A Sense of Belonging in Online Post-Traditional Students: What Matters?

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Abstract

Online education has grown and continues to expand, driven by innovative information and communication technologies that facilitate effective interactions both within and outside the online classroom. Post-traditional students with diverse and complex identities face unique challenges in establishing connections within online learning environments despite advancements in communication technology. However, further research on this demographic is needed to understand their sense of belonging and the factors influencing it. This research focuses on the sense of belonging of online post-traditional students as a critical factor for promoting and consolidating online learning experiences and as a factor associated with measures of student success.

In this pilot study, we surveyed a sample of online learners using a mixed-methods approach to examine whether students feel accepted and valued and whether identities such as academic discipline, gender, and ethnicity are influential. Our findings indicate that post-traditional learners report moderate levels of belonging, with university support, acceptance, and meaningful relationships with faculty and staff being pivotal factors. Significant differences among students in different academic programs or gender groups did not emerge. However, Hispanic students reported a higher sense of belonging, perhaps facilitated by the university's designation as a Hispanic-Serving Institution (HSI). This study provides actionable strategies to cultivate a more engaging and supportive online learning environment by pinpointing the critical and negligible factors affecting a sense of belonging.

Keywords: post-traditional students, sense of belonging, student identity, fostering connections, Community of Inquiry

Online education has grown rapidly, offering unprecedented accessibility and flexibility to a diverse population of learners. However, despite technological advances that have provided innovative communication methods among students, faculty, and peers, the absence of in-person interaction remains a challenge (Cilliers et al., 2022; Stover et al., 2024; Zhang & He, 2022). Our college offers a variety of online programs in applied science and computing disciplines and predominantly caters to post-traditional transfer students. Students completing their initial years at a community college, where in-person interactions may be prevalent, can struggle after transferring to an online program for their junior and senior years due to the reduced opportunities for in-person interactions. Additionally, a significant portion of our student body, nearly 60%, are first-generation college attendees. As discussed by DeRossett et al. (2021), this demographic may face additional social and academic challenges, including lower academic performance and a higher likelihood of adverse outcomes in online settings, particularly students from disadvantaged backgrounds (Figlio et al., 2013; Kaupp, 2012). Given that these challenges exist for our students, fostering a sense of belonging within the campus community is critical for supporting their success (Strayhorn, 2018).

This study explored the sense of belonging among online post-traditional students, focusing on their feelings of acceptance, value, and respect within their academic community. We contend that a sense of belonging impacts student engagement, retention, and success. It is a vital component of students' academic and personal growth, influencing their capacity for self-directed learning and their ability to complete degree programs. Strayhorn (2018) suggests that various factors can influence students' sense of belonging. These include enrolling in the "right" academic major and aspects of the campus environment, such as inclusiveness of gender and gender identity, minority status, age, and physical and cognitive ability. Meaningful interactions with faculty and peers, social support from peers, and perceived classroom comfort also play a role in influencing a sense of belonging. Additionally, external factors such as politically charged international, national, and local events, activist movements, and political divisiveness concerning systemic racism and xenophobia can impact a student's sense of belonging even in online classroom environments.

The literature suggests that a sense of belonging in online environments can be influenced by the quality of social, cognitive, and teaching presence (Garrison, 2016). Social presence (SP) is the ability of students to project their individuality in the online community, thereby fostering meaningful interactions. Cognitive presence (CP) is the extent to which learners can construct and confirm meaning through sustained reflection and discourse. Teaching presence (TP) refers to designing, facilitating, and directing cognitive and social processes to achieve meaningful learning outcomes. As instructors and students actively participate in online learning, SP, CP, and TP evolve dynamically in their learning community. Each presence plays a crucial role in shaping students' online learning experiences and overall sense of belonging.

With online post-traditional students comprising nearly 60% of undergraduate enrollments (American Council on Education, 2023), understanding what enhances their sense of belonging is

essential. Our study focused on students in Applied Computing, Computer Science, Human Services, and Family Studies & Human Development from among our college's programs. These students were surveyed to assess their sense of belonging and to address the following research questions:

R1: Do our online post-traditional students report a sense of belonging? How do their academic disciplines, gender, and ethnicity affect their sense of belonging?

R2: How do social, cognitive, and teaching presence impact the sense of belonging of online post-traditional students? How do their connections with faculty and peers influence this sense of belonging?

This paper details our methodology, findings, and the implications of our study for enhancing the online educational experience. By understanding and addressing the unique challenges faced by post-traditional students, we aim to provide actionable strategies to foster a more inclusive and supportive online learning environment that promotes academic success and personal growth.

Literature Review

Sense of Belonging in Higher Education

The proliferation of online education has extended access to diverse post-traditional learners (Jaggars & Xu, 2016). However, challenges persist, particularly concerning student retention, persistence, and completion rates of online learners compared to traditional face-to-face learners. As discussed by Mowreader (2024), enrollment in exclusively online degree programs negatively influenced bachelor's degree completion across all student subgroups by race and ethnicity. Central to addressing these challenges is the concept of a sense of belonging, which is linked to motivation (Baumeister & Leary, 1995), academic achievement (Walton & Cohen, 2007), persistence (Pittman & Richmond, 2008), and lower attrition rates in campus-based learning (Peacock & Cowan, 2019). Sense of belonging contains various components, but fundamentally, it reflects the feeling that one fits in, belongs to, or is a member of the academic community (Good et al., 2012). Studying a sense of belonging allows researchers to measure how college students' experiences shape their affiliation with their learning environment (Hurtado & Carter, 1997).

A significant issue that "sense of belonging" researchers have aimed to address at the postsecondary level is the development of valid and reliable scales to measure the sense of belonging construct. Slaten et al. (2018) developed the University Belonging Questionnaire (UBQ), validated as a reliable scale with three factors: university affiliation (UA), university support and acceptance (USA), and faculty and staff relations (FSR). Good et al. (2012) developed a Math Sense of Belonging Scale (MSBS) to predict variance in college students' intent to pursue math in the future. The MSBS has a factor structure for a sense of belonging composed of five factors: Membership, Acceptance, Affect, Desire to Fade, and Trust. Mooney and Becker (2021) adapted MSBS to measure the sense of belonging pre- and post-onset of the COVID-19 pandemic, investigating the impact of transitioning to online/hybrid learning on students' belonging experiences.

Community of Inquiry

Learning is an experience that shapes identity and, as discussed by Farnsworth et al. (2016), cannot be separated from identity development. Therefore, educational practices incorporating students' various identities, including their culture, social, and academic backgrounds, should be considered to enhance students' learning experiences and outcomes (Smith, 2004). A sense of belonging is not merely a passive experience but is actively fostered by learning environments that encourage reflective discourse and deep learning. This concept within the Community of Inquiry theoretical framework (CoI) proposed by Garrison et al. (1999) highlights the roles of social presence (SP), cognitive presence (CP), and teaching presence (TP) as a foundation for meaningful e-learning experiences (Garrison, 2016). As emphasized by Wempe and Collins (2024), creating a learning environment of engagement, collaboration, and a sense of community reduces the feeling of isolation and dissatisfaction with student learning experiences. Interventions designed to help students feel they belong can mitigate the effects of stereotype threat and improve academic performance and persistence (Walton & Cohen, 2011).

Identifying and understanding the factors in learning environments and experiences is critical for improving retention and academic success. Many factors can influence belonging, including students' identities and experiences, learning environment, people (faculty, staff, and peers), and academic discipline (Mooney & Becker, 2021). Swail's Geometric Model of Student Persistence and Achievement (Swail, 2003) also underscores academic, social, and institutional factors critical to student experiences. The CoI theoretical framework pinpoints the elements SP, CP, and TP that constitute meaningful learning experiences and suggests that the three elements interact synergistically within communities (Garrison et al., 2010). Further refining the CoI framework, Peacock and Cowan (2019) introduced elements focusing on nurturing online learners' sense of belonging through tailored instructional strategies. The importance of TP in achieving high levels of CP has been recognized by Garrison et al. (2001) and Rourke and Kanuka (2009). Practicing SP in an engaging, responsive, respectful, challenging, and supportive online environment is also critical (Garrison et al., 1999). Recently, Meech and Koehler (2024) investigated relationships between CoI (Garrison, 2016) and servant leadership theory (Buchen, 1998). They recognized and proposed the servant leadership theory to clarify the construct of online instructor leadership to facilitate SP, CP, and TP in online learning environments.

Faculty and Peer Interactions, Diversity, and Inclusion

Previous research has emphasized the importance of faculty-student and peer relationships in cultivating a sense of belonging. Students who perceive their faculty and peers as accessible and supportive are more likely to experience a stronger connection to their educational community (Rovai, 2003; Umbach & Wawrzynski, 2005). Hoffman et al. (2002) identified critical dimensions of belonging, including empathetic faculty understanding and perceived peer support, influencing students' educational satisfaction and persistence. Interpersonal aspects of online course design, such as those identified by Jaggers and Xu (2016), are critical in fostering a sense of belonging and can directly influence student performance.

Thriving learning communities can support diverse student populations by fostering a sense of belonging. However, how a sense of belonging is embodied across different student demographics may vary. Johnson et al. (2007) explored how racial and ethnic identities impact students' sense of belonging, noting that students with positive racial and ethnic identities report higher levels of belonging and overall well-being. This finding is particularly relevant in discussions about inclusivity at predominantly white institutions, where Latino students, for example, often report a lower sense of belonging (Strayhorn, 2018). Investigating the intersectionality of gender and minority status revealed complicated and nuanced trends in students' sense of belonging (Mooney & Becker, 2021). These trends and the potential disparities underscore the need for educational practices that support diverse student populations—for example, those at Hispanic-serving institutions (Maestas et al., 2007), where financial stability, inclusive campus climate, and faculty engagement play pivotal roles in enhancing students' sense of belonging.

Research Methods

Our research methodology followed an Institutional Review Board (IRB) approved protocol (STUDY00000062), using a mixed-methods approach to explore factors contributing to the sense of belonging among online post-traditional students. The mixed-methods approach allowed quantitative data, which offers measurable insights, and qualitative data, which provides rich, contextual information, to be collected and analyzed. This combination allowed us to quantify the level of belonging and underlying factors and explore the student narratives contributing to their experiences.

Survey Instrument

The survey instrument included five quantitative questions that asked students to indicate their level of agreement in feeling a sense of belonging in their classes, feeling that they matter, and feeling connected to other students, faculty, and staff. Additionally, we employed two validated instruments to compose our survey. The first and primary instrument we employed was the University Belonging Questionnaire (UBQ). Researchers validated the UBQ through exploratory and confirmatory factor analyses. Additional analyses demonstrated the instrument's convergent and incremental validity (Slaten et al., 2018). The UBQ questions in our survey allowed students to identify perceptions of a sense of belonging based on university affiliation (UA), university support and acceptance (USA), and faculty and staff relations (FSR) of their university experience. The secondary instrument was the Math Sense of Belonging Scale (MSBS), validated by exploratory and confirmatory factor analyses and internal consistency tests (Good et al., 2012). The MSBS survey questions contained 14 items, of which 7 were positively framed and 7 were negatively framed. The critical aspects assessed by the MSBS questions were feelings of acceptance and perceived value, inclusion, support, and encouragement.

In addition to the quantitative questions to measure the sense of belonging, the survey included ten questions related to student demographic information pertinent to our students, four open questions about their experiences, one regarding satisfaction, two about peer interactions, three about persistence in their studies, one each on recommending courses to others and perceived

identity valuation. The survey consisted of 64 questions, 46 of which focused on the sense of belonging (4 open questions included), using a combination of qualitative and quantitative questioning. Employing validated instruments and collecting demographic information, we aimed to assess students' sense of belonging from multiple dimensions. Correlation analyses aimed to determine comprehensive and reliable measures of a sense of belonging among our online post-traditional students.

Data Collection and Analysis

The student survey was administered via Qualtrics online, and students who were active in Applied Computing, Computer Science, Human Services, and Family Studies & Human Development programs were invited to participate in the research study. This subset of programs intentionally included both applied science and computing disciplines.

At the end of the survey participation period, responses were downloaded in an Excel file from Qualtrics. As participants were not required to answer all survey questions, Python programming was used to parse and clean the Excel data by filtering out the unfinished responses. The processed data was then analyzed and visualized. Each quantitative question in the survey used a 5-point Likert scale such as 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. When calculating an integrated score based on a group of quantitative questions, we transformed the Likert scale of each question's response into its corresponding ordinal value. For example, if a response was "agree," we transformed it to 4; if it was "disagree," the scale was transformed to 2. Based on the ordinal values associated with students' responses to the quantitative questions, we grouped them to compute the integrated scores representing variables related to the sense of belonging.

In statistical analyses, integrated scores were treated as numeric values. Spearman's Rho correlation test was applied to explore correlations between non-continuous variables. For continuous variables, Pearson's correlation was applied. Demographic data was used to categorize students according to academic discipline, gender, and ethnicity. Paired t-tests were used to compare the mean values between comparable measures for a group of responses, and Mann-Whitney U tests were used to compare measured values between two groups. If a comparison involved more than two groups, Welch's ANOVA test followed by pairwise Mann-Whitney U tests were used. A test result was considered statistically significant if the p-value was < 0.05. After identifying a statistically significant difference between two groups, Cohen-d was calculated to quantify and determine the practical difference.

Numeric Metrics of Sense of Belonging

Three integrated measures were developed to analyze the quantitative survey data and evaluate students' sense of belonging. The first measure, the Direct Score, was determined by calculating average scores from five quantitative questions in the survey: levels of agreement in feeling a sense of belonging in their classes, feeling that they matter, feeling connected to other students, feeling connected to faculty, and feeling connected to staff. A Direct Score ranges from 1 to 5, with a higher score indicating a stronger sense of belonging. The second measure (UBQ) was calculated as the sum of three aggregated measures based on the subgroups of UBQ: university

affiliation (UA), university support and acceptance (USA), and faculty and staff relations (FSR). Each integrated score representing UA, USA, or FSR was calculated as the average student responses to UBQ questions, resulting in a score range between 1 and 5. Thus, a UBQ score ranges between 3 and 15. The third measure, an Alternative Score, was calculated from the sum of positively framed question scores minus the sum of negatively framed question scores from the MSBS survey questions. Since each response to a positive or negative question has an ordinal value between 1 and 5, the Alternative Score ranged between -28 and 28. For all three measures, the higher scores indicate a stronger sense of belonging reported by students.

Qualitative Data Analysis

A provisional coding method was used to initiate analysis of the qualitative data from students' responses to four open-ended survey questions. These questions asked students to share their most positive experiences, their most negative experiences, an experience where they felt a real sense of belonging or connection to the college, and an experience where they felt a sense of disconnection or being an outsider to the college. Two researchers reviewed the data to identify preliminary codes (Saldana, 2021). Codes and coding categories were discussed to resolve any discrepancies and ensure consistency in the coding scheme between reviewers. Systematic data coding was based on Garrison's CoI elements (Garrison, 2016) and Swail's Geometric Model of Student Persistence and Achievement (Swail, 2003). Reviewers iteratively reviewed and updated the list of categories, incorporating new themes as they emerged. For example, themes of University Support and Acceptance and University Affiliation were included in response to analyzing UBQ (second measure). To verify the reliability of the coding process, collaborative coding sessions ensured consistency of the coding results. Table 1 presents the final coding list with factor elements and their corresponding categories. Factor categories include Social Presence (SP), Cognitive Presence (CP), Teaching Presence (TP), University Support and Acceptance (USA), and University Affiliation (UA). Column two of the table displays the coding elements for each category.

Table 1

Coding Elements and Categories

Category	Elements
Social Presence (SP)	Personal/affective Open communication Group cohesion Financial issues Location issues Maturity Attitude towards learning Cultural values Peer interaction/connections

Cognitive Presence (CP)	Academic rigor Quality of learning Aptitude Content knowledge Critical thinking ability Study skills Learning skills Time management Academic-related extracurricular activities
Teaching Presence (TP)	Design and organization Facilitating learning Direct instruction/connection Program Curriculum Teaching platform
University Support and Acceptance (USA)	Financial aid/scholarship Student service Academic services Recruitment and admission Staff Connection
University Affiliation (UA)	Proud as a U student Media about the college

Research Design for R1 and R2

This study aimed to address two critical questions by analyzing survey data. Below, we detail the research design and methodology used to approach and address the questions.

R1: Do our online post-traditional students report a sense of belonging? How do their academic disciplines, gender, and ethnicity affect their sense of belonging?

The survey responses calculated three sense of belonging scores (Direct, UBQ, and Alternative) for each completed response. Cronbach's alpha values were computed to ascertain the reliability of the three scores and the overall survey items. The mean, median, standard deviation and distributions of measure values were calculated to evaluate the scores. Pearson's correlation was used to find correlations between the three scores. Multiple measures were used to capture any nuances of students' sense of belonging and to provide a more comprehensive understanding of this complex construct. Critical factors were identified based on the categories of the UBQ survey questions, which measured students' sense of belonging based on their perceptions of UA, USA, and FSR, each with an integrated score for each student response. Then Pearson's correlation was applied to explore how the three factors related to the three measures of sense of belonging. Drawing from the findings of other studies (Mooney & Becker, 2021; Perez, 2020), academic disciplines, ethnicity, and gender were used to group the participating students for analysis. Differences between groups were analyzed using Mann-Whitney U tests, Welch's ANOVA tests, and Cohen's d measures, which were conducted between groups to quantify significant differences.

R2: How do social, cognitive, and teaching presence impact the sense of belonging of online post-traditional students? How do their connections with faculty and peers influence this sense of belonging.

Provisional coding was conducted to analyze the qualitative data from students' responses to the four open-ended survey questions regarding students' experiences (positive, negative, belonging, and disconnection). With the coding categories identified using Garrison's CoI elements (Garrison, 2016) and Swail's Geometric Model of Student Persistence and Achievement (Swail, 2003), critical factors emerged based on patterns and themes observed in the qualitative data. To further investigate the connections between students and faculty, staff, and peers, we assessed two integrated numeric measures in addition to the qualitative data analysis. The first measure, faculty/staff relations (FSR), was calculated based on the UBQ questions regarding relationships with faculty and staff. The second measure focused on peer interactions derived from a subgroup of survey questions. We compared the descriptive statistics of the two measures, conducted a paired t-test, and used Cohen's d to report the difference between the connections. Pearson's correlation was conducted to examine the correlations between the two types of connections (faculty/staff relations and peer interactions) and the three measures of sense of belonging (Direct, UBQ, and Alternative scores). By investigating qualitative and quantitative data, we aimed to understand how post-traditional students connect with faculty, staff, and peers and if these connections impact their sense of belonging.

Results

From August 2021 to May 2022, the survey was distributed through Qualtrics to 400 Applied Computing, Computer Science, Human Services, and Family Studies & Human Development students via official university emails. The survey was accompanied by a research study description and informed consent document. Monthly email reminders were sent to potential participants during the survey's availability period. A total of 79 responses were received, of which 53 were considered complete, generating a response rate of 13.3%. Table 2 presents the demographic information of the 53 responses, including data on discipline programs, gender, race, and ethnicity. In total, the four programs comprised 222 computing students (Applied Computing and Computer Science) and 178 applied science students (Human Services and Family Studies and Human Development); 52% male students and 48% female students; 43% Hispanic or Latinx, 36% White, 9% Black or African American, 5% Asian, 3% American Indian or Alaska Native, 1% Native Hawaiian or Other Pacific Islander, 0.5% International, and others. Table 2 shows that the study sample comprised 36 responses from computing students and 17 from applied science students, indicating a higher response rate in computing programs. However, the sample distributions of gender and race/ethnicity are close to those of the total potential cohort. Percentages may not total 100% due to rounding.

Table 2

Participant Demographics

Demographic	Frequency	Percent
Academic Programs		
Applied Computing (Major)	28	52.8%
Human Services (Major)	8	15.1%
Computer Science (Major)	6	11.3%
Family Studies & Human Development (Major)	5	9.4%
Human Services (Minor)	2	3.8%
Computer Science (Minor), Applied Computing (Major)	2	3.8%
Family Studies & Human Development (Minor)	1	1.9%
Human Services (Major), Family Studies & Human Development (Minor)	1	1.9%
Gender		
Male	27	50.9%
Female	24	45.3%
Different identity	1	1.9%
Prefer not to identify	1	1.9%
Race/Ethnicity		
White	20	37.7%
Hispanic or Latina/o	15	28.3%
Hispanic or Latina/o, White	7	13.2%
Asian	4	7.5%
I prefer not to respond	2	3.8%
American Indian or Alaska Native, White	1	1.9%
Asian, White	1	1.9%
American Indian or Alaska Native	1	1.9%
Black or African American, White	1	1.9%
Another race or ethnicity	1	1.9%

Findings to Address R1

R1: Do our online post-traditional students report a sense of belonging? How do their academic disciplines, gender, and ethnicity affect their sense of belonging?

To address R1, we calculated three measures, Direct Score, UBQ Score, and Alternative Score, for each of the 53 responses. Table 3 shows the three measures' mean, median, and standard deviation. The second column in the table shows the calculated Cronbach's alpha values to evaluate the internal consistency of the items used to calculate each score. The Cronbach's alpha value was 0.97 for the overall survey items. These values suggested the survey instrument was highly reliable to measure sense of belonging among our online post traditional students. Analyses revealed that our students reported a moderate sense of belonging from their online education experience. Specifically, the mean of each measure was lower than the median, suggesting left-skewed measure scores: most students had a relatively strong sense of belonging, but some individuals reported low levels of belonging (11 responses with Direct Score < 3, 9 with UBQ Score <10, and 9 with Alternative Score <0).

Table 3

Reported Sense of Belonging Measures

	Cronbach's Alpha	Mean	Median	Std. Deviation (SD)
Direct	0.88	3.69	3.80	0.99
UBQ	0.94	11.87	12.11	2.23
Alternative	0.94	11.43	15.0	12.34

Table 4

Correlations Between the Three Measures

	Direct	UBQ	Alternative
Direct	—	0.84***	0.74***
UBQ	—	—	0.81***
Alternative	—	—	—

Note. ***p < .001

Table 4 displays Pearson's correlation coefficients between the three measures of sense of belonging. All p-values were zero, indicating statistically significant positive correlations between the measures. These results suggest that all three scores were appropriate for measuring students' sense of belonging. However, the correlation between Direct and Alternative measures was weaker than other correlations, which may imply that UBQ and Alternative scores assess different aspects of a sense of belonging. Although all three scores were intended to measure the sense of belonging, the various correlations between the three scores highlight the multidimensional nature of this construct.

Figure 1

UBQ Subgroup Scores
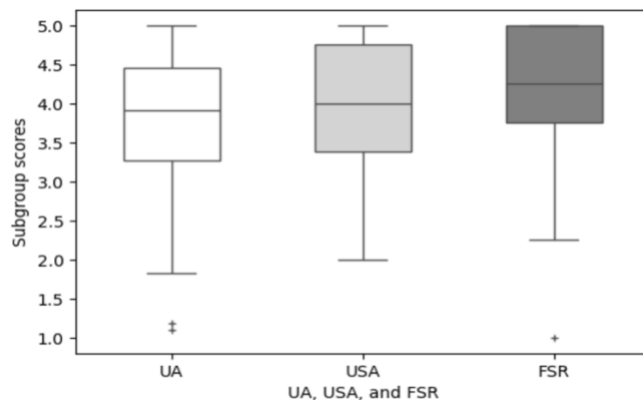
To reveal additional insights at a subscale level, categories of the UBQ survey questions were analyzed to identify three factors based on the subgroups of quantitative questions: University Affiliation (UA), University Support and Acceptance (USA), and Faculty/Staff Relations (FSR). Figure 1 shows the boxplots of the three integrated measures representing UA, USA, and FSR factors. The medians of the three factors were 3.91, 4.00, and 4.25, respectively.

We also conducted paired t-tests between each pair of subgroup scores. Our findings revealed that the differences between the subgroups were statistically significant (p < .02), suggesting that FSR was the strongest factor and UA was the weakest among the three factors in our online post-traditional students.

Table 5

Correlations Between UBQ Subscale Factors and Sense of Belonging Measures

	Direct	UBQ	Alternative
USA	0.74***	0.87***	0.73***
UA	0.67***	0.81***	0.63***
FSR	0.70***	0.83***	0.68***

Note. ***p < .001

Table 5 presents the correlations between these three UBQ factors and the overall measures of sense of belonging resulting from Pearson's correlation. Our findings indicate that USA and FSR had strong positive correlations with students' sense of belonging. The correlation between USA and sense of belonging was the strongest, and the correlation between UA and sense of belonging was consistently weakest among the correlations.

We investigated how student identities such as academic discipline, ethnicity, and gender relate to belonging. Table 6 presents the numbers of students and the means and standard deviations (SD) of the three composite scores in separate groups based on student identities. We conducted Mann-Whitney U tests to compare groups based on gender and academic disciplines, finding no significant differences. To examine differences in belonging scores among students of different ethnicities, we conducted Welch's ANOVA tests. We found that at least one group's mean Direct score differed from others (p = .02). Post hoc Mann-Whitney U tests following Welch's ANOVA revealed statistically significant differences in Direct (p = .01) and UBQ scores (p = .01) between Hispanic and White students. Cohen's d values of 0.96 (Direct) and 0.76 (UBQ) indicated large effective sizes, suggesting a substantial difference in the sense of belonging between Hispanic and white students as measured by Direct and UBQ scores.

Table 6

Belonging Measures in Student Groups

Identity		Number of Responses	Direct		UBQ		Alternative	
			Mean	SD	Mean	SD	Mean	SD
Academic Disciplines	Applied Science	17	3.51	1.15	11.55	2.47	8.47	13.69
	Computing	36	3.78	0.90	12.02	2.13	12.83	11.58
Gender	Female	24	3.55	1.00	11.86	2.29	12.58	12.43

	Male	27	3.87	0.90	12.04	2.01	10.96	11.93
Ethnicity	Hispanic	15	4.19	0.68	12.79	2.12	15.33	12.23
	White	20	3.33	1.06	11.20	2.08	9.00	11.68
	Other	18	3.69	0.99	11.85	2.33	10.89	13.03

Table 7

UBQ Subscale Factors in Student Groups

Identity		Number of Responses	UA		USA		FSA	
			Mean	SD	Mean	SD	Mean	SD
Academic Disciplines	Applied Science	17	3.83	0.83	3.87	0.82	3.85	1.17
	Computing	36	3.64	1.00	4.05	0.85	4.33	0.68
Gender	Female	24	3.89	0.92	3.96	0.80	4.01	1.06
	Male	27	3.74	0.86	4.05	0.83	4.34	0.66
Ethnicity	Hispanic	15	4.02	0.90	4.37	0.71	4.40	0.80
	White	20	3.30	0.83	3.77	0.84	4.13	1.07
	Other	18	3.87	1.00	3.92	0.87	4.06	0.74

We also investigated the integrated scores of subscale factors, including UA, USA, and FSA, adapted from the UBQ survey among student groups categorized by their reported identities. Table 7 presents the means and standard deviations of the subscale factors for these student groups. Mann-Whitney U tests revealed no significant differences between groups based on academic disciplines and gender. However, Welch's ANOVA tests to compare student groups based on their ethnicities indicated that at least one group's mean UA score differed from the others ($p = .047$). Post hoc Mann-Whitney U tests revealed that Hispanic students reported significantly higher UA scores than white students. The Cohen-d measure of 0.86 indicated a large effect size between the two groups.

Findings to Address R2

R2: How do social, cognitive, and teaching presences impact the sense of belonging of online post-traditional students? How do their connections with faculty and peers influence this sense of belonging?

To better understand the factors contributing to students' sense of belonging, we analyzed the qualitative data from the four open-ended survey questions that explored students' experiences: positive, negative, belonging, and disconnection. Table 8 presents the response rates for the four open-ended questions based on the 53 complete responses received.
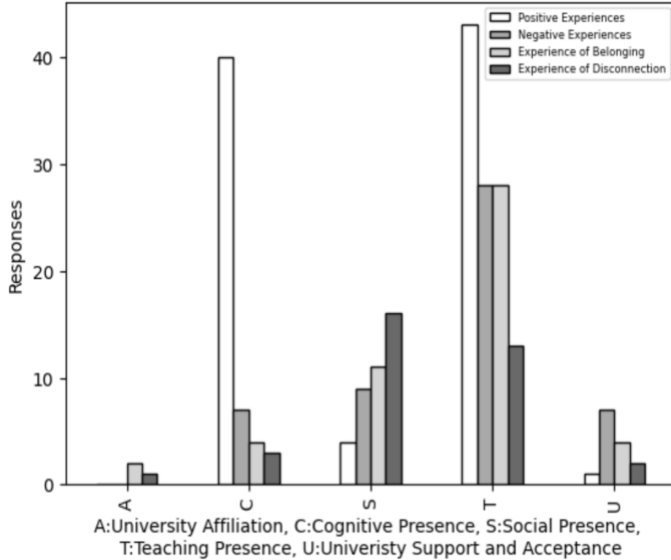
Table 8

Qualitative Question Response Rates

Question Topic	N	Response Rate
Positive experience	46	86.8%
Negative experience	45	84.9%

Experience of belonging	41	77.4%
Experience of disconnection	39	73.6%

Figure 2

Factors Identified in the Four Open-Ended Questions

Based on provisional coding, we identified five factors: university affiliation (UA), cognitive presence (CP), social presence (SP), university support and acceptance (USA), and teaching presence (TP). Figure 2 presents the factor frequencies in positive experiences, negative experiences, experiences of belonging and connections, and experiences of disconnection. Notably, TP was overwhelmingly reported across all categories, with 43 students reporting it in positive experiences, 28 in negative experiences, 28 in experiences of belonging and connections, and 13 in experiences of disconnection. CP was also frequently reported in positive experiences (40 students). While SP was reported in fewer instances than CP and TP, it was mentioned in experiences of disconnection (16 students).

Figure 3

Factors Identified by Students in Computing and Applied Science
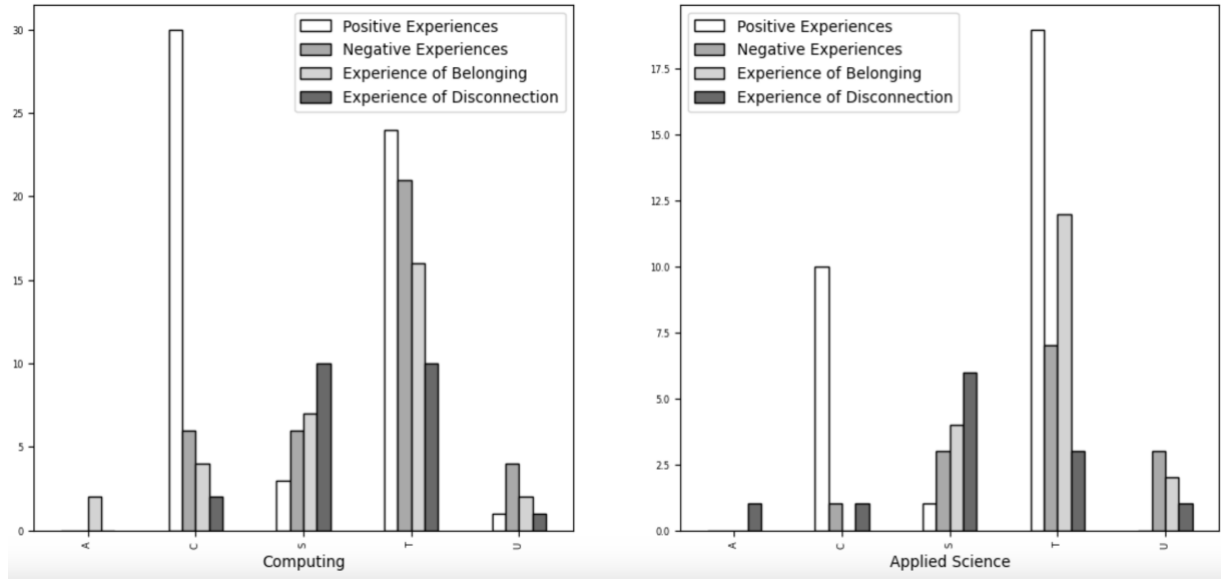
Figure 4

Factors Identified by Gender Groups
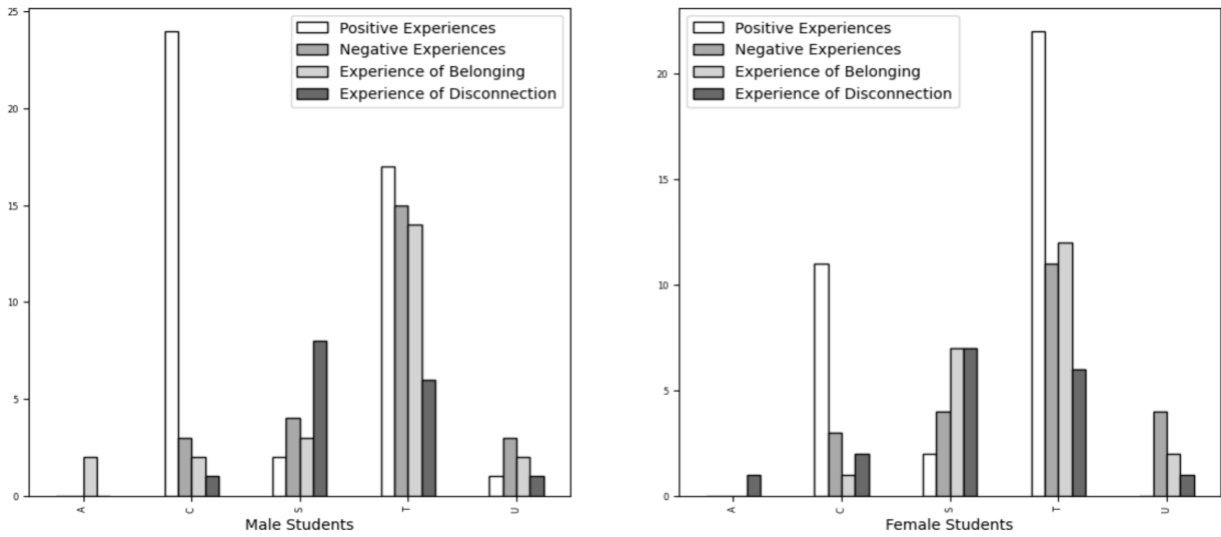
Figure 5

*Factors Identified by White, Hispanic Students, and Others*
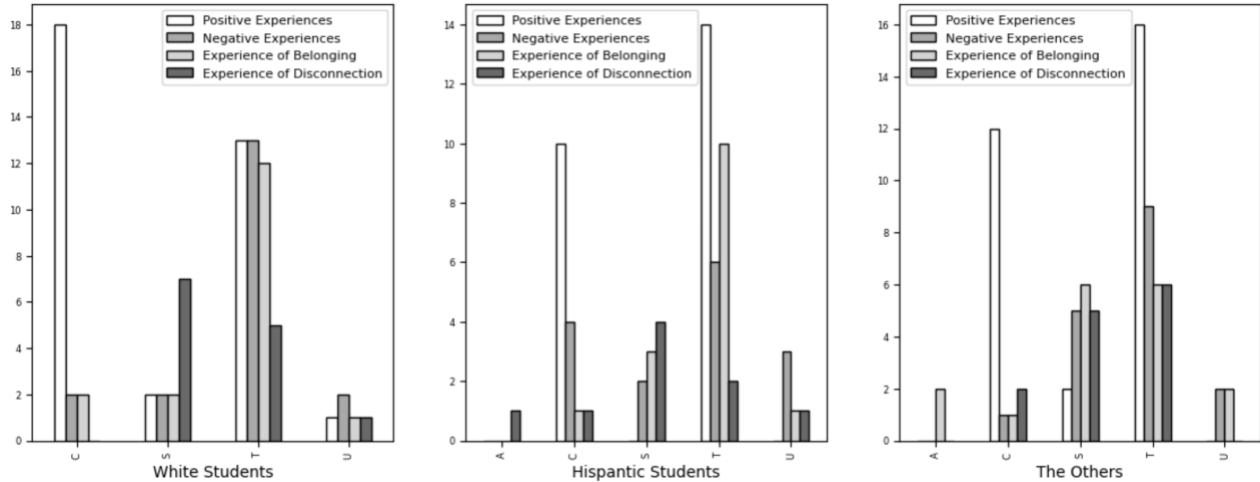
Figures 3, 4, and 5 display the factor frequencies in different student groups based on their reported identities. Notably, TP was overwhelmingly reported in belonging experiences across all groups. CP was more frequently reported in positive experiences by computing, male, and white student groups. SP was reported to have the most experiences of disconnection across all groups based on student identities.

Figure 5 reveals insight from our analysis using the qualitative data from students' groups based on their ethnic identities. We found that white students more frequently reported CP in their positive experiences. In contrast, other groups, including Hispanic students, highlighted TP in their positive experiences. Specifically, Hispanic students reported TP more in their positive and belonging experiences than other groups. Both white and other groups reported TP in their positive/negative and belonging/disconnection experiences. Across all ethnicity groups, students emphasized SP and TP in their disconnection experiences.

Figure 6

Peer Interactions Versus Faculty/Staff Relations
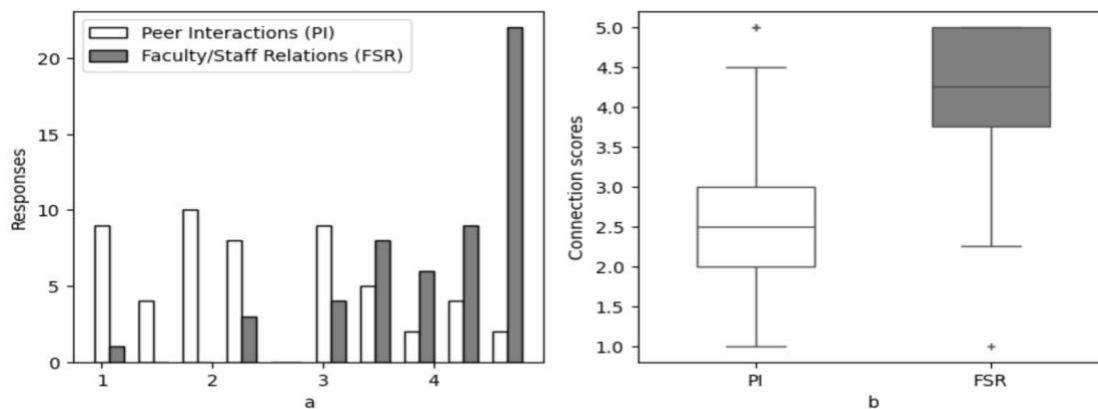
To evaluate whether students established meaningful connections with faculty, staff, and peers, we further explored the survey's quantitative data based on two groups of questions: the first group consisted of questions on peer interactions within and outside the academic program,

and the second group comprised UBQ questions on relationships with faculty and staff. Figure 6a displays the distribution of the two integrated scores. The white distribution represents levels of peer interactions (PI), while the gray distribution represents faculty/staff relations (FSR). Figure 6b uses boxplots to visualize the difference between the two integrated scores representing PI and FSR. The median of the PI scores is 2.5, and the median of FSR is 4.25. Figure 6 suggests an apparent difference between the two types of connections/relations. A paired t-test between PI and FSR scores confirmed that students perceived a significantly stronger relationship with faculty/staff than their interaction with peers ($p = .000$). Cohen's d value of 1.60 indicated a substantial difference between FSR and PI.

Table 9 displays the results of Pearson's correlation with p-values in parentheses between the interpersonal interaction measures (PI and FSR) and the three measures of sense of belonging (Direct, UBQ, Alternative). We found significant positive correlations between FSR and all three measures of sense of belonging. However, we did not find any significant correlation between PI and the three measures of sense of belonging ($p < .05$), although we did observe some positive correlations. Meaningful connections with faculty and staff impact students' sense of belonging more than their interactions with peers.

Table 9

Correlations Between Interactions and Sense of Belonging Measures

	Direct	UBQ	Alternative
Peer Interactions (PI)	0.21 (0.128)	0.26 (0.051)	0.04 (0.783)
Faculty/Staff Relations (FSR)	0.70***	0.83***	0.68***

Note. ***$p < .001$

These analyses highlighted the importance of direct instruction and faculty connections. Students mentioned TP 28 times, with 17 referring to direct instruction/connection with faculty. In contrast, in the reported disconnection experiences, four students noted the negative impact of having little or no personal connection or direct interaction with their instructors. Although no significant correlations were found between peer interaction and a sense of belonging via our quantitative data analysis, peer interaction was reported nine times in belonging experiences, four times in disconnection experiences, and five times in negative experiences. Further, group cohesion, related to peer interaction, was mentioned three times in disconnection experiences.

Students' qualitative responses were analyzed further to understand the priorities of online post-traditional students and develop actionable strategies for enhancing their sense of belonging. Responses to the four open-ended survey questions were categorized by SP, CP, and TP; Tables 10, 11, and 12 feature representative quotes for each of these three presence categories, illustrating the diversity of experiences within the Community of Inquiry (CoI) framework.

Table 10

Quotes on Social Presence (SP) in Student Experiences

Quote in Experiences	Identities
[1] My professor this semester has been amazing, and the small course makes me feel seen. *Positive experience*	Female, (Hispanic or Latina/o, White), Human Services
[2] In a classroom that has open discussion for students, teachers, and tutors. When students have the opportunity to attend a meeting or study environment that wasn't part of a lecture, it allowed us to talk and get to know one another. *Belonging experience*	Male, (White), Applied Computing
[3] During the online discussions you find that backgrounds of fellow students mirror that of your own. Any group project/meeting/discussion really embodies a sense of belonging. *Belonging experience*	Male, (West Indies), Applied Computing
[4] The lack of connection with my classmates. I was lucky enough to meet one of my classmates, but there is just a lack of connection. I miss classrooms and I am looking forward to a hybrid class I am taking next semester. *Negative experience*	Female, (Hispanic or Latina/o, White), Human Services
[5] Lectures, mostly. Other students simply aren't willing to engage or talk about the material presented. I am mostly the one doing all the talking. *Disconnection experience*	Male, (White), Applied Computing
[6] Because I'm non-military, I sometimes feel steamrolled by the cyber intelligence folks. It definitely feels more like a college for the military than for the general public. *Disconnection experience*	Male, (Hispanic or Latina/o, White), Applied Computing

In Table 10, Quote 1 shows the student's sense of belonging and being "seen" as an individual, which is a crucial aspect of SP. Additionally, mentioning a "small class" indicates a more intimate learning environment where interactions with the professor and peers may be more personal and meaningful, further enhancing SP. Quote 2 highlights activities to interact with peers outside class meetings. Quote 3 underscores the use of online discussions where they found their fellow students' backgrounds mirror their own. These quotes emphasize that group interactions can foster SP and contribute to a more profound sense of belonging. Quote 4 expresses a lack of connection with classmates, leading to feelings of isolation and disconnection. Quote 5 reflects a similar sense of disconnection in the context of class discussion. The student's perception of being the one who did most of the talking further underscores the issue of SP, where others' engagement could have been improved. Quote 6 introduces a unique dimension related to identity within the context of SP. This experience highlights a potential cultural or identity-related barrier to SP.

Table 11

Quotes on Cognitive Presence (CP) in Student Experiences

Quote in Experiences	Identities
[1] One of my courses really challenged me with a subject outside of my comfort zone: English composition. That course gave me a lot of sleepless nights and agony, but I feel that my grade was well worth the effort. I definitely improved my writing as a student at cast. *Positive experience*	Male, (White), Applied Computing
[2] As a student, I feel like I am learning a lot of skills and information that can be applied to the workforce. For example, I have taken two courses so far that have given me knowledge and programming in the command line. I am using that knowledge in my current job to run a	Male, (Hispanic or Latina/o), Applied Computing

Quote in Experiences	Student Identities
quick scan on txt files to save us time from clicking and examining each file line by line. Being able to apply these skills in a work setting has really made me feel confident in my learning. *Positive experience*	
[3] Some classes have taught antiquated techniques that are outdated or that are updated. This has caused a lot of frustration as a student, because we must force ourselves to learn something that is no longer relevant and we are not able to use the current up-to-date knowledge we have. *Negative experience*	Male, (White), Applied Computing
[4] Didn't have the opportunity to get involved in extra-activities outside the courses. *Negative experience*	Female, (Hispanic or Latina/o), Applied Computing
[5] I have not felt a strong sense of disconnection, but sometimes it's hard to connect during discussion posts where the content is not as engaging, and therefore students are not as active in responding/commenting. *Disconnection experience*	Female, (Asian, White), Applied Computing

In Table 11, Quote 1 indicates the student's critical thinking and problem-solving engagement as they grappled with new concepts and skills. Additionally, the student's reflection on improving writing skills indicates the construction of meaning through learning. Quote 2 emphasizes learning skills (programming in the command line) that they were able to apply in their current job. This demonstrates not only the acquisition of knowledge but also the practical application of that knowledge in a real-world context. Further, this quote showcases the "exploration" phase within CP, where learners actively seek to understand and apply what they have learned to solve real problems. Quote 3 expresses the student's frustration regarding outdated or irrelevant course content, highlighting the importance of meaningful and relevant learning experiences. Quote 4 shares the experiences of lacking the opportunity to be involved in extracurricular activities, highlighting the importance of a holistic educational experience. Quote 5 represents a disconnection experience, where students found it challenging to connect during less engaging discussion posts, aligning with CP.

Table 12

Quotes on Teaching Presence (TP) in Student Experiences

Quote in Experiences	Student Identities
[1] Most of the professor are great at clarifying information and at being available when needed. D2l was used in a very organized and easy to follow manner with updated information when needed in most of the cases. This really allowed me to use my time more effectively on assignments. Having access to professor really makes a difference. *Positive experience*	Female, (Hispanic or Latina/o), Human Services
[2] There have been some professors who make the course fun and enjoyable. These professors show us how we can use the material we learn in the future in school and in the real world …. *Positive experience*	Female, (White), Applied Computing
[3] The way some of the syllabuses were written were a bit strict and some came across as rigid, which made me begin the course with a cautious and negative attitude toward the course and the instructor, and it took time to get warmed up to the instructor and the course itself (and to readjust my attitude). *Negative experience*	Female, (Hispanic or Latina/o), Human Services

[4] I disconnected when there is no weekly Zoom meetings or open ZOOM office hours and the class is just based off of pre-recorded videos. *Disconnection experience*	Male, (White), Applied Computing

In Table 12, Quote 1 reflects effective TP, where the student highlighted that most professors were great at clarifying information and being available when needed. Using the learning management system (D2L) in an organized and informative manner contributed to a positive learning experience. The instructors' availability and the organized course materials indicate that TP was well-established, helping students feel supported and informed. Quote 2 mentions that certain professors made the course fun and enjoyable while demonstrating the real-world relevance of the material. This quote represents instructors effectively engaging students and demonstrating the practical application of course content, contributing to a positive learning experience. Quote 3 reflects the initial challenges with TP, where the approachability and support needed to create a positive learning environment improved over time. The disconnection experience points to the importance of TP in maintaining student engagement. Quote 4 mentions feeling disconnected when there were no weekly Zoom meetings or open Zoom office hours, and the course relied solely on pre-recorded videos, suggesting that the absence of real-time interactions with the instructor may lead to a sense of disconnection.

Discussion

Findings and Sample Characteristics

This study used three scores (Direct, UBQ, and Alternative) to measure the sense of belonging of online post-traditional students at our college. The results show that, overall, our online post-traditional students reported a moderate sense of belonging. However, it is noteworthy that a small number of respondents reported lower scores on all three measures (11 responses with Direct Score < 3, 9 with UBQ Score <10, and 9 with Alternative Score <0), indicating that there is room for improvement in promoting a sense of belonging. Nonetheless, the overall findings confirm the usefulness of the survey instrument in measuring the sense of belonging among a larger group of online post-traditional students.

In terms of the sample characteristics, the sample used in the study included a disproportionate number of computing students compared to applied science students. Additionally, due to a low survey response rate of only 13.3%, the sample size may introduce self-reflection bias, potentially reflecting the experiences of students who were more engaged or performed well academically. However, the other sample demographics, including gender and race/ethnicity, closely mirrored those of the overall student cohort population, which helps mitigate the concern about the sample's representativeness. Despite this consistency, the low response rate still warrants caution when interpreting the results and applying these results to post-traditional students at large. Targeted efforts to increase response rates are needed to improve the generalizability of future studies.

Impactful Factors

This study identified several critical factors central to fostering a sense of belonging among online post-traditional students. These factors include university support and acceptance (USA),

faculty and staff relations (FSR), university affiliation (UA), teaching presence (TP), social presence (SP), and cognitive presence (CP). Based on quantitative data analysis, the findings indicated that USA had a stronger correlation with a sense of belonging than UA and FSA. This may imply that when students perceived that they were accepted and supported by their institution, they were more likely to feel like they belonged. This study did not identify the impacts of student's academic program and gender identity. However, Hispanic students reported a stronger sense of belonging and UA than white students, which may reflect our university's designation as a Hispanic-Serving Institution (HSI).

The qualitative data analysis showed that students emphasized the importance of CP, including content knowledge, high-quality learning experiences, and effective time management strategies, in their positive experiences. TP emerged as a crucial factor in experiences, suggesting it may be critical in shaping students' experiences of belonging and connections, both positively and negatively. Positive experiences were associated with effective course design and organization, while negative experiences were linked to issues with online learning facilitation.

Informed by the literature review, the research design emphasized examining the roles of faculty, staff, and peers in fostering students' sense of belonging. The quantitative and qualitative survey data analysis revealed that students placed a higher value on their relationships with faculty and staff than on interactions with their peers. This finding is consistent with previous research on interpersonal interactions (Jaggars & Xu, 2016). However, the peer interaction in the current study demonstrated a positive correlation ($r = 0.28$, $p = .045$) with faculty/staff relationships. While our results indicate that faculty and staff interactions were more critical to students' sense of belonging than peer interactions, peer interaction was the most frequently reported factor in SP based on the qualitative data analysis. Additionally, the qualitative data regarding student-faculty connections revealed critical factors to those previously reported (Hoffman et al., 2002), including emphatic faculty understanding, perceived faculty support and comfort, and perceived classroom comfort.

Actions to Improve Connections

Based on the findings of this study's two key research questions, we proposed strategies at multiple levels of our education system, pedagogy, and people to enhance online post-traditional students' sense of belonging and foster connections. The goal is to create positive influences, including trust-building, meaning-making, and deepening understanding, which can contribute to online learners' educational experiences (Peacock & Cowan, 2019).

Table 13 presents a comprehensive set of recommended actions to enhance social presence (SP), cognitive presence (CP), and teaching presence (TP) within online learning environments. The five actions focusing on SP aim to normalize challenges, provide support, and promote interactions and inclusions. The four actions emphasizing improving CP focus on integrating extracurricular and research activities to promote active learning. The four actions highlighting TP aim to provide feedback, enhance learning engagement, and promote student-centered reflective learning. By implementing these recommendations, institutions can create a supportive online learning environment that enhances student engagement and learning outcomes.

Table 13

Actions to Improve Connections and Sense of Belonging

SP [1]	Promote trusting, open, and meaningful interactions via online discussion, tutoring, undergraduate research works, clubs, and student service.
SP [2]	Identify marginalized students to help them fit socially and academically.
SP [3]	Normalize challenges to belonging and provide strategies to overcome them.
SP [4]	Provide online materials that discuss coping mechanisms for working in online realms.
SP [5]	Develop peer mentoring programs, inclusive virtual support networks, and personalized advising services to enhance social integration.
CP [1]	Provide extracurricular activities, even in virtual space.
CP [2]	Integrate class-based research experiences with online program curricula that allow learners to contribute collaboratively.
CP [3]	Develop active learning activities by addressing and discussing ongoing and timely issues during the learning process.
CP [4]	Develop reflective activities that encourage learners to engage metacognitively in consolidating their meaning-making on concepts and skills.
TP [1]	Make plans to check in with students to ensure they can approach, access, and engage with appropriate course content, peers, and instructors.
TP [2]	Develop well-designed concept maps to inform self-directed navigation of course topics associated with skills.
TP [3]	Develop reflective activities that promote learners to engage metacognitively in deepening their understanding of concepts and skills.
TP [4]	Provide clear, meaningful, timely feedback and guidelines to facilitate student learning effectively and efficiently.

Conclusion

In conclusion, this study has provided valuable insight into the sense of belonging among online post-traditional students and the factors that contribute to it. By addressing two key research questions, we evaluated the extent to which our students feel accepted and valued and examined how their identities, such as academic program, gender, and ethnicity, impact their sense of belonging. Our findings suggest that faculty and staff relationships, university support and acceptance, teaching presence, cognitive presence, and social presence are pivotal contributors to students' sense of belonging. Specifically, facilitating learning in teaching presence and peer interaction in social presence were identified as particularly important for fostering a stronger sense of belonging. These results highlight the importance of cultivating meaningful connections within the online learning community. Our research findings have important implications for designing effective online programs and supporting the success of post-traditional learners. By pinpointing critical and negligible factors affecting the sense of belonging, we offer actionable strategies to develop a more engaging and supportive online learning environment. However, we are aware of the limitations of our research study, such as the small sample size due to the low survey response rate. Further research gathering more student responses is essential for the generalizability of the findings.

Conflict of Interests Statement

The authors declare that they have no competing interests.

Author Note

The authors report no conflicts of interest in conducting this study. The study's protocol (STUDY00000062) was approved by the Institutional Review Board (IRB) at the authors' home institution.

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