

## Article

# Nursing Students' Evolving Perceptions of Online Learning: A Hierarchy of Curricula

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**Abstract:** Many nursing programs had relatively light online learning components before the COVID-19 pandemic. The transition to fully online courses without preliminary planning represented a problematic shock to most nursing students and faculty. To understand students' perceptions of the critical success of online learning factors, an empirical comparison was conducted of nursing ( $n = 126$ ) and non-nursing students ( $n = 1766$ ) with similar demographic characteristics, but in different timeframes. A two-sample  $t$ -test was conducted for each question to ascertain significant differences in student perceptions between nursing and non-nursing students. While the ranking of critical success factors was similar for nursing and other students, the perceptions of nursing students were generally far more critical of the capability of online learning due, partially due to the perception that the online medium is less well suited to nursing education, and partially to instructional challenges caused by the rapid transition and chaos caused by the pandemic. The pandemic provided an inferior initial exposure to online nursing education in programs that had not previously prepared for online instruction, but had an abnormally increased demand for more online education. Without aggressive efforts to improve online teaching in programs with similar circumstances, students' perceptions of overall quality may not improve significantly in the long term.

**Keywords:** online learning; nursing education; discipline differences; online teaching



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## 1. Introduction

Online learning as an educational modality continues to grow in the United States. As of 2018—when the last comprehensive data were gathered before the COVID-19 pandemic—approximately 30% of all students were enrolled in an online course [1]. A slow but steady increase in the recording of student impressions has accompanied this. In one national study taken after the pandemic's forced transition to online teaching, about 41% of graduate students surveyed in the United States noted that online education provided an experience better than their undergraduate experiences [2].

Positive findings regarding implementing online elements or entire courses in nursing are numerous [3]. Early examples include Cragg et al. [4], who noted the need for a strong socialization program to ensure positive experiences. Christianson et al. [5] noted the success—but also the increased workload—for faculty. Yom [6] pointed to a successful case of online course development in a South Korean setting with diligent planning and support. The future success of online learning in nursing continues to be demonstrated by studies indicating that good online learning produces a similar learning achievement [7], that good planning by the academic unit enhances success substantially [8], that online nursing education was able to continue in the face of pandemic lockdowns [9,10], and that nursing clinics with online elements can result in significant learning improvement over face-to-face teaching only [11].

Yet, in a critique of the online nursing-education literature, Russell [12] (p. 13) reported that after reviewing 36 studies, “the findings reflect evaluation practices that are diffuse and superficial” and vulnerable to the Hawthorne effect, in which those who are observed perform better than those not surveyed. In addition to weak evaluation practices, the nursing literature has understandably focused on how to make online education more successful, but in so doing, has revealed a long list of areas needing special attention and increased effort to achieve positive outcomes. Because of the array of issues that must be incorporated into online education to make it successful, numerous researchers have pointed to the need for concrete standards and accountability rubrics in nursing education if it is to live up to its potential [13–17].

While the COVID-19 pandemic prodded nursing into online teaching—which had lagged in many other fields—to accelerate online teaching and experimentation [17], the adverse effects of the forced transition were often profound. The anxiety levels of nursing students during the pandemic were very high because of the sudden change. There were concerns about undesirable effects on post-training employment and stress in work settings for in-service students [18,19]. The inability to use blended or hybrid formats was quite off-putting, especially in clinical settings [20]. Furthermore, the lack of time for faculty to make the transition degraded online teaching, despite many instructors’ best efforts [21,22].

Providing quality and satisfactory online educational experiences by reducing barriers has become a prerequisite for most students’ success in the post-COVID era [23,24]. Improving curricular design is equally important. While expert recommendations, technological innovations, and simple trial-and-error experiences are all important in improving curriculum design and delivery, online educational programs must also incorporate students’ perceptions in designing programs with substantial online elements.

This study examines nursing students’ perceptions of online nursing courses with regard to the overall curricular design and delivery, selectively identifying factors that are perceived as the most critical under varying conditions during the pandemic when lockdowns caused involuntary reliance on online teaching platforms.

## 2. Background

There have been few reviews of nursing-education curricula from a global perspective. One early qualitative study used Chickering and Gamson’s [25] seven principles of good undergraduate teaching to provide examples of good online instruction. Bangert [26] also used a model based on Chickering and Gamson’s model that was well tested with a general population. Still, that survey on nursing education was conducted with only six students. Nwamu [27] used the seven dimensions of online learning espoused by Clayton [28] to study the relationships between the dimensions and students’ satisfaction in nursing education. That framework used both curricular and noncurricular factors. Several studies have used the Quality Matters [29] framework to examine the elements of good design. The results of one study did not reach significance using an experimental design [14], and another applied the framework in a mixed-methods qualitative framework [17]. For this research, an empirically derived model of seven factors was adopted from the work of Zhang et al. [30], Van Wart et al. [31], and Ni et al. [32], based primarily on students in business and public-administration disciplines. The seven factors include instructional support, teaching presence, basic online modality, social presence, online social comfort, cognitive presence, and interactive modality. These factors were used as a framework for the current study of online nursing-student satisfaction.

### 2.1. Basic Online Modality

Students who enroll in an online learning course expect the skillful use of basic online educational technology and tools. Such tools include online grading, announcements, online gradebook, and online rehearsal opportunities well recognized in the nursing-education literature. For example, Pilcher and Bradley [33] reported that online best practices should focus first on the acceptable use of technology, provide clear technology

standards, and ensure that essential functions in online classes are competently managed. Similarly, Abdelaziz et al. [34] examined the adaptability of essential technological tools to meet the needs of different learning styles. Quality Matters studies, such as Posey and Pintz [17] and Gaston and Lynch [14], heavily target basic online modality skills, since four of their eight standards focus on the use of basic technology (course overview and introduction, course technology, learner support, and accessibility and usability). The usefulness of frequent online quizzes for rehearsal purposes in nursing education is reported by Say et al. [35] (p. 1), who found that “formative online multiple-choice tests are used with good effect in nurse education as measured by knowledge gain and exam performance, increased confidence, and learner satisfaction.”

## 2.2. Instructional Design

Instructional design in online learning—where features are generally built into the course—is related to good course navigation, a clear and relatively comprehensive syllabus, built-in rehearsal opportunities, planned feedback, and a course design that provides a variety of techniques to communicate and learn. Nursing-education researchers have highlighted the vast differences between traditional and online learning venues [36]. Quality Matters researchers have been most focused on navigation using a detailed requirements rubric [14]. The organization of the course that comes preliminarily through the syllabus has been the focus of nursing-education researchers such as Sitzman [37]. Some researchers have focused on the need for variety in the design of modules to create a richer learning experience [38,39]. Numerous researchers have investigated how to ensure active learning [40,41]. Hariharan [42] found that providing access to lectures (e.g., via lecture capture) and lecture transcripts was helpful in all learning contexts. Inangil et al. [43] found that contemporary students immensely enjoy gamification, providing immediate feedback that students find satisfying.

## 2.3. Teaching Presence

Teaching presence encompasses students’ perception of the quality of communication during synchronous lectures, auxiliary direction given during the class, and individual feedback, including encouragement. For teaching presence to occur, the online program design must maximize the instructor’s ability to communicate with students in real time, emphasizing student interaction and activities that promote effective learning [44]. Teaching presence has been studied extensively in the nursing-education literature [45–47] in terms of satisfaction, but not necessarily in learning achievement. On the other hand, Claywell et al. [48] demonstrated a relationship between faculty participation and student satisfaction. Perceived learning increased when the students received feedback and saw the faces of their professors. Gause et al. [20] reported on the ability to increase adept technology to enhance instructor presence and effectiveness. In analyzing the relative importance of elements of teaching presence (and instructional design), Sitzman [14] found that clear instructions were most important, followed by precise dates and a calendar, quick response to emails and posting, grading rubrics, good lectures, and personal responses. Jones et al. [49] had similar findings.

## 2.4. Advanced Interactive Modality

Interactive online modality signifies the more advanced uses of online technologies to stimulate high-quality presentation and interaction. It occurs, for instance, when the instructor creates customized video lectures, well-designed videoconferencing using advanced features such as small-group breakouts, and carefully crafted and monitored small-group discussions. The use of powerful interactive online modality can generally match—and at times exceed—face-to-face modalities [11,50]. For example, in a literature review of online lectures in nursing courses, Wolf [51] (p. E16) found that web-based video lectures that had been carefully designed in nursing-education contexts were “equivalent to or better than in-person lectures.” Hariharan and Merkel [40] found it necessary to urge nursing students to

keep their cameras on during lectures and discussions. Various researchers have provided tips regarding online discussion groups [52,53], including Claywell et al. [47], who found a relationship between faculty participation and student satisfaction. Nursing-education researchers have also investigated virtual reality [54], animation [42], social media [55], audio feedback [56], and 360-degree panoramic videos [57].

### 2.5. Cognitive Presence

Cognitive presence involves stimulating ideas, reflecting, offering differing perspectives, posing problems to consider, and enhancing learning application. Smith et al. [44] (p. 98) opined that “online nursing exhibits unique challenges, such as providing nursing students with online authentic learning experiences that relate to real-world nursing situations, which comprise both high-stake medical and interpersonal elements.” Supporting this concern, Foster et al. [38] (p. 35) found critical thinking to be lacking in health science courses that were otherwise evaluated as good to very good. “Because most instructional modules did not extend beyond the lower steps of Bloom’s taxonomy, the opportunity to allow more intensive and substantive learning at these higher levels is lost.” Other researchers have found a strong connection between learner satisfaction and cognitive presence [58,59].

### 2.6. Social Presence

Social presence in the adopted model refers explicitly to the student-to-student environment and focuses on student goals in learning. It includes belongingness and community, interaction with other students, and knowing other students to the degree that they can form impressions of them. This has been a frequent topic in case studies [45,59–62] and literature reviews, e.g., [63]. For example, Plante and Asselin [46] conducted a literature review to determine the best online learning practices to promote social presence and caring behavior, and suggested activities such as posting photographs and biographies, structuring social interactions (via email, video, and discussion boards), and encouraging the free expression of opinions to promote a sense of belongingness and community. Nonetheless, Chunta et al. [64] note that while contemporary nursing students like some degree of social interaction, they prefer independent learning.

### 2.7. Online Social Comfort

Online social comfort involves students feeling comfortable participating, taking contrary positions, and collaborating in online modes. While an element of many nursing-education studies, few studies have focused on online social comfort. In a qualitative study of nursing students’ perceptions of community in online learning, Gallagher-Lepak et al. [65] held five focus groups. They asked online nursing students to discuss their experiences related to a sense of community. Seven of the 15 themes identified in the study related to online social comfort: aloneness, trepidation, unknowns, loss of nonverbal communication, anonymity, establishing commonalities, and disconnects. Rieck and Crouch [66] investigated strategies for ensuring online civility, such as syllabus statements and setting expectations. Smith and Crowe [67] found in interviewing nursing educators that there was a high interest in building comfortable and meaningful relationships with students. The research above indicates that integrating online elements can be successfully achieved in the seven specified domains when carefully designed. Indeed, a recent robust meta-analysis showed that “blended learning is more effective than traditional teaching in terms of knowledge, skill performance, and learning satisfaction” [68] (p. 1). However, the nursing-education literature does not identify the relative importance of these domains, nor does it give a sense of the adverse effects of the forced transition during the COVID lockdowns, which prevented blended learning and time for online curriculum development while simultaneously giving rise to an environment of high anxiety [69]. Further, the nursing-education literature does not provide a sense of when online modes are most desired by students beyond concerns about sufficient hands-on clinical training.

### 3. Research Questions

In the context of a primarily face-to-face program during the later stage of the pandemic lockdown, this research asks the following questions.

- (1) How do nursing students perceive online learning, and how does that compare to other students?
- (2) What materials do nursing students find most applicable to online learning, and is that perception different from other students?
- (3) How do nursing students perceive the importance of various factors related to online learning, and how does that compare to other students?

### 4. Methodology

To examine the importance and criticality of various quality factors on nursing students, we apply a critical success factor (CSF) methodology [70]. CSFs describe the underlying principles that must be incorporated to ensure success. Utilizing this methodology, CSFs—in the context of this study—define critical areas of instruction and design essential for an online class to be successful from a student's perspective in terms of criticality or importance. When made explicit, CSFs not only confirm the knowledge of successful instructors but also tap their intuition to guide and direct the accomplishment of quality instruction for entire programs. In addition, CSFs are linked with goals and objectives, helping generate a small number of significant matters on which an instructor should focus to achieve different thresholds of online success.

The instrument used to measure students' perceptions about the importance of techniques and indicators leading to quality was designed and field-tested by Zhang et al. [30], Van Wart et al. [31], and Ni et al. [32], who looked at the CSFs of online learning in management, business, and public administration students, respectively. The initial instrument was first tested and validated with a pilot study during the academic year of 2017–2018 with a sample of 397 students [71]. Based on the pilot study, the survey items were refined and finalized into the instrument of 78 questions in total. The instrument and procedure were approved by the California State University San Bernardino Institutional Review Board in 2018 (IRB-FY2018-131), and a revision was approved in 2020. Within the instrument, those factors discussed above include institutional support (6 items), teaching presence (8 items), essential online modality (4 items), social presence (6 items), online social comfort (3 items), cognitive presence (7 items), and interactive modality (3 items). In addition to looking at nursing students' perceptions of the importance of various quality factors, this study also weighs students' perceptions of the best use of online venues for learning. It compares the perspectives of students previously surveyed—albeit under different conditions—with nursing students from the same institution.

#### 4.1. Participant Recruitment

Participant recruitment for both samples was from a four-year, medium-sized institution in California with a highly underrepresented minority population, but during starkly different timeframes. The original model of business and public-administration students was recruited via a Qualtrics survey link sent out by 11 instructors to students who were unlikely to be cross-enrolled in classes during the 2018–2019 academic year. The survey provided for student anonymity. All students, whether they had taken an online course or not, were encouraged to respond, and 1766 students responded to the initial sample.

The nursing sample was collected using the same instrument by three different nursing instructors recruiting eligible students from their classes, resulting in 126 valid responses and representing 14% of all nursing students enrolled in the program that semester. However, the recruitment occurred during the spring of 2021—the second semester of the lockdown—when all students were required to take their coursework online. For context, during the term before the lockdown, 58 courses (including numerous lab sections, clinical, and readings-and-conference sections) were offered face to face, seven were provided in a hybrid format, and one was shown in a combination of synchronous and asynchronous



modes. By the fall of 2020, 28 classes were asynchronous, and the remainder were synchronous online. (Exact equivalences are difficult because of a conversion from a quarter to a semester system.) By the fall of 2021, when face-to-face courses resumed, 20 classes were still fully online (with a synchronous and asynchronous blend), 16 classes were hybrid classroom and online, and the rest had returned to face to face.

In summary, before the pandemic, fully online courses were rare, and hybrid courses constituted less than 10% of student options. During the time nursing students were surveyed, they were anxious due to the pandemic and frustrated over the lack of face-to-face possibilities. For their part, the nursing faculty experienced a high level of anxiety as well. The informal, overall hypothesis was that the ranking of quality-learning factors would be similar to the pre-pandemic non-nursing sample, but impressions of the online experience would be significantly less favorable overall.

#### 4.2. Sample Characteristics

The sample age of students is young, with 94% of the nursing sample under 30 compared to 81% of the non-nursing sample. Both samples comprised juniors and seniors (92% versus 75%). Only 14% of nursing students and 21% of non-nursing students reported having taken an online course in high school. Nursing students were less likely to work part or full time (58%) than non-nursing students (72%). The nursing sample was more white (23% to 16%), more Asian/Pacific Islander (24% to 13%), and less Latino (45% to 58%). The bulk of the non-nursing sample identified as accounting and finance (20%), management (13%), marketing (10%), public administration (8%), and information decision sciences (6%), with the bulk of the “other” students identifying with business specialties such as human resource management. All students in the nursing sample self-identified as nursing students.

### 5. Data Analysis

A two-sample *t*-test using JMP was conducted for each of the questions. The *t* ratio and degrees of freedom of each test are omitted to simplify the presentation. We only present the upper- and lower-class differences at the 95% confidence interval and the *p*-values to illustrate the differences in the samples as well as the significance of the differences. The one-sided tests (i.e., Prob > *t* or Prob < *t*) are for one-sided alternative hypotheses—for example, the null hypothesis that nursing students enjoy online learning more than other students. The two-sided tests (Prob > |*t*|) examine the null hypothesis that the responses of the two samples are equal. Our alternative hypothesis is that the mean answers to each question by the two groups of students are not similar. Means were compared to provide a ranking of each quality factor’s relative importance or criticality.

Optional, open-ended, qualitative answers were gathered responding to the question “What would most improve online learning for you?” The responses were carefully reviewed and analyzed with Excel spreadsheet to provide additional insights. Still, no empirical breakdown is provided because only a third of the nursing students responded to the optional question.

### 6. Results

#### 6.1. Overall Impressions

Nursing students were relatively negative about online learning (only 42% held a strong or very high impression), and nursing impressions were significantly (and overwhelmingly) more negative about online learning on all items than non-nursing students. While the favorable responses (“important/critical”) to the question “I am comfortable with online learning technologies” varied by only 12%, responses to “My overall impression of online learning is excellent” varied by 35%. Table 1 provides the data on impressions by item, mean, and significance.

**Table 1.** Overall impressions of hybrid/online learning and teaching. (\*  $p < 0.01$ ).

Impressions	1/2 Very High/High		3 Neutral		4/5 Low/Very Low		Mean (Stand Dev)		T-Test/ $p$ -Value	
	Nurse	Other	Nurse	Other	Nurse	Other	Nurse	Other	Upper CL Dif Lower CL Dif	Prob >  t  Prob > t Prob < t
My overall impression of online learning is very good.	42%	77%	29%	16%	39%	7%	2.86734 (1.21534)	1.95810 (0.90891)	1.15765 0.66076	<0.0001 * <0.0001 * 1.0000
I am comfortable with online learning technologies.	68%	80%	20%	15%	11%	5%	2.30612 (1.02954)	1.84094 (0.87531)	0.67681 0.25354	<0.0001 * <0.0001 * 1.0000
I enjoy online learning.	38%	58%	32%	22%	25%	10%	3.05102 (1.24662)	2.09132 (1.04179)	1.21574 0.70365	<0.0001 * <0.0001 * 1.0000
I enjoy face-to-face classes more.	73%	49%	20%	38%	7%	13%	1.90816 (1.05602)	2.43302 (1.07332)	−0.30552 −0.74421	<0.0001 * 1.0000 <0.0001 *
I learn more in face-to-face classes.	75%	54%	17%	33%	8%	12%	1.90816 (1.0849)	2.32039 (1.06244)	−0.18744 −0.63702	0.0004 * 0.9998 0.0002 *
I often speak or communicate to others in online classes.	23%	41%	29%	26%	48%	5%	3.33673 (1.12097)	2.86301 (1.21219)	0.70760 0.23984	0.0001 * <0.0001 * 0.9999
Instructors of online classes are generally responsive	58%	70%	34%	24%	6%	8%	2.40816 (0.84751)	2.08295 (0.87617)	0.50145 0.14897	0.0004 * 0.0002 * 0.9998

## 6.2. Online Learning Applicability

When asked when online learning was most applicable, nursing students were most supportive when classes were general education, introductory, or involved a lot of reading and writing. They were least supportive of classes in their major, and those that were technically inclined. The profile between nursing and non-nursing students differed. While nursing and non-nursing students agreed on when online classes are most appropriate (e.g., general education courses), the more pessimistic assessment of courses in the major and technical classes was significant and large, as seen in Table 2.

**Table 2.** Most applicable material and courses for online learning. (\*  $p < 0.01$ ).

Variable	1/2 Very High/High		3 Neutral		4/5 Low/Very Low		Mean (Std Dev)		T-Test/ $p$ -Value	
	Nurse	Other	Nurse	Other	Nurse	Other	Nursing	Other	Upper CL Dif Lower CL Dif	Prob >  t  Prob > t Prob < t
Highly technical material.	28%	45%	35%	27%	38%	27%	3.22120 (1.22280)	2.75540 (1.25123)	0.70159 0.23000	0.0001 * <0.0001 * 0.9999
General education classes.	74%	82%	17%	15%	9%	4%	1.92035 (1.00785)	1.78752 (0.88836)	0.33837 −0.07271	0.2032 0.1016 0.8984
Introductory classes.	65%	73%	20%	19%	14%	8%	2.23000 (1.11810)	1.98641 (1.00114)	0.45759 0.029761	0.0259 * 0.0130 0.9870
Classes in which there is a lot of reading and writing.	57%	59%	22%	24%	21%	17%	2.45132 (1.20260)	2.32550 (1.15687)	0.35680 −0.10517	0.2831 0.1416 0.8584
The type of material makes little difference.	27%	44%	33%	30%	39%	26%	3.18584 (1.27859)	2.70660 (1.22086)	0.72470 0.233757	0.0002 * <0.0001 * 0.9999
Courses in my major/concentration	24%	50%	21%	28%	55%	32%	3.53982 (1.31634)	2.63372 (1.21583)	1.15835 0.65384	<0.0001 * <0.0001 * 1.0000

### 6.3. Perceptions about Quality Online Learning Factors

Nursing and non-nursing students agreed about the importance and criticality of functions such as online grade books, online submissions, and online grading (both ranging from 89% to 92% important/significant). Nursing students were significantly less favorable about online quizzes (68% to 82%). Table 3 provides an overview of the results related to factor rankings and the significance of difference between the groups.

**Table 3.** Relative comparative importance of online learning factors: nursing versus other. (\*  $p < 0.01$ ).

Ranking of Factors by Average of Item Means						
Average of Nursing Item Means	Nursing Ranking	Factors	"Other" Ranking	Average of "Other" Item Means	T-Test/ $p$ -Value	
(1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree)					Upper CL Dif Lower CL Dif	Prob >  t  Prob > t Prob < t
1.5651	1	Basic online modality	1	1.4747	0.21883 −0.03798	0.1656 0.0828 0.9172 0.0134 *
1.8692	2	Instructional design	2	1.6621	0.37036 0.04383	0.0067 * 0.9933 0.0016 *
2.4121	3	Teaching presence	3	2.1087	0.48865 0.11806	0.0008 * 0.9992 0.0009 *
2.6250	4	Interactive online modality	4	2.2813	0.54359 0.14383	0.0005 * 0.9995 <0.0001 *
2.9336	5	Cognitive presence	5	2.2008	0.93814 0.52731	<0.0001 * 1.0000 <0.0001 *
2.9801	6	Social presence	7	2.6022	0.55366 0.20211	<0.0001 * 1.0000 <0.0001 *
3.2971	7	Social comfort	6	2.2408	1.29776 0.81482	<0.0001 * 1.0000

The next most crucial factor is instructional design. Favorable ratings by items range from 59% with nursing students to 89%. Good navigation and structured feedback are the top-rated items, and the variety of techniques is the lowest. There is no significant difference between the two items (navigation and instructor enthusiasm), and overall, nursing students rated the importance of instructional design modestly lower than non-nursing students.

Teaching presence is ranked third (very important) for both groups. There are minor-to-large significant differences (with ranges of 36% to 71% favorable to non-nursing with a range of 64% to 84%) in all but one item (timeliness of feedback). Again, overall nursing students rated the importance of teaching presence modestly lower than non-nursing students.

The fourth ranking factor for both was interactive online modality, which can be considered the other end of the technology spectrum from essential online modality, and is represented by only three items. While video lectures and videoconferencing were not significantly different, small-group discussions were, and the spread between nursing and non-nursing students regarding small-group discussions was large (23% to 53%), resulting in a significant difference overall for the factor.

The fifth factor for both was a cognitive presence. Favorable ratings for non-nursing ranged from 49% to 70%. The range for nursing students was consistently and significantly lower, from 28% (posing problems for interest and meaningful reflection) to 42% (utilizing various information sources to explore issues).

Social presence was the sixth-ranked factor for nursing students, but the seventh for non-nursing students. Again, nursing students rated the importance lower than



non-nursing students. The range for nursing students was 14% (i.e., forming distinct impressions, and online versus face-to-face communication) to 51% favorable (i.e., sense of community) to the non-nursing range of 35% to 60%. However, the differences between getting to know classmates for belongingness and a sense of community did not reach significance in contrast.

Social comfort (related to interactions with other students) was the least essential quality factor for nursing students, but the second-least important factor for non-nursing students. The different ranges, 20% to 34% for nursing compared to 54% to 68% for non-nursing signify a vast difference in the perception of importance or criticality. Table 4 details the findings.

**Table 4.** Research findings regarding the importance of online learning for nursing students and comparisons with other students \*.

How are the Following Perceived?	Nursing Students	Compared to Other Students
Online learning	Only moderately effective, generally prefer face-to-face learning	Significantly more critical
Importance of various factors related to online learning	—	
Importance/capability of basic online modality	Very important/capable	No significant difference except for online quizzes Similar in navigation and instructor enthusiasm, but slightly less important/capable
Importance/capability of instructional design	Very important/capable	Slightly but significantly less critical/qualified
Importance/capability of teaching presence	Essential/capable	Modestly less important/capable
Importance/capability of advanced interactive modality	Somewhat important/capable	Modestly but significantly less critical/capable
Importance/capability of cognitive presence	Somewhat important/capable	Modestly less important/capable
Importance/capability of social presence	Somewhat important/capable	Much less critical/capable
Importance/capability of social comfort	Modest importance/capability	
What material do nursing students find most applicable to online learning?	General education, introductory courses, and courses with heavy reading and writing	Significantly more critical of online courses in primary and technical subjects

\* It is important to note that data were collected from “other” students before and from nursing students immediately at the end of the pandemic lockdown.

## 7. Discussion

As expected, nursing students’ overall perceptions of online learning were far less positive than those regarding traditional learning settings. This became clearer when courses considered “less important” to the students—such as general education and introductory courses—were rated nearly as appropriate for online learning as face-to-face formats, and where flexibility and scheduling were a more significant consideration. However, qualitative comments revealed that much of the adverse reaction concerned lack of instructor design, leading to poor composition and instruction, and lack of a hybrid format. Nursing students understand the critical importance of their labs and clinicals, and the quickly assembled online learning experiences were generally an unsatisfactory substitute for nursing students, even under the duress of a medical emergency.

In terms of the importance of quality factors, basic online competence was deemed most important, because without it, the medium is underutilized, if not outright dysfunctional. Good online strategy (instructional design) and effective virtual instructional

practices (teaching presence) are also very high on the list. However, nursing students perceived the instructional design and teaching presence as less well handled than did other students, except for three items in which the differences did not reach significance.

In the subsequent tier—at the other end of the spectrum from essential online modality—advanced interactive modality is the next most important issue. Social presence—student-to-student-interaction—is less important for nursing students than for other students in terms of the simple overall mean—even though, ironically, other students ranked it slightly lower compared to other factors. While videoconferencing and recorded lectures were important for nursing students, small-group discussions were not particularly important, unlike for other students. Like other STEM students [72], nursing students are more focused on input and interaction from the instructor than on peer and communal learning. Although consistent with the learning profile of other students (both ranked it fifth), cognitive presence is much less important to nursing students who are more interested in learning data, processes, and skills than exploring the more conceptual aspects of knowledge. For example, nursing students perceived application opportunities as far less accessible in online learning contexts.

Last in importance is social comfort in online learning. Because nursing students have less interest in student-to-student modes of learning and interaction, and because they are more interested in the “practical” aspects of their professional training, online social comfort—such as having a safe discussion on a controversial topic—was simply not as applicable to them.

The literature indicates that there have been numerous successful examples of partially digitized nursing curricula and learning experiences. However, successful integration of virtual elements or substituting large portions of the curriculum is technically demanding, time-consuming, and therefore not easily achieved [50]. The opportunities and the challenges in creating high-quality online education are reflected by the similarity of the rankings for nursing and non-nursing students. Despite the similar order or profile of perceptions of capability and importance, nursing students in this study were far more critical than their counterparts in business disciplines who had been surveyed before the pandemic. It is not possible in the context of this study to assess with accuracy the degree to which the adverse reactions found in this study were due to the limitations and challenges of the medium itself in the context of a specific discipline, and on the other hand, the degree to which the sudden and wholesale transition to a fully online curriculum played a detrimental role.

## 8. Limitations and Conclusions

There are several limitations to this study. The authors adopted the critical success factors without replicating the factor analysis due to the modest number of participants. It would be worthwhile to assemble a larger sample and adjust the items for context-specific exploratory factor analysis. While the survey was identical for nursing and non-nursing students, the sample timing was starkly different and thus uncontrolled, making direct comparisons unreliable. Direct comparisons with other STEM and non-STEM students would be valuable as we move further from the height of the pandemic and its aftermath. Space did not allow for a fuller descriptive analysis of the items within the scope of the article itself.

The article’s contribution is replicating and contrasting students’ perceptions of critical success factors with other disciplines. While direct comparison must be guarded, the ranking of the elements was similar overall, despite different timeframes. Students thought that essential factors for student success were in this order: competence in using basic online functionality, sound instructional design, robust teaching practices, effective use of more sophisticated interaction methodologies such as videoconferencing, stimulating teaching (especially by highlighting applicability for nursing students), peer and community learning, and lastly, social comfort in online settings.

Nursing students were far more critical of online learning. It is impossible to tell exactly how much of this negative reaction is caused by the medium itself in the discipline context and how much the general lack of training and experience before the sudden lockdown exacerbated the adverse perceptions. In this case study, the amount of hybrid online courses doubled from the pre- to post-pandemic period and is now equaled by the number of fully online courses, which were nearly nonexistent before the pandemic. As such, learning from the successes and failures of the rapid transition, adapting to changing demands, and thoughtfully adopting best practices seem imperative for most programs.

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