
A study of quality assurance impact on online learning outcomes of college students

Received (in revised form): 5th September, 2023



Jianjun Wang

Professor, California State University, USA

Jianjun Wang, PhD and Professor, teaches statistics and research method courses for undergraduate, master's and doctoral programmes. During his tenure since 1993, he made over 100 publications across the academic fields of physics, statistics and educational research. Meanwhile, he worked on external grants totaling more than US\$100m, served on the University Professional Responsibility Committee for eight years, chaired the Department of Advanced Educational Studies for six years, worked as the Faculty Associate in the Student Quality Assurance Impact Research Project of the Chancellor's Office for seven years and mentored the professional growth of junior faculty, lecturers and doctoral students through his teaching and academic support in data analysis for three decades. His current research interests include text analytics, research design and statistical computing.

Department of Advanced Educational Studies, California State University, Bakersfield, 9001 Stockdale Highway, Bakersfield, CA 93311, USA

Tel: +1 661-654-3048; E-mail: jwang@csub.edu

Abstract The effectiveness of online teaching depends on quality assurance (QA) support, including individualised helpdesk assistance and group-based faculty training. The purpose of this study is to examine the QA impact on student learning outcomes through a twofold approach: (1) quantitative analyses of the relationship between QA assistance data and 51,670 grade point average (GPA) records across online courses during the COVID-19 pandemic; and (2) qualitative extraction of the topic patterns about helpdesk services at a state university in California. An R package is employed to capture the primary features of technical assistance. While the QA support is triggered by the massive course switch to online teaching, the impact has been sustained by the fact that many incoming college students have taken online courses during the pandemic and wish to keep the online programme options in higher education. In alignment with the extended needs, the research findings are discussed to draw the future implications of QA support for faculty professional development and student learning in the post-pandemic era.

KEYWORDS: quality assurance, online teaching, mixed methods

A STUDY OF QUALITY ASSURANCE IMPACT ON ONLINE LEARNING OUTCOMES OF COLLEGE STUDENTS

In recent years, the landscape of higher education has undergone a remarkable transformation due to the rise of online learning. Amid this paradigm shift, 'skepticism remains concerning the quality of online courses'.¹ Nonetheless, online classes

continue to attract enrolments primarily because of their flexibility — students can handle the coursework at their own pace. The online setting avoids potential schedule conflicts and is particularly appealing to working professionals in hard-to-reach communities. Remote courseware access is more affordable for reducing the cost of student commuting and campus parking.

Given these attractive features to grow the online sector of higher education, the purpose of this investigation is to examine the impact of quality assurance (QA) on student learning outcomes. QA gained more attention during COVID-19 when online teaching became a dominant platform. As Watkins² noted, 'being forced to teach remotely on short notice during a global pandemic would be framed as the disorienting dilemma'.

The disorientation has created unexpected uncertainties that serve as catalysts for transformative learning.³ In the following sections, QA issues are reviewed to introduce a transformative learning theory (TLT) in the background description. Research questions are derived subsequently to guide the study of QA's impact on student learning outcomes. In the method section, information is provided to clarify the data features and analytic approaches articulating grade point average (GPA) records and QA assistance data during the COVID-19 pandemic. An in-depth analysis is conducted to capture the primary features of technical assistance. The quantitative and qualitative findings are reported in the result section, and a discussion section is created to support the result interpretation.

BACKGROUND

Traditional face-to-face instruction dates to ancient civilizations, where knowledge was orally transmitted from teachers to students. In contrast, the evolution of online teaching is inseparable from the advancements in educational technology. The proliferation of the internet in the 1990s brought about a significant shift from in-person teaching to online course offerings. As a result, the quality matters (QM) standards started to evolve in the late 1990s when educators recognised the need for a comprehensive framework to ensure the quality of online teaching.

QM was developed by a non-profit organisation called MarylandOnline, Inc.,

with a main goal of enhancing online learning experiences through effective course settings that have been supported by research, best practices and instructional design principles. Traditionally, 'The need for regular face-to-face human interaction was considered vital to deliver effective feedback and enhance student learning'.⁴ To sustain the interactive feature, the latest QM standards emphasised the importance of providing a comprehensive course introduction that helps students feel connected to the instructor and the learning community.⁵ Accordingly, instructors were encouraged to establish a visible and active presence through introductory videos, personalised messages and regular communications to create a sense of instructor-student interaction. The QM standards also advocated for the effective use of discussion boards, group projects, peer assessments and collaborative activities to facilitate student engagement and simulate the dynamic exchanges in face-to-face classrooms. As an easy-to-implement strategy, the QM workshop has been widely adopted in faculty professional development to support quality enhancement in online education.⁶

Given the complexity of online teaching, QM does not represent a one-size-fits-all approach.⁷ Another component, helpdesk assistance, is typically included to complement the content of QM workshops and address individualised instructional needs.⁸ Due to different faculty preparations, technical assistance covers various topics that cannot be adequately addressed by the generic QM standards.⁹ Therefore, the group-based QM training and individualised helpdesk support compose the dual emphases of the QA pursuits in this investigation.

Despite the rapid expansion of online teaching, it is imperative to recognise that not all courses can be readily offered online. The diverse nature of higher education necessitates a nuanced understanding of the limitations of online instruction. For

instance, disciplines such as sciences, fine arts and vocational training demand hands-on experience, close supervision and real-time feedback that are hardly available online. Certain fields, such as healthcare, education and professional training, also require extensive practicum and skill development. Online learning is less conducive to honing practical skills, building professional networks and preparing students for school-to-work transition.

The misalignment between teaching modes and learning expectations may lead to a feeling of disorientation and induce critical reflection on the eLearning experiment, with consequences of stakeholder concern yet to be fully assessed.¹⁰ More specifically, an initial assumption of effective online teaching by tech-savvy teachers has been extrapolated to generalise to nearly all instructors.¹¹ Inevitably, the public health emergency has triggered adaptation that demands transformative learning to cope with the disorienting dilemma. In the past, 'Few empirical studies exist about fostering transformative learning in online environments'.¹² During the pandemic, a good portion of the existing practice must be abandoned from the face-to-face setting,¹³ and universities must invest more resources for online instructor preparation to support the transformative learning process.¹⁴ Govindarajan and Srivastava¹⁵ specifically suggested that faculty professional development and helpdesk support are the two approaches to confronting the disorienting dilemma.

The theory of transformative learning originated from adult education,¹⁶ which made it particularly relevant to instructional adaptation in higher education. As educators transitioned to online teaching due to campus closedown, TLT guided the critical reflection of QA factors, including faculty training and network building.¹⁷ QM workshops were built on 'the most widely used quality assurance rubric'¹⁸ to assist novice online instructors in improving their

course design. The professional development activities fostered a transformational dialogue between instructors and helpdesk professionals in a meaningful partnership building. In the research literature, networking had a proven record of success in strengthening the quality of online teaching.¹⁹

Altogether, the QA pursuit is needed because of 'the unique nature of online courses and the distinct skills necessary to create a quality online course'.²⁰ QA enforcement is impactful in institutional capacity building, including sustaining the faculty training to improve online course designs according to the QM quality standards. As a result, the California State University (CSU) System provides a 25–33 per cent discount on course enrolments that are certified by the latest QM rubric. Other universities, such as the State University of New York System, use the quality scorecard of the Online Learning Consortium (OLC). To improve the overall quality of online courses, a unique approach of the CSU Quality Learning and Teaching (2023) hinges on its development of an advanced Quality Learning & Teaching (QLT) rubric that aligns with and expands beyond the QM rubric. In comparison, the latest QM rubric has 44 standards across eight sections. The current version of OLT includes 52 objectives across nine sections to raise the quality bar for online teaching.²¹ The CSU effort started in 2011 and earned the university system an Outstanding Impact Award at the 2016 Annual QM Conference.²²

RESEARCH QUESTIONS

Pedro and Kumar²³ pointed out: 'Although faculty roles might vary depending on institutional structures and academic policies, effective systems and supports are needed to ensure that they are able to successfully teach in online environments.' A null hypothesis for statistical analyses assumes no

significant impact of QA support on student achievement. The hypothesis is pertinent to online teaching because many universities have already required QM training to improve online course design prior to the pandemic.²⁴ Meanwhile, ‘Good technical assistance is assumed and hardly noticed’.²⁵ Accordingly, three questions have been derived to guide this study:

1. Do QM training and helpdesk support significantly affect student learning outcomes in online classes?
2. Which of the factors demonstrates a larger effect size to show more practical importance?
3. What is the pattern of helpdesk ticket description to feature the QA assistance?

While the QM training conforms to its professional rubric specification, the helpdesk support is open-ended, subjecting to the need for various faculty teaching demands. Given the fact that not all factors are equally weighted, this investigation is expected to reveal whether the group-based QM training requirement, albeit its benefits, supersedes the impact of individualised helpdesk assistance as a quality assurance measure.

METHOD

The study site is selected at California State University, Bakersfield (CSUB), which has a service area as large as the state of New Jersey. The demand for online course offerings supports the creation of a *faculty associate* position for this author to identify and access the quantitative and qualitative information across different university divisions, including the QM training records from the Faculty Teaching and Learning Center and helpdesk service information from Instructional Technology (IT) department. The GPA information is exported by the institutional research office. The data merge between the GPA records and helpdesk tickets is grounded on the faculty ID that is common in the class

roster and IT documentation. Data collection for this investigation has been approved by the Institutional Review Board.

The quantitative data from autumn 2021 included 51,670 GPA records, and a dummy code was created to indicate whether faculty had QM training. In addition, ticket counts have been employed to examine the helpdesk service. GPA is measured on an interval scale to assess student outcome, and ticket count is aggregated on a ratio scale to document helpdesk services. Since student learning is affected by the multifaceted QA support, the data articulation enables this investigation to incorporate both helpdesk assistance and QM training factors in a regression analysis. To assess the effect sizes of regression factors, Guinn²⁶ suggested a semi partial eta-square index from standard software packages such as SAS. Because of the large sample, η^2 can be considered unbiased.²⁷ Khalilzadeh and Tasci²⁸ further asserted that ‘the square root of η^2 should be used as the effect size, instead of η^2 itself’. The eta (η) values are computed to assess the practical impact of QM training and helpdesk consulting in this study.

While ticket counts may help quantify the helpdesk workload, the details about IT assistance need a narrative description. For instance, Bailey²⁹ argued the importance of ticket archives for quality enhancement. In the qualitative inquiry, service descriptions are pulled from 8,494 ticket records to capture the nature of helpdesk support during 2019–2022. The topic mining is run by an R package, Quanteda. According to Benoit *et al.*,³⁰ Quanteda uses C++ and multithreading extensively and is considerably faster and more efficient than other R and Python packages in processing large textual data. The software application follows a natural language process (NLP) algorithm to: (1) identify primary topics through tokenisation; (2) reduce data sparsity with word-stemming; (3) simplify the information pooling by stopping word deletion; and (4) extract useful information via lemmatisation. In the end, a plot of

top-impact words is created to describe the features of helpdesk support.

In combination, this study is designed to not only produce statistical findings from large data (n = 51,670) in the quantitative analysis (Questions 1 and 2), but also drill down to the pattern of individualised support across 8,494 helpdesk tickets in qualitative inquiries (Question 3). While the quantitative method reveals the significance of QA factors, the qualitative approach further substantiates the characteristics of helpdesk assistance in a trend description.

RESULTS

Although QM workshops were offered to support online teaching before COVID-19, QM training remains a variable option because not all instructors have been originally assigned to teach online courses during the pandemic. The results show that 68.9 per cent of the CSUB teaching faculty do not have QM training. The background differences have led to various demands for helpdesk consulting. Table 1 shows that the helpdesk ticket count and QM training completion are significant factors in student GPA outcomes at $\alpha = .0001$.

Although it is not unusual to obtain a small η value in social science research,³¹ the effect size comparison indicates a relatively stronger impact on GPA from helpdesk consulting than QM training (see Table 1). In part, this is because the QM training factor is coded as a dummy factor with 0 and 1 values to indicate whether instructors completed the QM certificate. In contrast, the consulting count ranges from 0 to 54 (see Figure 1) and has a more expanded scale to describe its impact.

Features of the helpdesk support are extracted from text analytics to track the

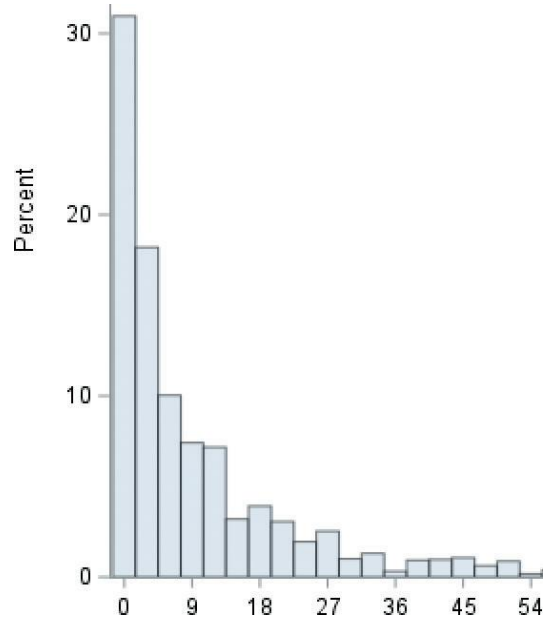


Figure 1: Distribution of helpdesk consulting counts

tokenised terms on the time dimension (see Figure 2). Coinciding with the outbreak of COVID-19, a sharp increase in helpdesk demand occurred in 2020. Except for the service count of 608 by the mid-term of spring 2022, a declining trend is observed in Figure 2 since 2020, which suggests alleviation of the helpdesk burden after the sustained QA provision.

Text mining is further conducted on the helpdesk records during 2019–2022. In 2019, online instructors were required to have QM training.³² Hence, topics of the helpdesk assistance were related to special tasks of online teaching, such as *TechSmith video editing* and *Turnitin plagiarism confirmation*. In this context, online teaching not only requires pedagogical changes, but also demands the use of instructional technology, such as a learning management system (LMS), to support remote

Table 1: Parameter estimates from the multiple regression analysis

Variable	df	β	t	p	Effect size
QM training	1	2.14146	70.26	<.0001	.04
Helpdesk consulting	1	0.03434	52.36	<.0001	.09

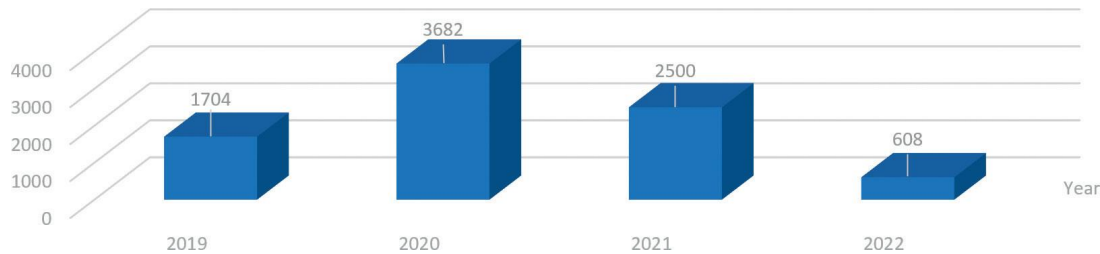


Figure 2: Helpdesk service counts

communication. *Blackboard* and *Canvas* are the LMS icons that have been highlighted in Figure 3. Because of the word-stemming operation in R, keywords such as ‘canvas’ are truncated as ‘canva’ in the plot. In addition, course merges and combinations surfaced as key topics after 2020.

DISCUSSION

After reinstalling face-to-face instruction in the post-pandemic era, many incoming students might still choose online classes because of their past learning experiences from high school. The QA mechanism established in COVID-19 is likely to sustain technology integration and pedagogical improvement for remote courseware access. While QM training offers general guidance for selecting and using technology tools that align with accessibility standards, the helpdesk service enables educators to troubleshoot technical issues. The quantitative data analyses in this study indicated that the group-based QM workshops and individualised technical assistance had a significant impact on student achievement.

It is crucial to acknowledge that not all factors of student performance can be modified by instructional pedagogies. So far, the QA approaches, including QM training, primarily addressed the variables that are adjustable through course designs. In higher education, student learning is channelled through academic departments. For instance, science, technology, engineering and mathematics majors are often associated with

more challenging coursework, which can result in lower GPAs. Without considering the discipline-specific characteristics, helpdesk support and QM training cannot be expected to explain a large portion of the variability in student GPA across the university. However, per indication of the effect size configuration, studying these modifiable variables is essential due to their implication in improving educational outcomes. In this regard, one limitation of this study hinges on its exclusion of non-modifiable factors, such as student gender, socioeconomic status and department affiliation, that cannot be adjusted by the QA approaches.

With the lessons learned and the experiences gained, quality enhancement can be supported mutually in online and face-to-face classes. As Whitelaw *et al.*³³ pointed out, ‘our definition of transformative learning focuses on the faculty members’ transformation in their role’. Through peer coaching and helpdesk assistance, instructors in face-to-face teaching may consider incorporating digital platforms to facilitate student collaboration on group projects. In addition, instructors who gained problem-solving skills from online teaching may set a role model of transformative learning to benefit students in addressing issues of disorienting dilemmas during unexpected circumstances. Because good teaching strategies often transcend across the modes of instruction, this study assumed similar effectiveness between synchronous and asynchronous course deliveries. It was also postulated that the QA commitments can sustain the improvement of student

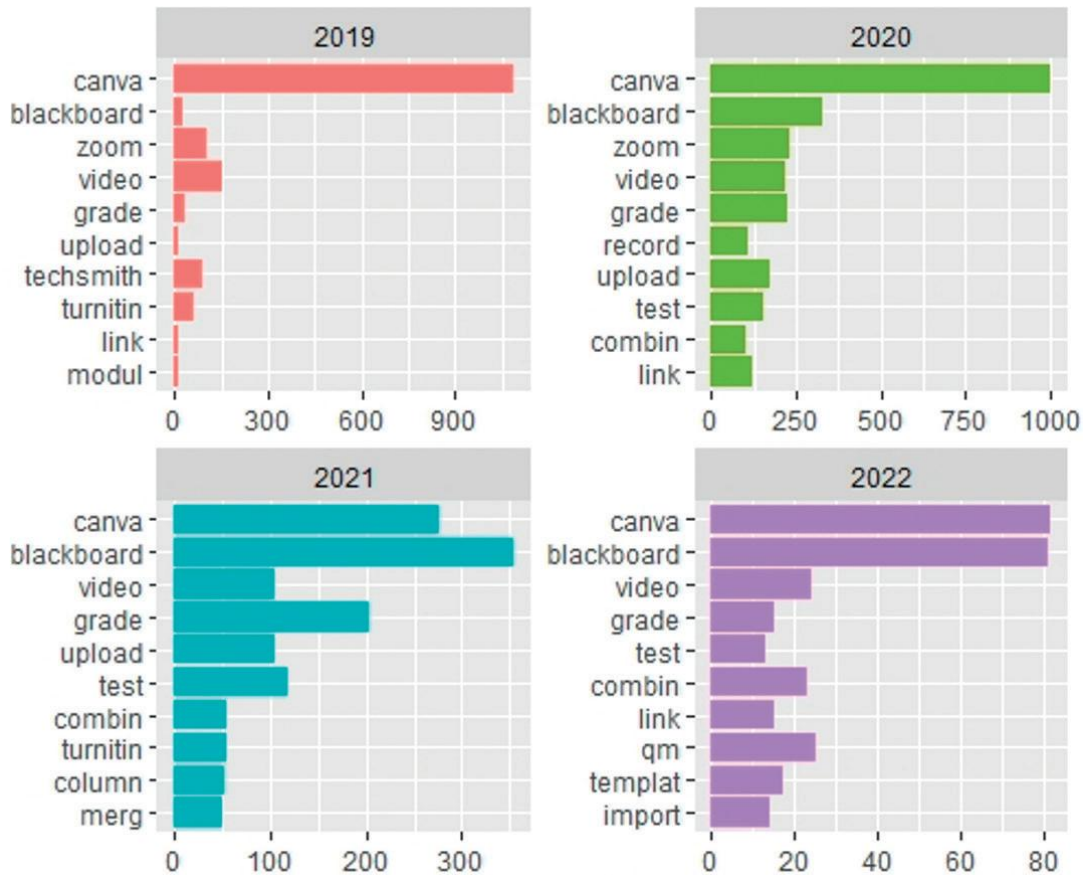


Figure 3: Patterns of the tokenised topics from helpdesk services

achievement in both online and face-to-face classes.

In the qualitative inquiries, Figure 2 shows an increase in the helpdesk ticket counts from 2019 to 2020 and 2021 to confirm the need for transformative learning during the period of massive course switch to online teaching. Based on the patterns of tokenised topics in Figure 3, helpdesk services were inseparable from the LMS, such as Canvas and Blackboard, that have been constantly used in online teaching. When QM standards were in their infancy, Boger³⁴ already stressed, ‘access to online helpdesk professionals is critical’. As the pandemic impact lifted in spring 2022, QM and *template* remained as keywords in Figure 3 to highlight the need for sustained support from helpdesk assistance and QM training.

During the pandemic, the attention was switched from the online module refinement to the massive transfer of face-to-face classes, which left *module* as a tokenised topic only in 2019, the year before COVID-19 (see Figure 3). Other terms, such as *Zoom*, *video link* and *grade upload*, represented the common practice of online teaching and were shared as a key topic across multiple years. One exception was the use of *TechSmith* tools and *Turnitin* software that did not carry over from 2019 to 2020 (see Figure 3). Perhaps because the course transition to online teaching was overwhelming in 2020, these terms for video editing and plagiarism prevention, despite their importance, did not enter the top-impact token list in Figure 3. However, the *Turnitin* token resurfaced in 2021 when

grade became the second most frequently mentioned topic below the *canvas* and *blackboard* tokens. In 2022, technical support maintained similar features of *file linking*, *combining* and *exporting*.

In summary, QM training and helpdesk support are treated as critical QA approaches in both quantitative and qualitative inquiries of this investigation. As Kavun³⁵ argued, ‘Consulting instructional designers should not happen only in the time of crisis’. Due to the distraction of COVID-19, no survey was conducted to collect the stakeholder’s opinions about online teaching. Hence, an important topic for future research is examining whether the views of education stakeholders have changed since COVID-19.

In the method consideration, Bentley *et al.*³⁶ support the use of ticket counts to ‘measure the individual performance of its IT technicians’. Nonetheless, the ticket count might be too simplistic without considering the waiting time for ticket completion. In comparison to the group-based QM training, the effect size findings reconfirmed the greater need for helpdesk support (see Table 1). Hence, timely assistance can be crucial to delivering effective online courses. In this regard, more qualitative studies are needed in the future to substantiate the contribution of timely technical assistance in minimising instructional disruptions, and thus, boosting student GPA outcomes.

ACKNOWLEDGMENT

This paper is developed from the Student Quality Assurance Impact Research Project (SQuAIR) that received funding from the Chancellor’s Office of the California State University (CSU). The author wishes to thank Ms Chris Shiery and Professor Rebecca Weller for leading the Faculty Teaching and Learning Center (TLC) in the faculty QM training data tracking at CSU, Bakersfield.

References

1. Mootispaw, A. D. (2022), ‘Online course completion rates and Quality Matters course templates’, p. 3, OhioLINK, available at https://etd.ohiolink.edu/acprod/odb_etd/ws/send_file/send?accession=frank1651585296183824&disposition=inline (accessed 5th September, 2023).
2. Watkins, P. (2021), ‘How did remote teaching during the COVID-19 crisis affect faculty’s attitudes and beliefs about Online teaching?’, p. 4, ProQuest, available at <https://www.proquest.com/openview/0c6f73019e8a12b3644c82fad64b1ff7/1?pq-origsite=gscholar&cbl=18750&diss=y> (accessed 5th September, 2023).
3. Mabwe, K., Chiyaka, E. T. and Sithole, A. (2023), ‘Assessing academics’ COVID-19-induced emergency remote teaching experiences using transformative learning theory’, *Journal of Transformative Education*, 15413446231155433.
4. Fine, P. D., Leung, A., Tonni, I. and Louca, C. (2022), ‘Teachers’ feedback practices in COVID-19: Has anything changed?’, *Journal of Dentistry*, Vol. 120, 104087, p. 3.
5. Mancilla, R. and Frey, B. A. (eds) (2023), *Guide to Digital Accessibility: Policies, Practices, and Professional Development*, Taylor & Francis, London.
6. Murillo, A. P. and Jones, K. M. (2020), ‘A “just-in-time” pragmatic approach to creating Quality Matters-informed online courses’, *Information and Learning Sciences*, Vol. 121, Nos. 5/6, pp. 365–80.
7. Bryan, C., Leeds, E. and Wiley, T. (2018), ‘The cost of online education: Leveraging data to identify efficiencies’, *Online Journal of Distance Learning Administration*, Vol. 21, No. 2, pp. 49–52.
8. Kavun, N. (2021), ‘Undergraduate students’ experiences of online learning environments’, OhioLINK, available at https://etd.ohiolink.edu/apexprod/rws_etd/send_file/send?accession=ohiou1627938399767033&disposition=inline (accessed 5th September, 2023).
9. Gosselin, D. J. (2017), ‘Faculty self-efficacy instructing in a hybrid learning environment at a career college’, Scholar Works, available at <https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=4876&context=dissertations> (accessed 5th September, 2023).
10. Mabwe *et al.*, ref. 3 above.
11. Lau, J., Yang, B. and Dasgupta, R. (2020), ‘Will the Coronavirus make online education go viral?’, Times Higher Education, available at <https://www.timeshighereducation.com/features/will-coronavirus-makeonlineeducation-go-viral> (accessed 5th September, 2023).
12. Cochrane, K. (2016), ‘Transformative learning in online professional development’, p. 15, Northeastern University Library, available at <https://repository.library.northeastern.edu/files/neu:cj82pn15k/fulltext.pdf> (accessed 5th September, 2023).
13. Sjolie, E., Francisco, S., Mahon, K., Kaukko, M. and Kemmis, S. (2020), ‘Learning of academics in the time of the Coronavirus pandemic’, *Journal of Praxis in Higher Education*, Vol. 2, No. 1, pp. 85–107.

14. Davidson, G. L. (2021), 'A qualitative study exploring online teaching at a rural community college: How do faculty prepare to teach online?', *Encompass*, available at <https://encompass.eku.edu/cgi/viewcontent.cgi?article=1701&context=etd> (accessed 5th September, 2023).
15. Govindarajan, V. and Srivastava, A. (2020), 'What the shift to virtual learning could mean for the future of higher ed', *Harvard Business Review*, Vol. 31, No. 1, pp. 3–8.
16. Mezirow, J. (1997), 'Transformative learning: Theory to practice', *New Directions for Adult and Continuing Education*, Vol. 74, pp. 5–12.
17. Castellanos, J., White, J. L. and Franco, V. (2023), *Riding the Academic Freedom Train: A Culturally Responsive, Multigenerational Mentoring Model*, Taylor & Francis, London.
18. Mayper, T. (2022), 'Faculty perception of quality assurance in online courses', p. 9, ProQuest, available at <https://www.proquest.com/openview/d4dfdcdd75bc7d1b75c50ae5c31002f5/1?pq-origsite=gscholar&cbl=18750&diss=y> (accessed 5th September, 2023).
19. McQuiggan, C. S. (2007), 'The role of faculty development in online teaching's potential to question teaching beliefs and assumptions', *OJDLA*, available at <https://ojdla.com/archive/fall103/mcquiggan103.pdf> (accessed 18th October 2023).
20. Quiroz, R. E., Ritter, N. L., Li, Y., Newton, R. C. and Palkar, T. (2016), 'Teaching K-12 educators to build quality online courses', *Journal of Online Learning Research*, Vol. 2, No. 2, pp. 123–144.
21. CSU Quality Learning and Teaching (2023), 'Rubric', The California State University, available at <https://ocs.calstate.edu/rubrics> (accessed 5th September, 2023).
22. Salvador, C. (2017), 'CSU's quality assurance of online teaching and learning gain national recognition', The California State University, available at <https://www.calstate.edu/csu-system/news/Pages/CSU%E2%80%99s-Quality-Assurance-of-Online-Teaching-and-Learning-Gain-National-Recognition.aspx> (accessed 5th September, 2023).
23. Pedro, N. S. and Kumar, S. (2020), 'Institutional support for online teaching in quality assurance frameworks', *Online Learning*, Vol. 24, No. 3, pp. 50–66.
24. Roehrs, C., Wang, L. and Kendrick, D. (2013), 'Preparing faculty to use the Quality Matters Model for course improvement', *Journal of Online Learning and Teaching*, Vol. 9, No. 1, pp. 52–67.
25. Van Wart, M., Ni, A., Rose, L., McWeeney, T. and Worrell, R. (2019), 'A literature review and model of online teaching effectiveness integrating concerns for learning achievement, student satisfaction, faculty satisfaction, and institutional results', *Pan-Pacific Journal of Business Research*, Vol. 10, No. 1, pp. 1–22.
26. Guinn, C. S. (2017), 'Contextualized Teacher-Training and Racial/Ethnic Tensions in US Schools', (dissertation), California State University, Fresno, available at https://repository.library.fresnostate.edu/bitstream/handle/10211.3/198434/Guinn_csu_6050D_10450.pdf?sequence=1 (accessed 18th October, 2023).
27. Mordkoff, J. T. (2019), 'A simple method for removing bias from a popular measure of standardized effect size', *Advances in Methods and Practices in Psychological Science*, Vol. 2, No. 3, pp. 228–232.
28. Khalilzadeh, J. and Tasci, A. D. (2017), 'Large sample size, significance level, and the effect size', *Tourism Management*, Vol. 62, pp. 89–96.
29. Bailey, J. (2012), 'Results of a customer-satisfaction survey with a convenience sample', UTA Libraries Research Commons, available at https://rc.library.uta.edu/uta-ir/bitstream/handle/10106/9174/BaileyNLWarticle_preprint.pdf?sequence=3&isAllowed=y (accessed 5th September, 2023).
30. Benoit, K., Watanabe, K., Wang, H., Nulty, P., Obeng, A., Müller, S. and Matsuo, A. (2018), 'quanteda: An R package for the quantitative analysis of textual data', *Journal of Open Source Software*, Vol. 3, No. 30, p. 774.
31. Shanthi, R. (2019), *Multivariate Data Analysis*, MJP Publisher, Delhi.
32. California State University, Bakersfield, 'Initial Requirements to Teach Online or Hybrid Classes for CSUB', available at <https://maindata.csub.edu/media/26956/download?attachment> (accessed 5th September, 2023).
33. Whitelaw, C., Sears, M. and Campbell, K. (2004), 'Transformative learning in a faculty professional development context', *Journal of Transformative Education*, Vol. 2, No. 1, pp. 9–27.
34. Boger, S. (2001), 'Instructional design', p. 49, Institute of Education Services, available at <https://files.eric.ed.gov/fulltext/ED457829.pdf> (accessed 5th September, 2023).
35. Kavun, ref. 8 above, p. 117.
36. Bentley, J., Blake, C., Shackell, M. and Trafford, P. (2020), 'Let me explain!', *Strategic Finance*, Vol. 101, No. 9, pp. 46–53.