Journal of Education and Learning (EduLearn)
Vol. 20, No. 2, May 2026, pp. 963~975
ISSN: 2089-9823, DOI: 10.11591/edulearn.v20i2.22806

A comparison study of engineering students' learning experience in face-to-face vs. synchronous modes

Magdy Akladios[1], Albertus Retnanto[2], Hamid R. Parsaei[3]
[1]College of Sciences and Engineering, University of Houston-Clear Lake, Houston, United States of America
[2]Petroleum Engineering Program, Texas A&M University at Qatar, Doha, Qatar
[3]Department of Industrial and Systems Engineering, Texas A&M University, College Station, United States of America

Article Info

Article history:

Received Jul 17, 2024
Revised Apr 5, 2025
Accepted Jul 17, 2025

Keywords:

Delivery methods
Distance learning
Effectiveness of online instructions
Engineering education
Remote teaching and learning ability

ABSTRACT

While distance education offered many conveniences, it was not until the COVID-19 pandemic forced educators worldwide to utilize this option more that its full potential was realized. After the shutdowns, some institutions began to realize the benefits of continuing to offer some courses online to accommodate students who seek the conveniences of distance education. During the pandemic, Texas A&M University campuses in College Station (CStat) and Qatar followed the recommended delivery methods implemented by the university in March 2020. The two undergraduate courses offered on these two campuses were the subject of empirical study at these universities. To identify the differences between the two campuses, this article will compare the findings of a survey that was given to students based on their academic performance and participation in both in-person and remote in-class (synchronous) learning. The survey used finite answers to simplify the comparison between the two sets of data, resulting in categorical-type data. The authors concluded that, regardless of location, if distance education is carried out consistently, the results should be similar after a chi-square comparison of the data revealed no significant differences between the two campuses.

Corresponding Author:

Magdy Akladios
College of Science and Engineering, University of Houston-Clear Lake
Houston, Texas, United States of America
Email: akladios@uhcl.edu

1. INTRODUCTION

Since the early 1990s, oil-rich countries in the Middle East have begun diverting their wealth into building economies that are less dependent on oil revenues. Therefore, many of them focused on developing their workforce and enhancing their educational offerings. Some have utilized technologies rivaled and envied by many Western countries. In doing so, they invited prominent universities in Europe and the US to establish branches in the Middle East, offering identical degree programs in the region [1], [2].

One such country in the Middle East is the small Gulf state of Qatar, which has actively embraced these technologies and invested heavily in education, training facilities, and encouraged its high school graduates to join high-technology programs, such as engineering, in most of its disciplines. Qatar is geographically located on a peninsula surrounded by Persian Gulf waters to the east, north, and west. It is connected by land to the Kingdom of Saudi Arabia along its southern border. Like the United Arab Emirates and many other Gulf states, Qatar was one of the early states in the region to realize the benefits of Western technologies. It utilized its oil-generated wealth to develop an infrastructure that prioritized a high level of education [3]–[5].

Qatar also utilized its vast wealth wisely by making significant investments in building world-class infrastructure, including roads, hospitals, ground transportation, communication networks, and numerous other projects, in addition to education. While the country's official language is Arabic, because they brought in engineers, builders, laborers, experts, physicians, and others from around the globe, Qataris were forced to communicate with these expats in English [3]–[5]. What made this easy is also the fact that many Qataris were educated abroad and learned English at a very young age.

Qatar has constructed an impressive institution known as Hamed Bin-Khalifa University (previously known as Education City) to establish a sustainable quality of education. It has offered four engineering degree programs in chemical, electrical, mechanical, and petroleum engineering, all of which have been accredited by the Accreditation Board for Engineering and Technology (ABET) since its founding. More than 1,650 students had earned undergraduate degrees in these four fields by August 2024 [1], [2]. In the Middle East and North Africa (MENA) region, the campus has long been well-acclaimed for its high-quality instruction and innovative teaching and learning strategies.

The Qatar Foundation, a non-profit organization established by the government in the late 1990s, took the initiative to modernize education by inviting several top-tier American and European academic institutions to open campuses in Doha, the capital of Qatar. As a result, several American universities established branches in Doha, including Texas A&M University, which first opened its doors there in 2003 [1], [2]. All of these branch campuses are situated in Education City, which was recently renamed the Hamad Bin Khalifa University (HBKU) campus.

The earliest known instance of remote learning dates back to the 1700s, when Caleb Phillips, a shorthand teacher in Boston, Massachusetts, conducted mail-based shorthand classes. In 1892, the University of Wisconsin was the first to use the term "distance education". Some of the first online courses, utilizing International Business Machines Corporation (IBM) computers, were offered at the University of Alberta in 1965. In 1986, the University of Phoenix became the world's first university to provide entirely online courses. Massive open online courses (MOOCs) were introduced by the Massachusetts Institute of Technology (MIT) in 2012 [6].

It was not until the COVID-19 pandemic in 2020 forced all educational institutions worldwide to adopt remote learning, even though some institutions had previously offered online courses or limited online programs. In terms of teaching and providing students with educational resources, COVID-19 marked the beginning of a new chapter [7]. Several studies have documented the effectiveness of virtual medical education during the pandemic [8]–[10]. Additionally, numerous studies detailed the experiences and observations of different institutions regarding students' learning and achievements during the COVID-19 pandemic [11], [12]. In contrast, other studies found that 40% of their students had difficulty understanding online lecture material, and a similar percentage reported that it was challenging to get their questions answered in online classes [13]. Furthermore, these results showed that online education performed worse in terms of student learning and achievement [14].

A qualitative and quantitative study with 336 participants found that while freshmen found remote interactions frustrating and less satisfying, senior students who had previously engaged in face-to-face (F2F) interactions with their classmates found it easier to continue their activities remotely [15]. According to a study aimed at evaluating the effects of online versus in-person teaching methods on Spanish as a foreign language instruction in China, the online cohort performed better than the group that received in-person instruction. According to this study, students' motivation, learning techniques, self-regulation, and self-efficacy were the main factors that contributed to their improved performance [16]. Students who participated in e-learning outperformed those who used the F2F method in other research comparing student aptitude and vocabulary retention in learning English [17], [18].

The efficacy of in-person, online, and hybrid techniques was evaluated in a study involving participants who required sensory training. The results showed that participants who used the hybrid method achieved 89% proficiency, which was even greater than the 75% competency attained by the F2F group. In comparison, those who participated online achieved 17% competency [19]. In an international study comparing students' learning in online and in-person classes during COVID-19, the results were deemed less satisfactory due to several issues, such as a communication gap between the teacher and students, poor internet connectivity, a lack of the students' environment, a lack of time, and other problems that reduced the effectiveness of the online approach [20]. According to the results of a randomized controlled study, in-person instruction is more successful than asynchronous online instruction. Additionally, the same study found no discernible differences between students' assessments of the efficacy of synchronous online instruction and F2F instruction [21].

Indeed, from 37% in 2019 to 74% in 2020, the use of distance learning in higher education nearly doubled as a direct result of the COVID-19 pandemic [22]. Since most information technology (IT) systems had never handled such a large volume of data, the shift from in-person to online interactions presented a major challenge for the IT division in the majority of academic and service industries [23], [24]. Almost 200 million people use distance learning worldwide today [6]. When F2F instruction is unavailable due to the epidemic, Texas A&M University's main campus in College Station (CStat) and its campus in Qatar are both embracing synchronous distance learning as a practical delivery strategy.

2. METHOD

The study was designed to compare the responses from students taking two different courses in two countries, the United States and Qatar. One course had two sections that were offered by the same instructor at an American university, namely, Texas A&M University campus in CStat, while the other had two sections of industrial systems engineering (ISEN 210: Introduction to Industrial and Systems Engineering Design) that were taught online by the same instructor at the Texas A&M University campus in Qatar. The two sections of the same course were also taught in Qatar to students in the Petroleum Engineering Program, while the ones taught in the United States were to industrial engineering students. The survey administered to students from both countries was the same. Also, the study was conducted during the same semester, Spring 2021 [25].

The survey asked students categorical questions about their experience enrolling in in-person and online programs, their skill level, basic demographics, advantages and disadvantages of in-person versus online education, remote access to course materials, and other information related to their views on in-person vs. online courses. The survey was reviewed and authorized by the Human Research Protection Program at Texas A&M University's CStat campus. Because the survey involved questions with categorical answer options, the statistical analysis comparing the two sets of data (CStat vs. Qatar) included calculating the relative frequency ratios of the data and conducting chi-square (χ^2) calculations after determining the expected distribution, and then comparing it to the actual distribution.

3. RESULTS

A list of the students who took part in the survey is provided in Table 1. The findings of an empirical investigation completed by 225 students are presented in this paper. The relative frequency ratios for each campus's list of survey respondents by gender are shown in Figure 1. There are slightly more males than females at both campuses.

The distribution of student levels from freshmen to seniors is shown in Table 2. The student classification's relative frequency ratios for the list of survey respondents are shown in Figure 2. In both portions of the study, juniors outnumbered sophomores and seniors by a significant margin on both campuses. No freshman-level students participated in this survey.

Table 1. Students participating in the survey

Campus	Male	Female	Total
CStat	66	30	96
Qatar	78	51	129
Total	144	81	225

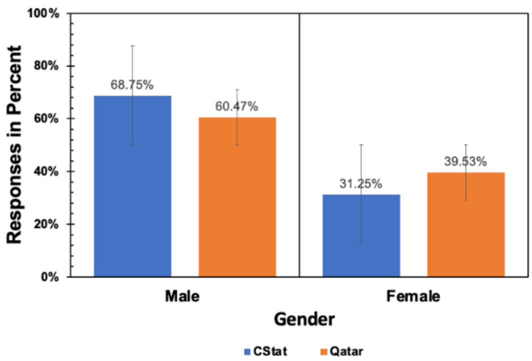

Figure 1. Relative frequency ratios by gender

Table 2. Student classification

Campus	Freshman	Sophomore	Junior	Senior	Total
CStat	0	32	60	4	96
Qatar	0	45	67	17	129
Total	0	77	127	21	225

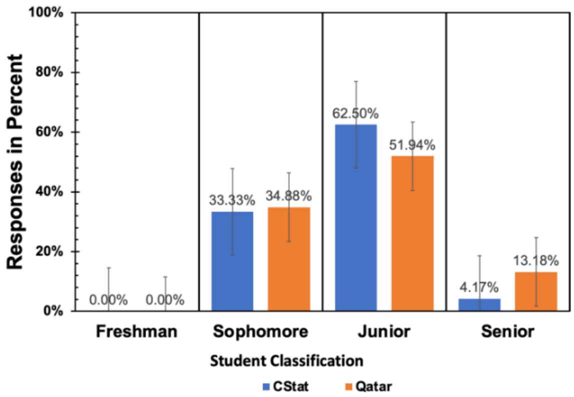

Figure 2. Relative frequency ratios of student classification

Students' perceptions of the benefits of taking a class remotely are shown in Table 3. The relative frequency ratios of the benefits students seek from remote learning are shown in Figure 3. The data shows that "interactivity in the classroom" was the lowest on the totem pole at both campuses.

Students' perceptions of the drawbacks of taking a class remotely are shown in Table 4. The relative frequency ratios of students perceived drawbacks of remote class participation is shown in Figure 4. All disadvantages were cited almost evenly among students from both campuses.

Students' perceptions of the logistical difficulties of taking a class remotely are shown in Table 5. The relative frequency ratios of students perceived logistical difficulties of remote class participation is shown in Figure 5. The data show that Internet reliability is the highest perceived logistical challenge at both campuses.

Table 3. Advantages of participating in a class remotely

Campus	Availability of online resources	Taking your time learning	Ability to remain at home	Interactivity in the classroom	Capability of recording the meeting	Convenient environment	Total
CStat	71	58	71	7	62	56	325
Qatar	96	80	98	17	92	85	468
Total	167	138	169	24	154	141	793

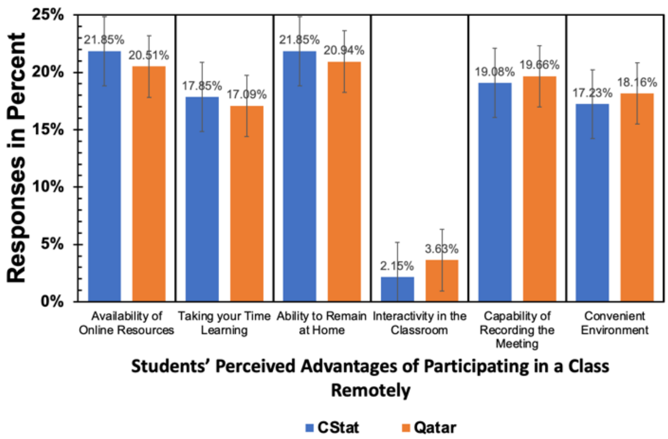

Figure 3. Relative frequency ratios of students perceived advantages of participating in a class remotely

Table 4. Disadvantages of participating in a class remotely

Campus	Decreased interaction with the instructor	Issues with technology	Insufficient engagement with fellow students	Unfavorable home learning environments	Inadequate self-control	Isolation from society	Total
CStat	80	63	81	47	65	68	404
Qatar	101	92	100	56	72	84	505
Total	181	155	181	103	137	152	909

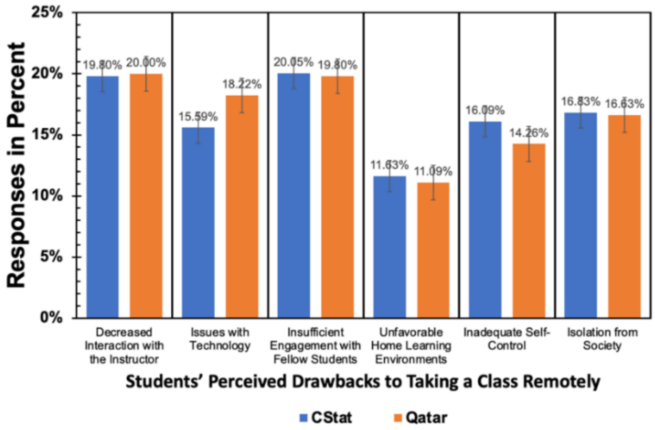

Figure 4. Relative frequency ratios of students perceived disadvantages of participating in a class remotely

Table 5. Difficulties with remote class participation

Campus	A quiet, private area for studying	Dependable remote connection or internet	Scanner/ printer	Camera/ webcam	Tablet/ computer	Total
CStat	50	57	39	22	14	182
Qatar	66	74	74	32	19	241
Total	116	131	131	54	33	423

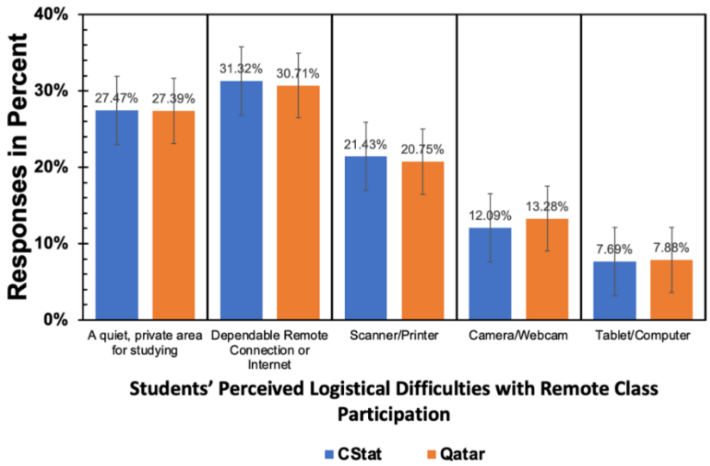

Figure 5. The relative frequency ratios of students perceived logistical difficulties with remote class participation

The students were then asked to compare their ability to master the knowledge, practical, and social competencies learning objectives between in-person (F2F) and distance (synchronous) learning. Students' evaluations of how well participation in class remotely increased their theoretical knowledge are shown in Table 6. The relative frequency ratios of students' success in participating in distance learning in terms of theoretical knowledge growth is shown in Figure 6. Most students on both campuses concurred that participating in distance learning was "ineffective" in terms of theoretical knowledge acquisition. This was followed by a close set of students who believed that it was effective.

Table 6. Ratings on the effectiveness of developing knowledge theoretically in class remotely

Campus	Extremely ineffective	Ineffective	No difference	Effective	Extremely effective	Total
CStat	8	44	11	30	3	96
Qatar	9	49	20	42	9	129
Total	17	93	31	72	12	225

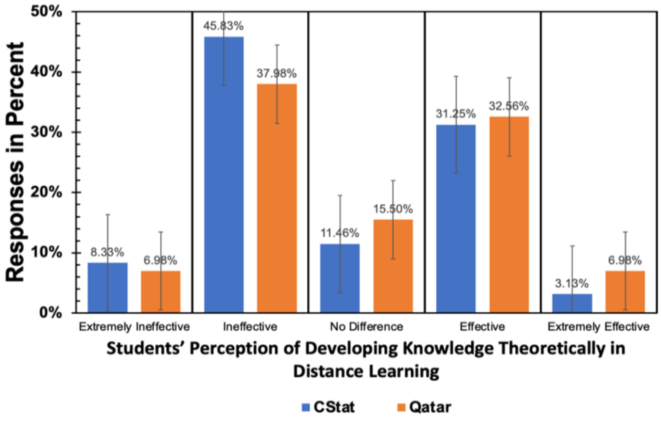

Figure 6. Relative frequency ratios of the students' perception of developing knowledge in distance learning

Students' assessments of the value of remote learning in terms of improving their practical and mathematical skills are shown in Table 7. The relative frequency ratios of students' perceptions of enhancing their practical and mathematical skills through distance learning is shown in Figure 7. In terms of developing practical skills, most students from both campuses concurred that distance learning was "ineffective". This was followed by a close set of students who believed that it made no difference.

Students' evaluations of how well remote participation in class increased their engineering lab abilities are shown in Table 8. The relative frequency ratios of the students' success in enhancing their engineering lab skills through distance learning is shown in Figure 8. More students from both campuses believed that participating in distance learning was "extremely ineffective" in increasing engineering lab skills. This was followed by a close set of students believing that it was "ineffective".

Table 7. Ratings on the effectiveness of developing practical/calculation skills in class remotely

Campus	Extremely ineffective	Ineffective	No difference	Effective	Extremely effective	Total
CStat	16	32	27	18	3	96
Qatar	18	42	31	30	8	129
Total	34	74	58	48	11	225

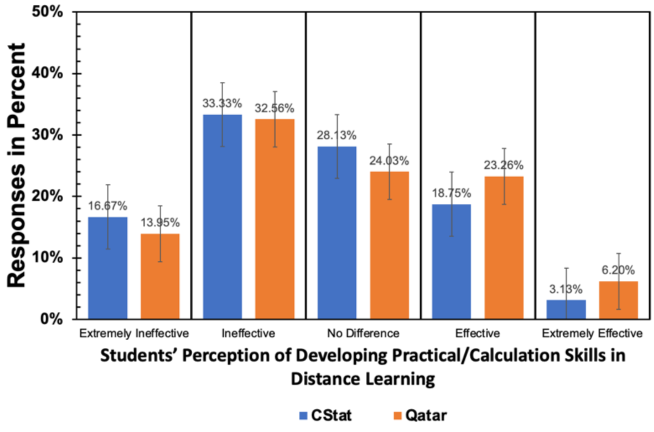

Figure 7. Relative frequency ratios of the students' perception in developing practical/calculation skills in distance learning

Table 8. Ratings on the effectiveness of developing engineering lab skills in class remotely

Campus	Extremely ineffective	Ineffective	No difference	Effective	Extremely effective	Total
CStat	52	34	4	5	1	96
Qatar	61	47	9	10	2	129
Total	113	81	13	15	3	225

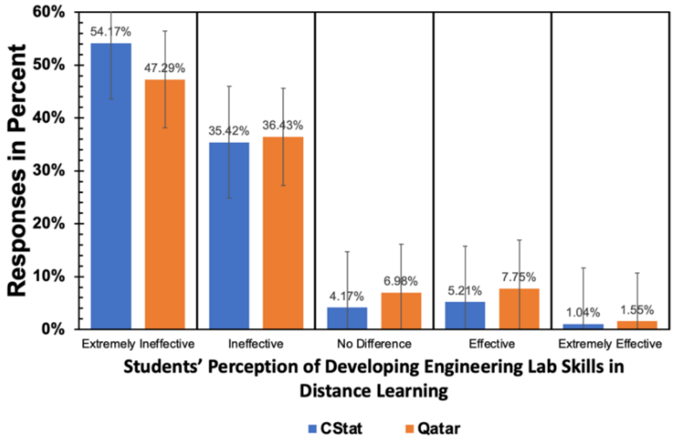

Figure 8. Relative frequency ratios of the students' perception in developing engineering lab skills in distance learning

Students' evaluations on the value of remote learning in terms of improving communication skills are shown in Table 9. The relative frequency ratios of how well students participated in distance learning in terms of improving their communication abilities is shown in Figure 9. More students from both campuses believed that participating in distance learning was "extremely ineffective" in increasing communication skills. This was followed by a close set of students believing that it was "ineffective".

Students' assessments of how well attending a F2F lesson increased their theoretical knowledge are shown in Table 10. The relative frequency ratios of students' efficacy in gaining theoretical information through in-person class participation is shown in Figure 10. More students from both campuses said that attending in-person classes was "effective" in terms of learning new material.

Table 9. Ratings of the effectiveness of developing communication skills in class remotely

Campus	Extremely ineffective	Ineffective	No difference	Effective	Extremely effective	Total
CStat	39	28	15	11	3	96
Qatar	43	38	22	20	6	129
Total	82	66	37	31	9	225

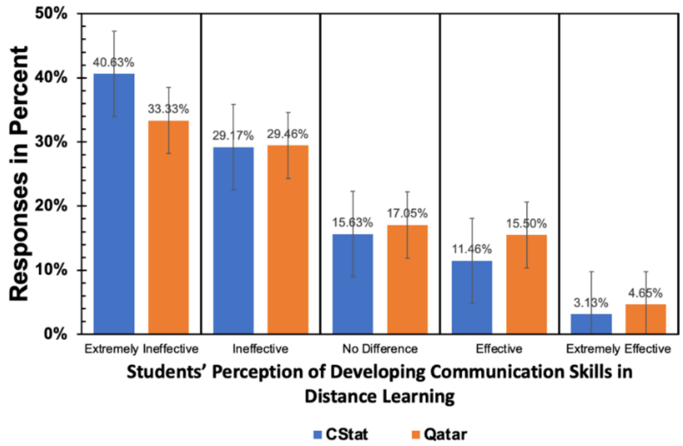

Figure 9. Relative frequency ratios of the students' perception of developing communication skills in distance learning

Table 10. Ratings on the effectiveness of developing knowledge theoretically in a F2F class

Campus	Extremely ineffective	Ineffective	No difference	Effective	Extremely effective	Total
CStat	2	7	14	60	13	96
Qatar	2	10	23	69	25	129
Total	4	17	37	129	38	225

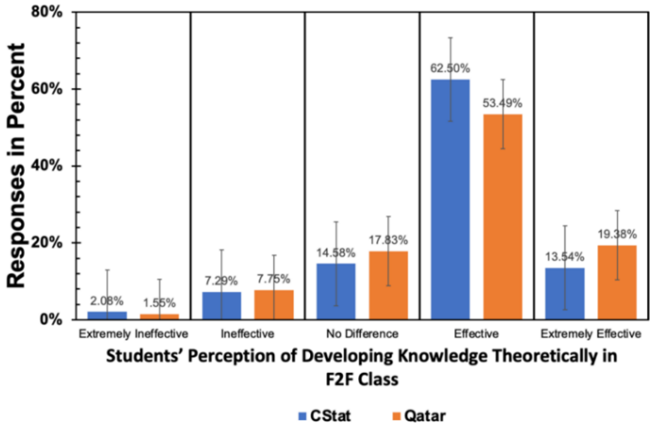

Figure 10. Relative frequency ratios of the students' perception of developing knowledge theoretically in a F2F class

Students' assessments of how well attending a F2F lesson increased their practical and mathematical skills are shown in Table 11. The relative frequency ratios of the students' efficacy in enhancing their practical and mathematical skills through in-person instruction is shown in Figure 11. More students from both campuses said that taking classes in person was "effective" in improving their practical abilities. The phrase "extremely effective" came next.

The students' assessments of how well attending a F2F class increased their engineering lab skills are shown in Table 12. The relative frequency ratios of students' growth in engineering lab abilities as a result of attending a (F2F) lesson is shown in Figure 12. Most students from both locations thought that taking classes in person was either "effective" or "extremely effective" at improving their engineering lab skills.

Table 11. Ratings on the effectiveness of developing practical/calculation skills in a F2F class

Campus	Extremely ineffective	Ineffective	No difference	Effective	Extremely effective	Total
CStat	1	4	18	47	26	96
Qatar	1	6	26	58	38	129
Total	2	10	44	105	64	225

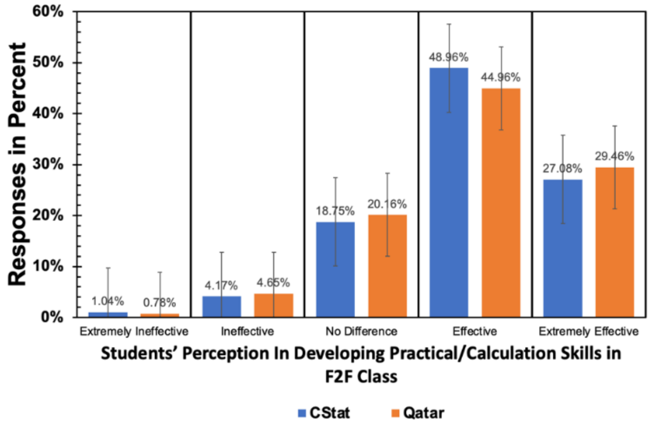

Figure 11. Relative frequency ratios of the students' perception of developing practical/calculation skills in F2F class

Table 12. Ratings on the effectiveness of developing engineering lab skills in the F2F class

Campus	Extremely ineffective	Ineffective	No difference	Effective	Extremely effective	Total
CStat	4	3	3	31	55	96
Qatar	4	5	7	41	72	129
Total	8	8	10	72	127	225

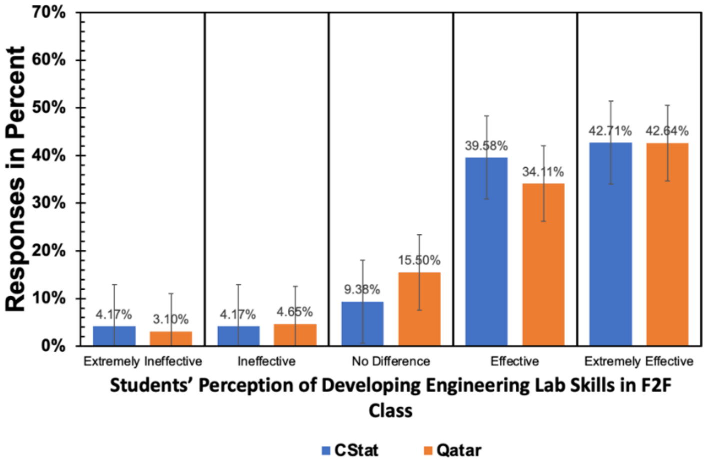

Figure 12. Relative frequency ratios of the students' perception of developing engineering lab skills in F2F class

Students' assessments of how well attending a F2F lesson improved their communication abilities are shown in Table 13. The relative frequency ratios of the students' efficacy in improving their communication abilities through in-person class participation is shown in Figure 13. Most students from both locations thought that taking a class in person was either "effective" or "extremely effective" for improving communication skills.

Table 13. Ratings on the effectiveness of developing communication skills in the F2F class

Campus	Extremely ineffective	Ineffective	No difference	Effective	Extremely effective	Total
CStat	4	4	9	38	41	96
Qatar	4	6	20	44	55	129
Total	8	10	29	82	96	225

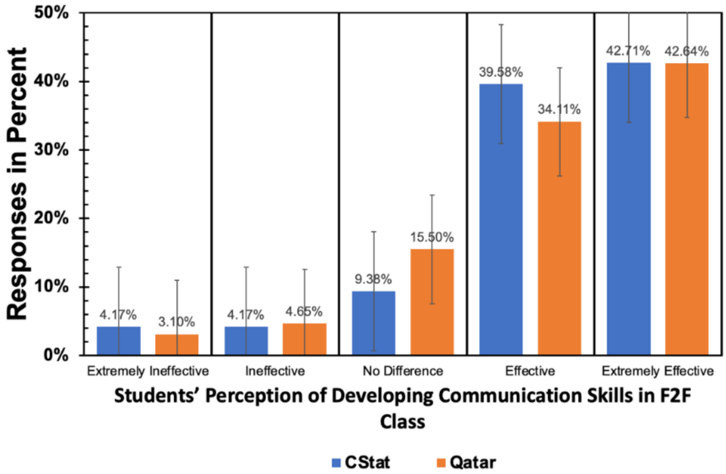

Figure 13. Relative frequency ratios of the students' perception of developing communication skills in a F2F class

Because this is categorical data, a Pearson chi-square analysis was also conducted to measure the difference between the observed and expected frequencies of the outcomes between the two campuses. To ascertain whether there is a significant difference between the two campuses, a *p*-value of less than 0.05 was employed. The analysis's findings are shown in Table 14.

Table 14. Chi-square analysis

Data and (possible responses)	Pearson chi-square *p*-values
Gender (male or female)	0.20
Student classification (freshman, sophomore, junior, and senior)	0.57
IT skills (high, moderate, and low)	0.57
Before the pandemic, did you engage in any kind of synchronous learning? (Yes, no)	0.53
What are the benefits of taking classes virtually, also known as synchronous learning? (Availability of online resources, taking your time learning, ability to remain at home, interactivity in the classroom, capability of recording the meeting, and convenient environment)	0.88
What are the drawbacks of taking classes virtually (synchronous learning)? (Decreased interaction with the instructor, issues with technology, insufficient engagement with fellow students, unfavorable home learning environments, inadequate self-control, and isolation from society)	0.92
The logistical difficulties of taking classes remotely, as seen from your point of view (a quiet private area for studying, dependable remote connection or internet, scanner/printer, camera/webcam, tablet/computer)	0.99
Rate how effective taking the class remotely is in improving your theoretical knowledge on a 5-point scale: extremely ineffective, ineffective, no difference, effective, extremely effective	0.53
Rate how effective taking the class remotely is in improving practical/calculation skills on a 5-point scale: extremely ineffective, ineffective, no difference, effective, extremely effective.	0.69
Rate how effective taking the class remotely is in improving engineering laboratory skills on a 5-point scale: extremely ineffective, ineffective, no difference, effective, extremely effective	0.75
Rate how effective taking the class remotely is in improving communication skills on a 5-point scale: extremely ineffective, ineffective, no difference, effective, extremely effective	0.76
Rate how effective conventional F2F learning is in improving knowledge theoretically on a 5-point scale: extremely ineffective, ineffective, no difference, effective, extremely effective	0.67
Rate how effective conventional F2F learning is in improving practical/calculation skills on a 5-point scale: extremely ineffective, ineffective, no difference, effective, extremely effective.	0.98
Rate how effective conventional F2F learning is in improving engineering laboratory skills on a 5-point scale: extremely ineffective, ineffective, no difference, effective, extremely effective	0.92
Rate how effective conventional F2F learning is in improving communication skills on a 5-point scale: extremely ineffective, ineffective, no difference, effective, extremely effective	0.69

4. DISCUSSION

The figures above show that student responses from both campuses were very comparable to each other. The data showed that, despite the conveniences of online learning, participating in a conventional (F2F) setting has achieved better skills and interaction. “Reduced interaction with the teacher” was identified as the most significant disadvantage of synchronous learning, which involves remote participation in class. Moreover, the data demonstrated that the logistical challenges of taking a remote class persisted even with Qatar’s improvements in internet connectivity, thanks to its excellent and cutting-edge WiFi technologies. Additionally, the second-highest logistical concern mentioned by students was finding peaceful, secluded study areas.

Students were asked to rate the increase in their theoretical knowledge resulting from participating in class remotely (synchronous learning). The results demonstrated that, in terms of acquiring theoretical knowledge, taking classes remotely was either very ineffective or ineffectual. When asked to rate the effectiveness of traditional F2F instruction in expanding their theoretical knowledge, students responded that it was “extremely effective” or “effective” in doing so, according to the survey results. According to the results of a poll that asked students to rate the effectiveness of remote learning in enhancing their practical and calculation skills, taking classes remotely was either unsuccessful or extremely ineffective at doing so. The survey results obtained when students were asked to evaluate how well traditional (F2F) instruction improved their practical and calculation skills showed that this mode of teaching was either extremely successful or effective.

Due to its nature, online teaching limits the students’ ability to conduct practical experiments in technical labs. Naturally, the laboratory experience cannot be replicated through any other method of delivering the courses. Therefore, students on both campuses had less-than-exemplary experiences with remote classes, particularly in terms of lab work. Online classes were either extremely ineffective or ineffective in improving students’ engineering laboratory skills. On the other hand, students believe that traditional, in-person instruction is quite helpful at enhancing engineering lab skills. Similarly, students felt that participating in a conventional classroom was either effective or extremely effective at improving their communication skills. This result was exactly opposite to their response to the same question for remote learning, where they believed that online learning was either extremely ineffective or ineffective in terms of improving communication skills.

The Pearson chi-square test (χ^2) statistical tool was used to check if the two categorical variables (the two campuses) are related or independent. In doing so, the observed data were compared to the expected data in terms of significant difference. To ascertain whether there is a significant difference between the two campuses on every survey question, a *p*-value of less than 0.05 was applied to the two datasets of the two campuses. The data showed that none of the survey responses were significantly different when comparing the two campuses. This indicates that we are 95% confident that students from both campuses responded very similarly to each other.

5. CONCLUSION

Undergraduate students at Texas A&M University's CStat Campus and its sister university in Qatar gave very comparable answers when asked about their thoughts on online versus in-person studying. Both seemed to agree to a very high degree that conventional teaching methods were significantly better than online learning. The survey results showed that, despite its conveniences, online education was ineffective in building the skills necessary for engineering students.

Both groups of students strongly favored conventional teaching methods, emphasizing that online learning, despite its flexibility and accessibility, does not effectively cultivate the practical skills essential for engineering. These findings suggest that, while online learning offers certain conveniences, it may not be the most suitable approach for hands-on, skill-intensive fields like engineering. For complex subjects, in-person training offers a more stimulating and encouraging atmosphere that promotes the development of technical and analytical problem-solving skills, in addition to knowledge acquisition.

FUNDING INFORMATION

The source of funding to support the publication fee of this paper was provided by the Wm Michael Barnes' 64 Department of Industrial and Systems Engineering at Texas A&M University, CStat, Texas, United States of America.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Magdy Akladios	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	
Albertus Retnanto						✓	✓	✓		✓	✓			
Hamid Parsaei	✓	✓				✓	✓	✓		✓	✓			

C : **C**onceptualization	I : **I**nvestigation	Vi : **Vi**sualization
M : **M**ethodology	R : **R**esources	Su : **Su**pervision
So : **So**ftware	D : **D**ata Curation	P : **P**roject administration
Va : **Va**lidation	O : Writing - **O**riginal Draft	Fu : **Fu**nding acquisition
Fo : **Fo**rmal analysis	E : Writing - Review & **E**diting	

CONFLICT OF INTEREST STATEMENT

The Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

DATA AVAILABILITY

The data supporting the findings of this study are available upon request from the corresponding author, [MA]. The data, which contain information that could compromise the privacy of research participants, are not publicly available due to certain restrictions.

REFERENCES

[1] A. Retnanto, H. R. Parsaei, and B. Parsaei, "Building communication strengths and skills for non-native English-speaking engineering students," in *Proceedings of the International Conference on Industrial Engineering and Operations Management*, vol. 0, no. March, pp. 939–942, 2020.

[2] A. Retnanto, H. Parsaei, and B. Parsaei, "Preparing new engineers for the job skills demanded in the 21st century," in *2nd Asia Pacific International Conference on Industrial Engineering and Operations Management*, 2021, pp. 1150–1159, doi: 10.46254/AP02.20210194.

[3] P. Magee, *The archaeology of prehistoric Arabia*. Cambridge: Cambridge Press, 2014.
[4] N. Al-Banai and R. Nasser, "The educational reform in Qatar: challenges and successes," in *Proceedings of INTCESS15-2nd International Conference on Education and Social Sciences*, 2-4 February 2015-Istanbul, Turkey.
[5] D. Commins, *The Gulf states: a modern history*. London: Bloomsbury Publishing, 2014.
[6] V. Petrova, "The evolution of distance education - from Caleb Philipps to the MOOC," *Vanguard Journal of Scientific Instruments in Management*, vol. 15, no. 1, 2019.
[7] A. I. Race, M. de Jesus, R. S. Beltran, and E. S. Zavaleta, "A comparative study between outcomes of an in-person versus online introductory field course," *Ecology and Evolution*, vol. 11, no. 8, pp. 3625–3635, 2021, doi: 10.1002/ece3.7209.
[8] B. N. Alarifi and S. Song, "Online vs in-person learning in higher education: effects on student achievement and recommendations for leadership," *Humanities and Social Sciences Communications*, vol. 11, no. 1, pp. 1–8, 2024, doi: 10.1057/s41599-023-02590-1.
[9] R. Radha, K. Mahalakshmi, V. S. Kumar, and A. R. Saravanakumar, "E-learning during lockdown of COVID-19 pandemic: a global perspective," *International Journal of Control and Automation*, vol. 13, no. 4, pp. 1088–1099, 2020.
[10] M. Kuhfeld, J. Soland, B. Tarasawa, A. Johnson, E. Ruzek, and J. Liu, "Projecting the potential impact of COVID-19 school closures on academic achievement," *Educational Researcher*, vol. 49, no. 8, pp. 549–565, 2020, doi: 10.3102/0013189X20965918.
[11] R. J. Wilcha, "Effectiveness of virtual medical teaching during the COVID-19 crisis: systematic review," *JMIR Medical Education*, vol. 6, no. 2, p. e20963, 2020, doi: 10.2196/20963.
[12] A. A. Siddiqui *et al.*, "Students' perception of online versus face-to-face learning: what do the healthcare teachers have to know?" *Cureus*, vol. 16, no. 2, p. e54217, 2024, doi: 10.7759/cureus.54217.
[13] S. Kumari, H. Gautam, N. Nityadarshini, B. K. Das, and R. Chaudhry, "Online classes versus traditional classes? Comparison during COVID-19," *Journal of Education and Health Promotion*, vol. 10, no. 1, p. 457, 2021, doi: 10.4103/jehp.jehp_317_21.
[14] C. C. Foo, B. Cheung, and K. M. Chu, "A comparative study regarding distance learning and the conventional face-to-face approach conducted problem-based learning tutorial during the COVID-19 pandemic," *BMC Medical Education*, vol. 21, no. 1, p. 141, 2021, doi: 10.1186/s12909-021-02575-1.
[15] P. Photopoulos, C. Tsonos, I. Stavrakas, and D. Triantis, "Remote and in-person learning: utility versus social experience," *SN Computer Science*, vol. 4, no. 2, p. 116, 2023, doi: 10.1007/s42979-022-01539-6.
[16] Z. Liu, "Face-to-face and online learning in higher education: academic achievements and learners' experience in the Chinese SFL context," *SAGE Open*, vol. 13, no. 4, pp. 1–18, 2023, doi: 10.1177/21582440231218114.
[17] J. Bi, M. Javadi, and S. Izadpanah, "The comparison of the effect of two methods of face-to-face and e-learning education on learning, retention, and interest in English language course," *Education and Information Technologies*, vol. 28, no. 10, pp. 13737–13762, 2023, doi: 10.1007/s10639-023-11743-3.
[18] I. Zezarwati, A. Kaharuddin, M. Abubakar, and M. S. Nawir, "Investigating EFL students' interest in the use of online discussion technique in asynchronous learning," *Journal of Applied Studies in Language*, vol. 6, no. 1, pp. 26–36, 2022, doi: 10.31940/jasl.v6i1.342.
[19] C. Forde *et al.*, "Comparing face-to-face, blended and online teaching approaches for practical skill acquisition: a randomised controlled trial," *Medical Science Educator*, vol. 34, no. 3, pp. 627–637, Apr. 2024, doi: 10.1007/s40670-024-02026-8.
[20] M. Abbas, M. Pervaiz, and F. Malik, "Comparison of students' learning through face-to-face and online classes during COVID-19," *Global Regional Review*, vol. 7, no. 2, pp. 190–199, 2022, doi: 10.31703/grr.2022(vii-ii).18.
[21] Y. Y. H. Cheung *et al.*, "A randomized controlled experiment for comparing face-to-face and online teaching during COVID-19 pandemic," *Frontiers in Education*, vol. 8, p. 1160430, 2023, doi: 10.3389/feduc.2023.1160430.
[22] M. Kofoed, L. Gebhart, D. Gilmore, and R. Moschitto, "Zooming to class? Experimental evidence on college students online learning during COVID-19," *SSRN Electronic Journal*, vol. 6, no. 3, pp. 324–340, 2021, doi: 10.2139/ssrn.3846700.
[23] E. S. Grange *et al.*, "Responding to COVID-19: the UW medicine information technology services experience," *Applied Clinical Informatics*, vol. 11, no. 2, pp. 265–275, 2020, doi: 10.1055/s-0040-1709715.
[24] F. Volk, C. G. Floyd, L. Shaler, L. Ferguson, and A. M. Gavulic, "Active duty military learners and distance education: factors of persistence and attrition," *American Journal of Distance Education*, vol. 34, no. 2, pp. 106–120, 2020, doi: 10.1080/08923647.2019.1708842.
[25] A. Retnanto, H. R. Parsaei, and B. Parsaei, "Teaching and learning using in-class remotely vs. traditional face-to-face methods: an empirical study," in *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 2023, pp. 1729–1738, doi: 10.46254/AN13.20230495.

BIOGRAPHIES OF AUTHORS

Magdy Akladios is the first and corresponding author for this manuscript. He is a professor of occupational safety and health at the University of Houston-Clear Lake. He is also the founding department chair of the Physical and Applied Sciences Department. He holds a PhD in Industrial Engineering, a Master's degree in Industrial Engineering, a Master's degree in Occupational Health and Safety (Industrial Hygiene), an MBA, and a BS degree in Mechanical Engineering. In addition, he holds multiple professional board certifications including certified safety professional (CSP), professional engineer (PE), certified professional ergonomist (CPE), certified safety and health manager (CSHM), and certified member of the Egyptian syndicate for mechanical engineers. He is also a member of the Industrial Engineers' Honorary Society (Alpha-Pi-Mu), a member of the Human Factors and Ergonomics Society (HFES), a member of the American Society for Safety Professionals (ASSP), a senior member of the Institute of Industrial Engineers (IIE), and a senior member of the Industrial Engineering and Operations Management Society (IEOM). He can be contacted at email: akladios@uhcl.edu.

Albertus Retnanto is a professor of Petroleum Engineering Programat Texas A&M University at Qatar and has been in the Petroleum Engineering Program since 2009. He received his PhD degree in Petroleum Engineering Program from Texas A&M University. He teaches undergraduate courses in well testing, petroleum production systems, production engineering, petroleum technical presentation, natural gas engineering, and integrated asset development as well as makes significant curriculum enhancements to several courses. He held a principal position with Schlumberger and has more than 18 years of experience worldwide in technical and management positions in well testing, field development, and production enhancement. He can be contacted at email: albertus.retnanto@tamu.edu.

Hamid R. Parsaei is an internationally recognized leader in the field of engineering education, manufacturing automation, economic and financial decision making, leadership, and additive manufacturing with more than three decades of experience in academia. He is a fellow of the Institute of Industrial and Systems Engineers (IISE), American Society for Engineering Education (ASEE), Society of Manufacturing Engineers (SME), and Industrial Engineering and Operations Management Society International (IEOM). He is an effective educator and an innovative researcher who draws on considerable expertise to lead colleagues toward visionary goals and exceptional results. He served as the chair of the Department of Industrial Engineering at the University of Houston and associate dean of Academic Affairs at Texas A&M University at Qatar. He is a registered professional engineer in the State of Texas and an ABET Engineering Accreditation Commissioner and Program Evaluator. He is currently a professor with the Wm Michael Barnes '64 Department of Industrial and Systems Engineering and Director of the College of Engineering Accreditation and Assessment. He can be contacted at email: hamid.parsaei@tamu.edu.