

Explaining Online Learning Attitudes: Community of Inquiry Presences, Learning Outcomes, and Learner Characteristics

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Abstract: Online learning has become a core mode of higher education, intensifying questions about what constitutes high-quality teaching and learning in digital environments and how students form evaluations of their online learning experiences. The Community of Inquiry (CoI) framework highlights teaching, social, and cognitive presence as key pedagogical conditions, yet less is known about how these conditions operate alongside learner characteristics and students' perceived learning outcomes to shape attitudes toward online learning. This quantitative study surveyed 316 undergraduates enrolled in 22 fully online undergraduate courses. Students reported demographic characteristics (including age, gender, ethnicity, faculty affiliation, learning-disability status) and self-reported cumulative Grade Point Average (GPA) range. Perceptions of CoI presences were measured using a validated CoI instrument, and perceived learning outcomes were assessed as multidimensional gains (cognitive, metacognitive, and social). Analyses included group comparisons and hierarchical regression models predicting attitudes toward online learning. Group comparisons indicated significant differences in perceived presence across demographic groups, although most effects were small. Perceptions of cognitive and social presence also varied across self-reported GPA ranges, whereas teaching presence was relatively stable. In hierarchical regression, demographic variables explained a modest portion of variance in attitudes. Adding CoI presences substantially improved prediction, with cognitive presence emerging as the primary presence-related predictor. When perceived learning outcomes were added, perceived cognitive and metacognitive gains were the strongest predictors of more positive attitudes, and the unique contribution of CoI presences was reduced, suggesting that perceived learning gains may help explain the presence–attitude link. The findings therefore point to a more integrative account of online learning quality, in which students' attitudes appear to depend less on fixed demographic differences and more on whether online courses are experienced as cognitively meaningful and supportive of reflective growth. Findings underscore the centrality of cognitive engagement and perceived learning gains for shaping students' attitudes toward online learning and point to actionable design priorities: inquiry-oriented activities, structured reflection and metacognitive scaffolds, and consistent course organization and support that promote equity across diverse learners. These results also inform institutional policy by emphasizing shared online-course quality standards and professional learning focused on evidence-informed design practices.

Keywords: Online learning, Community of inquiry, Student attitudes, Perceived learning outcomes

1. Introduction and Theoretical Background

In recent years, education systems around the world have invested considerable effort in designing innovative learning environments, with a particular emphasis on the integration of digital technologies (Collins & Halverson, 2018). The outbreak of the Covid-19 pandemic in early 2020 triggered a dramatic transformation in education, requiring a rapid and comprehensive transition to remote learning for all students (Dietrich, 2020, Fewella, 2023, McGaughey et al. 2022). Importantly, the pandemic accelerated a shift that was already underway: online learning had been steadily expanding in higher education as institutions sought to increase access and flexibility, and it has remained a central mode of provision in the post-pandemic landscape (McGaughey et al., 2022, Müller & Mildenerger, 2021, Getenet et al., 2024). Although it is difficult to equate emergency-induced online learning with programs designed intentionally for digital delivery, the pandemic nonetheless exposed persistent challenges in online learning, such as reduced interaction between students, instructors, and course content, and a noticeable decline in the sense of academic belonging for both students and faculty (Baxter & Haycock, 2014, Seifert & Bar-Tal, 2023). It also highlighted disparities in students' home learning environments, exacerbating existing inequalities (Gillis & Krull, 2020, Sasson & Yehuda, 2026). This issue is especially relevant in the Israeli higher-education context examined in the present study, which includes both Jewish majority and Arab minority students and therefore provides an opportunity to consider how online learning is experienced across a socially diverse student population. In this context, students' attitudes toward online learning have become a critical indicator of quality, shaping engagement, persistence, and willingness to enroll in future online courses (Akar, 2024, Jiang, Zhou & Yang, 2024, McIntyre et al., 2023, Paris, Lakhali & Mukamurera, 2025, Steyn et al., 2024). In addition to attitudes, students' perceived learning outcomes (Rovai et al., 2009, Yang, Wang &

Zhao, 2025) provide a complementary indicator of online course quality, capturing learners' own assessment of the gains they attribute to the learning experience. In the present study, we conceptualize perceived outcomes as multidimensional, encompassing cognitive, metacognitive, and social learning gains. Examining these perceived outcomes alongside pedagogical features and learner characteristics helps clarify how pedagogical conditions translate into students' overall evaluation of online learning. Taken together, these considerations position students' attitudes toward online learning as a product of the interplay among pedagogical conditions, learner characteristics, and perceived learning gains.

Alongside these challenges, online learning also offers meaningful pedagogical opportunities. At the institutional level, flexible provision can expand access across time and place, yet its value depends on intentional design and adequate student support rather than convenience alone (Jones et al., 2025, Xie, Siau & Nah, 2020). Pedagogically, well-designed online learning can support multimodal engagement and collaborative knowledge construction (Olsson, Mozelius & Collin, 2016, Reyes, Cuenca & Martínez, 2025, Simpson, 2016). In addition, learning analytics and student-facing dashboards enable monitoring of learning processes and the provision of actionable feedback, provided they are aligned with the learning sciences and used to inform pedagogical action (Paulsen & Lindsay, 2024, Saghafi, Franz & Crowther, 2014).

The shift to remote learning during Covid-19 catalyzed a new era of pedagogical experimentation. Online learning has moved from a marginal alternative to a central and, at times, essential component of higher education. As a result, the need for thoughtful pedagogical design and institutional policy for online learning has become both urgent (Andrade & Alden-Rivers, 2019). At the same time, evidence consistently suggests that students do not benefit from online learning in the same way: learner characteristics and resources (e.g., prior academic experience and self-regulation) shape how students engage with online courses and the support they require to succeed (Xu & Jaggars, 2013, Dumford & Miller, 2018, Muljana & Luo, 2019). These differences make it especially important to clarify which pedagogical conditions foster meaningful interaction and positive attitudes for diverse learners. However, we still have limited understanding of which pedagogical conditions most strongly foster meaningful interaction with instructors, peers, and course content and how these conditions relate to students' attitudes toward online learning (Nortvig, Petersen & Balle, 2018, Rodrigues et al., 2019).

Recent scholarship has increasingly moved beyond viewing online learning as a mere technological shift and has instead highlighted the pedagogical conditions that underpin high-quality online higher education. Research evidence indicate that effectiveness is shaped by interacting factors such as clear course structure and design (e.g., coherent organization of learning activities, transparent expectations, and feasible timelines), high-quality interaction and collaborative learning processes that build a sense of community, assessment and feedback practices aligned with intended learning outcomes, and student-related capabilities such as self-regulation, metacognitive skills, and digital literacy (Broadbent & Poon, 2015, Castro & Tumibay, 2021, Muljana & Luo, 2019, Sasson & Yehuda, 2026, Sun & Chen, 2016, van Dorresteijn et al., 2025). Complementing this broader picture, work on collaborative online learning demonstrates that outcomes such as learning gains and satisfaction are closely tied to the quality of digital interaction and group-process characteristics (e.g., participation, transactivity, and group climate), underscoring that pedagogical quality is enacted through interactional processes rather than tools alone (Bach & Thiel, 2024). Existing evidence often examines these elements in relative isolation, leaving open how pedagogical features of online learning environments, learner characteristics, and perceived learning gains jointly shape students' overall experience and attitudes toward online learning (Lai & Bower, 2019). Addressing this need, the present study investigates the combined contribution of pedagogical characteristics, learner characteristics, and perceived learning outcomes to students' attitudes toward online learning in higher education.

To examine these pedagogical conditions more systematically, the present study draws on the Community of Inquiry (CoI) framework developed by Garrison, Anderson, and Archer (2000), one of the most influential models for analyzing the quality of online learning environments. This model conceptualizes meaningful online learning as the result of the dynamic interaction between three core types of presence: cognitive presence – the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse, social presence – the ability of participants to present themselves as "real people" in the online environment and to engage in purposeful communication and collaboration, and teaching presence – the design, facilitation, and direction of cognitive and social processes to support learning outcomes. Together, these three dimensions form the foundation for a successful and engaging online learning experience. The CoI model provides a valuable lens for examining the pedagogical quality of online courses because it focuses directly on the interactional and

instructional processes through which meaningful online learning is organized, facilitated, and experienced by students.

Recent scholarship continues to affirm the Col framework as both a design guide and an analytic lens, while also emphasizing contextual variability in how “presence” is enacted in practice. In a systematic review of Col applications in TESL/TEFL, Guo, Jeyaraj, and Razali (2025) show that studies increasingly use Col not only to evaluate learners’ perceptions (often via survey-based measures) but also to inform concrete instructional design choices such as structuring interaction, scaffolding inquiry processes, and aligning activities with language-learning goals. Richardson et al. (2025) demonstrate through a multiple case study across disciplines that Col indicators are not uniformly evident in online course designs and that instructors’ disciplinary and pedagogical goals shape which indicators are foregrounded, suggesting that Col-informed “quality” may legitimately look different across contexts. Finally, meta-analytic evidence links Col processes to outcomes. Yang, Wang, and Zhao (2025) report strong positive associations between cognitive presence and both perceived learning and satisfaction, while also showing that effect sizes vary by factors such as disciplinary area, course duration, and measurement scale type. Taken together, these findings motivate examining how students’ perceptions of teaching, social, and cognitive presence relate to learner characteristics and attitudes, clarifying which pedagogical features are most consequential for students’ online learning experience in higher education. At the same time, an important explanatory gap remains within this line of research. Although Col studies have consistently linked the three presences to outcomes such as perceived learning and satisfaction, it is still unclear whether students’ attitudes toward online learning are shaped directly by teaching, social, and cognitive presence, or whether these presences matter primarily because they foster perceived cognitive and metacognitive gains.

This literature suggests that while the Col framework offers a strong lens for conceptualizing the pedagogical processes that shape online learning, it may not by itself fully explain variation in students’ evaluations of online courses. Studies indicate that Col indicators are enacted differently across disciplinary contexts and course designs (Lim & Richardson, 2022, Richardson et al., 2025), and meta-analytic evidence shows that Col processes, especially cognitive presence, are closely associated with perceived learning and satisfaction (Martin et al., 2022, Yang, Wang & Zhao, 2025). At the same time, broader research on online higher education shows that students do not experience online learning uniformly, as learner characteristics and resources shape engagement and support needs (Dumford & Miller, 2018, Muljana & Luo, 2019, Xu & Jaggars, 2013). For this reason, the present study uses Col as its primary pedagogical lens, while also incorporating learner characteristics and perceived learning outcomes to examine how pedagogical processes are experienced by different students and translated into attitudes toward online learning.

Grounded in the Col framework, the present study addresses these needs by examining (a) whether students’ perceptions of teaching, social, and cognitive presence differ across key demographic groups and self-reported achievement levels, and (b) how student characteristics, perceived three Col presences, and perceived learning outcomes jointly explain attitudes toward online learning. By clarifying whether the association of Col presences with attitudes is direct or is better understood through perceived cognitive and metacognitive gains, the study contributes to a more explicit account of how pedagogical quality is translated into students’ evaluations of online learning, while also offering actionable insights for improving both the effectiveness and equity of online course design and institutional policy.

1.1 Research Questions

RQ1: To what extent do students’ perceptions of the three Col presences (teaching, cognitive, and social) differ across student characteristics, including age, gender, ethnicity, faculty affiliation, learning-disability status, and self-reported academic achievement (GPA)?

RQ2: What are the predictors of students’ attitudes toward online learning, as examined through three conceptual models: (1) student demographic characteristics, (2) perceived three Col presences, and (3) perceived learning outcomes (cognitive, metacognitive, and social)?

2. Methodology

The quantitative research method that focuses on collecting numerical data that are analyzed using statistics in order to explain a phenomenon (Creswell & Creswell, 2018), was chosen for the present research. The goal is to identify statistical relationships between the study variables.

The research was carried out at a university in Northern Israel and examined students' experiences in fully online courses. The sample included 316 students. Notably, the Israeli context is substantively relevant because the analysis considers demographic differences between Jewish and Arab students - groups that reflect broader social and cultural diversity in Israeli higher education. Within the institution, roughly three-quarters of students are Jewish (about 75%), while the remaining quarter consists of minority students from the Arab sector. This demographic composition provides a meaningful context for interpreting patterns in students' perceptions and attitudes toward online learning.

A total of 22 undergraduate courses were represented, spanning multiple disciplines, including education, social sciences, humanities, and science and technology. The courses varied in scope and level, comprising both introductory courses and more content-specific offerings. All courses were delivered fully online. Some were conducted in a fully asynchronous format, whereas others included limited synchronous online sessions (e.g., via Zoom) or other structured online interaction components.

2.1 Instruments

A structured questionnaire was developed consisting of four parts. The first part collected demographic information from the participants, including age, gender, ethnicity (self-identified as Jewish or Arab), faculty affiliation, and whether they had been diagnosed with a learning disability. Students were also asked to report their cumulative academic grade point average (GPA) by selecting one of five predefined ranges: below 60, 60–70, 70–80, 80–90, or 90–100. This categorical measure was used to examine whether perceptions of online-course presences differed across self-reported achievement levels.

The second part assessed students' perceptions of the pedagogical components of the online course, focusing on the three types of presence - cognitive, social, and teaching presence, as defined by the Community of Inquiry COI framework (Garrison, Anderson & Archer, 2000). This section was based on the validated instrument developed by Arbaugh et al. (2008) and included 34 items rated on a five-point Likert scale. The third part of the questionnaire included 16 items addressing students' perceptions of learning outcomes in the online course. These items were adapted from the instruments of Rovai et al. (2009) and Alt (2017). In Alt's original questionnaire, the items were phrased to describe the pedagogical characteristics of the course, in the current study, they were modified to reflect students' perceived benefits and learning outcomes of the course. The final part of the questionnaire included five items designed to measure student satisfaction with online learning: "I find online courses convenient," "Online courses can help me grow as a learner," "I am satisfied with online learning," "I would like to take online courses in the future," and "I would recommend an online course to a friend". The overall reliability of this part of the questionnaire, which refers to student satisfaction with online learning, was $\alpha = 0.935$.

An Exploratory Factor Analysis (EFA) was conducted for the 34 questionnaire items, assessing students' perceptions of the pedagogical components of the online course, based on the three types of presence (cognitive, social, and teaching presence) as defined by the COI framework (Garrison, Anderson & Archer, 2000). No restriction on the number of extracted factors was made. The default criterion for factor retention was an eigenvalue greater than 1 (Eigenvalue Criterion). The analysis used the Principal Component extraction method with oblique (Oblimin) rotation, based on the assumption that the factors are correlated. The analysis yielded 34 items loading on three distinct factors (see Appendix 1), which together explained 66.2% of the total variance (KMO = 0.964, Bartlett's test < 0.001). Each item loaded on only one of the three factors, with a loading threshold set at 0.40. Table 1 presents the results of the factor analysis for the three identified factors: cognitive presence, social presence, and teaching presence.

Table 1: Factor Loadings - Exploratory Factor Analysis – Pedagogical Components

Item	Cognitive presence	Social presence	Teaching presence
Problems posed increased my interest in course issues	0.764		
Course activities piqued my curiosity	0.874		
I felt motivated to explore content related questions	0.813		
I utilized a variety of information sources to explore problems posed in this course	0.647		
Brainstorming and finding relevant information helped me resolve content related questions	0.570		

Item	Cognitive presence	Social presence	Teaching presence
Online discussions were valuable in helping me appreciate different perspectives	0.638		
Combining new information helped me answer questions raised in course activities	0.611		
Learning activities helped me construct explanations/solutions	0.696		
Reflection on course content and discussions helped me understand fundamental concepts in this class	0.616		
I can describe ways to test and apply the knowledge created in this course	0.832		
I have developed solutions to course problems that can be applied in practice	0.774		
I can apply the knowledge created in this course to my work or other non-class related activities	0.788		
Getting to know other course participants gave me a sense of belonging in the course		0.810	
I was able to form distinct impressions of some course participants		0.841	
Online or web-based communication is an excellent medium for social interaction		0.574	
I felt comfortable conversing through the online medium		0.491	
I felt comfortable participating in the course discussions		0.564	
I felt comfortable interacting with other course participants		0.795	
I felt comfortable disagreeing with other course participants while still maintaining a sense of trust		0.706	
I felt that my point of view was acknowledged by other course participants		0.718	
Online discussions help me to develop a sense of collaboration		0.520	
The instructor clearly communicated important course topics			0.626
The instructor clearly communicated important course goals			0.753
The instructor provided clear instructions on how to participate in course learning activities			0.753
The instructor clearly communicated important due dates/time frames for learning activities			0.719
The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn			0.755
The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking			0.683
The instructor helped to keep course participants engaged and participating in productive dialogue			0.667
The instructor helped keep the course participants on task in a way that helped me to learn			0.617
The instructor encouraged course participants to explore new concepts in this course			0.577

Item	Cognitive presence	Social presence	Teaching presence
Instructor actions reinforced the development of a sense of community among course participants			0.410
The instructor helped to focus discussion on relevant issues in a way that helped me to learn			0.620
The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives			0.506
The instructor provided feedback in a timely fashion			0.465

Cronbach's alpha reliability coefficients were calculated for each of the factors (categories) identified in this section of the questionnaire. The results indicated a reliability of $\alpha = 0.950$ for cognitive presence, $\alpha = 0.940$ for social presence, and $\alpha = 0.946$ for teaching presence. The overall reliability of this part of the questionnaire was $\alpha = 0.974$.

An Exploratory Factor Analysis (EFA) was conducted for the 16 items addressing students' perceptions of learning outcomes in the online course as well. No restriction on the number of extracted factors was made. The default criterion for factor retention was an eigenvalue greater than 1 (Eigenvalue Criterion). The analysis used the Principal Component extraction method with oblique (Oblimin) rotation, based on the assumption that the factors are correlated. The analysis yielded 15 items loading on three distinct factors (see Appendix 2), which together explained 73.82% of the total variance (KMO = 0.947, Bartlett's test < 0.001). Each item loaded on only one of the three factors, with a loading threshold set at 0.40. Table 2 presents the results of the factor analysis for the three identified factors: metacognitive learning outcomes, cognitive learning outcomes, and social learning outcomes.

Table 2: Factor Loadings - Exploratory Factor Analysis – Learning Outcomes

Item	Metacognitive outcomes	Cognitive outcomes	Social outcomes
I am able to organize the course materials in a logical way	0.680		
I am able to create a type of "study guide" that would help future students taking this course	0.943		
I am able to apply the skills I acquired in this course to other academic courses (both online and in-person)	0.856		
I am able to provide well-founded criticism of the texts used in the course	0.675		
I have expanded my skills in the subject area covered by the course	0.569		
I can demonstrate to others the skills I acquired in the subject	0.604		
I feel that I am able to think more effectively as a result of the course		0.739	
I learned how to solve real-world problems (theoretical or practical) as a result of the course		0.911	
I learned how to ask questions about complex problems as a result of the course		0.841	
I learned how to search for explanations to real-world problems as a result of the course		0.923	
In the framework of the course, I learned skills that help me investigate a topic that interests me		0.857	
In the framework of the course, I learned how to explore a selected topic in depth		0.706	
Overall, I believe I can achieve what is important to me as a result of the course		0.701	
As part of the course, I was given opportunities to work with other students and develop my teamwork skills			0.796

Item	Metacognitive outcomes	Cognitive outcomes	Social outcomes
As part of the course, I was given opportunities to engage in discussions with peers and improve my argumentation skills			0.720

Cronbach's alpha reliability coefficients were calculated for each of the factors (categories) identified in this section of the questionnaire. The results indicated a reliability of $\alpha = 0.911$ for metacognitive outcomes, $\alpha = 0.828$ for social outcomes, and $\alpha = 0.944$ for cognitive outcomes. The overall reliability of this part of the questionnaire was $\alpha = 0.956$.

2.2 Participants

The questionnaire was distributed among 578 students, of whom 316 responded (55%). Participants ranged in age from 20 to 63 years ($M = 27.14$, $SD = 6.18$, median = 26, valid age data were available for 310 students). Respondents were 58% women (182) and 42% men (134), 57% (179) majored in the social sciences and humanities, 25% (78) majored in education and teaching, and 18% (58) majored in science and technology, 73% (231) of the respondents were not diagnosed with learning disabilities, whereas 27% (85) were diagnosed. Of the respondents, 87% (276) were self-identified as Jewish, 10% (30) as Arab, and the remainder (10, 3%) did not answer the ethnicity question.

2.3 Ethical Considerations

The study received approval from the Ethics Committee of the academic institution. Participants were informed that their participation was voluntary and anonymous, and that they could withdraw from the study at any time without any consequences. The objectives of the study were clearly presented to the participants prior to data collection, and informed consent was obtained. It was explicitly stated that participation in the study would have no impact on their academic status or coursework. The questionnaire was distributed electronically via a link sent by departmental administrative staff through email communication with students.

3. Results

RQ 1: To what extent do students' perceptions of the three Col presences (teaching, cognitive, and social) differ across student characteristics, including gender, ethnicity, faculty affiliation, learning-disability status, and self-reported academic achievement (GPA)?

To assess the normality of the dependent variables, Kolmogorov-Smirnov and Shapiro-Wilk tests were conducted for each variable separately. In all cases, the significance values (p) were below .05, indicating that the variables were not normally distributed. Therefore, non-parametric tests were used to address the research question. To examine differences in students' perceptions of the pedagogical design of online courses according to demographic characteristics, the Mann-Whitney U test was applied for dichotomous variables (gender, ethnicity, and learning disabilities), and the Kruskal-Wallis H test was used for the variables faculty (with three categories) and students' self-reported cumulative GPA range (categorized into five intervals).

The results revealed significant differences in students' perceptions of all types of presence based on gender (in favor of male students) and faculty (in favor of students from the Faculties of Humanities and Social Sciences, and Education). Significant differences were also found in teaching presence (in favor of students without learning disabilities) and in social presence (in favor of Arab students). In all cases, the effect sizes were relatively small. Table 3 presents the full results.

Table 3: Perceptions of the pedagogical characterization of the online course according to demographic variables

Variable		Teaching presence Mean rank	Social presence Mean rank	Cognitive presence Mean rank	Total Mean rank
Gender	Female	147.02	138.01	142.75	141.76
	Male	174.10	185.36	178.87	181.23

Variable		Teaching presence Mean rank	Social presence Mean rank	Cognitive presence Mean rank	Total Mean rank
	Mann–Whitney U test	U=10104, z=-2.607, p<.01, effect size=0.147	U=8464.5, z=-4.563, p<.01, effect size=0.257	U=9327.5, z=-3.479, p<.01, effect size=0.196	U=9148, z=-3.795, p<.01, effect size=0.214
Ethnicity	Jews	150.92	149.58	150.79	150.32
	Arabs	177.23	184.33	173.23	182.72
	Mann–Whitney U test	n.s.	U=3185, z=-2.052, p<.05, effect size=0.115	n.s.	n.s.
Learning disabilities	Without diagnosis	167.94	163.59	163.29	166.48
	With diagnosis	132.84	142.63	143.44	136.81
	Mann–Whitney U test	U=7636.5, z=-3.032, p<.01, effect size=0.170	n.s.	n.s.	U=7974, z=-2.560, p<.05, effect size=0.144
Faculty	Social Sciences and Humanities	175.90	175.58	173.50	177.15
	Education and Teaching	144.10	149.69	140.76	143.82
	Science and Technology	121.44	111.42	130.15	117.98
	Kruskal-Wallis H test	H(2)=18.12, p<.001	H(2)=22.41, p<.001	H(2)=13.40, p<.001	H(2)=21.00, p<.001
GPA	Below 60	198.94	213.00	199.81	210.38
	60-70	184.24	219.50	198.10	202.43
	70-80	156.80	155.89	147.17	145.43
	80-90	145.07	141.94	144.71	143.35
	90-100	167.61	162.69	169.19	166.44
	Kruskal-Wallis H test	n.s.	H(4)=16.65, p<.005	H(4)=10.74, p<.05	H(4)=12.06, p<.05

The GPA-based comparisons in Table 3 indicate that students with lower self-reported academic achievement tend to perceive stronger cognitive and social presence in online courses. In contrast, teaching presence appears to be perceived similarly across all GPA ranges. To better understand the direction of these differences, the mean ranks for each GPA group were examined. In all significant presence types—social and cognitive presence—students who reported lower cumulative GPA scores (especially those in the "< 60" and "61–70" ranges) showed higher mean ranks, indicating stronger perceptions of presence. Conversely, students in the "81–90" GPA range consistently had the lowest mean ranks, suggesting weaker perceptions of presence in the online learning environment. Post-hoc comparisons using Mann–Whitney U tests were conducted to further examine the significant differences identified in the Kruskal–Wallis tests regarding students' perceptions of cognitive and social presence across self-reported GPA ranges. For cognitive presence, students in the 61–70 GPA group reported significantly higher levels compared to those in the 71–80 and 81–90 GPA groups. Specifically, students in the 61–70 group had a higher mean rank (49.38) than those in the 71–80 group (Mean Rank = 33.10), U=302.50, Z=-2.895, p=.004, with a medium effect size (r=.337). Similarly, they reported higher cognitive presence than students in the 81–90 group (Mean Rank = 101.90 vs. 74.46), U=872.00, Z=-2.553, p=.011, with a small-to-medium effect size (r=.205).

For social presence, the 61–70 GPA group also perceived significantly higher levels than their higher-achieving peers. They scored higher than the 71–80 group (Mean Rank = 48.50 vs. 32.63), $U=339.50$, $Z=-2.721$, $p=.007$, with a medium effect size ($r=.316$), and higher than the 81–90 group (Mean Rank = 100.71 vs. 75.12), $U=896.50$, $Z=-2.472$, $p=.013$, with a small-to-medium effect size ($r=.199$). No other pairwise comparisons yielded statistically significant differences for either presence type.

RQ 2: What are the predictors of students' attitudes toward online learning, as examined through three conceptual models: (1) student demographic characteristics, (2) perceived three Col presences, and (3) perceived learning outcomes (cognitive, metacognitive, and social)?

To identify the predictors of students' attitudes toward online courses, a hierarchical multiple regression analysis was conducted in three steps:

Model 1 – Student Demographic Characteristics: The model included five variables: gender, age, faculty, learning disability status, and ethnicity (Jewish/Arab). The model was significant, $F(5, 289) = 4.731$, $p < .001$ and explained 7.6% of the variance in attitudes ($R^2 = 0.076$). Among the predictors, gender ($\beta = -0.119$, $p = .044$), ethnicity ($\beta = 0.144$, $p = .014$), and faculty affiliation ($\beta = -0.133$, $p = .030$), were significant contributors. Female and Jewish students reported more positive attitudes.

Model 2 – Pedagogical Characteristics (COI Presences): The second model included the predictors from Model 1 and added pedagogical variables: teaching presence, social presence, and cognitive presence (Garrison, Anderson & Archer, 2000). The model was significant, $F(8, 286) = 17.495$, $p < .001$ and explained variance increased to 33% ($R^2 = 0.329$). Cognitive presence ($\beta = 0.338$, $p < .001$) was a significant contributor. Students who experienced greater cognitive engagement reported more positive attitudes. Teaching and social presence were not statistically significant when controlling for cognitive presence and demographics.

Model 3 – Perceived Learning Outcomes: The third model added variables related to perceived cognitive, metacognitive, and social learning outcomes. The final model was significant, $F(11, 283) = 14.479$, $p < .001$ and explained variance further increased to 36% ($R^2 = 0.360$). Among the predictors, perceived metacognitive learning outcomes ($\beta = 0.212$, $p = .033$) and perceived cognitive learning outcomes ($\beta = 0.205$, $p = .042$), were significant contributors. Greater self-reported development of metacognitive skills predicted more positive attitudes. Cognitive learning gains were also positively associated with student attitudes. None of the presences (teaching, social, or cognitive) remained significant in this model, indicating that their influence may be mediated through students' perceptions of actual learning outcomes. Table 4 presents the results of the hierarchical multiple regression analysis predicting students' attitudes toward online learning across the three conceptual models.

Table 4: Hierarchical multiple regression predicting attitudes toward online learning

Predictor	Model 1 B (SE)	β	p	Model 2 B (SE)	β	p	Model 3 B (SE)	β	p
Constant	3.683 (1.159)	-	.002	0.689 (1.037)	-	.507	0.862 (1.037)	-	.406
Gender	-0.065 (0.032)	-.119	.044	-0.015 (0.028)	-.027	.595	-0.010 (0.028)	-.019	.713
Age	-0.002 (0.010)	-.014	.809	-0.004 (0.009)	-.024	.619	-0.006 (0.009)	-.036	.453
Faculty affiliation	-0.184 (0.084)	-.133	.030	-0.027 (0.074)	-.019	.719	-0.013 (0.074)	-.009	.861
Learning disability status	0.267 (0.141)	.110	.059	0.183 (0.121)	.076	.133	0.115 (0.120)	.047	.340
Ethnicity (Jewish/Arab)	0.225 (0.091)	.144	.014	0.100 (0.079)	.064	.207	0.093 (0.077)	.060	.231
Teaching presence	-	-	-	0.147 (0.101)	.125	.147	0.048 (0.102)	.041	.637
Social presence	-	-	-	0.102 (0.074)	.108	.169	0.130 (0.085)	.138	.128
Cognitive presence	-	-	-	0.375 (0.108)	.338	<.001	0.104 (0.129)	.093	.422

Predictor	Model 1 B (SE)	β	p	Model 2 B (SE)	β	p	Model 3 B (SE)	β	p
Cognitive learning outcomes	-	-	-	-	-	-	0.209 (0.103)	.205	.042
Social learning outcomes	-	-	-	-	-	-	-0.069 (0.066)	-.080	.296
Metacognitive learning outcomes	-	-	-	-	-	-	0.230 (0.108)	.212	.033
Model statistics									
R	.275			.573			.600		
R ²	.076			.329			.360		
Adjusted R ²	.060			.310			.335		
ΔR^2	.076			.253			.032		
F for model	4.731***			17.495***			14.479***		
ΔF	4.731***			35.911***			4.651**		

p < .01; *p < .001.

4. Discussion

This study examined how pedagogical characteristics of online learning environments, conceptualized through the Col presences, relate to students' attitudes toward online learning, and whether these associations are shaped by learner characteristics and students' perceived learning outcomes. Data were collected from undergraduate students enrolled in fully online courses, representing a range of disciplines. Using a quantitative survey design, teaching, social, and cognitive presence were assessed, alongside perceived learning outcomes (cognitive, metacognitive, and social) and overall attitudes toward online learning. The discussion below highlights the main findings, situates them within recent scholarship on online course quality, and outlines implications for equitable online course design and institutional policy in higher education.

Regarding group differences (RQ1), students' perceptions of Col presences varied across several student characteristics, however, these differences should be interpreted with caution because most effect sizes were small. Rather than indicating large or stable divides between student groups, the findings point to modest variations in how different learners may experience the online learning environment under particular disciplinary and instructional conditions. In this sense, learner characteristics appear to shape online-course perceptions in limited and context-sensitive ways, while much of the overall experience may still be driven by course-level pedagogical design.

The disciplinary differences observed in the present study, where students from education and the humanities/social sciences reported stronger perceived presences than students from science and technology, are consistent with growing evidence that Col-related processes are enacted in discipline-sensitive ways rather than as a uniform "one-size-fits-all" configuration. Research on online course design suggests that instructors' disciplinary aims and pedagogical traditions shape which Col indicators are foregrounded in learning activities and assessment, which in turn may influence how visible teaching, social, and cognitive presence becomes to students (Richardson et al., 2025). Complementary qualitative work also indicates that while teaching presence is typically valued across fields, the salience and perceived necessity of social presence can vary by discipline, particularly in hard-applied contexts where interaction may be less central to how learning is organized and evaluated (Lim & Richardson, 2022). In line with these arguments, large-scale evidence further points to systematic disciplinary patterns in online learning experiences and presence-related dimensions, often showing comparatively weaker indicators in science/engineering relative to humanities, and highlighting that certain pedagogical components (e.g., facilitating discourse) may be especially consequential in STEM contexts (Li & Wang, 2024). Taken together, these findings suggest that the differences detected in our sample may reflect variation in how online courses operationalize interaction, facilitation, and inquiry across disciplines, underscoring the need for discipline-sensitive Col-informed design and faculty development rather than assuming that the same presence profile will emerge, or be equally functional, across all fields. At the same time, because the effect sizes were small, these disciplinary differences are better understood as modest tendencies in students' perceptions rather than as evidence of sharply distinct online learning experiences across fields.

Gender-related differences in perceptions of online learning conditions have been reported, although findings are not always directional or consistent. Li and Wang (2024) highlight this heterogeneity by showing that specific dimensions of teaching presence relate differently to male and female students' online learning experiences, suggesting that gender effects may depend on which pedagogical processes are most salient in a given context. In the present study, male students reported higher levels of teaching, social, and cognitive presence than female students, albeit with relatively small effect sizes. This pattern may reflect differences in how students engage with and interpret online interaction and instructional support, or it may be partially shaped by contextual factors such as disciplinary enrollment patterns and course design features. Future research should therefore examine whether gender differences persist after accounting for course-level variation and whether they are mediated by participation behaviors or perceived learning gains. Given the relatively small effect sizes, this pattern should be interpreted cautiously and not as evidence of a strong or uniform gender-based divide in online learning experience.

In the current study, students' disability status was associated with a small but significant difference in teaching presence perceptions. Students without a diagnosed learning disability reported higher teaching presence, whereas no significant differences emerged for cognitive or social presence. At the same time, the effect size was small, suggesting that this result should be interpreted as a limited area of difference rather than as evidence of a broad disparity in online learning experience. This pattern is consistent with the view that, for students with special needs, the "pedagogical work" of online teaching is often experienced most strongly through instructor-led design and guidance, namely, how clearly the course is structured, how expectations are communicated, and how feedback and support are provided throughout the learning process (Öhrstedt et al., 2024). From a CoI perspective, these elements map directly onto teaching presence as the design, facilitation, and direction of learning processes, suggesting that when instructional organization and instructor support are less visible or less accessible, students with learning disabilities may evaluate teaching presence more critically even if peer interaction and cognitive engagement are perceived similarly. Practically, this finding reinforces the importance of inclusive online course design: strengthening transparency (instructions, timelines, criteria), accessibility of materials, and timely, actionable instructor feedback may be particularly consequential for reducing barriers and supporting equitable learning experiences among students with learning disabilities.

Our finding is consistent with recent evidence suggesting that, although many faculty members are genuinely motivated to support online students with disabilities, they often feel underprepared and constrained by limited time, compensation, and institutional training, conditions that can reduce the extent to which teaching presence is enacted through proactive design, facilitation, and guidance (Lehan et al., 2025). These insights offer a plausible explanation for why teaching presence, more than social or cognitive presence, may be the dimension most sensitive to disability-related differences. Students who need clearer structure, predictable communication, and timely, targeted feedback may experience variability in these "high-touch" instructional processes more strongly when inclusive design is not systematically embedded.

Ethnicity-related differences in perceived social presence should be interpreted cautiously given the small effect size, yet they may point to how online environments can reshape participation conditions for students from minoritized groups within hegemonic academic spaces. In the present study, students from the Arab minority reported higher social presence, which aligns with qualitative evidence suggesting that synchronous online learning (e.g., via Zoom) can reduce fear, self-censorship, and linguistic inhibition that sometimes characterize face-to-face participation in majority-group settings, thereby enabling more confident self-expression and interaction (Halabi, 2023). At the same time, research on Jewish–Arab undergraduates during COVID-19 indicates that minority students may concurrently experience greater academic challenges alongside lower perceived social support and institutional trust, underscoring that "feeling socially present" in online learning does not necessarily imply equal access to supportive resources or a uniformly positive overall experience (Ismail et al., 2023). Taken together, these findings suggest that social presence may be shaped not only by course design but also by perceived psychological safety, power relations, and language comfort, mechanisms that may similarly affect other underrepresented or minoritized groups across higher education systems.

Interestingly, perceptions of presence varied across self-reported cumulative GPA categories. Students in the lower GPA ranges tended to report stronger cognitive and social presence, whereas teaching presence was perceived more similarly across achievement levels. This pattern is noteworthy because the broader CoI literature typically reports positive associations between presences and learning outcomes, including actual performance and perceived learning (Martin et al., 2022, Rockinson-Szapkiw et al., 2016), and recent evidence in blended contexts likewise links teaching, social, and cognitive presence to learning performance (Li & Ye, 2025). One interpretation is a compensatory salience mechanism. Students who struggle academically may rely

more on interaction, clarification, and community resources, and thus become more attuned to, or place greater value on, the social and cognitive dimensions of the online learning environment when these are present. This aligns with research framing academic help-seeking as a central self-regulated learning strategy in online courses and linking it to achievement-related outcomes (Fong et al., 2023, Won et al., 2024), as well as reviews showing that SRL processes are consistently related to academic achievement in online and blended learning (Xu, Shi & Zhao, 2023). At the same time, the observed pattern may reflect contextual confounding (e.g., disciplinary clustering, course design differences, or instructor practices that co-vary with both GPA distributions and perceived presence) and should therefore be examined in future work using multilevel models nested within courses and instructors, complemented by objective achievement and behavioral trace indicators of engagement and help-seeking.

The RQ1 findings suggest that although learner characteristics were associated with some differences in perceived presence, these differences were generally small in magnitude and context-dependent. Rather than indicating large or stable divides between student groups, the results point to modest variations in how different learners may experience the online learning environment under particular disciplinary and instructional conditions. In practical terms, these findings suggest that while student characteristics should not be ignored, online learning quality is unlikely to be determined primarily by fixed group membership alone.

In addressing Research Question 2, the hierarchical models suggest that learner demographics played a relatively limited role in explaining students' attitudes toward online learning. Although some demographic predictors reached statistical significance, Model 1 accounted for only a modest proportion of the variance. By contrast, the substantial increase in explained variance after adding Col presences, and the further contribution of perceived learning outcomes, indicates that students' attitudes are shaped less by who they are demographically and more by how they experience the pedagogical quality and learning value of the course. More specifically, the findings suggest that cognitive presence may be important not simply as a favorable feature of online learning in itself, but because it is linked to students' sense that meaningful learning has taken place. Once perceived cognitive and metacognitive gains were introduced, the direct contribution of Col presences was reduced, which is consistent with the interpretation that students evaluate online learning primarily through the extent to which it produces deeper understanding and reflective growth. Because the study is cross-sectional, this pattern should not be interpreted causally, however, it does support a more proximal account of student attitudes in which perceived learning gains may help explain why certain pedagogical conditions matter more than others.

This pattern aligns with accumulated evidence that cognitive presence is strongly associated with blended contexts (Martin et al., 2022), and with recent meta-analytic findings showing large correlations between cognitive presence and both perceived learning and satisfaction, alongside meaningful heterogeneity across disciplinary areas and course features (Yang, Wang & Zhao, 2025). At the same time, prior work indicates that perceived learning outcomes are a proximal determinant of satisfaction and related judgments about online learning quality (e.g., Su & Guo, 2021), suggesting that Col presence may matter to students' attitudes to the extent that they recognize it as cognitively and metacognitively beneficial.

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design does not allow causal conclusions about the relationships among Col presences, perceived learning outcomes, and attitudes. Second, all variables were measured through self-report, which may introduce shared-method variance. This limitation is especially relevant for the self-reported cumulative GPA measure, as students may over-report their academic achievement due to social desirability or recall bias, because GPA was analyzed in broad intervals, even modest inaccuracies may have affected group classification and should therefore be considered when interpreting the GPA-related findings. Third, although the response rate was acceptable, non-response bias cannot be ruled out, as no formal comparison was conducted between respondents and the broader invited student cohort. Fourth, the sample was drawn from a single university, and generalizability to other institutional and national contexts should be made cautiously. Finally, students were nested within multiple online courses and instructors. Because the analyses did not explicitly model this clustering structure, some variance attributable to course-level design, instructional practices, and assessment conditions may not have been adequately separated from learner-level variance. As a result, the standard errors of some individual-level estimates may have been biased, and the magnitude of learner-level effects should therefore be interpreted with appropriate caution.

Despite these limitations, the findings suggest that improving students' attitudes toward online learning may depend less on fixed demographic differences and more on whether course design makes meaningful learning

gains visible to students. The relatively modest contribution of demographic variables, compared with the stronger explanatory role of Col presences and especially perceived cognitive and metacognitive gains, suggests that online-course quality should be designed primarily around pedagogical processes that support deeper understanding, reflective learning, and a clear sense of progress. In practical terms, this means prioritizing inquiry-oriented and application-based tasks that strengthen cognitive presence, embedding metacognitive scaffolds such as planning prompts, self-monitoring activities, and guided reflection, and ensuring transparent course organization and timely feedback, particularly as a targeted support for students who may be more sensitive to variability in teaching presence, including those with learning disabilities. At the institutional level, the findings support shared quality standards and faculty development that focus not only on technical delivery, but on designing online courses in ways that help students experience learning as cognitively meaningful and metacognitively productive.

Beyond these practical implications, the study also makes a theoretical contribution by extending Col-based research by suggesting an integrative view in which perceived learning outcomes constitute a central link in understanding students' attitudes toward online learning, alongside the three presences. By combining process indicators (Col presences), multidimensional perceived gains (cognitive, metacognitive, and social), and learner characteristics, the study contributes to more nuanced models of online learning quality in higher education.

Future research can build on these findings by testing formal mediation models (e.g., SEM) to examine whether perceived learning outcomes account for the association between Col presences and attitudes. Multi-level designs that nest students within courses and instructors would help disentangle course-level pedagogical effects from learner-level differences. In addition, incorporating objective indicators, such as LMS trace data, course grades, and retention, could complement self-reports and clarify how perceived quality aligns with behavioral engagement and academic performance. Finally, comparative studies across fully online, blended, and synchronous formats would strengthen generalizability and identify which pedagogical conditions are most robust across delivery modes.

In conclusion, this study suggests that students' attitudes toward online learning are shaped less by fixed demographic differences than by how they experience the pedagogical quality and learning value of online courses. Although some subgroup differences in perceived presence were statistically significant, their generally small effect sizes indicate that these patterns should be interpreted as modest and context-dependent rather than as strong divides between student groups. By contrast, the findings point more clearly to the importance of pedagogical processes and, in particular, to the central role of perceived cognitive and metacognitive gains in shaping students' evaluations of online learning. In this sense, the study contributes to the field by advancing a more integrative account of online learning quality, one that connects Col presences, perceived learning outcomes, and learner characteristics, while highlighting that students' judgments of online learning may depend primarily on whether they experience it as meaningful, cognitively engaging, and supportive of reflective growth.

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Appendix 1

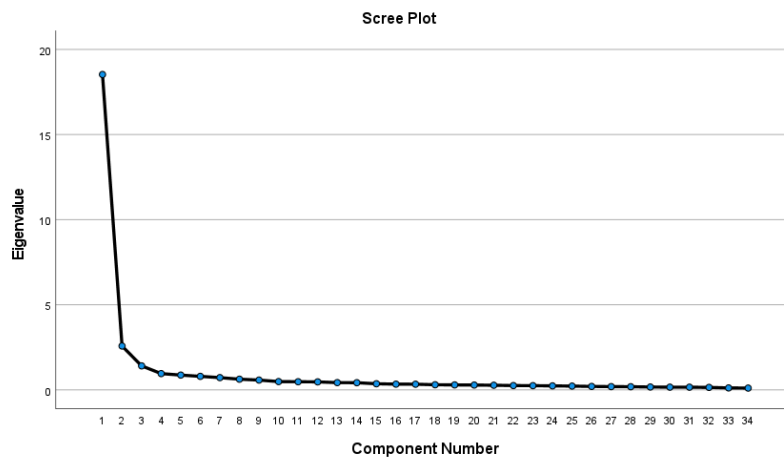


Figure 1: Scree plot for the exploratory factor analysis of students' perceptions of the three types of presence (cognitive, social, and teaching presence) as defined by the Community of Inquiry framework

Appendix 2

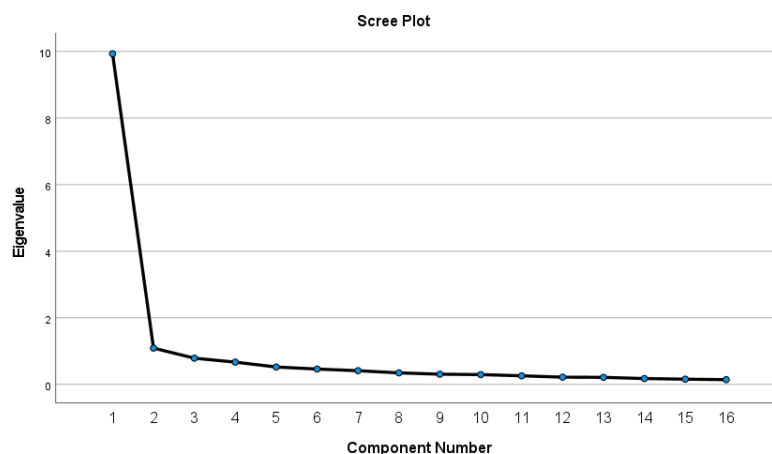


Figure 2: Scree plot for the exploratory factor analysis of students' perceptions of learning outcomes in the online course