*(3), 327–355. https://doi.org/10.1177/00472395211062552

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297–334. https://doi.org/10.1007/BF02310555

Dewan, M. A. A., Murshed, M., & Lin, F. (2019). Engagement detection in online learning: A review. *Smart Learning Environments*, *6*(1), 1. https://doi.org/10.1186/s40561-018-0080-z

Dharmadjaja, P. N., & Tiatri, S. (2021). The effect of online interaction types and acceptance of technology factors on student satisfaction with online learning during the COVID-19 pandemic. *Proceedings*

of the International Conference on Economics, Business, Social, and Humanities (pp. 936–942). https://doi.org/10.2991/assehr.k.210805.148

Doo, M. Y., Bonk, C. J., & Heo, H. (2023). Examinations of the relationships between self-efficacy, self-regulation, teaching, cognitive presences, and learning engagement during COVID-19. *Educational Technology Research and Development*, *71*(2), 481–504. https://doi.org/10.1007/s11423-023-10187-3

Doo, M. Y., Bonk, C. J., Shin, C. H., & Woo, B. -D. (2021). Structural relationships among self-regulation, transactional distance, and learning engagement in a large university class using flipped learning. *Asia Pacific Journal of Education*, *41*(3), 609–625. https://doi.org/10.1080/02188791.2020.1832020

Eom, S. B., Wen, H. J., & Ashill, N. (2006). The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical investigation. *Decision Sciences Journal of Innovative Education*, *4*(2), 215–235. https://doi.org/10.1111/j.1540-4609.2006.00114.x

Ergün, E., & Koçak Usluel, Y. (2015). The Turkish adaptation of student's engagements scale in online learning environment: A study of validity and reliability. *Educational Technology Theory and Practice, 5*(1), 20–33. https://doi.org/10.17943/etku.64661

Fabian, K., Smith, S., Taylor-Smith, E., & Meharg, D. (2022). Identifying factors influencing study skills engagement and participation for online learners in higher education during COVID-19. *British Journal of Educational Technology*, *53*(6), 1915–1936. https://doi.org/10.1111/bjet.13221

Febrinzky, I. T. (2020). The influence of student engagement towards learning achievement of School of Communication and Business Telkom University. *Jurnal Ilmu Sosial Politik Dan Humaniora*, *3*(1), 13–21. https://doi.org/10.36624/jisora.v3i1.51

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks*, *11*(1), 61–72.

Hajibayova, L. (2017). Students' viewpoint: What constitutes presence in an online classroom? *Cataloging & Classification Quarterly*, *55*(1), 12–25. https://doi.org/10.1080/01639374.2016.1241972

Hambali, N., Zaiton, S. N. 'Ain H., Sidik, N., Hanib, N. H., Zahid, F. S., & Rahim, N. H. (2022). Exploring online education experience through the teaching, social and cognitive presences. *International Journal of Academic Research in Business and Social Sciences*, *12*(10), 1440–1459. https://doi.org/10.6007/IJARBSS/v12-i10/14871

Harb, J., & Krish, P. (2020). Cognitive presence in a blended learning environment at Jordanian universities. *Arab World English Journal*, *11*(1), 44–51. https://doi.org/10.24093/awej/vol11no1.4

Hu, S. (2011). Reconsidering the relationship between student engagement and persistence in college. *Innovative Higher Education*, *36*(2), 97–106. https://doi.org/10.1007/s10755-010-9158-4

Huisman, B., Saab, N., van Driel, J., & van den Broek, P. (2018). Peer feedback on academic writing: Undergraduate students' peer feedback role, peer feedback perceptions and essay performance. *Assessment & Evaluation in Higher Education*, *43*(6), 955–968. https://doi.org/10.1080/02602938.2018.1424318

Joksimović, S., Poquet, O., Kovanović, V., Dowell, N., Mills, C., Gašević, D., Dawson, S., Graesser, A. C., & Brooks, C. (2018). How do we model learning at scale? A systematic review of research on MOOCs. *Review of Educational Research*, *88*(1), 43–86. https://doi.org/10.3102/0034654317740335

Kang, M., & Im, T. (2013). Factors of learner–instructor interaction which predict perceived learning outcomes in online learning environment. *Journal of Computer Assisted Learning*, *29*(3), 292–301. https://doi.org/10.1111/jcal.12005

Karaoglan-Yilmaz, F. G., Zhang, K., Ustun, A. B., & Yilmaz, R. (2022). Transactional distance perceptions, student engagement, and course satisfaction in flipped learning: A correlational study. *Interactive Learning Environments*, *32*(2), 447–462. https://doi.org/10.1080/10494820.2022.2091603

Karasar, N. (2020). *Scientific research method: Concepts, principles, techniques*. Nobel Publishing.

Kauffman, H. (2015). A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology*, *23*. https://doi.org/10.3402/rlt.v23.26507

Klavina, A., & Block, M. E. (2008). The effect of peer tutoring on interaction behaviors in inclusive physical education. *Adapted Physical Activity Quarterly*, *25*(2), 132–158. https://doi.org/10.1123/apaq.25.2.132

Kucuk, S., & Richardson, J. C. (2019). A structural equation model of predictors of online learners' engagement and satisfaction. *Online Learning*, *23*(2), Article 2. https://doi.org/10.24059/olj.v23i2.1455

Kuo, Y. -C., Walker, A. E., Belland, B. R., & Schroder, K. E. E. (2013). A predictive study of student satisfaction in online education programs. *The International Review of Research in Open and Distributed Learning*, *14*(1), 16–39. https://doi.org/10.19173/irrodl.v14i1.1338

Lee, Y., & Pillai, V. (2022). The impact of online learning on 7th grade students' perception of engagement, social presence, and satisfaction during the COVID-19 pandemic. *Journal of Student Research*, *11*(3). https://doi.org/10.47611/jsrhs.v11i3.3685

Li, L., Zhang, R., & Piper, A. M. (2023). Predictors of student engagement and perceived learning in emergency online education amidst COVID-19: A community of inquiry perspective. *Computers in Human Behavior Reports, 12*, 100326. https://doi.org/10.1016/j.chbr.2023.100326

Li, Q., Jiang, Q., Liang, J. -C., Pan, X., & Zhao, W. (2022). The influence of teaching motivations on student engagement in an online learning environment in China. *Australasian Journal of Educational Technology*, *38*(6), Article 6. https://doi.org/10.14742/ajet.7280

Liu, B., Xing, W., Zeng, Y., & Wu, Y. (2022). Linking cognitive processes and learning outcomes: The influence of cognitive presence on learning performance in MOOCs. *British Journal of Educational Technology*, *53*(5), 1459–1477. https://doi.org/10.1111/bjet.13193

Luthfiarini, P., & Susandari. (2022). Pengaruh community of inquiry terhadap student's satisfaction in online learning di Universitas Islam Bandung. *Bandung Conference Series: Psychology Science*, *2*(1), Article 1. https://doi.org/10.29313/bcsps.v2i1.1096

Martin, F., & Bolliger, D. U. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning*, *22*(1), Article 1. https://doi.org/10.24059/olj.v22i1.1092

Mayne, L. A., & Wu, Q. (2011). Creating and measuring social presence in online graduate nursing courses. *Nursing Education Perspectives*, *32*(2), 110–114. https://doi.org/10.5480/1536-5026-32.2.110

McCreery, M. P., Schrader, P. G., Krach, S. K., & Boone, R. (2013). A sense of self: The role of presence in virtual environments. *Computers in Human Behavior*, *29*(4), 1635–1640. https://doi.org/10.1016/j.chb.2013.02.002

Meyer, K. A. (2014). Student engagement in online learning: What works and why. *ASHE Higher Education Report*, *40*(6), 1–114. https://doi.org/10.1002/aehe.20018

Mitchell, C., Cours Anderson, K., Laverie, D., & Hass, A. (2021). Distance be damned: The importance of social presence in a pandemic constrained environment. *Marketing Education Review*, *31*(4), 294–310. https://doi.org/10.1080/10528008.2021.1936561

Moon, J., & Ke, F. (2020). Exploring the relationships among middle school students' peer interactions, task efficiency, and learning engagement in game-based learning. *Simulation & Gaming*, *51*(3), 310–335. https://doi.org/10.1177/1046878120907940

Moore, M. G. (1993). Theory of transactional distance. In Keegan, D. (Ed.), *Theoretical principles of distance education* (pp. 22–38). Routledge.

Moore, M. G. (2018). The theory of transactional distance. In Moore, M. G. & Diehl, W. C. (Eds.), *Handbook of distance education* (pp. 32–46). Routledge.

Muilenburg, L. Y., & Berge, Z. L. (2005). Student barriers to online learning: A factor analytic study. *Distance Education*, *26*(1), 29–48. https://doi.org/10.1080/01587910500081269

Natarajan, J., & Joseph, M. A. (2022). Impact of emergency remote teaching on nursing students' engagement, social presence, and satisfaction during the COVID-19 pandemic. *Nursing Forum*, *57*(1), 42–48. https://doi.org/10.1111/nuf.12649

Oyarzun, B., Stefaniak, J., Bol, L., & Morrison, G. R. (2018). Effects of learner-to-learner interactions on social presence, achievement and satisfaction. *Journal of Computing in Higher Education*, *30*(1), 154–175. https://doi.org/10.1007/s12528-017-9157-x

Öztürk, E. (2012). An adaptation of the community of inquiry index: The study of validity and reliability. *Elementary Education Online, 11*(2), 408–422.

Pallant, J. (2001). *SPSS survival manual*. Maidenhead, PA: Open University.

Pardales, M. J., & Girod, M. (2006). Community of inquiry: Its past and present future. *Educational Philosophy and Theory*, *38*(3), 299–309. https://doi.org/10.1111/j.1469-5812.2006.00196.x

Picciano, A. G. (2002). Beyond student perceptions: Issues of interaction, presence, and performance in an online course. *Online Learning*, *6*(1), Article 1. https://doi.org/10.24059/olj.v6i1.1870

Ramadhani, S. A., & Wulandari, L. (2019). The difference of student engagement between Javanese and non-Javanese students who are studying in Malang. *Proceedings of the 4th ASEAN Conference on Psychology, Counselling, and Humanities* (pp. 288–290). https://doi.org/10.2991/acpch-18.2019.70

Richardson, J. C., Besser, E., Koehler, A., Lim, J., & Strait, M. (2016). Instructors' perceptions of instructor presence in online learning environments. *The International Review of Research in Open and Distributed Learning*, *17*(4). https://doi.org/10.19173/irrodl.v17i4.2330

Saraç, M., & Doğan, M. (2022). Evaluation of the instructor-student interaction in online classes: Instructors' perspective. *E-International Journal of Educational Research*, *13*(4), 99–112. https://doi.org/10.19160/e-ijer.1122570

Setyawati, A., Wijaya, S., & Widjaja, D. C. (2022). The effect of student's perception of learning innovation on student engagement and student satisfaction. *Petra International Journal of Business Studies*, *5*(2), Article 2. https://doi.org/10.9744/ijbs.5.2.198-205

Shea, P., & Bidjerano, T. (2009). Community of inquiry as a theoretical framework to foster "epistemic engagement" and "cognitive presence" in online education. *Computers & Education*, *52*(3), 543–553. https://doi.org/10.1016/j.compedu.2008.10.007

Shea, P., Hayes, S., & Vickers, J. (2010). Online instructional effort measured through the lens of teaching presence in the community of inquiry framework: A re-examination of measures and approach. *The International Review of Research in Open and Distributed Learning*, *11*(3), 127–154. https://doi.org/10.19173/irrodl.v11i3.915

Starr-Glass, D. (2013). From connectivity to connected learners: Transactional distance and social presence. In C. Wankel & P. Blessinger (Eds.), *Increasing student engagement and retention in e-learning environments: Web 2.0 and blended learning technologies* (Vol. 6, Part G, pp. 113–143). Emerald Group Publishing. https://doi.org/10.1108/S2044-9968(2013)000006G007

Sun, J. C. -Y., & Rueda, R. (2012). Situational interest, computer self-efficacy and self-regulation: Their impact on student engagement in distance education. *British Journal of Educational Technology, 43*, 191–204. https://doi.org/10.1111/j.1467-8535.2010.01157.x

Sun, Y., Ni, L., Zhao, Y., Shen, X. -L., & Wang, N. (2019). Understanding students' engagement in MOOCs: An integration of self-determination theory and theory of relationship quality. *British Journal of Educational Technology*, *50*(6), e0001. https://doi.org/10.1111/bjet.12724

Supardi, S., & Ashari, S. (2021). Determinants of vocational student satisfaction levels following online lectures during the COVID-19 pandemic. *E-Jurnal Akuntansi*, *31*(3), 677–692. https://doi.org/10.24843/EJA.2021.v31.i03.p12

Swan, K., Garrison, D. R., & Richardson, J. C. (2009). A constructivist approach to online learning: The community of inquiry framework. In C. Payne (Ed.), *Information technology and constructivism in higher education: Progressive learning frameworks* (pp. 43–57). IGI Global. https://www.igi-global.com/gateway/chapter/www.igi-global.com/gateway/chapter/23488

Tadesse, T., & Edo, B. (2020). The relationships between student engagement and learning outcome in the undergraduate sports science program in Ethiopia. *Journal of Applied Research in Higher Education*, *13*(1), 48–62. https://doi.org/10.1108/JARHE-01-2019-0017

Themeli, C., & Bougia, A. (2016). Tele-proximity: Tele-community of inquiry model. Facial cues for social, cognitive, and teacher presence in distance education. *International Review of Research in Open and Distributed Learning, 17*(6), 145–163. https://doi.org/10.19173/irrodl.v17i6.2453

van Popta, E., Kral, M., Camp, G., Martens, R. L., & Simons, P. R. -J. (2017). Exploring the value of peer feedback in online learning for the provider. *Educational Research Review*, *20*, 24–34. https://doi.org/10.1016/j.edurev.2016.10.003

Vaughan, N. D. (2010). A blended community of inquiry approach: Linking student engagement and course redesign. *The Internet and Higher Education*, *13*(1), 60–65. https://doi.org/10.1016/j.iheduc.2009.10.007

Vaughan, N., & Garrison, R. (2006). How blended learning can support a faculty development community of inquiry. *Online Learning*, *10*(4), Article 4. https://doi.org/10.24059/olj.v10i4.1750

Weidlich, J., & Bastiaens, T. J. (2018). Technology matters: The impact of transactional distance on satisfaction in online distance learning. *The International Review of Research in Open and Distributed Learning*, *19*(3). https://doi.org/10.19173/irrodl.v19i3.3417

Wu, Y. (2016). Factors impacting students' online learning experience in a learner-centred course. *Journal of Computer Assisted Learning*, *32*(5), 416–429. https://doi.org/10.1111/jcal.12142

Xiao, M., Zhou, J., & Xu, T. (2021). Research on the influence of synchronous interactive class on student online learning engagement. *Proceedings of the 12th International Conference on Education Technology and Computers* (pp. 98–104). https://doi.org/10.1145/3436756.3437028

Xiaoxing, L., & Deris, F. D. (2022). CoI-based teaching practices to promote EFL learners' online discussion in China's blended learning context. *Asian Journal of University Education*, *18*(2), 477–488.

Xue, J., Xu, X., Wu, Y., & Hu, P. (2023). Student perceptions of the community of inquiry framework and satisfaction: Examining the role of academic emotion and self-regulation in a structural model. *Frontiers in Education*, *8*. https://doi.org/10.3389/feduc.2023.1046737

Yılmaz, R., & Keser, H. (2015). The adaptation study of transactional distance scale. *Hacettepe University Journal of Education, 30*(4), 91–105.

Yilmaz, R. (2017). Exploring the role of e-learning readiness on student satisfaction and motivation in flipped classroom. *Computers in Human Behavior, 70*, 251–260.

Yu, Z. (2022). Sustaining student roles, digital literacy, learning achievements, and motivation in online learning environments during the COVID-19 pandemic. *Sustainability, 14*(8), 4388.

Zapata-Cuervo, N., Montes-Guerra, M. I., Shin, H. H., Jeong, M., & Cho, M. -H. (2023). Students' psychological perceptions toward online learning engagement and outcomes during the COVID-19 pandemic: A comparative analysis of students in three different countries. *Journal of Hospitality & Tourism Education*, *35*(2), 108–122. https://doi.org/10.1080/10963758.2021.1907195

Zhang, A. (2003). *Transactional distance in web-based college learning environments: Toward measurement and theory construction* [Doctoral dissertation, Virginia Commonwealth University]. LearnTechLib. https://www.learntechlib.org/p/117282

Zhao, H., & Sullivan, K. P. H. (2017). Teaching presence in computer conferencing learning environments: Effects on interaction, cognition and learning uptake. *British Journal of Educational Technology*, *48*(2), 538–551. https://doi.org/10.1111/bjet.12383

Zilka, G. C., Cohen, R., & Rahimi, I. (2018). Teacher presence and social presence in virtual and blended courses. *Journal of Information Technology Education: Research*, *17*, 103–126.


Athabasca
University


BY