

# A Survey on Online Computer Practicum during the COVID-19 Pandemic: Students' Perceptions

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## ABSTRACT

The COVID-19 pandemic requires all of the educational institution to organize the online learning due to social distancing policy. The online computer practicum is the one method to comply the online learning during the pandemic. The study conducted a survey to scrutinize the students' perceptions on the online computer practicum implementation in three perspectives: acceptance, satisfaction, and knowledge comprehension. A total 1155 students are selected as the respondent and the descriptive statistical analysis is employed as the means to analysing data. The findings show that students are satisfied and accepted the technology use. The knowledge transfer also runs properly from the instructor to students even it was hold by online.

**Keywords:** Online Learning, Computer Practicum, Acceptance, Satisfaction, Knowledge.

## INTRODUCTION

The computer practicum is an activity that usually organized in a computer laboratory in a university. Each of students held a computer with the direction from the instructor to follow the guidance of the learning material. As the one of the private university in Indonesia, Universitas Medan Area (UMA) organizes the computer practicum services by providing several computer laboratories and hundreds of computers to be used by students (Lubis & Sutrisno, 2019). However, the physical education progress is prohibited during the

COVID-19 pandemic (Daniel, 2020). The social distancing is implemented to decrease the virus spread (Khasanah et al., 2020). Hence, UMA made a step to provide an online computer practicum to replace the usual activity in the computer laboratory.

As the organizer of a computer laboratory in UMA, the Puskom (Pusat Komputer / Computer Centre) has been started the computer practicum since 1985, which aims to be an object of community service to prepare workforce skills of Computer Science and Technology. Puskom provides the opportunities for students to improve their ability to use computers, especially the use of applications through practicum activities and courses. The learning materials are various. It starts from a basic computer operating systems, Microsoft Office (namely: Microsoft Word, Microsoft Excel, Microsoft Power Point), creating blogs, and other applications such as Mendeley, and SPSS. However, the online practicum was executed during the COVID-19 pandemic. An online practicum is the new construct of the education transformation with the improvement of the online education and computer technology, whereas the learning activity runs virtually and can be done everywhere (Ersin et al., 2020). In consequence of the first time organized, there was shortage of the online practicum implementation. A direct learning process in a laboratory is a usual activity by the instructors and students (Villanueva et al., 2020). Therefore, the study aims to

conduct a survey to obtain the students perception of the online computer practicum.

### LITERATURE REVIEW

**Acceptance.** The emergence of online learning delivers the novel characteristics, needs and reactions from users. The various demographic factors of users is causing the uncertain usage of this technology (J.-W. Lee et al., 2011). The successful of a technology usage is determined by the user acceptance. Hence, in the context of online learning, the organizer (i.e. university, school) should prepare all the students' needs for their participation (Farahat, 2012). There are several attributes that illustrate the students' acceptance and usage of online technology, namely usefulness, interaction, accessibility, and ease of use. The usefulness is a factor that presents the level of users' belief on the technology usage can enhance their performance in a certain task (Chuah et al., 2016).

Furthermore, the usability of a learning technology is the crucial factor to deliver an optimum process of online learning (Rohloff et al., 2019). Then, the usability can be extended to provide enjoyment of interaction during the technology usage. The interaction among users is the factor that also influencing the technology acceptance (Kuciapski, 2020). Moreover, accessibility is also the crucial factor that illustrating the user' acceptance of educational technology. The level of accessibility is determined by how the users feel convenience on accessing a system (Lee et al., 2014). The ease of use is the factor that describes the degree of effort freeness of a system and become the part of the technology acceptance depiction. In other words, this factor explains how user

uses the system or a technology in easy way (Nayanajith et al., 2019).

**Satisfaction.** The satisfaction is vital for the technology adoption. Users' satisfaction usually express the continuance of a system used in the future (Abdel-Maksoud, 2019). In the context of E-Learning, students' satisfaction can be generated through the role of educators, course program adequacy, efficiency of the system, and the effective interaction among students or educators (Martin-Rodriguez et al., 2015). Moreover, the *satisfaction in the online learning* subject can be described by how the material is delivered, communication facilitation, operation of the system, and content (Siritongthaworn & Krairit, 2006). Then, other indicators to explain the students' satisfaction are course design, interaction with the instructor, interaction among students, individual learning processes, and learning outcomes (Bernik et al., 2018).

**Knowledge.** The main goal of the online learning is how the students achieved the knowledge from the instructors (Bakia et al., 2012). In other words, online learning facilitates the instructor to teach the students by the means of technology to assist / replace the traditional learning (Al-Fahad, 2010). Therefore, the online learning should have the ability to become the knowledge transfer facilitator from educator to students. Subsequently, the educators' role is crucial to obtain a proper knowledge transfer by using the educational technology (Owens & Price, 2010). Hence, the educator's capabilities both in technology and the learning material are required to enhance the performance of online learning. Table 1 shows the indicators of acceptance, satisfaction, and knowledge.

**Table 1. Indicators of Acceptance, Satisfaction, and Knowledge.**

Variables	Indicators	Source
Acceptance	Usefulness, interaction, accessibility, and ease of use.	(Chuah et al., 2016; Kuciapski, 2020; Y.-H. Lee et al., 2014; Nayanajith et al., 2019; Rohloff et al., 2019)(Chuah et al., 2016; Kuciapski, 2020; Y.-H. Lee et al., 2014; Nayanajith et al., 2019; Rohloff et al., 2019)
Satisfaction	Course program, content, system operation, interaction, learning processes, learning outcomes, learning material deliver method.	(Bernik et al., 2018; Martin-Rodriguez et al., 2015; Siritongthaworn & Krairit, 2006)
Knowledge	Knowledge comprehension	(Bakia et al., 2012; Owens & Price, 2010)

## MATERIALS & METHODS

**Research Population.** The population of the study are all of students in UMA who has registered for the computer practicum in second semester of 2019/2020 academic year. The totals of 1155 respondents were selected from three departments, including Psychology, Social Science, and Economy. Then, the study used the primary data which were distributed online directly to all respondents.

**Instrument Development.** The research exposes the level of students' acceptance, satisfaction and knowledge comprehension while using the online computer practicum. The research instrument is developed by using the indicators of the variables with the total of 27 items. In addition, gender and

department origin are asked as the demographic of respondent. Meanwhile, items from the variable of knowledge are adjusted from Puskom learning materials, including basic computer operating systems, Microsoft Office, and Mendeley. All of the questions will be answered through the Likert scale respond (Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree) from the students. However, the items of knowledge variable are excluded. The questions will be answered also through the Likert scale, but with different respond, namely Not Understand, Less Understand, Quite Understand, Understand, and Very Understand. The set of questions of the instrument is listed in Table 2.

Variables	Questions	Item Code
Acceptance	I found the online computer practicum useful in my learning during the Pandemic.	A01
	I can interact clearly and understandably with the instructor while attending the online computer practicum during the Pandemic.	A02
	I find easiness to access the online computer practicum during the Pandemic	A03
	I feel that the implementation of online practicum is easy to run during the Pandemic.	A04
Satisfaction	In my opinion, the implementation of online computer practicum is quite met my expectations.	S01
	In my opinion, the online computer practicum was running efficiently	S02
	In my opinion, the Microsoft Office is quite necessary for students to help with college assignments.	S03
	In my opinion, the teaching staffs were good at delivering the practicum material.	S04
	I think the knowledge I got really helped me to finish my education and will be useful in the future.	S05
	I felt comfortable to attending the computer online practicum during the Pandemic.	S06
	I will attend the next online computer practicum in the future.	S07
	Overall, I feel satisfied to attend the computer online practicum during the Pandemic.	S08
Knowledge	How understand did you to do the mouse settings on the Windows Operating System?	K01
	How understand did you to do language switching on the Windows Operating System?	K02
	How understand did you to perform ATTRIB commands on a Windows Operating System?	K03
	How understand did you to create page numbers with different format in Microsoft Word?	K04
	How understand did you to create an automatic table of contents in Microsoft Word?	K05
	How understand did you to create automatic citations and bibliography in Microsoft Word?	K06
	How understand did you to create a column model script in Microsoft Word?	K07
	How understand did you to create a certificate with Mail Merge in Microsoft Word?	K08
	How understand did you to create an ID card with Mail Merge in Microsoft Word?	K09
	How understand did you to use the arithmetic operators (e.g. +, -, *, /) in Microsoft Excel?	K10
	How understand did you to use the statistical functions (e.g. AVERAGE, SUM) in Microsoft Excel?	K11
	How understand did you to use the text functions (e.g. LEFT, MID, RIGHT in Microsoft Excel?	K12
	How understand did you to use the IF function in Microsoft Excel?	K13
	How understand did you to use the HLOOKUP & VLOOKUP table reading function in Microsoft Excel?	K14
How understand did you to use the Mendeley application?	K15	

### Validity and Reliability of the Instrument.

The research uses the coefficient correlation to determine the instruments validity and Cronbach Alpha ( $\alpha$ ) as the reliability assessment. the Pearson Correlation was used by calculating the value correlation coefficient between each item and the total

item to determine the validity of the instrument (Z. Lubis & Osman, 2015). The validity of the instrument is shown in Table 3 as follow.

Variables	Item Code	Coefficient Correlation	p-value
Acceptance	A01	0.886**	0.000
	A02	0.920**	0.000
	A03	0.908**	0.000
	A04	0.868**	0.000
Satisfaction	S01	0.841**	0.000
	S02	0.870**	0.000
	S03	0.599**	0.000
	S04	0.781**	0.000
	S05	0.779**	0.000
	S06	0.873**	0.000
	S07	0.809**	0.000
	S08	0.886**	0.000
Knowledge	K01	0.792**	0.000
	K02	0.820**	0.000
	K03	0.858**	0.000
	K04	0.823**	0.000
	K05	0.834**	0.000
	K07	0.863**	0.000
	K06	0.858**	0.000
	K08	0.880**	0.000
	K09	0.893**	0.000
	K10	0.856**	0.000
	K11	0.864**	0.000
	K12	0.877**	0.000
	K13	0.896**	0.000
	K14	0.885**	0.000
	K15	0.839**	0.000

According to the Table 3, the correlation values of all items are greater than 0.7 and indicates indicate a good validity (Hair et al., 2010). Item code of A02 has the highest correlation value as 0.920 and item code of S04 has the lowest score as much as 0.781 but still pass the cut-off value. Furthermore, the reliability test is carried out by determining the Cronbach Alpha ( $\alpha$ ) of each variable. The result of the reliability test is illustrated in Table 4.

Variables	Items	Cronbach Alpha ( $\alpha$ )
Acceptance	4	0.918
Satisfaction	8	0.924
Knowledge	15	0.974

As shown in Table 4, the Cronbach Alpha ( $\alpha$ ) of each variable has great score and indicates the good reliability (Hair et al., 2010). The Acceptance variable has the alpha score as much as 0.918; the Satisfaction variable is at 0.924 and the Knowledge variable with the 0.974 of alpha value.

## RESULT

**Overview of Data Gathered.** The data were obtained among 1155 students. The majority of respondents are female with total of 827 (71.6%) students and total of 328 among them are male (28.4%). Furthermore, a total of 458 (39.7%) students are from Economy department, followed by students from department of Psychology as much as 415 (35.9%) and Social Science department as much as 282 (24.4%) respondents. The summary of data gathered in the study is depicted in Table 5.

Demographic	Category	Frequency	Percentage
Gender	Male	328	28.4
	Female	827	71.6
Department	Psychology	415	35.9
	Social Science	282	24.4
	Economy	458	39.7

**Descriptive Statistic.** The study discovers the low or high level of acceptance, satisfaction, and knowledge comprehension of students while performing online computer practicum during COVID-19 pandemic. Descriptive statistic is used to determine the level of variable by computing the mean score from the variables. The summary of the findings is shown in Table 6.

Variable	Mean Score	Standard Deviation
Acceptance	3.1803	1.00087
Satisfaction	3.3131	0.90393
Knowledge	3.2096	0.87669

Based on the Table 6, Satisfaction variable has the highest mean score as 3.3131, followed by Knowledge variable as much as 3.2096 and Acceptance variable as much as 3.18103. In other words, students are quite satisfied to attend the online computer practicum and accept the technology use. Moreover, the students claimed that the knowledge comprehension in online computer practicum execution is in a good level based on the scale of score as 1 to 5.

**Acceptance.** The study also explains the level of students' acceptance in using the online computer practicum per items. A total of 4 questions were asked and various

responses are obtained from the respondents. Table 7 shows respondents' responses to each item of this variable.

Item	Indicator	Responses					Mean
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
A01	Usefulness	79	201	333	377	165	3.3013
A02	Interaction	112	326	318	292	107	2.9619
A03	Accessibility	96	275	351	315	118	3.0727
A04	Ease of use	68	175	332	404	175	3.3853

According to Table 7, the mean score from item of A04 is as much as 3.3853 and become the highest score among other items. Majority of students claimed that the online computer practicum is easy to use. Then, item of A01 has the second highest mean score as much as 3.3013 and indicates that the online computer practicum is useful for students' learning. The item of A03 has the mean score as much as 3.0727. Most of students stated that the online computer practicum is easy to be accessed. However, students disagreed with the quality of interaction to the instructor. The item of

A02 has the lowest mean score as much as 2.9619 and expresses the disagreement of majority of respondents to the level of interaction in using online computer practicum.

**Satisfaction.** The Satisfaction variable consists of 8 items from the questionnaire to explain the students' expression on the online computer practicum during COVID-19 pandemic. The respondents' responses to each item of this variable are depicted in Table 8.

Item	Indicator	Responses					Mean
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
S01	Met the expectation	140	336	284	283	112	2.9056
S02	Efficiency	94	272	329	340	120	3.1039
S03	Necessity	28	50	184	488	405	4.0320
S04	Delivering method	34	93	290	506	232	3.7004
S05	Learning outcome	57	118	279	469	232	3.6069
S06	Comfortability	159	278	295	307	116	2.9506
S07	Continuance	129	201	258	403	164	3.2355
S08	Overall satisfy	149	276	306	309	115	2.9697

As shown in Table 8, item of S03 has the highest mean score with the value of 4.0320. Thus, it indicates that students claimed that the online computer practicum is quite necessary for their learning process. Then, most of students also agreed that delivering method in the implementation of online computer practicum is still sufficient, with the mean score of the item of S04 as much as 3.7004. The item of S05 gained the third rank of means score level among items. The value of 3.6069 mean score expresses a better learning outcome can be achieved through the online computer practicum usage. Moreover, item of S07 has the mean score as much as 3.2355 and

majority of respondents are agreed to continue in using online computer practicum in the future. The item of S02 has the mean score as 3.1039 and stated that the respondents claimed that the online computer practicum is running efficiently. However, there are three items that have the mean values below than others, namely item of S08 (2.9697), S06 (2.9506), and S01 (2.9056).

**Knowledge.** Students' knowledge comprehension is the main goal for the online computer practicum during COVID-19 pandemic. The online learning becomes the replacement for the traditional learning

in class due to the social distancing policy. There are 15 items listed in Knowledge variable to describe how understand students through online learning method.

The respondents' responses to each item of this variable are shown in Table 9 and Figure 1.

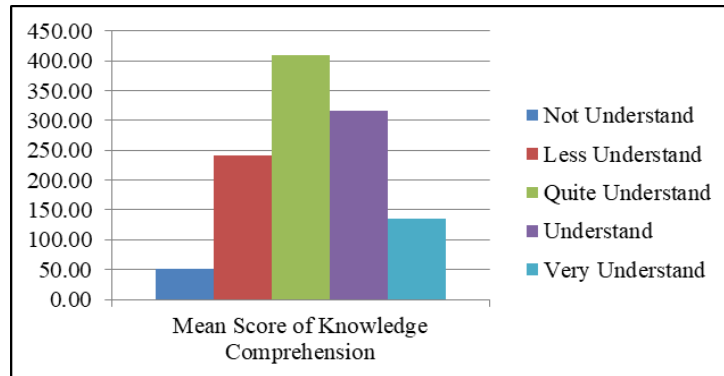


Figure 1. Level of Knowledge Comprehension in Using Online Computer Practicum

Item	Indicator	Responses					Mean	Rank
		Not Understand	Less Understand	Quite Understand	Understand	Very Understand		
K01	Mouse settings	33	142	413	391	176	3.4632	3
K02	Language exchange	38	170	437	373	137	3.3472	4
K03	ATTRIB command	73	321	419	258	84	2.9645	14
K04	Page number format	31	135	412	390	187	3.4909	2
K05	Table of content	24	155	404	373	199	3.4918	1
K06	Citations and bibliography	37	206	421	334	157	3.3186	6
K07	Column model	35	196	411	361	152	3.3455	5
K08	Mail Merge (certificate)	56	266	408	319	106	3.1325	10
K09	Mail Merge (ID Card)	64	319	404	269	99	3.0173	12
K10	Arithmetic operators	57	278	382	296	142	3.1628	9
K11	Statistical functions	63	245	406	297	144	3.1853	8
K12	Text functions	49	243	417	313	133	3.2061	7
K13	IF functions	59	268	416	291	121	3.1273	11
K14	HLOOKUP & VLOOKUP	60	330	404	263	98	3.0078	13
K15	Mendeley application	93	345	404	230	83	2.8831	15
Mean		51.47	241.27	410.53	317.20	134.53		

Table 9 shows the students' level of knowledge comprehension while learning by using online computer practicum. There are various learning materials presented to the participants regarding to the basic computer software skill (e.g. computer operating systems, Microsoft Office, and Mendeley). According to Table 9, majority of students are quite understood to the learning material from instructors. In addition, Figure I illustrates the pattern of knowledge comprehension among students is at the moderate level.

Based on Table 9, Microsoft Word is the most understandable learning material than others. The materials are including creating a table of content (3.4918), formatting page number (3.4909), creating a column model script (3.3455), creating citation and bibliography (3.3186), and Mail Merge (3.1325 and 3.0173). Furthermore, students stated that Microsoft Excel is quite understandable learning material. All of items related to Microsoft Excel have sufficient mean scores including text function (3.2061), statistical function (3.1853), arithmetic function (3.1628), IF

function (3.1273), and Lookup function (3.0078). In term of basic computer operation system, students have good knowledge on mouse setting (3.4632) and language exchange (3.3472) but not for utilizing ATTRIB command (2.9645). They are agreed that ATTRIB command is a difficult material to be learned. In line with this, most of students claimed that learning to use Mendeley application is also quite hard to be learned with the mean score at 2.8831.

## DISCUSSION

The findings pointed out that the implementation of online computer practicum by Puskom UMA is at the moderate level. Students are accepting to perform the computer practicum by using online method. Students also feel satisfy and the knowledge transfer is running sufficiently. Furthermore, the result of descriptive statistical analysis of technology acceptance is shown in a good level. Most of students claimed that the online computer practicum is easy to use, useful for learning, and easy to be accessed. In contrast, students are having difficulties to interact with instructor due to the inadequacy of physical contact among them. This is in line with Stone et al. (2016) and Markova et al. (2017), which stated that online learning is presenting lack of interaction between students and educators.

Moreover, students claimed that the online computer practicum is quite necessary for their learning process and giving an opportunity for better learning outcome, and running efficiently. Then, they also agreed that delivering method is in a good way. Students declared that they will continue to attend the online computer practicum in the future. However, students are not comfortable to perform computer practicum in online. They also stated that online learning is not met the expectation as the traditional learning. In overall satisfaction, they felt quite satisfy to conducting computer practicum in online. Besides, the mean score of the Satisfaction variable is in

a moderate level. Furthermore, the online computer practicum is able to performing the knowledge transfer from educator to students in online sufficiently. Students claimed that Microsoft Office is necessary and ease to be learned while learning online.

## CONCLUSION

The online computer practicum is performed due to the social distancing policy during COVID-19 pandemic. The computer practicum should be hold in traditional way due to necessity of many direct interactions between instructors and students. The instructor is usually guiding the students through the step-by-step method as they can understand and able to performing the learning material. The online computer practicum is carried out without guidance from the instructors physically but using ICT (Information and Communication Technology) as the means of knowledge transfer. The study discovers how students' perception on the online computer practicum accomplishment which organized by Puskom UMA. Based on the findings, the three variables of Acceptance, Satisfaction, and Knowledge have the moderate level of mean score. Thus, it indicates that the online computer practicum is run in good way. The students stated that they satisfy with the online computer practicum performance and will continue to attend again for the future.

**Conflict of Interest:** None

## REFERENCES

1. Abdel-Maksoud, N. F. (2019). Factors Affecting MOOCs' Adoption in the Arab World: Exploring Learners' Perceptions on MOOCs' Drivers and Barriers. *Higher Education Studies*, 12(11), 164–177.
2. Al-Fahad, F. N. (2010). The Learners' Satisfaction toward Online E-Learning Implemented in the College of Applied Studies and Community Service, King Saud University, Saudi Arabia: Can E-Learning Replace the Conventional System of Education?. *Turkish Online Journal of Distance Education*, 11(2), 61–72.
3. Bakia, M., Shear, L., Toyama, Y., & Lasseret,

- A. (2012). Understanding the Implications of Online Learning for Educational Productivity. *Office of Educational Technology, US Department of Education*.
4. Bernik, A., Bubaš, G., & Radošević, D. (2018). Measurement of the effects of e-learning courses gamification on motivation and satisfaction of students. *2018 41st International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)*, 806–811.
  5. Chuah, S. H.-W., Rauschnabel, P. A., Krey, N., Nguyen, B., Ramayah, T., & Lade, S. (2016). Wearable technologies: The role of usefulness and visibility in smartwatch adoption. *Computers in Human Behavior*, *65*, 276–284.
  6. Daniel, S. J. (2020). Education and the COVID-19 pandemic. *Prospects*, 1–6.
  7. Ersin, P., Atay, D., & Mede, E. (2020). Boosting Preservice Teachers' Competence and Online Teaching Readiness through E-Practicum during the COVID-19 Outbreak. *International Journal of TESOL Studies*, *2*(2), 112–124.
  8. Farahat, T. (2012). Applying the technology acceptance model to online learning in the Egyptian universities. *Procedia-Social and Behavioral Sciences*, *64*, 95–104.
  9. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis: Global edition*. Pearson Higher Education Upper Saddle River, NJ.
  10. Khasanah, D. R. A. U., Pramudibyanto, H., & Widuroyekti, B. (2020). Pendidikan Dalam Masa Pandemi Covid-19. *Jurnal Sinestesia*, *10*(1), 41–48.
  11. Kuciapski, M. (2020). *Interaction Enjoyment Perspective in Explaining Technology Acceptance: a Study of Employees' Acceptance of M-Learning*.
  12. Lee, J.-W., Mendlinger, S., & others. (2011). Perceived self-efficacy and its effect on online learning acceptance and student satisfaction. *Journal of Service Science and Management*, *4*(03), 243.
  13. Lee, Y.-H., Hsiao, C., & Purnomo, S. H. (2014). An empirical examination of individual and system characteristics on enhancing e-learning acceptance. *Australasian Journal of Educational Technology*, *30*(5).
  14. Lubis, A. H., & Sutrisno, S. (2019). Examining The Students' Satisfaction of the Computer Laboratory Quality in University of Medan Area, Indonesia. *International Journal of Innovative Science and Research Technology*, *4*(12), 170–173.
  15. Lubis, Z., & Osman, A. (2015). *Statistik dalam Penyelidikan Sains Sosial: Aplikasi dan Falsafah*. Penerbit Universiti Malaysia Perlis.
  16. Markova, T., Glazkova, I., & Zaborova, E. (2017). Quality issues of online distance learning. *Procedia-Social and Behavioral Sciences*, *237*, 685–691.
  17. Martin-Rodriguez, Ó., Fernández-Molina, J. C., Montero-Alonso, M. Á., & González-Gómez, F. (2015). The main components of satisfaction with e-learning. *Technology, Pedagogy and Education*, *24*(2), 267–277.
  18. Nayanajith, G., Damunupola, K. A., & Ventayen, R. J. (2019). Impact of Innovation and Perceived Ease of Use on E-Learning Adoption. *Asian Journal of Business and Technology Studies*, *2*(1), 19–27.
  19. Owens, J. D., & Price, L. (2010). Is e-learning replacing the traditional lecture? *Education+ Training*.
  20. Rohloff, T., Sauer, D., & Meinel, C. (2019). On the Acceptance and Usefulness of Personalized Learning Objectives in MOOCs. *Proceedings of the Sixth (2019) ACM Conference on Learning@ Scale*, 1–10.
  21. Siritongthaworn, S., & Krairit, D. (2006). Satisfaction in e-learning: the context of supplementary instruction. *Campus-Wide Information Systems*.
  22. Stone, C., O'Shea, S., May, J., Delahunty, J., & Partington, Z. (2016). Opportunity through online learning: Experiences of first-in-family students in online open-entry higher education. *Australian Journal of Adult Learning*, *56*(2), 146–169.
  23. Villanueva, O., Behmke, D. A., Morris, J. D., Simmons, R., Anfuso, C., Woodbridge, C. M., & Guo, Y. (2020). Adapting to the COVID-19 Online Transition: Reflections in a General Chemistry Sequence Taught by Multiple Instructors with Diverse Pedagogies. *Journal of Chemical Education*.

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