

# RESEARCH PATHS AND FUTURE TRENDS OF ONLINE TEACHING QUALITY IN HIGHER EDUCATION: A BIBLIOMETRIC AND CONTENT ANALYSIS

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## Abstract

Online teaching reshapes the traditional classroom teaching by shifting instructions online, providing remote and virtual learning, and enriching and integrating electronic resources and activities into academic programs. Due to the influence of the coronavirus pandemic, online teaching has become a common distance education tool and widely used in higher education. Despite its universal adoption, the effect of online teaching has raised many questions, resulting in a variety of studies conducted for addressing the quality issue of online teaching. To systematically identify main findings, explore challenging issues and reveal research gaps and future trends in the field of online teaching quality, this study conducts a bibliometric and content analysis based on 477 articles from the Web of Science Core Collection published from 2000 to 2021. With the analysis of keyword co-occurrence and bibliographic coupling, 7 thematic clusters and main research contributions are identified. With the analysis of co-citation network, 5 theoretical clusters together with 13 widely used theories in online teaching quality research are explored. The relationships between the research themes and theoretical roots are then clarified and visualized in a social relation diagram, providing scholars with clear research paths which link the future studies and existing knowledge. The content analysis is applied to reveal gaps and key research issues for future study. The outcome of the study provides a research framework that clarifies the variety of research avenues for further developing the field of online teaching quality.

**Keywords:** *Online teaching quality, research path, bibliometric analysis, content analysis.*

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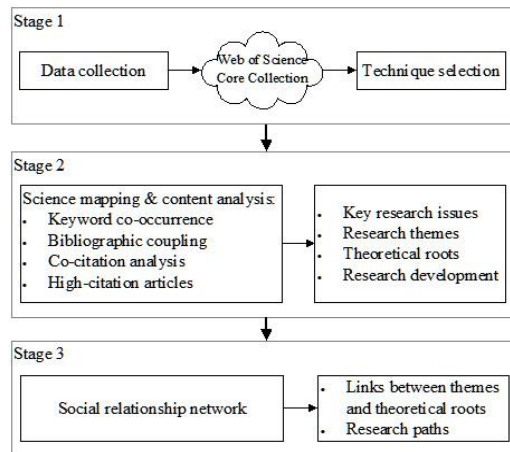
## 1. Introduction

Catalyzed by the global impact of the coronavirus pandemic, online teaching has emerged as a common means of education. This transformation has led to a reconfiguration of the learning environment and teaching approaches. Universities have to prioritize their teaching resources to support online courses and ensure the quality of education. Meanwhile, a diverse and rapidly growing body of research has been conducted on the quality of online teaching. To gain a comprehensive understanding of the key issues and developments related to online teaching quality (OLTQ) and to identify potential avenues for future research, it is imperative to conduct a systematic and holistic review on the existing literature. To this end, this paper applies a bibliometric and content analysis to (a) investigate the current status of OLTQ research, (b) identify key issues in OLTQ and (c) discover the connections between research themes and theoretical roots and provide future studies with viable research paths.

## 2. Design and methods

Figure 1 shows the framework of the research design. Stage 1 collects the data of the quality papers in the field of OLTQ from the Web of Science Core Collection by conducting an extensive search using the keywords related to “online teaching”. The collected articles are dated between 2000.1 and 2021.10. With a rigorous manual screening to remove irrelevant and repetitive articles, 477 contributions are identified. Stage 2 applies the bibliometric analysis techniques to perform science mapping on the collected articles. The VOSviewer is used in this stage for discovering and visualizing the research hotspots, themes, and theoretical roots of the OLTQ research. Stage 3 applies Ucinet to translate the relationships between research themes and theoretical roots into a social network diagram. The result provides an integrative framework for clarifying the research avenues for future study of OLTQ.

Figure 1. Research Design.



### 3. Results and analysis

#### 3.1. Keyword co-occurrence analysis

In the keyword co-occurrence analysis, 41 keywords with high frequency (appeared in 5 or more articles) are identified from the OLTQ literature and mapped into four clusters according to their relevance. Table 1 shows the keywords and their occurrences in each cluster. Cluster 1 focuses on the adoption of online teaching services, exploring the acceptance factors of online teaching from the aspects of technology, continued usage intentions, and service quality. Cluster 2 emphasizes on the development of new teaching modes driven by various motivations for improving the effectiveness of online teaching. Cluster 3 focuses on the performance assessment of OLTQ with respect to criteria such as effectiveness, implementation process, and student participation. Cluster 4 focuses on the discussion of OLTQ assurance from the organizational and individual perspectives.

Table 1. Clusters of co-keyword in the OLTQ research.

Cluster	Keyword (Occurrence > 5)
Cluster 1 (15 items)	Service quality (37), students (22), acceptance (12), motivation (11), continuation intention (10), information-systems success (7), technology acceptance (6), adoption (6).
Cluster 2 (12 items)	Blended learning (13), flipped classroom (9), framework (9), teaching mode (6), instruction (5), self-efficacy (5), strategies (5).
Cluster 3 (8 items)	Performance (12), engagement (7), student engagement (6), feedback (6), experience (6), perceptions (5).
Cluster 4 (6 items)	Quality assurance (13), impact (11), learning management (6), university (6), faculty (5).

#### 3.2. Bibliographic coupling

The aim of the bibliographic coupling is to group papers based on their shared references for identifying connections between articles. In this analysis, the largest set of connected items consisting of 100 out of 477 articles is grouped into 7 clusters, which describe the intellectual core of OLTQ. In each cluster, the articles with the highest closeness centrality are analyzed to reveal the key research issues, theoretical contributions, and their connections.

Thematic cluster 1 (red) comprises 23 contributions. The main contribution focuses on exploring student interactions in online teaching environments. Based on cognitive learning theory, behaviorist learning theory, and social constructivism, the integration of innovative elements such as mobility, augmented reality, and sense of place with the development of online teaching models attaches importance to the interactions in online teaching effectiveness. However, the effect of interaction is different under fully-online and partially-online teaching modes. A fully-online mode can be synchronous, asynchronous, or partially synchronous. Students can participate in learning activities in real time using video conferencing, chat rooms, or virtual whiteboards, but the limited attendance means may negatively impact the student interactions and engagement. Exemplified by the mode of flipped classroom, where students first conduct self-learning using videos, readings, or other forms of media and then engage in classroom activities that reinforce what they have learned with their instructors, the partially-online mode allows for more interactive and collaborative learning, providing personalized and self-paced learning experience for each student (Chapman, Goodman, and Jawitz, 2016).

Thematic cluster 2 (green) comprises 23 contributions. The main contribution of this cluster focuses on the strategies or methods for monitoring and evaluating OLTQ and MOOCs are often used to illustrate and validate the proposed methods. In fact, the complexity and innovative nature of MOOCs have posed great challenges to quality evaluation. To deal with this, a two-pronged approach and a

peer-assessment approach are proposed for effective MOOCs monitoring and evaluation. The former first defines interactive entities at different levels in the MOOC system and then determines specific assessment criteria (e.g. coverage, participation rate, and grading) at each level. The latter indicates that the peer assessment allows the participants to fully utilize their experience and knowledge to engage in evaluating their peers. Other evaluation strategies are proposed from the perspective of infrastructures such as the design of online teaching platform. The assessment criteria may include accessibility, flexibility, interactivity, and usability.

Thematic cluster 3 (pink) comprises 15 contributions. The main contribution focuses on the social roles: teachers/instructors and administrators in the online teaching environment for exploring the key elements to enhance the online teaching and learning experience. It is noticed that the academic level, teaching attitude, achievement goals, professional skills, and teaching experience of instructors are positively correlated with the effectiveness of online teaching experience. Individual characteristics and performance of administrators can also affect the quality of online teaching.

Thematic cluster 4 (yellow) comprises 14 contributions. The main contribution focuses on the satisfaction and continued usage intention of online teaching systems. The development of online teaching often requires assistance of unique system design by identifying the key factors that affect the users' willingness to continue using the system. As identified by many studies, the continued usage intention may be negatively influenced by computer anxiety and high perceived financial cost and positively influenced by computer self-efficacy, compatibility and perceived information quality. Technical environmental characteristics, such as media richness, interactivity, and gamification also have a positive impact on users' behavioral intention. In particular, psychological experiences such as interpersonal factors and atmospheric cues of online teaching systems will significantly affect the continuous usage intention.

Thematic cluster 5 (purple) comprises 10 contributions. The main contribution focuses on individual performance with respect to behavior and attitude. In terms of behavior, with the flexibility in learning time and place, most online students lack of self-regulation skills. According to relevant studies, proactive help-seeking is identified as an effective method to guide students to actively participate in online learning activities (Albelbisi, 2019). In terms of attitude, this cluster emphasizes on examining the impact of learning attitude and goals on educational success. The findings show that the value-focused students often adopt a positive attitude, devote their time and effort in learning, and perform better among their peers (Paechter, Maier, and Macher, 2010).

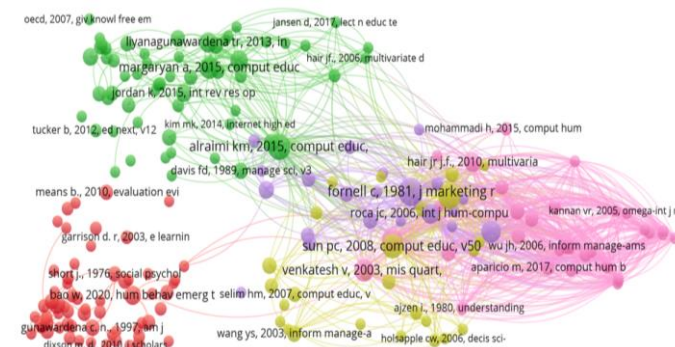
Thematic cluster 6 (blue) comprises 8 contributions. The main contribution focuses on the impact of online teaching technologies on instructional design. OLTQ is increasingly influenced by new technologies. For example, Ellis et al. (2019) pointed out that online teaching technologies can help teachers improve their instructional design. Ellis et al. (2016) suggested that the learning principles for using online teaching technologies should be included in the instructional design. Owens (2012) emphasized that the professional skills and development of teaching and technical staff are essential for effectively integrating teaching technologies with instructional design and practice.

Thematic cluster 7 (orange) comprises 7 contributions. The main contribution focuses on the factors influence online learners' participation. Various external and internal factors are thus investigated such as environmental factors (e.g., COVID-19), personal characteristics, gender, technological ability, and social skills. Dias et al. (2020) further developed a predictive model using deep learning techniques to predict student participation in online learning in order for enhancing their motivations.

### 3.3. Co-citation analysis

The theoretical roots of the intellectual core are identified by grouping articles that share similar content into a co-citation cluster. By setting the minimum number of citations of a cited reference of 3, a network of 5 clusters is constructed, as shown in Figure 2.

Figure 2. Bibliographic co-citation network.

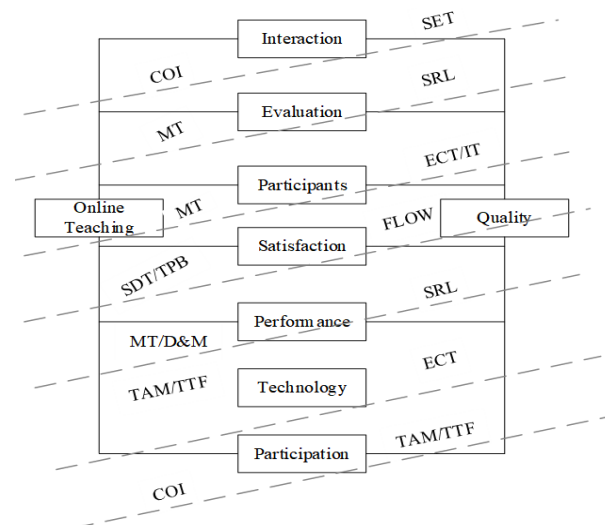


Co-citation cluster 1 (red) comprises 76 contributions. The cluster mainly based on Community of Inquiry (COI) and Self-Efficacy Theory (SET). COI indicates that a successful online teaching involves the interaction of three key elements: social presence, cognitive presence, and teaching presence. By promoting these elements, the COI model can help instructors create an effective and engaging online learning experience for their students. SET explains how people's beliefs about their own capabilities affect their motivation, behavior and learning outcomes. Cluster 2 (green) comprises 60 contributions. The cluster mainly relies on the Theory of Motivation (MT), Self-Regulated Learning (SRL), and Implicit Theory (IT). The core of this cluster is to explore various factors that motivate learners to participate in online learning activities and identify the ways to enhance motivation, engagement, and persistence, such as individual autonomy, belief in intelligence and learning ability. Cluster 3 (pink) comprises 32 contributions. The cluster mainly relies on Technology Acceptance Model (TAM), Task-Technology Fit (TTF), and Expectation-confirmation Theory (ECT). These theories are applied to study user acceptance and usage of technology in online teaching. In particular, TAM is used to predict user acceptance of technology-based teaching tools and platforms. TTF assesses whether the technology used to deliver course content and facilitate communication between students and instructors is well-suited and meet course objectives. ECT further explains why students and instructors continue to use a particular online teaching tool or platform (Bhattacharjee, 2001). Cluster 4 (yellow) comprises 23 contributions. This cluster mainly studies models for measuring the success of online teaching systems. Information Systems Success Model (D&M) and Structural Equation Modeling (SEM) are commonly applied in the cluster. Cluster 5 (purple) comprises 22 contributions. This cluster mainly relies on Self Determination Theory (SDT), Theory of Planned Behavior (TPB) and the Flow theory of social psychology. The use of the three theories provides useful frameworks for understanding the intentional behavior of using online teaching. The results can be used for the design and implementation of effective online teaching strategies.

### 3.4. Social relation analysis

With a content analysis of the articles, a quantitative matrix between the thematic and co-citation clusters is established and their relation diagram can be drawn by Ucinet. Based on the diagram, a framework with multiple research paths can be obtained, as shown in Figure 3.

Figure 3. Research paths.



It is noted that the research of student interactions in online teaching environments is mainly based on COI and SET, indicating OLTQ is significantly affected by the interactions between instructors and students, computer self-efficacy, and learners' reflection strategies. The discussion about OLTQ evaluation is highly dependent on MT and SRL. Due to the lack of supervision in online learning, it is necessary to explore internal and external motivations that promote learners' proactive participation, investigate strategies that enhance autonomous learning. IT is often used to study the role of participants in dealing with situational changes and challenges in adoption of new technologies. It is recognized that the implicit intelligence of students, instructors, and administrators has strong influences on their adaptive behaviors. The research on online teaching satisfaction and continued usage intention apply a variety of theories such as TPB, Flow and SDT. These theories mainly investigate the influence of attitude, motivation, enjoyment and other psychological factors on the willingness to continue using the online teaching tools. In the study of individual performance in online learning, theories such as TPB, ECT and SRL are used for exploring the changes brought by attitudes, perceptions, and motivations. To understand

the impact of online teaching technologies, TAM and TTF are used to investigate the user acceptance of online teaching and sustained usage behavior over time. In the discussion of student participation, COI serves as a framework for assessing the participation rate in online teaching environments from the perspectives of technology and user perception.

#### 4. Discussion

The results of this study can help scholars track contributions of the intellectual core and identify research gaps or future research issues along each path. For example, effective learner reflection strategies need to be established in a trusted environment and are subject to potential interventions caused by other network users. Future research can thus be conducted to address **RQ 1**: *Will the intimacy of peer relationship affects the students' decision-making in formulating reflection strategies?* Due to the heterogeneity of online teaching, it is necessary to differentiate synchronous and asynchronous teaching modes and investigate the impact of autonomy on OLTQ under different environments. Future research can thus investigate **RQ 2**: *What is the impact of heterogeneity in online teaching on self-regulated learning behaviors?* To further explore the influencing factors to OLTQ from the perspective of participants, future research can investigate **RQ 3**: *Will the leadership style of administrators affect the quality of online teaching?* According to the Flow theory, gamification of online teaching interface design can improve OLTQ via incorporating pleasure. Future research can further investigate the variables that affect the flow experience of the students, such as **RQ 4**: *How to make online teaching platforms more gamified?* Although the SRL theory can help explain individual behavior in online learning, little research has been done on the triggering mechanisms for such behavior. As suggested by MT, individual behavior can be largely influenced by external motivation. Future research can thus identify **RQ 5**: *What kind of organizational mechanisms (e.g. scale and gender ratio) can facilitate proactive learning?*

#### 5. Conclusion

This study makes theoretical and practical contributions to the OLTQ research. By using bibliometric techniques and content analysis, the study overcomes the limitations of qualitative reviews and systematically explores the key research topics, contributions, theoretical roots, and main findings. By establishing the relationships between the research themes and theoretical roots, the study constructs a research framework with viable research paths for connecting existing knowledge and presenting mature study schemes. The framework can help reveal gaps and key questions for guiding the future research in this field. Practically, the concept of “Internet + teaching” has become an important means of education in the post-COVID-19 era. It is important for universities to ensure that students receive high-quality education in remote learning environments. The findings of this study provide a comprehensive review of the past, current and future development of OLTQ and can be used to facilitate the universities to develop strategies for improving the quality of online teaching.

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