



The Effect of Online and Face-to-Face Active Learning on The Students' Social Skills in The Post-Pandemic

Pengaruh Pembelajaran Daring dan Luring Pada Keterampilan Sosial Siswa Pasca-Pandemik

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Abstract

Online learning during the COVID-19 pandemic (SARS-CoV-2) isolated students for three years, leading to several consequences, one of which is social skills. This study compares cognitive abilities, social presence, social interaction, collaboration, and student satisfaction in online and offline learning from the perspective of gender differences among students. Social presence, social interaction, collaboration, and student satisfaction are structural components of social skills. The research employs multivariate covariance analysis with basic statistics courses as the covariate variable. The population includes all Mathematics Education students at a public university in Surakarta. The sample was obtained through random cluster sampling, specifically, second-semester students enrolled in data analysis techniques courses. The results indicate significant differences in cognitive abilities, social interaction, collaborative learning, and satisfaction between the two learning modalities. The social skills of students post-COVID-19 are unique to each gender.

Keywords: *Multivariate Covariance Analysis; Post-Pandemic; Social Skills.*

Abstrak

Pembelajaran daring di masa Pandemi COVID-19 (SARS-CoV-2) mengisolasi mahasiswa selama 3 tahun, menimbulkan beberapa konsekuensi, salah satunya keterampilan sosial. Penelitian ini membandingkan kemampuan kognitif, kehadiran sosial, interaksi sosial, kolaborasi, dan kepuasan siswa dalam pembelajaran online dan offline dari sudut pandang perbedaan jenis kelamin siswa. Kehadiran sosial, interaksi sosial, kolaborasi, dan kepuasan siswa merupakan bagian struktur dari keterampilan sosial. Penelitian ini menggunakan analisis kovarian multivariat dengan matakuliah statistika dasar sebagai variabel kovariat. Populasi meliputi seluruh mahasiswa Pendidikan Matematika di perguruan tinggi negeri di Surakarta. Sampel diambil secara random cluster sampling, yaitu mahasiswa semester 2 yang mengambil mata kuliah teknik analisis data. kemampuan kognitif, interaksi sosial, pembelajaran kolaboratif, dan kepuasan pada kedua pembelajaran tersebut berbeda secara signifikan. Kemampuan sosial siswa pasca COVID-19 bersifat unik untuk setiap jenis kelamin siswa.

Kata Kunci: *Analisis Kovarian Multivariat; Keterampilan Sosial; Pasca-Pandemik.*

Introduction

The occurrence of the Covid-19 pandemic in the last 3 years has had a global impact, including in Indonesia. In the world of education, the pandemic has forced schools to close their doors to their students. Schools, which are the second home for children to learn to socialize with the environment outside their home, automatically cannot function as they should. Not only socialization problems, but the consequences of online learning have also resulted in various problems in the world of education^{1 2}.

Starting on March 9, 2020, the Ministry of Education and Culture of Indonesia has issued a regulation addressed to the heads of schools and universities to implement working from home and learning from home. Further, learning from home is made on online learning. Online learning has been promoted as learning from home being more cost-effective and convenient than traditional educational environments and providing opportunities for more learners to continue their education³.

The problem raised by the policy of online learning. A significant number of Indonesian students face the problems of not having cell phones or being unable to buy internet data plans to access the internet. The effectiveness of online education at home during the COVID-19 pandemic period has been monitored by the Indonesian Child Protection Commission (KPAI)⁴. According to a survey conducted by the commission in 34 provinces of Indonesia, online learning constraints are becoming a serious consideration⁵.

Online learning that isolates students for 3 years of study certainly results in several consequences, one of which is social skills. Social skills have a huge influence on personal and social life. Undoubtedly, the university as a social environment greatly affects social development. Social skills are an important condition for a harmonious existence in a social group, a possibility

¹ Poncojari Wahyono, H. Husamah, and Anton Setia Budi, "Guru Profesional Di Masa Pandemi Covid-19: Review Implementasi, Tantangan, Dan Solusi Pembelajaran Daring," *Jurnal Pendidikan Profesi Guru* 1, no. 1 (April 30, 2020): 51-65, <https://doi.org/10.22219/jppg.v1i1.12462>.

² Dewi Padmo, Lidwina Ardiasih, and Olivia Idrus, "Online Learning During the Covid-19 Pandemic and Its Effect on Future Education in Indonesia," 2020, 71-86, https://doi.org/10.51432/978-1-8381524-0-6_5.

³ Jennifer Casey Richardson, *Examining Social Presence in Online Courses in Relation to Students' Perceived Learning and Satisfaction* (State University of New York at Albany, 2001), <https://search.proquest.com/openview/60e3e55a1aff8c8804203e4a0a5da15a/1?pq-origsite=gscholar&cbl=18750&diss=y>.

⁴ Mahir Pradana and Syarifuddin Syarifuddin, "The Struggle Is Real: Constraints of Online Education in Indonesia During the COVID-19 Pandemic," *Frontiers in Education* 6 (September 13, 2021), <https://doi.org/10.3389/feduc.2021.753776>.

⁵ Ahmad Satryo, "Survei KPAI Tentang Efektifitas Belajar Daring: 43 Persen Tidak Memiliki Kuota, 29 Persen Tidak Punya HP," Rmol.id, Agustus 2020, <https://rmol.id/nusantara/read/2020/08/08/447142/survei-kpai-tentang-efektifitas-belajar-daring-43-persen-tidak-memiliki-kuota-29-persen-tidak-punya-hp>.

for an individual to act effectively in a social environment, and an assumption of successful socialization ⁶. Social skills are defined as the skills needed to behave competently in a specific social situation and identified social presence, social interaction, collaborative learning, and satisfaction as parts of social skills as important constructs of an online course (Gunawardena in Spears) ⁷. Spears examines descriptive survey research about social presence, social interaction, collaborative learning, and satisfaction in online and face-to-face courses⁸. This paper examined the social skills of undergraduate students in the post-pandemic. As a result of the pandemic, students studied in online learning modes, and after the government announced the endemic, learning came back to offline mode. Therefore, in this study, we compare the social skills of the students in both learning. We also investigate the gender of the study to provide information on the significance of the student's sex in both learnings. From the study, further, we will find out which variables have a significant effect on the viewpoint of students' gender.

Methods

This study is quantitative in the form of descriptive analysis and inference in the form of multivariate covariance analysis with basic statistics courses as covariate variables. The study population included all students of the Mathematics Education Department in a public university in Surakarta. The sample was taken by random cluster sampling, namely 2nd-semester students who took data analysis techniques courses. This study aimed to describe and infer the variables, namely cognitive ability, perceptions of social presence, social interaction, collaborative learning, and satisfaction in online and offline learning with the viewpoint of students' gender. We defined all these variables as a response; learning and gender as a fixed factor of the design of the research; and prerequisite as a covariate variable. We were using multivariate analysis of covariance design. The prerequisite we take is the score in Calculus and Basic statistics. This score is taken from 1st semester. All the data excluding cognitive learning were collected with a questionnaire. All the indicator measurements follow Spears as the instrument of the questionnaire with 5-point Likert-type data ⁹.

⁶ Margarita Jurevičienė, Irena Kaffemaniene, and Jonas Ruškus, "Concept and Structural Components of Social Skills," *Baltic Journal of Sport and Health Sciences* 3, no. 86 (December 27, 2012), <https://doi.org/10.33607/bjshs.v3i86.266>.

⁷ LaJoy Spears, "Social Presence, Social Interaction, Collaborative Learning, and Satisfaction in Online and Face-to-Face Courses" (Article, IOWA State University, 2012), <https://dr.lib.iastate.edu/entities/publication/6e8a3c0f-cd39-4bab-a0c9-f149ac6cc85d>.

⁸ Ibid.

⁹ Ibid.

The variable analyze with descriptive statistics by visualization and the measure of central tendency and dispersion. Whereas, infer the significance of the defined variables using multivariate analysis of covariance. An analysis of the significance of the variables namely the students' cognitive ability, social presence, social interaction, collaborative learning, and satisfaction in online and offline learning from the view of the gender of students will be carried out. Data sampling was taken. Participants in the study were 29 undergraduate students in the university, Indonesia collected from data analysis technique course class B consisting of 22 female and 7 male students. Since we have a small Likert-type data, we are allowed to apply parametric statistics (i.e., multivariate analysis of covariance). See Norman for reference ¹⁰.

Results and Discussion

First, the assumption of homogeneity of the variance-covariance matrix should be verified before analyzing the data using multivariate analysis of covariance. By using Table 1 in a significant level of 0.01, 0.05, and 0.1, it is known that Box's M is 83.30 with a significance value of 0.07, it can be concluded that the assumption of equal variance-covariance fulfilled.

Table 1. Box's test of equality of covariance matrices

Box's M	F	df1	df2	Sig.
83.30	1.34	45	1386.65	0.07*

*p<0.1, 0.05, 0.01

In the next discussion, we present descriptive statistics for each variable by associating its relationship with statistical inference to make decisions about the variables being analyzed.

1. The student's cognitive ability

Cognitive abilities are aspects of mental functioning, such as memorizing and remembering; inhibiting and focusing attention; speed of information processing; and spatial and causal reasoning. Individual differences between people are measured by comparing scores on tests of these mental abilities ^{11,12}.

The visualization of the student's cognitive abilities in different learning can be seen in Figure 1. From Figure 1, the cognitive ability of male students is

¹⁰ Geoff Norman, "Likert Scales, Levels of Measurement and the 'Laws' of Statistics," *Advances in Health Sciences Education* 15, no. 5 (December 2010): 625-32, <https://doi.org/10.1007/s10459-010-9222-y>.

¹¹ Peter Robinson, "Abilities to Learn: Cognitive Abilities," 2012, 17-21, https://doi.org/10.1007/978-1-4419-1428-6_620.

¹² Xiaotong Yi, "Student's Cognitive Ability in Different Learning Environments-Asynchronous Online Learning vs Face-to-Face Learning," in *2021 4th International Conference on Humanities Education and Social Sciences (ICHESS 2021)* (Atlantis Press, 2021), 1722-26, <https://www.atlantis-press.com/proceedings/ichess-21/125967261>.

higher than female students. This fact is satisfactory for online and offline learning.

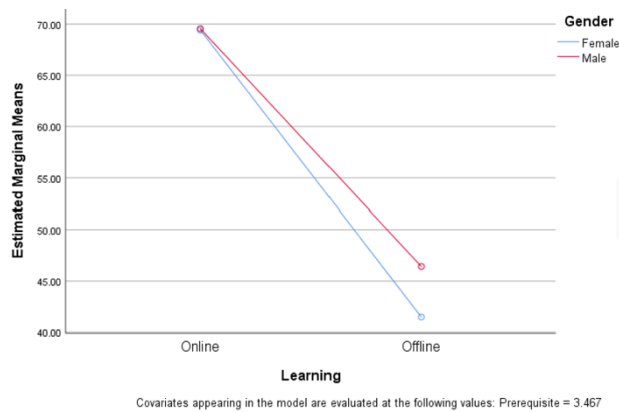


Figure 1. Estimated marginal means of students' cognitive ability.

Based on Table 2, the mean of male students' cognitive ability in online learning is 70.57 (with stdev=10.29), and offline learning is 48.86 (with stdev=10.46). Whereas, the female students' cognitive ability online is 68.91 (with stdev=11.33) and offline is 40.91 (with stdev=29.60). We can see that the dispersion of female students is higher than male students. This incident is an interesting finding, considering that students' cognitive abilities are higher in online learning than in offline learning.

Table 2. The descriptive statistics of students' cognitive ability.

	Mean	Stdev
Online		
Female	68.91	11.33
Male	70.57	10.29
Offline		
Female	40.91	29.60
Male	48.86	10.46

Stdev: standard deviation

To find out the significance of students' cognitive abilities, we can conclude from Table 3.

Table 3. Test of between-subjects effects

	Sum of Square	df	Mean Square	F	Sig.
Prerequisite					
Cognitive	2265.42	1	2265.42	5.97	0.02
Social presence	33.25	1	33.25	2.10	0.15
Social interaction	57.49	1	57.49	5.10	0.03
Collaborative learning	2.30	1	2.30	0.07	0.80
Satisfaction	16.25	1	16.25	0.69	0.41
Learning					
Cognitive	6906.50	1	6906.50	18.19	0.00*
Social presence	16.65	1	16.65	1.05	0.31
Social interaction	266.30	1	266.30	23.60	0.00*
Collaborative learning	529.28	1	529.28	15.27	0.00*
Satisfaction	328.40	1	328.40	13.77	0.00*
Gender					
Cognitive	66.72	1	66.72	0.18	0.68
Social presence	12.81	1	12.81	0.81	0.37
Social interaction	7.18	1	7.18	0.64	0.43
Collaborative learning	5.90	1	5.90	0.17	0.68
Satisfaction	15.31	1	15.31	0.64	0.43
Learning*Gender					
Cognitive	60.88	1	60.88	0.16	0.69
Social presence	0.89	1	0.89	0.06	0.81
Social interaction	9.16	1	9.16	0.81	0.37
Collaborative learning	167.66	1	167.66	4.84	0.03
Satisfaction	10.22	1	10.22	0.43	0.52
Error					
Cognitive	20126.79	53	379.75		
Social presence	838.88	53	15.83		
Social interaction	598.06	53	11.28		
Collaborative learning	1837.15	53	34.66		
Satisfaction	1263.74	53	23.84		
Total					
Cognitive	215248.00	58			
Social presence	60497.00	58			
Social interaction	29172.00	58			
Collaborative learning	35733.00	58			
Satisfaction	88642.00	58			

df: degree of freedom

Based on Table 3, it can be stated that:

- 1) At the significance level of 1%, 5%, and 10%, because of Sig. Learning-Cognitive = 0.00, online and offline learning has a significant effect on student's cognitive abilities,
- 2) At the significance level of 1%, 5%, and 10%, because of Sig. Gender-Cognitive = 0.68, the difference in gender, namely male and female students, does not have a significant effect on student's cognitive abilities,
- 3) At the significance level of 1%, 5%, and 10%, because of Sig. Learning*Gender-Cognitive = 0.69, the male and female students' cognitive abilities in online and offline learning are not significantly different.

2. The student's social presence

Social presence is said to be a vital element in influencing online interactions^{13 14}. Sort defines social presence as the degree of salience of the other person in the interaction and the salience of the interpersonal relationships¹⁵. Student perceptions of social presence will be measured with the social presence scale. The social presence scale consists of nine 5-point Likert-type items with response options ranging from strongly disagree (1) to strongly agree (5).

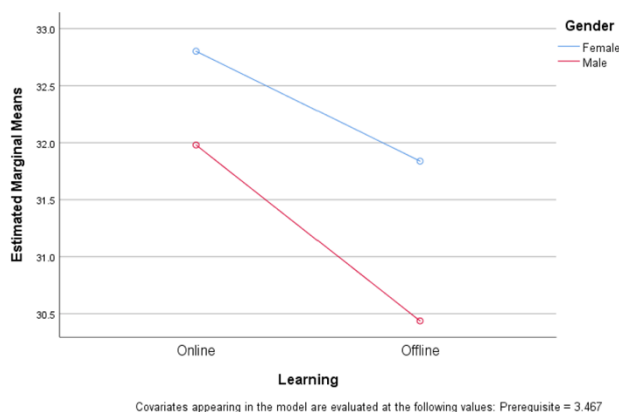


Figure 2. Estimated marginal means of social presence.

From Figure 2, the trend of social presence tends to be down in offline learning for both students. We can see the social presence of female students is higher than male students for online and offline learning. Based on Table 4,

¹³ Chih-Hsiung Tu and Marina McIsaac, "The Relationship of Social Presence and Interaction in Online Classes," *The American Journal of Distance Education* 16, no. 3 (2002): 131-50, https://www.tandfonline.com/doi/abs/10.1207/S15389286AJDE1603_2.

¹⁴ Chih-Hsiung Tu, "The Measurement of Social Presence in an Online Learning Environment," in *International Journal on E-Learning*, vol. 1 (Association for the Advancement of Computing in Education (AACE), 2002), 34-45, <https://www.learntechlib.org/p/10820/>.

¹⁵ Edwin B. Parker et al., "The Social Psychology of Telecommunications," in *Contemporary Sociology*, vol. 7, 1978, 32, <https://doi.org/10.2307/2065899>.

the mean of female students' social presence in online learning is 32.86 (with stdev=4.06), and offline learning is 31.91 (with stdev=3.27). Whereas, the male students' social presence online is 31.86 (with stdev=4.45) and offline is 30.14 (with stdev=5.52). Therefore, the pattern of social presence decreases as the raising of dispersion of the skills.

Table 4. The descriptive statistics of students' social presence.

	Mean	Stdev
Online		
Female	32.86	4.06
Male	31.86	4.45
Offline	39.91	3.27
Female	30.14	5.52
Male		

Stdev: standard deviation

The significance of social presence from Table 3 as follows:

- 1) At the significance level of 1%, 5%, and 10%, because of Sig. Learning-Social presence = 0.31, online and offline learning has no significant effect on students' social presence abilities,
- 2) At the significance level of 1%, 5%, and 10%, because of Sig. Gender-Social presence = 0.37, the gender difference, namely male and female students, does not have a significant effect on students' social presence abilities,
- 3) At the significance level of 1%, 5%, and 10%, because of Sig. Learning*Gender-Social presence = 0.81, the social presence of male and female students in online and offline learning are not significantly different.

3. The student's social interaction

The next variable is the student's social interaction. Social interaction is defined as an interaction between learners and instructors that occurs when instructors adopt strategies to promote interpersonal encouragement and social integration¹⁶. Student perceptions of social interaction will be measured with the interaction scale. The social interaction scale consists of six 5-point Likert-type items with response options ranging from strongly disagree (1) to strongly agree (5). Based on Figure 3, we can see the social interaction of male students is higher than female students for online and offline learning.

¹⁶ Insung Jung et al., "Effects of Different Types of Interaction on Learning Achievement, Satisfaction and Participation in Web-Based Instruction," *Innovations in Education and Teaching International* 39, no. 2 (January 1, 2002): 153-62, <https://doi.org/10.1080/14703290252934603>.

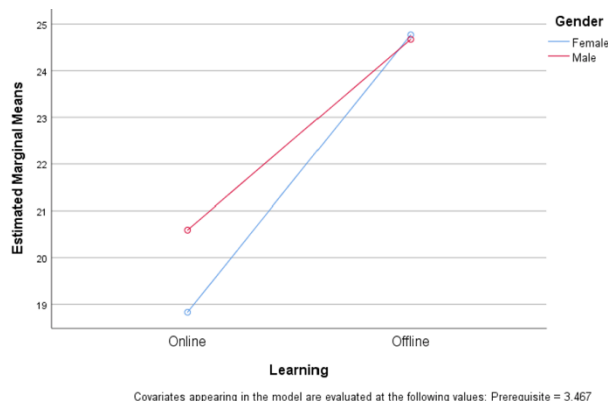


Figure 3. Estimated marginal means of social interaction.

Table 5. The descriptive statistics of students' social interaction

	Mean	Stdev
Online		
Female	18.91	3.50
Male	20.43	5.41
Offline		
Female	24.86	2.77
Male	24.29	3.20

Stdev: standard deviation

Based on Table 5, the mean of male students' social interaction in online learning is 20.43 (with stdev=5.41), and offline learning is 24.29 (with stdev=3.20). Whereas, the female students' social interaction online is 18.91 (with stdev=3.50) and offline is 24.86 (with stdev=2.77). From here, the pattern of both students is the same, namely the tendency of social interaction increases as the diversion of it decreases for each learning.

The significance of the student's social interaction can be seen in Table 3.

- 1) At the significance level of 1%, 5%, and 10%, because of Sig. Learning-Social interaction = 0.00, online and offline learning has a significant effect on students' social interaction abilities,
- 2) At the significance level of 1%, 5%, and 10%, because of Sig. Gender-Social interaction = 0.43, the gender difference, namely male and female students, does not have a significant effect on students' social interaction skills,
- 3) At the significance level of 1%, 5%, and 10%, because of Sig. Learning*Gender-Social presence = 0.37, the social presence abilities in online and offline learning are not significantly different for male and female students.

4. The collaborative learning

The next variable is collaborative learning. Collaborative learning requires cognitive and environmental determinants, social presence is required to enhance and foster online social interactions, a major vehicle for

collaborative learning¹⁷. An instructional approach in which a small number of learners interact together and share knowledge and skills to reach a specific learning goal¹⁸. Student perceptions of collaborative learning will be measured with the collaborative learning scale. The collaborative learning scale consists of seven 5-point Likert-type items with response options ranging from strongly disagree (1) to strongly agree (5).

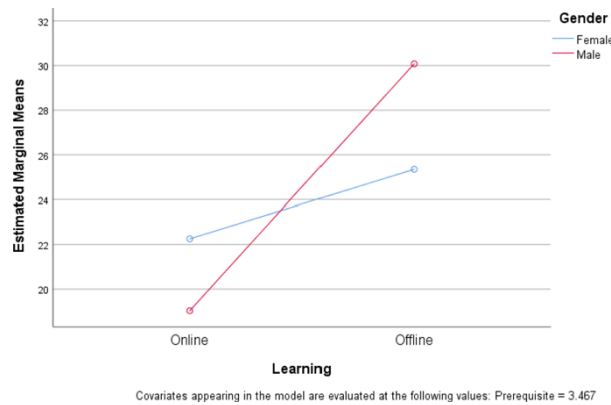


Figure 4. Estimated marginal means of collaborative learning.

Based the Figure 4, female students' collaborative learning is higher than male students for online learning, whereas the collaboration of male students is higher in offline learning. Based on Table 6, the mean of female students' collaborative learning in online learning is 22.27 (with stdev=5.91), and for male students is 19.00 (with stdev=4.83). Offline learning for male students is 30.00 (with stdev=3.37), and for female students is 25.36 (with stdev=6.54).

Table 6. The descriptive statistics of students' social interaction

	Mean	Stdev
Online		
Female	22.27	5.91
Male	20.43	4.83
Offline		
Female	25.36	6.54
Male	30.00	3.37

Stdev: standard deviation

¹⁷ Chih-Hsiung Tu, "On-Line Learning Migration: From Social Learning Theory to Social Presence Theory in a CMC Environment," *Journal of Network and Computer Applications* 23, no. 1 (January 1, 2000): 27-37, <https://doi.org/10.1006/jnca.1999.0099>.

¹⁸ Hyo-Jeong So and Thomas A. Brush, "Student Perceptions of Collaborative Learning, Social Presence and Satisfaction in a Blended Learning Environment: Relationships and Critical Factors," *Computers & Education* 51, no. 1 (August 1, 2008): 318-36, <https://doi.org/10.1016/j.compedu.2007.05.009>.

The significance of collaborative learning from Table 3.

- 1) At the significance level of 1%, 5%, and 10%, because of Sig. Learning-Social interaction = 0.00, online and offline learning has a significant effect on students' social interaction abilities,
- 2) At the significance level of 1%, 5%, and 10%, because of Sig. Gender-Social interaction = 0.43, the gender difference, namely male and female students, does not have a significant effect on students' social interaction skills,
- 3) At the significance level of 1%, 5%, and 10%, because of Sig. Learning*Gender-Social presence = 0.37, the male and female student's social presence abilities in both learnings are not differently significant.

5. The students' satisfaction

The last variable in this research is the students' satisfaction. An affective learning outcome indicates the degree of learner reaction to values, quality of learning, and motivation for learning¹⁶. Student perceptions of satisfaction will be measured with the satisfaction scale. The satisfaction scale consists of eleven 5-point Likert-type items with response options ranging from strongly disagree (1) to strongly agree (5).

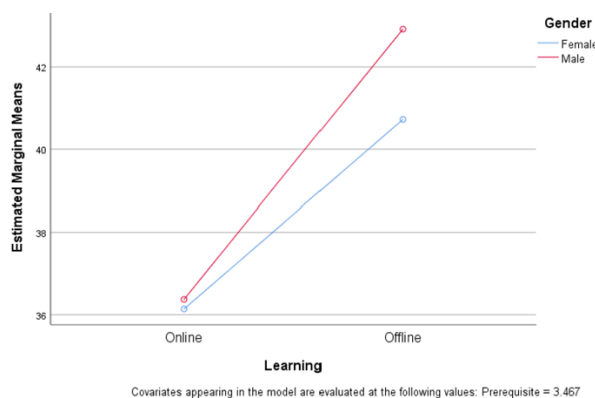


Figure 5. Estimated marginal means of satisfaction

Based on Figure 5, the male students' satisfaction is higher than female students for both learning. Based on Table 7, the mean of male students' satisfaction with online learning is 36.29 (with stdev=3.45), and for female students is 36.18 (with stdev=5.40). The satisfaction is then raised in the offline learning, 42.71 (with stdev=4.65) for male students, and 40.77 (with stdev=4.71) for female students.

Table 7. The descriptive statistics of students' satisfaction

	Mean	Stdev
Online		
Female	36.18	5.40
Male	36.29	3.45
Offline	40.77	4.71
Female	42.71	4.65
Male		

Stdev: standard deviation

The significance of student's satisfaction with the learning can be concluded based on Table 3, namely:

- 1) At a significance level of 1%, 5%, and 10%, because of Sig. Learning-Satisfaction = 0.00, online and offline learning has a significant effect on student satisfaction,
- 2) At the significance level of 1%, 5%, and 10%, because of Sig. Gender-Satisfaction = 0.43, the gender difference, namely male and female students does not have a significant effect on student satisfaction,
- 3) At the significance level of 1%, 5%, and 10%, because of Sig. Learning*Gender-Satisfaction=0.52, the male and female students' satisfaction in both learnings are not differently significant.

The analyze from Table 8 that both of the learning, namely online and offline are significantly different in cognitive ability, social presence, social interaction, collaborative learning, and satisfaction. Whereas, the interaction of learning and gender, and the gender of the students are not significantly different at 1%, 5%, and 10%. This means in the given significance level that the gender of the students does not affect their cognitive ability, social presence, social interaction, collaborative learning, and satisfaction in both learnings. The findings show us that the sex difference in the social skills of student became a unique character. She et al examined associations between the intensity of social networking use and social skills, and between social anxiety and problematic social networking site use was more evident among male college students while the associations between social skills and social anxiety were stronger among female college students compared to males ¹⁹.

¹⁹ Rui She et al., "The Double-Edged Sword Effect of Social Networking Use Intensity on Problematic Social Networking Use Among College Students: The Role of Social Skills and Social Anxiety," *Computers in Human Behavior* 140 (March 1, 2023): 107555, <https://doi.org/10.1016/j.chb.2022.107555>.

Table 8. Multivariate tests

Effect	Pillai's	Wilks'	Hotelling's	Roy's	Sig.
Prerequisite	0.24	0.76	0.31	0.31	0.02
Learning	0.59	0.41	1.47	1.47	0.00*
Gender	0.05	0.95	0.06	0.06	0.74
Class*Gender	0.10	0.90	0.11	0.11	0.37

*p<0.1, 0.05, 0.01

Conclusion

Based on the discussion, cognitive abilities, social interaction, collaborative learning, and satisfaction differ significantly between online and face to face activity learning. Students' social skills in the post-pandemic are unique to each gender. Specifically, cognitive ability, social presence, social interaction, collaboration, and satisfaction exhibit different patterns based on students' gender in both learning modalities, however, the effects are not significantly different

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