Optimizing Online Teaching: Total Quality Management in Action for Quality Assurance Measures

Sun Wei[1,2] & Guozhen Yin[3]

[1] School of English, Jilin International Studies University, Changchun 130117, China

[2] English Department, Sunchon National University, Sunchon-si 162742, Korea

[3] School of Foreign Language Education, Qingdao University, Qingdao 266071, China

Correspondence: Guozhen Yin, School of Foreign Language Education, Qingdao University, Qingdao 266071, China.

Abstract

The large-scale online teaching amid the pandemic triggered increasing concern over online teaching management and quality assurance. Take the theory of Total Quality Management (TQM) as guidance, a Chinese higher education institution (CHEI) built a multi-level, multi-link, and multi-dimensional teaching quality monitoring system (Online Teaching Quality Assurance Measures) with full participation, whole process, and all-round development by innovating teaching quality management and monitoring mechanism, aiming to ensure the continuous improvement of talent training quality to realize the sustainable development of application-oriented undergraduate universities with quality improvement as the core. The effectiveness of online teaching quality was demonstrated through the Questionnaire of Student Evaluation of Online Teaching Faculty and students' academic performance (GPA) before and after the implementation of Online Teaching Quality Assurance Measures, guided by the principles of Total Quality Management theory. The results indicated that Online Teaching Quality Assurance Measures have a series of positive effects on online teaching in CHEI, and systematically guide online instructors as evidenced by outstanding ratings and feedback in course evaluations and students' academic performance. This study also revealed that CHEI's online teaching is facing some challenges, especially in the effort to promote learning interaction and teaching cooperation. The study underscored the importance of continuous improvement and provided some interventions in enhancing online educational practices, aligning with TQM principles. The findings are expected to make an important contribution to the field of online teaching quality management in higher education.

Keywords: effectiveness, Online Teaching Quality Assurance Measures, Total Quality Management, interventions

1. Introduction

Since the early spring of 2020, Chinese universities have been witnessing a significant "migration" from traditional in-class face-to-face instruction to online education on a scale never seen before. Because of the prevalence of the pandemic around the world, and in accordance with the government's mandate of "nonstop teaching and learning", most Chinese colleges have begun to offer online courses. Millions of faculty members began to lecture in front of a computer screen in a short period of time, and their students were required to stay at home and take courses via internet. Beyond China, with the expansion of the pandemic around the world, 61 countries in Africa, Asia, Europe, the Middle East, North America, and South America had declared or implemented school and university closures as of March 13, with the majority of universities enforcing localized closures (UNESCO, 2020).

During the pandemic, China's higher education institutions significantly increased their use of online education (Sun et al., 2020; Yang, 2020; Zhu & Liu, 2020). Multiple scholars have explored the online experiences of administrators, teachers, and students during this transformation (Sun et al., 2020; Zhu & Liu, 2020). Most academics agreed that this development heralds a shift toward more use of online education methods in the future, while also highlighted problems that must be overcome (Huang, 2020; Zhu & Liu, 2020). In such cases, institutions and teacher educators had to quickly respond to an unexpected and "forced" transition from

face-to-face to remote teaching (Carmen & Maria, 2020; Turnbull et al., 2020).

There is a growing body of literature that recognizes the importance of online teaching quality and online teaching management. Online teaching management is made more difficult by the online learning environment (Hassan, 2021; Mishra et al., 2020). It's tough to keep students engaged, and appropriately interacting in this context, whether you're teaching entirely online or only using online features as part of in-person training (Bhuana & Apriliyanti, 2021). Traditionally, online course quality has been assessed for relevance to the student by evaluating course design, learning resources, and the course delivery process (Sepulveda-Escobar & Morrison, 2020). Schools have started investigating criteria to compare the academic rigor and integrity of online courses with those offered in person (Richmond et al., 2021). The quality control method considers the process at various levels ranging in breadth from macro, such as institutional monitoring, to micro, such as delivering assistance in orienting the student to the online learning environment through the types of involvement available in the course delivery (Shraim, 2020). A search of the literature revealed few studies investigating quality assurance measures of online teaching and students' academic performance, which potentially provide some guidance to online teaching management practice.

This research is dedicated to examining the impact of the Online Teaching Quality Assurance Measures under the paradigm of Total Quality Management (TQM) theory in a Chinese higher education institution (hereby called CHEI) from the perspectives of learners' evaluation and student academic performance (GPA). The second purpose of this research is to explore the potential weaknesses of online teaching at this Chinese higher education institution and develop some interventions for further teaching quality improvement. The research questions are as follows:

1) Is it effective to implement Online Teaching Quality Assurance Measures under the guidance of Total Quality Management (TQM)?

2) What interventions can be suggested to further improve online teaching quality based on the results?

2. Literature Review

2.1 Online Leaching

The words online learning and remote learning, as well as blended learning and e-learning, are sometimes used interchangeably. Online learning has become an important aspect of education globally during the last three decades (Singh & Thurman, 2019). It is vital to comprehend online learning expectations as well as online teaching practice (i.e. the design and delivery of learning online). What constitutes online learning, however, and how to construct it to enable online learning, remains a hazy area of education and educational research (Zhang et al., 2020).

One cause of this problem is our misunderstanding of "online learning". Singh and Thurman (2019) discovered 46 alternative definitions of online learning, the majority of which originated from the setting of higher education. There are a few universally agreed-upon characteristics of online learning; nevertheless, they are frequently understood differently and have changed over time as digital technologies supporting online learning have evolved. A lack of a precise definition in the field hinders the potential of clear articulation in teaching, identifying exemplars, and providing assistance on how to address design issues (Singh & Thurman, 2019). As a result, schools that implement online learning are left with little guidance on how instructors might be supported or what a suitable vision for online learning can be.

Countries began implementing lockdowns on March 13, which meant shutting down sectors of the economy (Hirsch, 2020). This accelerated the global transition to totally online teaching and learning for schools and universities. Teachers were suddenly required to give online instruction, creating a foreign scenario for themselves and their pupils (Ferdig et al., 2020). Because online learning has not been well defined (e.g., Singh & Thurman, 2019), and it is very varied, the move to online teaching for secondary teachers and students was abrupt and chaotic (Howard et al., 2021). In part, the lack of clarity led to a scarcity of evidence on best practices to guide the transition. Furthermore, many teachers lack expertise in online pedagogies or how to promote online learning because it is not covered in many teacher training programs (Carrillo & Flores, 2020). As a result, many school teachers are unfamiliar with and have limited experience with online learning and teaching (Hassan et al., 2020).

Questions about online education may include how to deliver clear instruction, how to communicate most effectively, and how to assess learning most efficiently (Gurley, 2018; Nilson & Goodson, 2021). Additionally, users in online teaching encounter challenges such as difficulty reaching students, motivating them, and a lack of technical/software knowledge (Gurung, 2021). As a result, to learn from teachers' experiences with the rapid

transition to online teaching during the Covid-19 pandemic, it is necessary to investigate what quality assurance measures have been adopted and the effectiveness of online teaching from students' perspectives.

2.2 Quality Assurance in Education

Quality assurance has its origins in large-scale manufacturing (Morariu et al., 2021) when monitoring production quality became more crucial in the second part of the twentieth century. According to Jain and Prasad (2018), quality assurance in education can be viewed as an expansion of the conventional systemic checks and balances. In some aspects, quality assurance in education is a relatively recent concept and differs from other aspects of education.

The university distinguishes various aspects of quality, including course design, delivery, mentoring, administration, support services, and technologies (Britto et al., 2013; Collier, 2023). These dimensions, taken together, have an impact on the overall quality of students' online learning experience. While objective criteria and applicable standards can be used to assess quality, each student's experience is subjective and unique, and it may be skewed due to key events or course components. As a result, quality is a variable that must be evaluated from various angles, and its definition encompasses multiple dimensions. These include, but are not limited to, the use of university-wide, standardized course evaluations, quality enhancement reviews, and standardized forms and procedures for the approval of course syllabi and program specifications (Hanna & Hanna, 2023). In this study, quality is evidenced through students' perspectives, as reflected in their evaluations of online teaching and academic performance.

2.3 Total Quality Management Theory (TQM)

The education industry was among the service industries to which TQM concepts and techniques were introduced in the 1980s. It alludes to a successful management theory that states that an organization should put quality first, use full participation as the cornerstone, conduct various tasks related to quality management, and achieve long-term success through satisfying customers and maximizing benefits for both the organization and society as a whole. The achievement of all management goals is connected to the quality idea in the TQM philosophy. The TQM theory places a strong emphasis on staff participation and overall process quality management. In the 1980s, American colleges and universities were the first to implement TQM theory in higher education management. The increased competitiveness among educational institutions, especially those in higher education, was directly linked to the growth of TQM in the education sector (Tien et al., 2022).

The Total Quality Management theory has garnered significant attention from educationalists, policymakers, scholars, and researchers due to its efficaciousness in promoting continuous improvement, customer satisfaction, and organizational excellence. This is further supported by the findings of Yusuf (2023), who discovered that TQM components are applicable in the setting of higher education and that TQM may be crucial in streamlining procedures and raising customer satisfaction. Within the research subjects of the existing studies on Total Quality Management, teaching and learning came in first. Scholars have investigated education from several perspectives, such as accreditation and quality control (Jasti et al., 2022), enhancement of instructional strategies (Igbinakhase & Naidoo, 2020), and student learning experiences (Mkheimer & Ibrahim, 2020).

Practice has proved that TQM plays a great role in promoting the improvement of educational management levels (Sciarelli et al., 2020; Wani & Mehraj, 2014). In the post-epidemic era, faced with the challenge of new teaching methods, educational institutes must innovate the teaching quality management and monitoring mechanism, and constantly improve the teaching quality, so as to achieve the purpose of cultivating high-quality talents for the society (Díez et al., 2020). The teaching quality of colleges and universities involves all aspects, levels, departments, and teaching links of the university. Therefore, it is necessary to introduce the theory of TQM and make top-level design based on the characteristics of the university, to build a multi-level, multi-link and multi-dimensional teaching quality monitoring system with the participation of all staff, and the whole process.

TQM views an organization as a collection of interconnected processes. TQM is a methodology that incorporates employees and management in the continuous improvement of the production of goods and services. According to Goetsch & Davis (1994) and Magd & Karyamsetty (2020), TQM is a series of continuous improvement activities that involve all company stakeholders in a fully integrated effort to improve performance at all levels. Chen et al. (2020) remarked that for an institution to give quality service in this fast-paced world, TQM fosters an environment where all the resources are employed creatively and effectively.

2.4 The Teaching Quality Assurance System in CHEI Constructed Under the Guidance of TQM Theory

According to the theory of TQM, the construction of online teaching quality monitoring system in CHEI follows

three principles (as cited by Lei & Zhu, 2023). One is universality. All personnel from top to bottom, including school leaders, administrators, supervisors, teachers, and students, are required to have a sense of quality and participate in online teaching quality management and monitoring. Second, the whole process. It requires not only online teaching quality management and monitoring in the teaching process but also to extend the online teaching quality management and monitoring to the beginning of the teaching process and the end of the teaching process, to form a closed-loop online teaching quality monitoring system. Third, it is all-dimensional. It requires multi-dimensional management and monitoring of related factors affecting online teaching quality, not only from teaching methods, and teaching means, but also from teaching space, teaching time, teaching conditions, and other aspects of comprehensive management and monitoring.

2.4.1 Multi-Level Online Teaching Quality Monitoring with Full Participation

Regarding top-level management, CHEI attached great importance to the teaching quality management and monitoring work, the establishment of school leaders, and the leadership of relevant functional departments. The leading group of teaching quality management and monitoring, combined with the actual situation of the school, determined the decisive plan to improve the teaching quality in top-level design and planning.

Coming to the middle-level management, CHEI Teaching Quality Management Center as the specific execution department of teaching quality management and monitoring, is responsible for the development of teaching quality management and monitoring objectives, systems, procedures, and specific standards. CHEI set up a teaching supervision team at the university level, to collect, make statistics and analyze the online teaching quality data of the school, compile regular teaching inspection reports, and guide the secondary colleges to carry out online teaching quality management and monitoring.

To the lower-level management, CHEI gave full play to the role of teaching supervision in online teaching quality control and helped teachers especially young teachers to improve their teaching ability and level. The forms of teaching supervision include the examination of teaching materials, in-class lectures, online course sampling, teaching guidance feedback, teacher interview, etc. The evaluation content includes teaching attitude, teaching content, teaching organization and implementation, platform teaching resources construction, teaching effect, etc.

Organizations at all levels also carried out a variety of forms of evaluation, such as teacher self-evaluation, peer evaluation, student evaluation, etc., to stimulate the willingness and enthusiasm of teachers to improve teaching level, and to improve teachers' emphasis on online teaching quality engagement.

2.4.2 The Whole-Process and Multi-Link Online Teaching Quality Monitoring

The online teaching quality monitoring runs through the whole teaching process, that is, the whole process of online teaching quality evaluation, management and monitoring were carried out before, during and after the implementation of teaching, forming a closed-loop online teaching quality monitoring system.

Before the implementation of teaching, CHEI timely introduced the online teaching quality management and monitoring system, and the Teaching Administration Office formulated the principle of talent cultivation program according to the school's development goals and school-running orientation, and on this basis, each secondary college shall formulate professional talent cultivation program and submit it to the Teaching Quality Management Center of the university for examination and verification.

During the implementation of teaching, the process of online teaching quality monitoring includes two aspects: teachers' teaching and students' learning. The management and monitoring of teaching quality mainly include: checking whether teachers' teaching content, teaching design and teaching links are reasonable and can meet students' needs, whether they are proficient in using online teaching platforms, whether they can timely grasp students' learning trends in the teaching process and whether they can timely answer students' questions. The management and monitoring of student behavior mainly include: checking whether students can keep up with the teaching progress and rhythm of the course, whether they can actively participate in learning, whether they can complete relevant homework tasks according to the requirements of teachers, whether they can skillfully use the online learning platform, and actively engage in online interaction and communication. The supervision of online teaching quality in teaching implementation is completed jointly by supervisors, teachers and students, and different subjects have their own emphasis on the evaluation of teaching activities from their different perspectives, which is conducive to the timely detection and correction of universal and representative problems. At the same time, through the establishment of an online teaching evaluation management system based on big data, timely summary and analysis of teachers' teaching evaluation data can be found in time and targeted solutions.

The after-teaching information feedback in CHEI plays an important role in the online teaching quality assurance system. A sound feedback and control system enables the school decision-making bodies to timely understand the online teaching quality information and management effects and also guarantees the continuous improvement of online teaching quality. Problems in the teaching process can be found and fed back in time through supervision evaluation, peer evaluation, teacher self-evaluation and student evaluation, and the teachers can fully communicate with each other and put forward improvement methods to help teachers constantly improve their teaching level.

2.4.3 All-Round Development of Multi-Dimensional Online Teaching Quality Monitoring

According to the requirements of TQM theory, the online teaching quality control of CHEI is not only carried out in the whole process of multi-level participation and multi-links but also carried out in a multi-dimensional and all-round way. Among them, the multi-dimension is mainly embodied in teaching conditions, teaching space, teaching time, teaching methods and teaching means. Teaching conditions mainly include three aspects: hardware, software and environment. The teaching environment at the school has undergone significant changes. Instructors can now conduct classes not only in person but also utilize internet technology, enabling teaching activities to be independent of class time constraints. Monitoring online teaching quality also involves tracking the teaching process, ensuring the implementation of innovative teaching methods such as situational teaching, PBL, heuristic, and interactive approaches. Regarding the teaching means, teachers could utilize platforms like Super Star, China University MOOC, DingDing, and Tencent, engaging in synchronous or asynchronous teaching and flipped classrooms. In summary, CHEI implemented a multi-dimensional and comprehensive approach to online teaching quality monitoring, aligning with Total Quality Management (TQM) principles and incorporating aspects such as teaching conditions, space, time, methods, and means.

3. Method

3.1 Context

The study was conducted at a university located in northeast China (in this research named CHEI), which is a teaching institution dedicated to nurturing students' success in foreign languages and foreign affairs. CHEI currently houses about 12000 students, among whom 9903 are full-time undergraduates. Online teaching was the primary teaching mode from 2020 to 2022.

3.2 Participants

In this research, a group of participants are selected based on stratified sampling and students' willingness to respond. Before implementing Online Teaching Quality Assurance Measures at the beginning spring term of 2021, 168 students were given an online teaching quality questionnaire, and the response rate was 100%. One year after the implementation of Online Teaching Quality Assurance Measures, the same online teaching quality questionnaire was administered to the same participants at the end of autumn term in 2021. The demographic information is given in Table 1.

Table 1. Demographic information of the respondents

		Gender			
		Male		Femle	
		Count	Column N %	Count	Column N %
Grade	Freshman	12	23.1%	46	39.7%
	Sophomore	26	50.0%	40	34.5%
	Junior	14	26.9%	30	25.9%

3.3 Instrument

A Questionnaire named The Student Evaluation of Online Teaching Faculty (SEOTF) was adapted from National Standards for Quality Online Teaching (2009) issued by North American Council for Online Learning (NACOL). It was created to offer a set of excellent standards for online teaching and instructional design to states, districts, online programs, and other organizations.

The scale consists of five levels, each associated with a specific descriptor:

0-Absent—component is missing

1-Unsatisfactory—needs significant improvement

2-Somewhat satisfactory—needs targeted improvements

3-Satisfactory—discretionary improvement needed

4-Very satisfactory—no improvement needed

To ensure the effectiveness of the standards adopted, the initiative started with a thorough review of the existing literature on online teaching quality standards. Next, the standards were cross-referenced. As shown in Table 2, the SEOTF consists of 8 constructs with strong reliability (Cronbach's alpha = 0.786). For more details, please see Appendix A.

Table 2. Eight standards of online teaching faculty

Standards	Name	Description
STD 1	Technology Proficiency	The teacher has the prerequisite technology skills to teach online.
STD 2	Active Learning Design	The teacher plans, designs and incorporates strategies to encourage active learning, interaction, participation and collaboration in the online environment.
STD 3	Leadership and Feedback	The teacher provides online leadership in a manner that promotes student success through regular feedback, prompt response and clear expectations.
STD 4	Special Needs Responsiveness	The teacher understands and is responsive to students with special needs in the online classroom.
STD 5	Assessment Competency	The teacher demonstrates competencies in creating and implementing assessments in online learning environments in ways that assure validity and reliability of instruments and procedures along with developing and delivering assessments, projects, and assignments that meet learning objectives & outcomes, and assess learning progress by measuring student achievement.
STD 6	Data-Informed Instruction	The teacher demonstrates competencies in using data and findings from assessments and other data sources to modify instructional methods and content and to guide student learning.
STD 7	Collaborative Engagement	The teacher collaborates with colleagues.
STD 8	Effective Media Arrangement	The teacher arranges media and content to help students and teachers transfer knowledge most effectively in the online environment.

Note. National Standards for Quality Online Teaching. (2009). Retrieved from https://www.nsqol.org/wp-content/uploads/2019/02/National-Standards-for-Quality-Online-Teaching.pdf

3.4 Data Collection and Analysis

The Student Evaluation of Online Teaching Faculty (SEOTF) was sent to the participants via the Teaching Evaluation Platform in the CHEI, which collected data without disclosing participants names. Each student's average score of his/her online teachers' performance was calculated. Then, the data were exported into SPSS (V.26) for analysis. The scores of the students' GPAs were exported from the Teaching Affairs Office without disclosing individual student information. A paired t-test was conducted to compare the evaluation of teaching quality results and students' GPA scores before and after the implementation of the Online Teaching Quality Assurance Measures.

4. Results

4.1 Effectiveness of Online Teaching Quality Assurance Measures

The efficacy of Total Quality Management in implementing Online Teaching Quality Assurance Measures for online teaching quality is demonstrated through two key facets: Students' teaching quality evaluation and academic performance (GPA), both before and after the implementation of Online Teaching Quality Assurance Measures.

4.1.1 Effectiveness Evidenced in Students' Teaching Quality Evaluation

Table 3 provides a comprehensive overview of the descriptive statistics for evaluation scores before and after the implementation of Online Teaching Quality Assurance Measures across different standards. In Technology Proficiency (STD 1), during the spring term, the mean score was 2.27 (SD = 0.48), indicating a somewhat satisfactory level, while in the autumn term, there was a substantial improvement with a mean of 3.12 (SD = 0.52) and an interpretation of satisfactory. Moving to Active Learning Design (STD 2), the scores remained consistently satisfactory, with a slight decrease in mean from 2.63 (SD = 0.74) in the spring term to 2.60 (SD = 0.85) in the autumn term. Leadership and Feedback (STD3) displayed somewhat satisfactory firstly, with a

minor increase in mean from 2.49 (SD = 0.52) to 3.13 (SD = 0.58), moving to satisfactory. In Special Needs Responsiveness (STD 4), the somewhat satisfactory mean of 2.20 (SD = 0.48) during the spring term saw improvement, reaching a satisfactory mean of 2.98 (SD = 0.47) in the autumn term. A similar trend was observed in Assessment Competency (STD 5), where the mean increased from 2.32 (SD = 0.54) to 3.09 (SD = 0.54), moving from somewhat satisfactory to satisfactory. In the spring term, the mean score for Data-Informed Instruction (STD 6) was 1.93 (SD = 0.48), indicating a somewhat satisfactory level. This increased to 3.03 (SD = 0.61) in autumn, signifying satisfaction. Regarding Collaborative Engagement (STD 7), the mean score was 2.73 (M = 0.52) in the spring term and 2.75 (SD = 0.52) in autumn, suggesting a consistently somewhat satisfactory level. In Effective Media Arrangement (STD 8), there was an improvement from a somewhat satisfactory mean of 1.78 (SD = 0.51) in the spring term to a satisfactory mean of 2.95 (SD = 0.63) in the autumn term. This detailed breakdown underscores the positive impact of Online Teaching Quality Assurance Measures, with improvements and sustained satisfactory performance observed across various standards from the spring term to the autumn term.

Table 3. Descriptive statistics of evaluation scores before and after implementation of quality assurance measures

Standards	N	Spring Term		Autumn Term	
		M(SD)	Interpretation	M(SD)	Interpretation
Technology Proficiency	168	2.27(0.48)	Somewhat satisfactory	3.12(0.52)	Satisfactory
Active Learning Design	168	2.63(0.74)	Satisfactory	2.60(0.85)	Satisfactory
Leadership and Feedback	168	2.49(0.52)	Somewhat satisfactory	3.13(0.58)	Satisfactory
Special Needs Responsiveness	168	2.20(0.48)	Somewhat satisfactory	2.98(0.47)	Satisfactory
Assessment Competency	168	2.32(0.54)	Somewhat satisfactory	3.09(0.54)	Satisfactory
Data-Informed Instruction	168	1.93(0.48)	Somewhat satisfactory	3.03(0.61)	Satisfactory
Collaborative Engagement	168	2.73(0.52)	satisfactory	2.75(0.52)	Satisfactory
Media Arrangement	168	1.78(0.51)	Somewhat satisfactory	2.95(0.63)	Satisfactory

Note. The scale ranges are delineated as follows: a score falling between 3.51 and 4.00 is categorized as "very satisfactory," scores within the range of 2.51 to 3.50 are termed "satisfactory," those between 1.51 and 2.50 are considered "somewhat satisfactory," and scores ranging from 1.00 to 1.50 are interpreted as "unsatisfactory."

The comparison of key standards between the Spring Term (SPR) and Autumn Term (AT) in Table 4 indicates various trends. In terms of Technology Proficiency, the MD is 0.85 (p = 0.00), indicating a substantial rise in technological skills during the Autumn Term. Learning Design shows a minimal increase with an MD of 0.03 (p = 0.61), suggesting a relatively stable environment for teaching methodologies. Leadership and Feedback exhibit a positive shift with an MD of 0.64 (p = 0.00), emphasizing an improvement in evaluative aspects. Special Needs Responsiveness reflects a notable increase (MD = 0.79, p = 0.00), highlighting enhancements in addressing diverse needs. Assessment Competency presents a positive shift (MD = 0.77, p = 0.00), signaling improvements in assessment practices. Data-Informed Instruction records a significant increase with an MD of 1.11 (p = 0.00), emphasizing a notable rise in utilizing data for teaching strategies. Collaborative Engagement remains relatively stable (MD = 0.03, p = 0.44), suggesting consistent collaboration levels. Lastly, Media Arrangement demonstrates a substantial increase (MD = 1.17, p = 0.00), highlighting significant changes in the use of media resources for teaching. These underscored values collectively signify an overall positive trend, showcasing improvements in various teaching standards during the Autumn Term compared to the Spring Term.

Table 4. Paired T-test of Eight standards between spring term and autumn term

Pairs		MD	SE	95% Confidence Interval of the Difference		t	df	Sig.
				Lower	Upper			
Technology Proficiency	SPR - AT	-0.85	0.04	-0.93	-0.77	-20.53	167	0.00
Learning Design	SPR - AT	0.03	0.06	-0.09	0.15	0.51	167	0.61
Leadership and Feedback	SPR - AT	-0.64	0.05	-0.73	-0.55	-13.68	167	0.00
Special Needs Responsiveness	SPR - AT	-0.79	0.03	-0.85	-0.72	-23.01	167	0.00
Assessment Competency	SPR - AT	-0.77	0.04	-0.85	-0.69	-19.00	167	0.00
Data-Informed Instruction	SPR - AT	-1.11	0.05	-1.20	-1.01	-23.62	167	0.00
Collaborative Engagement	SPR - AT	-0.03	0.03	-0.09	0.04	-0.77	167	0.44
Media Arrangement	SPR - AT	-1.17	0.05	-1.28	-1.06	-21.66	167	0.00

Note. "SPR" refers to "Spring Term"; "AT" refers to "Autumn Term".

In summary, Figure 1 illustrates significant improvements in Technology Proficiency (STD 1), Leadership and Feedback (STD 3), Special Needs Responsiveness (STD 4), Assessment Competency (STD 5), Data-Informed Instruction (STD 6), and Effective Media Arrangement (STD 8). These positive changes suggest enhancements in the evaluated criteria over the period. In contrast, Active Learning Design (STD 2) and Collaborative Engagement (STD 7) did not demonstrate significant improvement. These standards remained relatively stable between the spring and autumn terms, indicating a lack of substantial change in the assessed aspects.
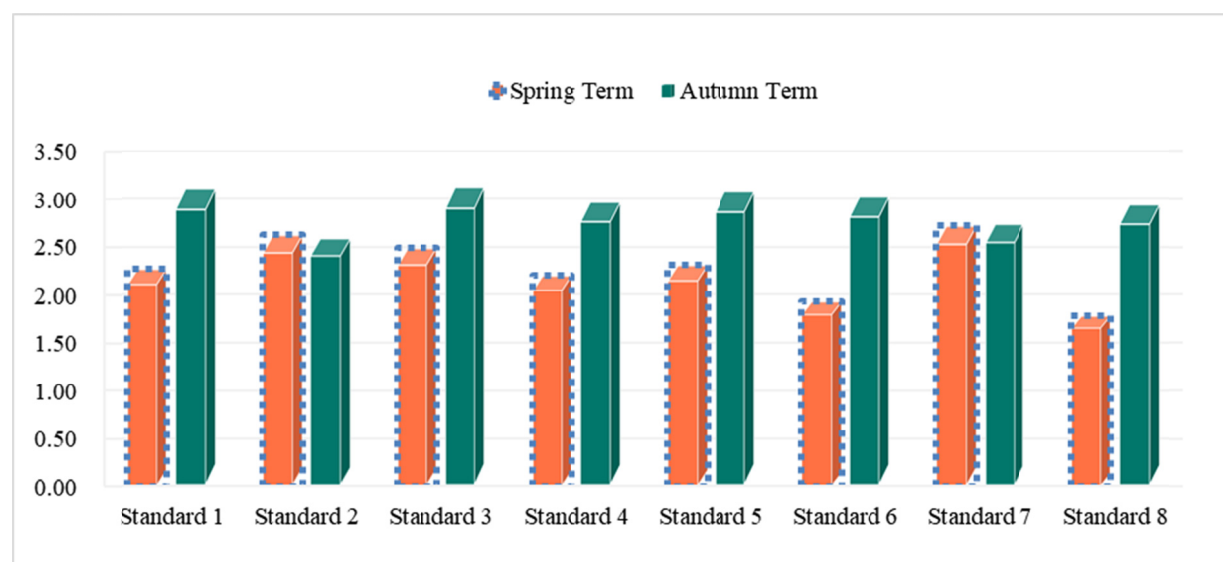

Figure 1. Bar Chart of Scores of the Eight Standards

4.1.2 Effectiveness Evidenced in Students' GPA

To assess the efficacy of Total Quality Management in implementing Online Teaching Quality Assurance Measures for online teaching quality, an examination through the lens of students' academic performance was conducted. GPA scores from both spring and autumn terms were collected and compared to gauge the impact of these measures on students' overall academic achievement.

Table 5 provides the results of a paired t-test comparing students' GPAs between two time points, denoted as GPA 1 (spring term) and GPA 2 (autumn term). The mean score for GPA 1 is 2.84 (SD = 0.77), while for GPA 2, it is 3.27 (SD = 0.60). The calculated mean difference (MD) between the two terms is 0.42, and the 95% confidence interval (CI) ranges from -0.513 to -0.334. The t-test statistic is reported as -9.378 with 167 degrees of freedom, and the associated p-value is 0.00. This significant p-value indicates a notable difference in GPAs between the spring and autumn terms, suggesting a meaningful change in students' academic performance over this period. In practical terms, this improvement translates to an average increase of at least 4.2 points out of 100 in students' scores between the two terms.

Table 5. Paired T-test of students' GAP

GPA 1 M(SD)	GPA 2 M(SD)	MD (2-1)	CI (95%)		t	df	Sig.
2.84(0.77)	3.27(0.60)	0.42	-0.513	-0.334	-9.378	167	0.00

Note. "GPA 1" refers to GPA score in spring term, "GPA 2" refers to GPA score in autumn term.

4.2 Interventions Suggested to Improve Online Teaching Quality Based on The Results

To tailor interventions for each standard, items in the eight standards with scores below "2.5" (considered Somewhat Satisfactory, indicating the need for targeted improvements) were identified, as illustrated in Table 6. In addition to the three items in STD 2 (Active Learning Design) with scores below 2.5, two items in STD 4 (Special Needs Responsiveness) have scores below 2.5. Similarly, in STD 6 (Data-Informed Instruction), two items have a score below 2.5, and in STD 7 (Collaborative Engagement), there is one item with a score below 2.5. Relative measures were then implemented to enhance online teaching quality based on the identified weak indicators.

To address specific weaknesses within the Active Learning Design standard, targeted interventions have been identified for three key items. Firstly, for Item 1, which emphasizes the demonstration of effective strategies for active student engagement, the recommended intervention involves the implementation of diverse active learning approaches. This includes incorporating collaborative problem-solving, in-class writing activities, and methods focusing on analysis, synthesis, and evaluation to shift away from passive lecture formats. Secondly, for Item 5, centered around leading goal-oriented and project-based online instruction groups, the proposed intervention suggests providing additional training on structuring such groups with clear goals, emphasizing project-based and inquiry-oriented methodologies to enhance student engagement and learning outcomes. Lastly, for Item 12, which addresses providing structure with flexibility and negotiation, the intervention recommends offering guidance on achieving a balance between structure and flexibility in online instruction. This involves emphasizing the importance of providing a framework while allowing adaptability and negotiation to meet diverse student needs. By implementing these interventions, the identified weaknesses can be effectively addressed, contributing to an overall enhancement of Active Learning Design within the online teaching framework.

Table 6. Somewhat satisfactory items (Needs Targeted Improvements) in Each standard

SDT 2	**Active Learning Design**	Average Score
Item 1	Demonstrates effective strategies and techniques that actively engage students in the learning process (e.g., team problem-solving, in-class writing, analysis, synthesis and evaluation instead of passive lectures).	1.8
Item 5	Leads online instruction groups that are goal-oriented, focused, project-based and inquiry-oriented.	1.8
Item 12	Provides structure for students but allows for flexibility and negotiation.	1.7
STD 4	**Special Needs Responsiveness**	Average Score
Item 3	Provides activities, modified as necessary, that are relevant to the needs of all students.	2.1
Item 4	Adapts and adjusts instruction to create multiple paths to learning objectives.	1.9
STD 6	**Data-Informed Instruction**	**Average score**
Item 1	Assesses each student's background and content knowledge and uses these data to plan instruction.	1.9
Item 6	Provides evidence of effective learning strategies that worked for the individual student and details specific changes in future instruction based upon assessment results and research study (data-driven and research-based).	1.7
STD 7	**Collaborative Engagement**	Average Score
Item 2	Leads collaborative efforts to create common assessments among grade-level and/or content-area teachers and share assessment results with colleagues to collaboratively plan instruction that will best meet individual student needs.	2.2

To enhance the Special Needs Responsiveness standard, targeted interventions have been identified based on weaknesses identified in two crucial items. For Item 3, which focuses on providing activities relevant to the needs of all students (Average Score: 2.1), the intervention involves developing comprehensive training programs. These programs aim to improve teachers' abilities to create modified activities that cater to diverse needs, emphasizing inclusivity. Resources on adapting activities for various learning styles and abilities will be provided to facilitate effective implementation. Additionally, for Item 4, addressing the adaptation and adjustment of instruction to create multiple paths to learning objectives (Average Score: 1.9), interventions will include the implementation of professional development sessions. These sessions will center on instructional adaptation strategies, aiming to establish multiple pathways for achieving learning objectives. Practical examples

and case studies will be integrated to demonstrate effective adaptation strategies for accommodating diverse student needs. The overarching goal of these interventions is to rectify weaknesses in Special Needs Responsiveness, ensuring that teachers are well-equipped to deliver inclusive and adaptive instruction tailored to the diverse needs of all students.

To elevate the Data-Informed Instruction standard, targeted interventions have been identified based on the "weak" items. Item 1, which involves assessing each student's background and content knowledge and using these data to plan instruction, received an average score of 1.9. To address this, a specific intervention will be developed: tailored training programs aimed at enhancing teachers' proficiency in assessing individual student backgrounds and content knowledge. The emphasis will be on utilizing collected data to inform instructional planning, aligning teaching strategies with the unique needs of each student. Similarly, Item 6, with an average score of 1.7, emphasizes providing evidence of effective learning strategies for individual students and detailing specific changes in future instruction based on assessment results and research study (data-driven and research-based). To tackle this, professional development sessions will be implemented, concentrating on evidence-based learning strategies. Guidance will be provided on documenting and utilizing assessment results and research studies to inform instructional changes, highlighting the integration of data-driven approaches for continuous improvement in teaching practices. Through the implementation of these interventions, the goal is to address weaknesses in Data-Informed Instruction, ensuring that teachers adeptly utilize student data to tailor instruction and consistently refine their teaching strategies based on evidence and research.

To strengthen the Collaborative Engagement standard, a targeted intervention is proposed based on the identified weakness in Item 2, where teachers lead collaborative efforts to create common assessments and share results for collaborative instruction planning, receiving an average score of 2.2. The intervention involves developing professional development sessions to empower teachers in spearheading collaborative initiatives for creating unified assessments. Emphasis will be placed on sharing assessment results among colleagues to collectively plan instruction, ensuring it aligns with individual student needs. Practical guidance on effective collaboration strategies and tools will be provided to facilitate seamless communication among teachers. Implementing this intervention aims to address the identified weakness, fostering a culture of shared assessment and collaborative planning, ultimately enhancing instructional effectiveness.

5. Discussion

The Online Teaching Quality Assurance Measures had great influence on improving education quality since its implementation in 2021. Based on STD 1 (Technology Proficiency), the teaching staff possesses the necessary technological skills to teach online through self-improvement and external support. According to Saykili (2019), one of the crucial traits of a successful online distance educator in higher education is the ability to use technology skillfully. STD 3 (Leadership and Feedback) showed that the CHEI's teachers could provide online leadership in a way that encourages student involvement through regular feedback, quick responses, and transparent expectations. This was echoed by Tanis (2020), who established several expectations for online learners in the study, including regular and prompt communication with professors, prompt feedback on assignments, clear professor expectations, and academic rigor. This also aligns with the assertion made by Yao et al. (2020) that in the context of online teaching, educators should not only act as conveyors of knowledge but also adopt the roles of "leader" and "accompanier," emphasizing the importance of offering effective guidance and communication. In the online classroom, STD 4 (Special Needs Responsiveness) demands that the teacher be aware of and accommodate to students with special needs. It indicates that the instructor demonstrates enhanced proficiency in modifying instructional methods and content and guiding student learning using data and findings assisted by technology from assessments and other data sources, this finding aligns with Stojan et al. (2022) who revealed that teachers' use of technology during the pandemic largely 'replaced' existing instructional methods. These three areas (STD 1, STD 3, and STD 4) of teaching quality moved from somewhat satisfactory to satisfactory level, where discretionary improvement is required. The teacher also demonstrated improved competencies in creating and implementing assessments in online learning environments (STD 5: Assessment Competency). Utilizing efficient assessment methods can enhance an instructor's grasp of student requirements and contribute to the establishment of learner-centered classrooms. As argued by Dyer et al. (2018) and Chopra et al. (2021) that the assessment of student learning undergoes a distinct transformation in the online classroom setting, where students and instructors lack physical proximity in promoting formative assessment in online teaching and learning.

STD 6 (Data-Informed Instruction), indicates that teachers are proficient in utilizing data and findings from assessments and other sources to adapt instructional methods and content, guiding student learning accordingly. A satisfactory performance in this standard implies that teachers are effectively incorporating data-driven

approaches to inform their instructional strategies. They showcase a competence in comprehending students' needs and customizing their teaching methods according to gathered data, ensuring a personalized and targeted educational approach, as emphasized by Kucirkova et al. (2021). This proficiency aligns with the broader goal of creating an adaptive and responsive learning environment, emphasizing the importance of evidence-based practices to enhance the overall quality of instruction. Research indicates that data-informed practice helps teachers change their teaching and promotes teacher professional development (Saar et al., 2022). All levels of the educational system—the institution, instructors, students, and classroom levels—are expected to use data in evaluation and decision-making processes related to education. This will provide a longitudinal record of each student's performance over time. By providing educators, parents, students, and other stakeholders with a scalable and effective platform to track performance and make well-informed, valid enhancement decisions, these records and data can play a critical role (Aburizaizah, 2021). STD 8 (Effective Media Arrangement) was also satisfactory with comparatively lower score, which means that teachers are basically able to arrange media and content to help students and teachers transfer knowledge effectively in the online environment in this high institution. Teachers should enhance their multimedia technology in their online teaching because it ensures effective language teaching and enhances learners' linguistic abilities (Kumar et al., 2021), especially in this university where there are many language courses.

The comparatively less satisfactory performance was seen in STD 2 (Active Learning Design) and STD 7 (Teacher Collaborative Engagement), which need significant improvement. These two criteria share some similarities, the former one requires teachers' ability of encouraging active learning, interaction, participation, and collaboration in the online environment, and the later one involves interaction and cooperation among teachers. Interaction and cooperation are quite challenging to teachers and students on online platforms (Bhuana & Apriliyanti, 2021). This is aligning with a former study by Muhammad and Kainat (2020) who found that problems with internet connection, low teacher-student engagement, and a lack of technology resources are all obstacles to the effectiveness of online learning. Similarly, it was argued that maintaining student engagement and fostering meaningful interactions proves challenging, whether you are delivering fully online instruction or integrating online elements into face-to-face training (Bhuana & Apriliyanti, 2021).

CHEI is concentrating on boosting individualized support, tailoring training, and emphasizing and showcasing the advantages of adhering to standards as a response to the issues raised above. There is no direct link between Online Teaching Quality Assurance Measures and students' GPA in CHEI, but students' GPA increased moderately after enhancing the eight teaching standards. This finding was similar to Hamdan and Amorri's (2022) research, which attempted to quantify students' final academic performance following their exposure to online learning during the pandemic lockdown. Their study's concluding findings unmistakably show how much e-learning affects students' academic performance and accomplishments because it can help them in a number of ways, such as maximizing their learning independence and classroom participation. Student academic performance as evidence of the effectiveness of Online Teaching Quality Assurance Measures may not be absolutely conclusive, but it does bring some insight to online teaching quality evaluation.

The targeted interventions align with TQM principles, emphasizing continuous improvement in educational standards (Diamandescu, 2016; Sciarelli et al., 2020). TQM, a comprehensive management philosophy, encourages systematic processes to enhance overall quality. In the context of educational standards, the interventions incorporate TQM principles by identifying specific weaknesses (gaps), designing tailored training programs (interventions), and implementing continuous improvement strategies. The approach is akin to the Plan-Do-Check-Act (PDCA) cycle (Gidey et al., 2012; Realyvásquez-Vargas et al., 2018), where weaknesses are identified, interventions are planned and executed, outcomes are checked, and adjustments are made for sustained improvement. The goal is to integrate TQM principles into educational practices, ensuring ongoing enhancement and alignment with quality standards. In summary, the targeted interventions in online education in CHEI are in harmony with Total Quality Management (TQM) principles, embodying a commitment to continuous improvement in educational standards.

6. Conclusion

In conclusion, the results and discussions highlight the effectiveness of Online Teaching Quality Assurance Measures in enhancing online teaching quality at CHEI. The evaluation scores across various standards showed significant improvements, emphasizing the positive impact of these measures on teaching proficiency. Notable enhancements were observed in Technology Proficiency, Leadership and Feedback, Special Needs Responsiveness, Assessment Competency, Data-Informed Instruction, and Effective Media Arrangement. Despite the overall positive trends, some standards, particularly Active Learning Design and Collaborative Engagement, indicated areas with minimal improvement, signaling the need for focused attention.

The results also extend beyond the online teaching evaluation standards, showcasing a positive impact on students' GPAs. The significant improvement in students' academic performance suggests a meaningful change in learning outcomes, reinforcing the overall success of the Online Teaching Quality Assurance Measures.

The interventions proposed for Active Learning Design, Special Needs Responsiveness, Data-Informed Instruction, and Collaborative Engagement aim to address specific weaknesses identified in these standards. By implementing targeted training programs, professional development sessions, and emphasizing the importance of inclusivity and adaptability, these interventions aim to further elevate teaching quality.

The study underscores the importance of continuous improvement in educational practices, aligning with TQM principles. The interventions and evaluations, guided by a systematic approach, reflect the commitment to ongoing enhancement and the pursuit of excellence in online teaching at CHEI. As the institution continues to prioritize personalized support, customized training, and upholding quality standards, the continuous improvement in online teaching quality sets a commendable example for others to follow.

The study on Online Teaching Quality Assurance Measures under guidance of TQM theory at CHEI highlights insights into online teaching quality but has methodological limitations. The use of stratified sampling may introduce sampling bias, impacting the representativeness of the results for the entire student population. Additionally, the single-institution focus limits the generalizability. Furthermore, the reliance on the SEOTF questionnaire may lead to a limitation in exploring the richness of data and obtaining diverse perspectives from student evaluations in the context of online teaching. Moreover, the one-year evaluation period may not fully capture long-term impact, and the GPA analysis lacks exploration of other influencing factors. Addressing these issues is vital for a more robust assessment of the sustained impact and effectiveness of quality assurance measures in online teaching at CHEI.

Authors' contributions

Dr. Sun and Dr. Yin collaborated in conceiving and designing the study, contributing equally to its conceptualization and providing critical revisions throughout. Dr. Sun supervised data collection, analysis, and visualization, ensuring its quality and accuracy. Dr. Sun led the drafting of the manuscript, with Dr. Yin making significant revisions to improve clarity and coherence. All authors reviewed and approved the final manuscript. No special agreements regarding authorship were established, and each author's contribution reflects their expertise and involvement in the study.

Competing interests

Sample: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data

are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

References

Aburizaizah, S. J. (2021). Data-Informed Educational Decision Making to Improve Teaching and Learning Outcomes of EFL. *Journal of Education and Learning*, *10*(5), 17–29. https://doi.org/10.5539/jel.v10n5p17

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

Bhuana, G. P., & Apriliyanti, D. L. (2021). Teachers' encounter of online learning: Challenges and support system. *Journal of English Education and Teaching*, *5*(1), 110–122. https://doi.org/10.33369/jeet.5.1.110-122

Britto, M., Ford, C., & Wise, J. M. (2013). Three institutions, three approaches, one goal: Addressing quality assurance in online learning. *Online Learning Journal*, *17*(4). https://doi.org/10.24059/olj.v17i4.402

Carmen, C., & Maria, A. F. (2020). COVID-19 and teacher education: a literature review of online teaching and learning practices. *European Journal of Teacher Education*, *43*(4), 466–487. https://doi.org/10.1080/02619768.2020.1821184

Chen, R., Lee, Y. D., & Wang, C. H. (2020). Total quality management and sustainable competitive advantage: serial mediation of transformational leadership and executive ability. *Total Quality Management & Business Excellence*, *31*(5–6), 451–468. https://doi.org/10.1080/14783363.2018.1476132

Chopra, J., Rani, A., Chopra, S., Manik, P., & Singh, R. R. (2021). Transition from physical to virtual classroom amidst COVID-19 crisis: Analyzing students' perspective to drive improvement in the current online teaching methodology. *Journal of Education and Health Promotion*, *10*(1), 1–7.

Collier, P. J. (2023). *Developing effective student peer mentoring programs: A practitioner's guide to program design, delivery, evaluation, and training*. Taylor & Francis. https://doi.org/10.4324/9781003444145

Davis, S. M. (1994). *Introduction to total quality: Quality, productivity, competitiveness*. Merrill.

Diamandescu, A. (2016). The main principles of total quality management. *Challenges of the Knowledge Society*, *1*(1), 672–678.

Díez, F., Villa, A., López, A. L., & Iraurgi, I. (2020). Impact of quality management systems in the performance of educational centers: educational policies and management processes. *Heliyon*, *6*(4), 1–7. https://doi.org/10.1016/j.heliyon.2020.e03824

Dyer, T., Aroz, J., & Larson, E. (2018). Proximity in the online classroom: Engagement, relationships, and personalization. *Journal of Instructional Research*, *7*. https://doi.org/10.9743/JIR.2018.10

Ferdig, R. E., Baumgartner, E., Hartshorne, R., Kaplan-Rakowski, R., & Mouza, C. (2020). *Teaching, technology, and teacher education during the COVID-19 pandemic: Stories from the field*. Association for the Advancement of Computing in Education. Retrieved from https://www.learntechlib.org/p/216903/

Gidey, E., Jilcha, K., Beshah, B., & Kitaw, D. (2014). The plan-do-check-act cycle of value addition. *Industrial Engineering & Management*, *3*(124), 2169–0316.

Gurley, L. E. (2018). Educators' preparation to teach, perceived teaching presence, and perceived teaching presence behaviors in blended and online learning environments. *Online Learning*, *22*(2), 179–220. https://doi.org/10.24059/olj.v22i2.1255

Gurung, S. (2021). Challenges faced by teachers in online teaching during Covid-19 pandemic. *The Online Journal of Distance Education and E-Learning*, *9*(1), 8–18. https://orcid.org/0000-0002-2734-2268

Hamdan, K., & Amorri, A. (2022). The impact of online learning strategies on students' academic performance. In *E-learning and digital Education in the twenty-first century* (pp. 1–19). https://doi.org/10.5772/intechopen.94425

Hanna, B., & Hanna, A. (2023). Online Learning Quality Assurance and Accreditation in Egyptian Higher Education Institutions. In *Quality Assurance in Higher Education in the Middle East: Practices and Perspectives* (Vol. 54, pp. 49–66). Emerald Publishing Limited. https://doi.org/10.1108/S2055-364120230000054003

Hassan, M. (2021). Online teaching challenges during COVID-19 pandemic. *International Journal of Information and Education Technology*, *11*(1). https://doi.org/10.18178/ijiet.2021.11.1.1487

Hassan, M. M., Mirza, T., & Hussain, M. W. (2020). A critical review by teachers on the online teaching-learning during the COVID-19. *International Journal of Education and Management Engineering*, *10*(8), 17–27. https://doi.org/10.5815/ijeme.2020.05.03

Hirsch, C. (2020, March 31). *Europe's coronavirus lockdown measures compared*. Politico. Retrieved from https://www.politico.eu/article/europes-coronavirus-lockdown-measures-compared/

Huang, J. (2020). Successes and challenges: Online teaching and learning of chemistry in higher education in China in the time of COVID-19. *Journal of Chemical Education*, *97*(9), 2810–2814. https://doi.org/10.1021/acs.jchemed.0c00671

Howard, S. K., Tondeur, J., Siddiq, F., & Scherer, R. (2021). Ready, set, go! Profiling teachers' readiness for online teaching in secondary education. *Technology, Pedagogy and Education*, *30*(1), 141–158. https://doi.org/10.1080/1475939X.2020.1839543

Igbinakhase, I., & Naidoo, V. (2020). Higher Education Quality Improvement Strategies Through Enriched Teaching and Learning. In *Quality Management Principles and Policies in Higher Education* (pp. 246–262). IGI Global. https://doi.org/10.4018/978-1-7998-1017-9.ch013

Jain, C., & Prasad, N. (2018). Quality in Education—Concept, Origin, and Approaches. In *Quality of Secondary Education in India* (pp. 9–16). Springer. https://doi.org/10.1007/978-981-10-4929-3_2

Jasti, N. V. K., Venkateswaran, V., & Kota, S. (2022). Total Quality Management in higher education: A literature review on barriers, customers and accreditation. *The TQM Journal*, *34*(5), 1250–1272. https://doi.org/10.1108/TQM-11-2020-0256

Kucirkova, N., Gerard, L., & Linn, M. C. (2021). Designing personalised instruction: A research and design framework. *British Journal of Educational Technology*, *52*(5), 1839–1861. https://doi.org/10.1111/bjet.13119

Kumar, T., Malabar, S., Benyo, A., & Amal, B. K. (2021). Analyzing multimedia tools and language teaching. *Linguistics and Culture Review*, *5*(S1), 331–341. https://doi.org/10.21744/lingcure.v5nS1.1400

Lee, J. L., & Hirumi, A. (2004). Analysis of Essential Skills and Knowledge for Teaching Online. *Association for Educational Communications and Technology*, *11*(3), 534–540.

Lei, C., & Zhu, X. (2023). Study on the Quality Assurance System of After-school Service for Primary and Secondary Schools in the Context of "Double Reduction": Based on Total Quality Management Theory. *International Journal of Education and Humanities*, *7*(3), 62–68. https://doi.org/10.54097/ijeh.v7i3.6001

Magd, H., & Karyamsetty, H. (2020). Organizational performance and sustainability in manufacturing and service through TQM implementation. *Open Journal of Business and Management*, *8*(06), 2775. https://doi.org/10.4236/ojbm.2020.86172

Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, *2*(6), 5–10. https://doi.org/10.1016/j.ijedro.2020.100012

Mkheimer, M. I., & Ibrahim, M. (2020). TQM Role in Achieving Student Satisfaction in Higher Education Institutions. *Journal of Xi'an University of Architecture & Technology*, *13*(3), 3180–3192.

Morariu, C., Morariu, O., Răileanu, S., & Borangiu, T. (2020). Machine learning for predictive scheduling and resource allocation in large scale manufacturing systems. *Computers in Industry*, *120*, 103244. https://doi.org/10.1016/j.compind.2020.103244

Mupinga, D. M., Nora, R. T., & Yaw, D. C. (2006). The learning styles, expectations, and needs of online students. *College Teaching*, *54*(1), 185–189. https://doi.org/10.3200/CTCH.54.1.185-189

Nilson, L. B., & Goodson, L. A. (2021). *Online teaching at its best: Merging instructional design with teaching and learning research*. John Wiley & Sons.

Pape, L., & Wicks, M. (2009, October). *National Standards for Quality Online Programs. International Association for K-12 Online Learning*. Aurora Institute. Retrieved from https://www.aurora-institute.org/wp-content/uploads/national-standards-for-quality-online-programs.pdf

Realyvásquez-Vargas, A., Arredondo-Soto, K. C., Carrillo-Gutiérrez, T., & Ravelo, G. (2018). Applying the Plan-Do-Check-Act (PDCA) cycle to reduce the defects in the manufacturing industry. A case study. *Applied Sciences*, *8*(11), 2181. https://doi.org/10.3390/app8112181

Saar, M., Prieto, L. P., & Rodríguez Triana, M. J. (2022). Classroom data collection for teachers' data-informed practice. *Technology, Pedagogy and Education*, *31*(1), 123–140. https://doi.org/10.1080/1475939X.2021.1989024

Saykili, A. (2019). Higher education in the digital age: The impact of digital connective technologies. *Journal of Educational Technology and Online Learning*, *2*(1), 1–15. https://doi.org/10.31681/jetol.516971

Sciarelli, M., Gheith, M. H., & Tani, M. (2020). The relationship between soft and hard quality management practices, innovation and organizational performance in higher education. *The TQM Journal*, *32*(6), 1349–1372. https://doi.org/10.1108/TQM-01-2020-0014

Shraim, K. (2020). Quality standards in online education: The ISO/IEC 40180 framework. *International Journal of Emerging Technologies in Learning* (iJET), *15*(19), 22–36. https://doi.org/10.3991/ijet.v15i19.15065

Singh, V., & Thurman, A. (2019). How many ways can we define online learning? A systematic literature review of definitions of online learning (1988–2018). *American Journal of Distance Education*, *33*(4), 289–306. https://doi.org/10.1080/08923647.2019.1663082

Sohel-Uz-Zaman, A. S. M. (2016). Implementing total quality management in education: Compatibility and challenges. *Open Journal of Social Sciences*, *4*(11), 207. https://doi.org/10.4236/jss.2016.411017

Stojan, J., Haas, M., Thammasitboon, S., Lander, L., Evans, S., Pawlik, C., … Daniel, M. (2022). Online learning developments in undergraduate medical education in response to the COVID-19 pandemic: A BEME systematic review: BEME Guide No. 69. *Medical Teacher*, *44*(2), 109–129. https://doi.org/10.1080/0142159X.2021.1992373

Sun, L., Tang, Y., & Zuo, W. (2020). Coronavirus pushes education online. *Nature Materials*, *19*(6), 687–687. https://doi.org/10.1038/s41563-020-0678-8

Tanis, C. J. (2020). The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning. *Research in Learning Technology*, *28*. https://doi.org/10.25304/rlt.v28.2319

Tien, N. H., Ngoc, N. M., Trang, T. T. T., & Mai, N. P. (2022). Sustainable Development of Higher Education Institutions in Developing Countries: Comparative Analysis of Poland and Vietnam. *Contemporary Economics*, *16*(2), 195–210. https://doi.org/10.5709/ce.1897-9254.477

Turnbull, D., Chugh, R., & Luck, J. (2021). Transitioning to E-Learning during the COVID-19 pandemic: How have Higher Education Institutions responded to the challenge? *Education and Information Technologies*, *26*(5), 6401–6419. https://doi.org/10.1007/s10639-021-10633-w

UNESCO, U. World Bank. (2020). *Survey on National Education Responses to COVID-19 School Closures, Round 1 (April–June) and Round 2 (July–October)*. Retrieved from http://covid19.uis.unesco.org/joint-covid-r2/

Wani, I. A., & Mehraj, H. K. (2014). Total quality management in education: An analysis. *International Journal of Humanities and Social Science Invention*, *3*(6), 71–78.

Yang, X. (2020). Teachers' perceptions of large-scale online teaching as an epidemic prevention and control strategy in China. *ECNU Review of Education*, *3*(4), 739–744. https://doi.org/10.1177/2096531120922244

Yao, J., Rao, J., Jiang, T., & Xiong, C. (2020). What role should teachers play in online teaching during the COVID-19 pandemic? Evidence from China. *Sci. Insigt. Edu. Front.*, *5*(2), 517–524. https://doi.org/10.15354/sief.20.ar035

Yusuf, F. A. (2023). Total quality management (TQM) and quality of higher education: A meta-analysis study. *International Journal of Instruction*, *16*(2), 161–178. https://doi.org/10.29333/iji.2023.16210a

Zhang, W., Wang, Y., Yang, L., & Wang, C. (2020). Suspending classes without stopping learning: China's education emergency management policy in the COVID-19 outbreak. *Journal of Risk and Financial Management*, *13*(3), 55. https://doi.org/10.3390/jrfm13030055

Zhu, X., & Liu, J. (2020). Education in and after COVID-19: Immediate responses and long-term visions. *Postdigital Science and Education*, *2*(3), 695–699. https://doi.org/10.1007/s42438-020-00126-3

Appendix A

Questionnaire of The Student Evaluation of Online Teaching Faculty

1. Rating Scale

0 Absent—component is missing.

1 Unsatisfactory—needs significant improvement.

2 Somewhat satisfactory—needs targeted improvements.

3 Satisfactory—discretionary improvement needed.

4 Very satisfactory—no improvement needed.

2. Standards and Indicators

STD 1	**The teacher has the prerequisite technology skills to teach online.**
Item 1	Demonstrates the ability to effectively use word-processing, spreadsheet and presentation software.
Item 2	Demonstrates effective use of Internet browsers, e-mail applications and appropriate online etiquette.
Item 3	Utilizes synchronous and asynchronous tools (e.g., discussion boards, chat tools, electronic whiteboards) effectively.
Item 4	Troubleshoots typical software and hardware problems (i.e. change passwords, download plug-ins, etc).
Item 5	Demonstrates growth in technology knowledge and skills in order to stay current with emerging technologies and trends.
STD 2	**The teacher plans, designs and incorporates strategies to encourage active learning, interaction, participation and collaboration in the online environment.**
Item 1	Demonstrates effective strategies and techniques that actively engage students in the learning process (e.g., team problem-solving, in-class writing, analysis, synthesis and evaluation instead of passive lectures).
Item 2	Facilitates and monitors appropriate interaction among students.
Item 3	Builds and maintains a community of learners by creating a relationship of trust, demonstrating effective facilitation skills, establishing consistent and reliable expectations, and supporting and encouraging independence and creativity.
Item 4	Promotes learning through group interaction.
Item 5	Leads online instruction groups that are goal-oriented, focused, project-based and inquiry-oriented.
Item 6	Demonstrates knowledge and responds appropriately to the cultural background and learning needs of non-native English speakers.
Item 7	Differentiates instruction based on students' learning styles and needs and assists students in assimilating information to gain understanding and knowledge.
Item 8	Demonstrates growth in teaching strategies in order to benefit from current research and practice.
Item 9	Creates a warm and inviting atmosphere that promotes the development of a sense of community among participants.
Item 10	Encourages students to bring real-life examples into the online classroom.
Item 11	Mandates participation by setting limits if participation wanes or if the conversation is headed in the wrong direction.
Item 12	Provides structure for students but allows for flexibility and negotiation.
Item 13	Uses best practices to promote participation.
Item 14	Begins each lesson with a short, student-friendly, summary statement indicating the goal of the lesson and the primary benchmarks that will be covered.
Item 15	Provides extended resources and activities to increase achievement levels.
STD 3	**The teacher provides online leadership in a manner that promotes student success through regular feedback, prompt response and clear expectations.**
Item 1	Models effective communication skills and maintains records of applicable communications with students.
Item 2	Encourages interaction and cooperation among students, encourages active learning, provides prompt feedback, communicates high expectations, and respects diverse talents and learning styles.
Item 3	Persists, in a consistent and reasonable manner, until students are successful.
Item 4	Establishes and maintains ongoing and frequent teacher-student interaction, student-student interaction and teacher-parent interaction.
Item 5	Provides an online syllabus that defines objectives, concepts and learning outcomes in a clearly written, concise format.
Item 6	Provides an online syllabus that defines the terms of class interaction for both teacher and students, defines clear expectations for both teacher and students, defines
Item 7	the grading criteria, establishes inappropriate behavior criteria for both teacher and
Item 8	students, and explains the course organization to students.
Item 9	Uses student data to inform instruction, guides and monitors students' management of their time, monitors learner progress with available tools and develops an intervention plan for unsuccessful learners.
Item 10	Provides timely, constructive feedback to students about assignments and questions.
Item 11	Gives students clear expectations about teacher response time.
Item 12	Contacts students who are not participating.
Item 13	Recognizes that student interaction with the lesson has instructional value and therefore encourages students to participate in leading the instruction and/or demonstrating mastery of the content in other appropriate ways.

Item 14	Personalizes feedback (support, growth and encouragement).
Item 15	Communicates high expectations.
STD4	**The teacher understands and is responsive to students with special needs in the online classroom.**
Item 1	Understands that students have varied talents and skills and uses appropriate strategies designed to include all students.
Item 2	Provides activities, modified as necessary, that are relevant to the needs of all students.
Item 3	Adapts and adjusts instruction to create multiple paths to learning objectives.
Item 4	Encourages collaboration and interaction among all students.
Item 5	Exhibits the ability to assess student knowledge and instruction in a variety of ways.
Item 6	Provides student-centered lessons and activities that are based on concepts of active learning and that are connected to real-world applications.
Item 7	Demonstrates ability to identify students struggling with ELL or literacy issues and delivers specific strategies.
Item 8	Identifies options to expand student thinking, address styles of learning and avenues for enrichment or intervention.
Item 9	Knows how to implement a team teaching concept.
STD5	**The teacher demonstrates competencies in creating and implementing assessments in online learning environments in ways that assure validity and reliability of instruments and procedures along with developing and delivering assessments, projects, and assignments that meet learning objectives & outcomes, and assesses learning progress by measuring student achievement.**
Item 1	Creates or selects fair, adequate and appropriate assessment instruments to measure online learning that reflect sufficient content validity (i.e., that adequately cover the content they are designed to measure), reliability and consistency over time.
Item 2	Implements online assessment measures and materials in ways that ensure instrument validity and reliability.
Item 3	Includes authentic assessment (i.e., the opportunity to demonstrate understanding of acquired knowledge and skills as opposed to testing isolated skills or retained facts) as part of the evaluation process; assesses student knowledge in a forum beyond multiple guess.
Item 4	Provides continuous evaluation of students to include pre- and post-testing and student input throughout the course.
Item 5	Demonstrates an understanding of the relationships between and among the assignments, assessments and standards-based learning goals.
STD6	**The teacher demonstrates competencies in using data and findings from assessments and other data sources to modify instructional methods and content and to guide student learning.**
Item 1	Assesses each student's background and content knowledge and uses these data to plan instruction.
Item 2	Reviews student responses to test items to identify issues related to test validity or instructional effectiveness.
Item 3	Uses observational data (e.g., tracking data in electronic courses, Web logs, e-mail) to monitor course progress and effectiveness.
Item 4	Creates opportunities for self-reflection or assessment of teaching effectiveness within the online environment (e.g., classroom assessment techniques, teacher evaluations, teacher peer reviews).
Item 5	Addresses multiple intelligences and levels of ability through a variety of alternative interventions such as adjusting lessons based upon re-teaching and using varied assessment strategies.
Item 6	Provides evidence of effective learning strategies that worked for the individual student and details specific changes in future instruction based upon assessment results and research study (data-driven and research- based).
Item 7	Evaluates instructional strategies to determine their accuracy and usefulness for presenting specific ideas and concepts.
STD7	**The teacher collaborates with colleagues.**
Item 1	Networks with others involved in online education.
Item 2	Leads collaborative efforts to create common assessments among grade-level and/or content-area teachers and share assessment results with colleagues to collaboratively plan instruction that will best meet individual student needs.
STD8	**The teacher arranges media and content to help students and teachers transfer knowledge most effectively in the online environment.**
Item 1	Demonstrates the ability to modify and add content and assessment, using an online Learning Management System (LMS).
Item 2	Incorporates multimedia and visual resources into an online module.
Item 3	Demonstrates the ability to effectively use and incorporate subject-specific and developmentally appropriate software in an online learning module.
Item 4	Reviews all materials and Web resources for their alignment with course objectives and state and local standards and for their appropriateness on a continuing basis.
Item 5	Creates assignments, projects and assessments that are aligned with students' different visual, auditory and hands-on ways of learning.
Item 6	Arranges media and content to help transfer knowledge most effectively in the online environment.