

Psychometric Properties of the 'Distance Learners' Online Component Challenges' Scale (DLOCC)

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Article Info	Abstract
Article History Received: May 10,2026 Accepted: August 12,2026	<i>This study aims to develop and validate the "Distance Learners' Online Component Challenges' Scale (DLOCC). An opportunity sample of 4380 undergraduate students enrolled in online learning classes during the early stages of the first lockdown of the COVID 19 pandemic. Results of exploratory factor analysis supported a 27 items scale consisted of four components and identified as follows; (1) the 'Technological Sufficiency Challenges,' (2) the 'Technological Competency Challenges,' (3) Student Emotional Challenges', and (4) 'Self-management challenges.' Cronbach alpha showed adequate internal consistency levels and a total of .939. We encourage researchers to implement this scale in their future studies.</i>
Keywords : Distance learning, COVID-19, Higher education, Online component challenges	
DOI: 10.5281/zenodo.21921975	

Introduction

The use of information and communication technology offers learners several advantages, along with traditional methods. Since the beginning of the 21st century, computer network technology has brought enormous transformation to people's life (Mitchell & Forer, 2010). Online material had to be engaging and interactive (Keogh et al., 2017).

Higher education institutions invest in integrating technology components into their courses. They have registered a remarkable increase in internet use in the last few years in education. (Bailey & Morais, 2005). Yet, universities and colleges, due to the threat of the global pandemic COVID-19, are facing decisions about how to continue the teaching/learning process while keeping everyone safe from such a public unpredictable, fast health emergency. Institutions have decided to cancel all face-to-face theoretical and practical classes; they have moved to the distance learning (DL) option to prevent the spread of COVID-19 (Hodges et al., 2020).

Moving to online instruction enable flexible teaching and learning process, anywhere and anytime. Nevertheless, the speed and quality with which this move to the online approach is expected to happen is unprecedented and staggering (Hodges et al., 2020). The success of the DL initiative is affected by several factors such as technical competencies and instructors' pedagogical (Motaghian et al., 2013). The need for quality materials to improve learners' engagement in DL increases, and self-regulated learners become vital (Mei et al., 2017). Several concerns related to moving online are difficulties accessing technology and engaging participants remotely (Rainford, 2020).

Some challenges might lead to high attrition in DL programs. However, campus support personnel and teams help faculty members and students learn about and implement online learning; these teams typically support those who show interest. It would be difficult to offer all support on such short notice. They find quick solutions for any possible difficulties users may encounter during these difficult circumstances (Hodges et al., 2020). Sometimes users have problems embedding technology into pedagogy for effective teaching. This may lead to poor instructional support, less experienced instructors who cannot transmit essential instructional supports for learners (Khan, 2005). Finally, students who fail to interact positively or submit their assignments for correction (Angelaki, 2013; Kaur & Ahmed, 2006).

Changing a teaching approach is a challenging process (Tay, 2016). It is crucial to discuss essential matters like identifying vulnerable learners, improving retention in higher education, and providing good learner support (Hughes, 2007). Proper incentives encourage learning systems to effectively use and implement new resources and knowledge to the best of their students (Grubb & Allen, 2011). Kenney & Newcombe, (2011) and Sweeney et al., (2016) recommended exploring the quality of the learning experiences and outcomes, especially if these students are new to such experience in a limited-resource environment not suitable for the change. The correct incentives should encourage schools to find out how to use resources efficiently and implement this newfound

knowledge in the interests of their pupils. Teaching activities during the COVID-19 crisis need to be assessed regularly to understand how best to adapt them for distance learning (Rainford 2020).

The Importance of the study

In Jordan, due to COVID 19 pandemic, the Higher Education Council has decided to continue education at universities through remote learning, given the current circumstances in the Kingdom. Although the University of Jordan has been partially applying a blended learning approach for several years now, this has been the first time the whole Campus must study remotely. Students were obliged to accept the fact of using web-based and online learning during the pandemic. This DL has raised concerns; several studies have highlighted the overall challenges, students' expectations, opinions, or satisfaction. Yet, to date, no comprehensive instruments have been developed to assess online component challenges students experience during their emergency remote learning experience COVID-19.

Research Goal

This study describes the development process of forming and validating an instrument to assess online learning environments for higher education; the 'Distance Learners' Online Component Challenges' Scale (DLOCC).

The scale describes the possible challenges encountered by students in the online component of DL. Hence, this study will address the following objectives:

- 1.To develop the 'Distance Learners' Online Component Challenges' Scale (DLOCC)
- 2.To test the validity and reliability of the scale.

One significant factor is the importance of online learning that affects the entire learning process. The COVID-19 crisis means that day-to-day activities need to be re-examined to understand how best to adapt them for remote delivery. The scale outcomes will encourage all those participating in the learning/teaching process to build an efficient and effective learning environment, stakeholders, curriculum planners, teachers, and students. To be adequately prepared for the need for remote learning in the future.

Sample and Data Collection

An opportunity sample of 4380 undergraduate students enrolled in online learning classes of compulsory courses in the second semester of the academic year 2020/2021 during the early stages of the first lockdown of the COVID 19 pandemic/ University of Jordan, who voluntarily participated in the study. According to Hair et al., (2010), the sample size is adequate in providing approximately ten respondents per item and determining the psychometric properties of latent constructs by using Factor Analysis. The mean age of the participants was 20.3 years old $SD \pm 1.5$. Participants read and approved a consent letter before answering the questionnaire.

Data collection was initiated in April 2020 and was concluded in June 2020. The institutional review board approved this study of the University of Jordan (52/2020).

Method

To Fulfill the first objective of the scale to develop the 'Distance Learners' Online Component Challenges' Scale (DLOCC), we needed to complete phase one and phase two of the scale development procedures as follows;

Phase one – Understanding the distance learning implementation during the lockdown of the COVID 19 pandemic

Before the COVID 19 pandemic, the university of Jordan has been implementing the blended learning approach in different courses for several years. It has been a voluntary approach for instructors/teachers. Nevertheless, since the pandemic, the whole Campus had to study remotely. Students had to accept the fact of using web-based and online learning. The University of Jordan offered both students and academic staff the e-learning Moodle platform for online classes administered by ICT professionals, side by side to all available communication features such as Zoom, Microsoft teams, and other social media applications.

Neither the instructors nor the students were ready for such a profound change; they were novices to the experience. From the first beginning, students were instructed to follow up the Moodle pages to keep track of any announcement from the instructors of the courses. The compulsory courses had been blended courses even before the pandemic, making it easier for them to follow up with their instructors and switch to the online mode during the lockdown successfully.

The students could log in to the Moodle platform using their campus username and password from any computer, tablet, or phone. An android application of Moodle helped both teachers and students reach out to all systematically structured learning materials. Students were expected to learn and practice the skills assigned, watch the videos, practice routines, and complete assignments. Students were encouraged to use search engines, expand their knowledge, find out more about specific skills or information, then submit their work on the

Moodle platform. Sometimes they were asked to submit a paper, discuss a topic, or upload their routine and trials as a video

Phase two - Developing the 'Distance Learners' Online Component Challenges' Scale (DLOCC)

This research aimed to create a tool that will illustrate the difficulties faced by students in the online aspect of distance learning. We analyzed relevant literature and new research discussing online and integrated education and how they are applied to students as they (Adnan & Anwar, 2020; Akcayır & Akcayır, 2018; AlJarrah et al., 2018; Allo, 2020; Azzahra, 2020; Brown, 2016; Chen et al., 2020; Chyr et al., 2017; Daniel, 2020; Eldeeb, 2014; Dietrich et al., 2020; Henrie et al., 2015; Keller & Cernerud, 2002; Er et al., 2015; Lassoued et al., 2020; Lightner & Lightner-Laws, 2016; Lothridge & Fynan, 2013; Mamattah, 2016; Mislinawati & Nurmasyitah, 2018; Safford & Stinton, 2016; Schneider & Council, 2020; Sun et al., 2017). According to similar literature, we identified online component challenges. We developed a scale consisting of 27 items, using deductive and inductive methods; these items sought to address online component challenges related to the students' skills and technological literacy and sufficiency.

The five-point Likert type scale was used to assess the participant's online component challenges in response to the scale as follows; (1) for (correspond never), (2) for (correspond occasionally), (3) for (correspond moderately), (4) for (correspond usually), and (5) (correspond always).

Three subject specialists examined the scale for content validation. Their comments and recommendations have been taken into account, and the scale has been revised accordingly.

The scale was distributed to a random out-sample of 30 students to test the scales' reliability and clarity, attending the distance learning classes. Reliability was calculated using Cronbach's alpha, 0.81 coefficient suggested that the scale was reliable. The scale's items were revised for clarity in accordance with the sample's feedback, and the 27 items were randomized to avoid bias. Finally, the Distance Learners' Online Component Challenges' Scale (DLOCC) was now ready for phase three.

Phase three - Data collection

By the end of the qualitative steps of scale development, the 'Distance Learners' Online Component Challenges' Scale (DLOCC) was ready to be distributed. We uploaded soft copies of the scale as a Google document link on the Moodle platform. The participants read and signed consent, we assured them that we would only use their information and answers for scientific research. We advised them to read the items carefully and check the answers that correspond to them the most.

Analyzing of Data – Validation

Statistical Package for the Social Sciences (SPSS) (version 22) was used to understand the underlying structure of the scale and analyze the collected data. According to Rummel, (1970), Exploratory Factor Analysis (EFA) is the first step in the developing process of the scale to assess the construct validity of the scale and place variables into meaningful factors. These factors provide a better understanding and interpretation of the results (Yong & Pearce, 2013).

High values of Kaiser-Meyer-Olkin Measure of Sampling Adequacy indicate that we can apply factor analysis with our data. At the same time, Bartlett's Test of Sphericity sampling adequacy test confirms matrix factorability. Once the matrix is considered factorable, we use the eigenvalues and scree plot to determine the number of factors extracted based on the Kaiser's criterion rule of thumb, all factors above the eigenvalue of 1, above than 3% of explained variance for each factor, and > 50 % for accumulated rotated explained variance. The Principal Components Analysis method (PCA) with orthogonal rotation (varimax) is conducted to help decide the possible number of factors extracted and rotated. The factor loadings of a variable reflect its contribution to each factor; the larger the factor loading is, the more the variable has contributed to that factor (Yong & Pearce, 2013). Comrey and Lee (1992) has classified items with loadings ≥ 0.71 as excellent; ≥ 0.63 as very good; ≥ 0.55 as good; ≥ 0.45 as reasonable; and ≥ 0.32 as poor.

Results and Discussion

The initial sample consisted of 4389 students of distance learning classes, out of which nine questionnaires were spoiled and were eliminated, leaving 4380 completed questionnaires for analysis. The ratio of the participants: items was perfect for conducting and running the Exploratory Factor Analysis. Data was normally distributed, with skewness of $-.154$ ($SE = .037$) and kurtosis of $-.402$ ($SE = .074$).

PCA with the orthogonal rotation (varimax) was conducted on the 27 items' questionnaire. Both KMO (.951) and Bartlett's test results (68165.309) were adequate to produce distinct and reliable factors, $p < .001$ indicated that correlations between items were sufficient for PCA, table (1).

We ran an initial analysis to obtain Eigenvalues for each component in the data, table (1). Four factors had eigenvalues over Kaiser's criterion of 1 and in combination, explained approximately 40.744 % of the variance.

The scree plot showed inflections that support the four-factor extraction, Figure (1). A multifactorial scale has emerged. Given the adequate sample size and the convergence of the scree plot and Kaiser's criterion on four factors, this is the number of factors retained in the final analysis.

Table (1)
Factors' eigenvalues, explained variance and data adequacy indicators

Factors	Eigenvalues	%Explained variance	KMO	Bartlett's test Approx. Chi-Square	df	sig
1	11.001	40.744	.951	68165.309	351	0.000
2	2.226	8.243				
3	1.502	5.564				
4	1.180	4.369				

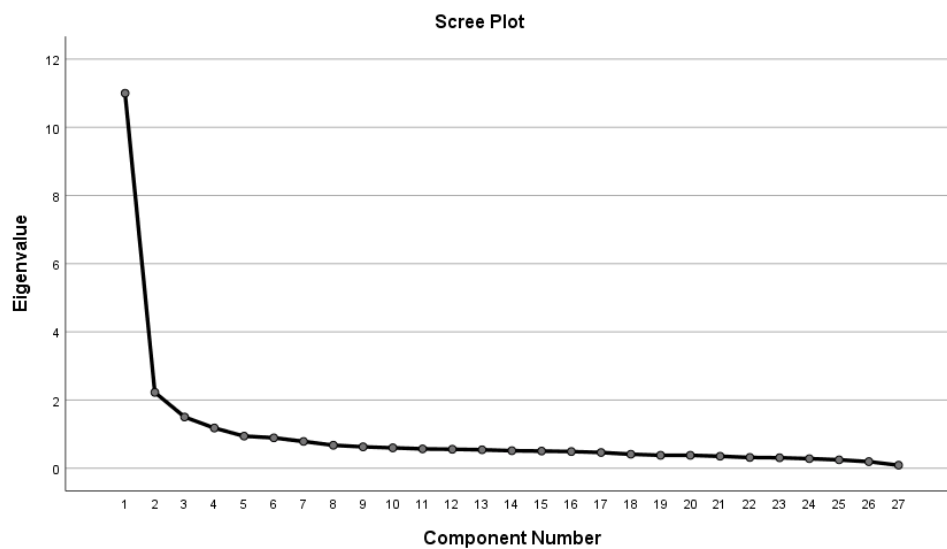


Figure 1. Scree plot

We conducted the Exploratory Factor Analysis (EFA) to identify the distribution of items into the proposed factors, considering the uni-dimensionality of each item to load on one factor only. Table (2) is a factor analysis with varimax rotation; it illustrates the item codes, the rotated factor loadings, the proposed factor for the item, and the communalities. The factors of the scale were derived based on empirical studies. The items that cluster on the same component suggest that component 1 represents factor 1, component 2 represents factor 2, component 3 represents factor 3, and component 4 represents factor 4. Factor loadings reflect items' contribution to the meaning of each factor proposed. Thus, the final version of the scale comprises 27 items, distributed across four factors. These factors are compatible with the theoretical review, explaining approximately 59% of the construct's total explained variance.

Table (1)
Rotated component matrix

	TSC	Component			SMC
		TCC	SEC		
1 I usually procrastinate doing my homework.	-.029	-.041	.095		.740
2 It is hard to get help online.	.421	.312	.114		.386
3 I can not organize/prioritize my chores and homework.	.340	.168	.238		.624
4 I do not prepare enough for class.	.074	.019	.192		.750
5 I do not have self-managerial skills	.046	.183	.158		.725
6 I copy my colleagues work.	.058	.206	-.045		.569
7 It is hard to use Moodle	.360	.487	.127		.211
8 I prefer not to use technology	.273	.587	.161		.251

9 I feel distracted when using technology in learning	.385	.305	.555	.189
10 I find it hard to catch up with online schooling.	.374	.365	.480	.229
11 I am not good at using technology.	.351	.773	.113	.155
12 I do not know much about technology.	.267	.811	.053	.137
13 I feel intimidated to use technology due to my age.	.296	.610	.370	.136
14 I do not wish to be helped with my homework.	-.114	.402	.301	-.231
15 I do not understand the need to use distance learning.	.314	.356	.506	.167
16 I feel lonely when using blended learning.	.221	.179	.763	.042
17 The feeling of isolation decreases my interest in learning.	.253	.154	.760	.215
18 I face technical problems in setting up my devices for online learning.	.646	.282	.297	.063
19 I feel anxious when I am the center of attention in the online discussion.	.428	.263	.467	.149
20 It is hard to get access to technology	.695	.430	.257	.097
21 I do not feel that everyone is equal when it comes to access to technology.	.706	.419	.242	.101
22 I notice the lack of internet and updated computer devices	.777	.232	.133	.035
23 Low speed of the electronic devices and slow Internet connection	.783	.019	.189	.004
24 I face technical difficulties when doing my homework electronically	.731	.194	.260	.166
25 I feel distracted by the complexity of technology when doing blended learning homework	.691	.262	.345	.141
26 I find technology to be complicated	.558	.481	.267	.099
27 I feel bored by lengthy educational videos	.362	-.127	.538	.218

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 8 iterations.

Rasheed et al., (2020) were able to identify the online component challenges. They categorized them into five domains. We adopted their approach and domains as key for our developed 'Distance Learners' Online Component Challenges' Scale. According to our results, the final version of the scale comprised of 27 items, distributed across four factors; (1) the 'Technological Sufficiency Challenges' (TSC), (2) the 'Technological Competency Challenges' (TCC), (3) Student Emotional Challenges' (SEC), and (4) 'Self-management challenges' (SMC). These factors were compatible with the theoretical review, explaining approximately 59% of the construct's total explained variance. Each challenge was identified as single and non-ambiguous.

Reliability

To check the internal consistency of the scale, the reliability coefficient Cronbach's alpha was calculated.; All four factors TSC, TCC, SEC, SMC indicated alpha coefficients of (.921, .802, .860, .770) respectively, with a total of .939. Alpha coefficients values > 0.70 indicate a reliable scale, while values > 0.80 indicate good reliability (Yong & Pearce, 2013).

Discussion

Based on our findings, the 'Distance Learners' Online Component Challenges' Scale proved valid and reliable. Factors were well represented by the items' loadings ranging between .402 and .783. According to Comrey and Lee (1992), loadings $\geq .71$ are classified as excellent; $\geq .63$ as very good; $\geq .55$ as good; $\geq .45$ as reasonable; and $\geq .32$ as poor. Therefore, all the loading of the scales' items were classified as excellent, very good and good. and referring to previous and related studies, the four factors were identified and explained as follows;

Component 1. 'Technological Sufficiency Challenges' (TSC) involves a set of challenges students encounter in accessing resources and adequate online learning technologies, or lack of internet, low bandwidth, and slow processing speeds. Challenges of this component might also be related to over-sufficient or complex learning technologies used for distance learning. The scale consisted of 9 items (2, 18, 20, 21, 22, 23, 24, 25, 26) reflecting these challenges, and they are; 2. 'It is hard to get help online.', 18. I face technical problems in setting up my devices for online learning.', 20. 'It is hard to get access to technology.', 21. 'I do not feel that

everyone is equal when it comes to access to technology.', 22. 'I notice the lack of internet and updated computer devices.', 23. 'Low speed of the electronic devices and slow Internet connection.', 24. 'I face technical difficulties when doing my homework electronically.', 25. 'I feel distracted by the complexity of technology when doing blended learning homework.', and 26. 'I find technology to be complicated.'

Component 2. 'Technological Competency Challenges' (TCC) involves a set of challenges students encounter in distance learning due to their technological proficiency. These challenges are reflected in their resistance to technology and seeking online help, and learning new technology. Students are distracted by the complexity of technology and by handling different applications and programs. The scale consisted of a set of 6 items (7, 8, 11, 12, 13 and 14) reflecting these challenges, and they are; 7. 'It is hard to use Moodle.', 8. 'I prefer not to use technology.', 11. 'I am not good with using technology.', 12. 'I do not know much about technology.', 13. 'I feel intimidated to use technology due to my age.', and 14. 'I do not wish to be helped with my homework.'

Component 3. 'Student Emotional Challenges' (SEC) involves a set of challenges related to isolation and loneliness feelings due to distance learning. They lose interest in education and feel unease while being the center of attention using microphones, cameras, and video. The scale consisted of 7 items (9, 10, 15, 16, 17, 19, and 27) reflecting these challenges, and they are; 9. 'I feel distracted when using technology in learning.', 10. 'I find it is hard to catch up with online schooling.', 15. 'I do not understand the need to use distance learning.', 16. 'I feel lonely when using blended learning.', 17. 'The feeling of isolation decreases my interest in learning.', 19. 'I feel anxious when I am the center of attention in an online discussion.', and 27. 'I feel bored by lengthy educational videos.'

Component 4. 'Self-management challenges' (SMC) involves a set of challenges students encounter while distance learning experience. They have difficulties managing and steering themselves, their feelings, thoughts, time, and skills during their distance learning experience. The scale consisted of 5 items (1, 3, 4, 5, and 6) reflecting these challenges, and they are; 1. 'I usually procrastinate doing my homework.', 3. 'I cannot organize/prioritize my chores and homework.', 4. 'I do not prepare enough for class.', 5. 'I do not have self-managerial skills.', and 6. 'I copy my colleagues' work.'

Conclusion

During the Covid-19 pandemic, the lockdown affected all sectors, including the higher education institutions. The implementation of the Distance Learning approach was the only solution to resume the learning /teaching process. Online component challenges encountered by all parties involves. The need for a valid and reliable scale to assess these challenges has emerged. Therefore, this study attempted to develop and validate a DLOCC scale. Results of the EFA supported a 27 items scale consisting of four components; TSC, TCC, SEC, and SMC. The components were distinguished and named although some items were loaded on more than one factor, for example; item No. (3) shows a clear loading in the first factor (0.340) and in the fourth factor (0.624), and item No. (7) shows a clear loading in the first factor (0.360) and the second factor (0.487). The results of this study were consistent with the researchers' assumptions of the number of factors composing the scales at phase one, and they construct the items distributed into four subscales that make up the scale in its construction, depending on the literature review and evaluations of the arbitrators. There is no doubt that this result reveals the similarity in the general perception of the concept and dimensions of the DLOCC scale while emphasizing the validity of the scale. Internal consistency of the DLOCC scale proved to be reliable. Cronbach alpha for the TSC, TCC, SEC, SMC were .921, .802, .860, .770) respectively.

Recommendations

We encourage researchers to implement this scale in their future studies.

Acknowledgements or Notes

A special thank you for all who participated in this study.

References

- Adnan, M., & Anwar, K (2020) Online Learning amid the COVID-19 Pandemic: Students' Perspectives. Online Submission, 2(1), 45-51. <https://doi.org/10.33902/jpsp.2020261309>
- Akcayır, G., & Akcayır, M (2018) The flipped classroom: A review of its advantages and challenges. Computers & Education, 126, 334–345. <https://doi.org/10.1016/j.compedu.2018.07.021>
- AlJarrah, A., Thomas, M. K., & Shehab, M (2018) Investigating temporal access in a flipped classroom: Procrastination persists. International Journal of Educational Technology in Higher Education, 15(1), 1. <https://doi.org/10.1186/s41239-017-0083-9>
- Allo, M. D. G. (2020). Is the online learning good in the midst of Covid-19 Pandemic? The case of EFL learners. Jurnal Sinestesia, 10(1), 1-10.
- Angelaki, C (2013) Communication and Social Presence: The Impact on Adult Learners' Emotions in Distance Learning. Journal of the Theoretical Humanities, 16(1), 78-93.

- Azzahra, N. F. (2020). Addressing distance learning barriers in Indonesia amid the Covid-19 pandemic.
- Bailey, K. D., & Morais, D. B (2005) Exploring the use of blended learning in tourism education. *Journal of Teaching in Travel & Tourism*, 4(4), 23-36. https://doi.org/10.1300/j172v04n04_02
- Brown, M. G (2016) Blended instructional practice: A review of the empirical literature on instructors' adoption and use of online tools in face-to-face teaching. *The Internet and Higher Education*, 31, 1–10. <https://doi.org/10.1016/j.iheduc.2016.05.001>
- Chen, E., Kaczmarek, K., & Ohshima, H (2020) Student perceptions of distance learning strategies during COVID-19. *Journal of dental education*. <https://doi.org/10.1002/jdd.12339>
- Chyr, W.-L., Shen, P.-D., Chiang, Y.-C., Lin, J.-B., & Tsai, C.-W (2017) Exploring the effects of online academic help-seeking and flipped learning on improving students' learning. *Journal of Educational Technology & Society*, 20(3), 11–23.
- Comrey, A. L., & Lee, H. B (1992) Interpretation and application of factor analytic results. Comrey AL, Lee HB. *A first course in factor analysis*, 2, 1992.
- Daniel, J. (2020). Education and the COVID-19 pandemic. *Prospects*, 49(1), 91-96.
- Dietrich, N., Kentheswaran, K., Ahmadi, A., Teychené, J., Bessière, Y., Alfenore, S., ... & Hébrard, G (2020) Attempts, successes, and failures of distance learning in the time of COVID-19. *Journal of Chemical Education*, 97(9), 2448-2457. <https://doi.org/10.1021/acs.jchemed.0c00717>
- Eldeeb, R., A (2014) Students' perceptions to e-learning. *IOSR Journal of Research & Method in Education*, 4(3), 33-36.
- Er, E., Kopcha, T. J., Orey, M., & Dustman, W (2015) Exploring college students' online help-seeking behavior in a flipped classroom with a web-based help-seeking tool. *Australasian Journal of Educational Technology*, 31(5). <https://doi.org/10.14742/ajet.2527>
- Grubb, W. N., & Allen, R (2011) Rethinking school funding, resources, incentives, and outcomes. *Journal of Educational Change*, 12(1), 121-130. <https://doi.org/10.1007/s10833-010-9146-6>
- Henrie, C. R., Bodily, R., Manwaring, K. C., & Graham, C. R (2015) Exploring intensive longitudinal measures of student engagement in blended learning. *The International Review of Research in Open and Distributed Learning*, 16(3). <https://doi.org/10.19173/irrodl.v16i3.2015>
- Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A (2020) The difference between emergency remote teaching and online learning. *Educause review*, 27, 1-12.
- Hughes, G. (2007). Using blended learning to increase learner support and improve retention. *Teaching in Higher Education*, 12(3), 349-363.
- Kaur, A., Ahmed, A (2006) E-Learning Challenges as Perceived by Communities of Practice. *AAOU Journal*, 2 (1), 51-65. <https://doi.org/10.1108/aaouj-02-01-2006-b006>
- Keller, C., & Cernerud, L (2002) Students' perceptions of e-learning in university education. *Journal of Educational Media*, 27, 1-2.
- Kenney, J., & Newcombe, E (2011) Adopting a blended learning approach: Challenges encountered and lessons learned in an action research study. *Journal of Asynchronous Learning Networks*, 15(1), 45-57. <https://doi.org/10.24059/olj.v15i1.182>
- Keogh, J. W., Gowthorp, L., & McLean, M (2017) Perceptions of sport science students on the potential applications and limitations of blended learning in their education: a qualitative study. *Sports biomechanics*, 16(3), 297-312. <https://doi.org/10.1080/14763141.2017.1305439>
- Khan, B.H (2005) Managing E-learning Strategies: Design, Delivery, Implementation and Evaluation. Information Science Publishing United State. <https://doi.org/10.4018/978-1-59140-634-1>
- Lassoued, Z., Alhendawi, M., & Bashithalshaaer, R (2020) An exploratory study of the obstacles for achieving quality in distance learning during the COVID-19 pandemic. *Education Sciences*, 10(9), 232. <https://doi.org/10.3390/educsci10090232>
- Lightner, C. A., & Lightner-Laws, C. A (2016) A blended model: Simultaneously teaching a quantitative course traditionally, online, and remotely. *Interactive Learning Environments*, 24(1), 224–238. <https://doi.org/10.1080/10494820.2013.841262>
- Lothridge, K., Fox, J., & Fynan, E (2013) Blended learning: efficient, timely, and cost effective. *Australian Journal of Forensic Sciences*, 45(4), 407-416. <https://doi.org/10.1080/00450618.2013.767375>
- Mamattah, R., Selorm (2016) Students' perceptions of e-Learning. (Master program Adult Learning and Global Change), Linköping University, Linköping. https://doi.org/10.5353/th_991044020098103414
- Mei L., Su L., W Ahmad F.A., & Rosnaini. M (2017) Teachers' Perceptions of E-Learning in Malaysian Secondary Schools. *Malaysian Online Journal of Educational Technology*, 5(2) 20-33
- Mislinawati, V., M., & Nurmasyitah (2018) Students' perceptions on the implementation of e-learning: Helpful or unhelpful? Paper presented at the 6th South East Asia Design Research International Conference. <https://doi.org/10.1088/1742-6596/1088/1/012058>
- Mitchell, P., & Forer, P (2010) Blended learning: The perceptions of first-year geography students. *Journal of Geography in Higher Education*, 34(1), 77-89. <https://doi.org/10.1080/03098260902982484>

- Motaghian, H., Hassanzadeh, A., & Moghadam, D. K (2013) Factors affecting university instructors' adoption of web-based learning systems: Case study of Iran. *Computers & Education*, 61, 158-167. <https://doi.org/10.1016/j.compedu.2012.09.016>
- Rainford, J. (2020). Moving widening participation outreach online: challenge or opportunity?. *Perspectives: Policy and Practice in Higher Education*, 1-5. <https://doi.org/10.1080/13603108.2020.1785968>
- Rasheed, R. A., Kamsin, A., & Abdullah, N. A (2020) Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701. <https://doi.org/10.1016/j.compedu.2019.103701>
- Safford, K., & Stinton, J (2016) Barriers to blended digital distance vocational learning for non-traditional students. *British Journal of Educational Technology*, 47(1), 135–150. <https://doi.org/10.1111/bjet.12222>
- Schneider, S. L., & Council, M. L (2020) Distance learning in the era of COVID-19. *Archives of dermatological research*, 1-2.
- Sun, J. C. Y., Wu, Y. T., & Lee, W. I (2017) The effect of the flipped classroom approach to OpenCourseWare instruction on students' self-regulation. *British Journal of Educational Technology*, 48(3), 713–729. <https://doi.org/10.1111/bjet.12444>
- Sweeney, M. R., Kirwan, A., Kelly, M., Corbally, M., O'Neill, S., Kirwan, M., Hurrican, S., Mathews, A., & Hussey, P (2016) Transition to blended learning: experiences from the first year of our blended learning Bachelor of Nursing Studies programme. *Contemporary nurse*, 52(5), 612-624. <https://doi.org/10.1080/10376178.2016.1197781>
- Tay, H. Y (2016) Investigating engagement in a blended learning course. *Cogent Education*, 3(1), 1135772. <https://doi.org/10.1080/2331186x.2015.1135772>
- Yong, A. G., & Pearce, S (2013) A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in quantitative methods for psychology*, 9(2), 79-94. <https://doi.org/10.20982/tqmp.09.2.p079>

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