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รุ่ย หยาง[1] คณกร สว่างเจริญ[2*] พงศ์ หรดาล[3] สมบัติ ทีฆทรัพย์[4]

Exploration of Issues in Online Learning for Undergraduates in Sichuan Province and Construction of an Evaluation Model

Rui Yang[1] Kanakorn Sawangcharoen[2*] Pong Horadal[3] Sombat Teekasap[4]

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บทคัดย่อ

การเรียนรู้ออนไลน์เป็นช่องทางสำคัญในการเสาะหารู้ของผู้คน ดังนั้น การสร้างรูปแบบการประเมินการเรียนรู้ออนไลน์ที่มีประสิทธิภาพจึงกลายเป็นประเด็นเร่งด่วน การศึกษานี้ใช้การสัมภาษณ์และการสำรวจเพื่อทำความเข้าใจเชิงลึกเกี่ยวกับสถานะภาพการพัฒนาการเรียนรู้ออนไลน์ในปัจจุบัน ผลการวิจัยพบว่าการเรียนรู้ออนไลน์มีปัญหาจากการมีส่วนร่วมและแรงจูงใจของนักเรียนต่ำ เนื้อหาและวิธีการสอนที่จำกัด ผู้สอนมีองค์ความรู้ในการสอนไม่เพียงพอ ความสามารถในการสอนออนไลน์ไม่เพียงพอ ความเป็นส่วนตัวและความปลอดภัยทางระบบดิจิทัลที่ไม่สมบูรณ์ สภาพแวดล้อมทางเทคนิคและเงื่อนไขการใช้งานไม่สอดคล้องกัน และไม่มีการแบ่งปันทรัพยากรและปรับปรุงให้ทันสมัย ฯลฯ การศึกษานี้ใช้วิธี Delphi เพื่อสร้างแบบจำลองการประเมินการเรียนรู้ออนไลน์เพื่อใช้เป็นข้อมูลอ้างอิงเชิงปฏิบัติสำหรับการปฏิรูปการเรียนรู้ออนไลน์ โมเดลที่นำเสนอประกอบด้วยองค์ประกอบหลัก 4 ประการ ได้แก่ นักเรียน ครู การสนับสนุนด้านเทคนิค และทรัพยากรการเรียนรู้ สำหรับนักเรียน ควรส่งเสริมการมีส่วนร่วมในการเรียนรู้ ควรได้รับการสนับสนุนจากครอบครัว และควรมีความปรารถนาในการเรียนรู้ ในขณะที่ครูควรพิจารณาวิธีการสอน การออกแบบการสอน และการรับข้อมูลป้อนกลับในการสอน สำหรับการสนับสนุนทางเทคนิค ควรสนับสนุนความพร้อมใช้งานของแพลตฟอร์ม ความปลอดภัยทางเทคนิค และการสนับสนุนทางเทคนิคที่มีประสิทธิภาพ และสำหรับทรัพยากรการเรียนรู้ ควรใส่ใจเนื้อหาที่เหมาะสม เครื่องมือสื่อสาร และจัดการการใช้ทรัพยากรร่วมกัน

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[1] Leshan Normal University และมหาวิทยาลัยราชภัฏบ้านสมเด็จเจ้าพระยา
Leshan Normal University, Chaina and Bansomdejchaopraya Rajabhat University, Thailand.
E-mail: yr0817@126.com
[2, 3, 4] มหาวิทยาลัยราชภัฏบ้านสมเด็จเจ้าพระยา
Bansomdejchaopraya Rajabhat University, Thailand.
E-mail: [2]kanakorn323@hotmail.com., [3]horadalpong@gmail.com, 4sombat.teekasap@gmail.com
* Corresponding author e-mail: kanakorn323@hotmail.com

Abstract

Online learning gradually becomes an important way for people to acquire knowledge. The current study aims to construct an effective online learning evaluation model to enhance online learning. In order to achieve the research aim, this study interviewed 21 respondents regarding online learning to analyze the current problems in the development of online learning among undergraduate students in Sichuan Province. Secondly, the Delphi method was used to establish a graphical model based on the feedback from 21 experts. Finally, referring to the CIPP evaluation principle, 5 experts evaluated the online learning evaluation model. Research results show that online learning suffers from low student engagement and motivation, limited teaching content and methods, inadequate personalized teaching know-how, insufficient online teaching capabilities, imperfect privacy and security, technical environment and conditions mismatched, and not available resource updates and sharing, etc. To solve the above-mentioned problems, the current study constructed an online evaluation model which comprised four core components, namely, students, teachers, technical support, and learning resources. For students, this model encourages students' learning engagement, family support, and learning desire. At the same time, this model takes teaching method, instructional design, and teaching feedback into consideration. Moreover, this model provides support for technical support, platform availability, and technical security. Last but not least, this model generates learning resources with appropriate content, interactive tools, and managing shared resources

Keywords: online learning, online evaluations model, problems of online learning, online learning evaluation factors

Introduction

Online learning is a long-distance teaching and learning method based on Internet technology, which can break the boundaries of time and space, display and transmit learning content through the Internet and computers, and then realize long-distance two-way communication between teachers and students (Liu & Zhao, 2021). The rapid growth of online learning, accelerated by the COVID-19 pandemic, has underscored the need for comprehensive evaluation frameworks to ensure quality and effectiveness (Vlachopoulos, 2020). Online learning can not only enhance people's educational opportunities, but also provide a superior learning experience, shared educational resources, and mutual teaching information. This can balance teachers' strengths, promote educational equity, reduce educational costs, and more. Additionally, online learning can better cater to the diverse and personalized learning needs of students (Cui, 2021). Besides, numerous studies have shown that online learning can increase the participation rate in learning, enhance the quality of discussions, and facilitate online communication and interaction (Yu, 2021). Though online learning has the above-mentioned advantages, it contains some drawbacks. For example, Hart (2012) and Moore (2013) found that student engagement and motivation in online learning was insufficient, due to the technological barriers, lack of interaction, feeling isolated, unengaging course content, lack of self-regulated learning, and distractions from the external environment (Hart, 2012; Moore, 2013). Additionally, students may feel uncomfortable as they are not accustomed to the

autonomy of online learning, which may lead to decreased engagement and motivation. Some research show that online learning is limited in various teaching content and methods. The technology and resource limitations make it difficult for some complex subjects and practical skills to be taught effective through online platforms (Means, Toyama, Murphy, Bakia, & Jones, 2009). This has resulted in limited usage of online learning in certain fields, such as laboratory science, medicine, and engineering, where hands-on experimentation and practical experience are crucial. Ally (2004), Hattie (2008) and Ferguson (2012) identified that lacking of personalize teaching was a drawback of this platform which challenged both students and teachers. What is more, online learning was found to have insufficient online teaching capabilities. Multiple studies have pointed out that many teachers lack the necessary online teaching capabilities, including technical skills, adaptability of teaching methods, promotion of student interaction, and online course management (Baran, Correia, & Thompson, 2011; Koehler & Mishra, 2009). In addition, concerns remain about student engagement, interaction, learning outcomes, and overall satisfaction in online learning (Owusu-Boampong & Holmberg, 2015).

Drawing upon the above-discussed drawbacks or disadvantages of online learning, developing an effective online learning model to enhance students' online learning performance is urgent.

Problem Statement and Theoretical Framework

Problem Statement of Online Evaluation Models

Existing evaluation models often struggle to capture the complexities of online learning. They may primarily focus on quantitative data like course completion rates, neglecting the nuanced aspects of engagement, learner satisfaction, and deeper learning outcomes (Means et al., 2014). Furthermore, current models may not adequately consider the specific features and functionalities unique to online platforms, including interactivity, accessibility, and collaborative tools (McCarthy, 2005). This requires strengthening effective evaluation in the online learning process to ensure the quality of online learning. At present, online learning still focuses on summative evaluation methods with exams as the core. This method can only evaluate students' knowledge and skills, which reflect indirect guiding and motivating role in teaching and learning, so it cannot effectively promote students' all-round development. In addition, the large amount of evaluation tasks and the cumbersome processing of results do not satisfy most of the teacher's expectations. As a result, evaluation has not received due attention in online learning.

With a reference to the limitations of existing online learning and evaluation models discussed above, this research thus aims to develop an evaluation model specifically tailored for comprehensive assessment of online learning systems.

Theoretical Framework:

Elements of online learning evaluation include four major parts: objectives, content, subjects, and methods. Evaluation objectives have a direct effect on the overall design of evaluation schemes and occupy a core position among the evaluation constituent elements. Therefore, the evaluation objective has direct effects on evaluation content setting, evaluation subject establishment, and evaluation methods selection. The evaluation content is a specific regulation of "what to evaluate" based on the evaluation objectives with concrete determinations. Evaluation can be made from several aspects such as interaction level, Q&A situation, resource utilization, homework, and exams. Online learning evaluation

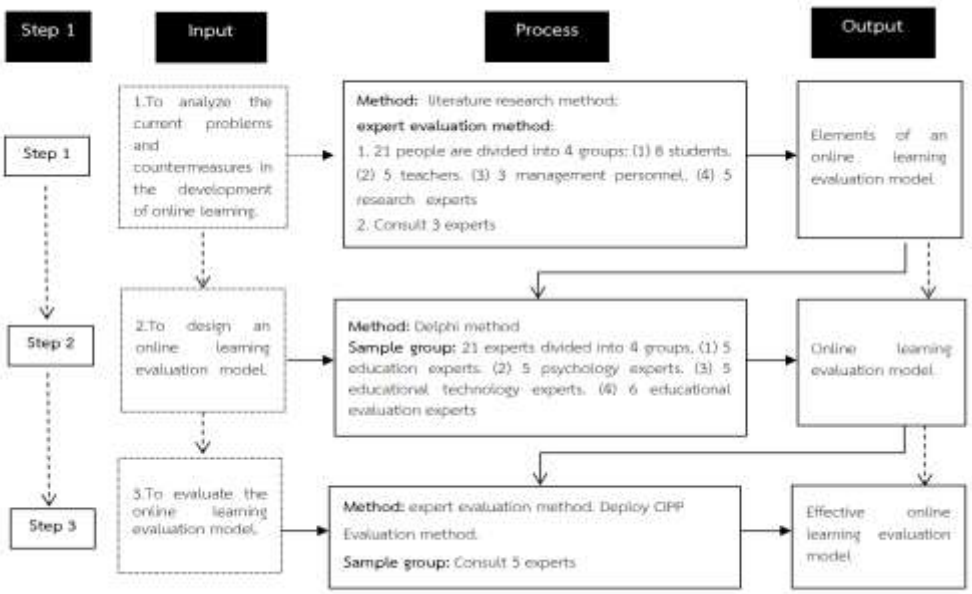
should include four components: teachers, learners, learning peers, and online learning platforms. The above synthesis of literature on technology-enhanced learning, evaluation theory, and online pedagogies inform the model components and criteria. Thus, the author adopted the theories of Constructivism (Jonassen & Ronrer-Murphy,1999) and Self-Determination (Ryan & Deci, 2000) to form effective model. Furthermore, relevant evaluation frameworks like Kirkpatrick's Four Levels (Kirkpatrick & Kirkpatrick, 2006) and the ADDIE model provide valuable starting points for constructing a comprehensive model.

In summary, this research will integrate various theories and frameworks to develop a comprehensive and systematic online learning evaluation model, aiming to enhance the effectiveness of online learning and promote the comprehensive development of students.

Research Methodology

With a reference to the problem statement and research aim discussed above, this research addresses the key question of "What is the appropriate model tailored to account for the specific features and functionalities of different online learning systems?". Based on the above-mentioned theoretical framework and potential evaluation models, this study tries to combine advanced information technology, assist certain research theories, and model development paradigms, and find an effective method to develop an online learning evaluation model. The evaluation model helps teachers understand which issues need to be considered and improved during the online teaching process and proposes measures to improve the quality of students' online learning.

To solve the research problems, this study applied the research methods and instruments, such as interviews and questionnaires to firstly gain an in-depth understanding of the actual situation and needs of online learning. Then the author selected a specific online course, adopted the Delphi method, and designed a comprehensive online learning evaluation model for college students through multiple rounds of anonymous expert consultation with an aim to provide guidance for the reform of college students' online learning, practical reference, and inspiration.



1. Participants

The participants are online learning teachers, students of online training plan, management personnel of online teaching project, and experienced researchers. And the sample groups consist of 5 teachers (23.81%), 8 students (38.10%), 3 management personnel (14.28%), and 11 research experts (23.81%) selected by using purposive sampling method (Table 1).

Table 1 Participants

No.	Component categories	Number of people	Percentage
1	Student	8	38.10%
2	Teacher	5	23.81%
3	Management personnel	3	14.28%
4	Research expert	5	23.81%
5	Total	21	100.00%

2. Research Instruments:

2.1 Interview: An interview with designed open-ended questions was applied in the current evaluation model of online learning. This allowed relevant personnel to express their views on various aspects. The student interviews were divided into three parts with a total of 16 questions. The first part introduces the interviewee to the background and basic requirements of this interview. The second part contains 3 questions on students' basic information, such as gender, grade, subject category, etc. The third part consists of 13 questions, covering key areas such as goal setting, main issues in online learning, strategies to improve online learning, and factors affecting online learning evaluation. The interview questions also include open-ended questions to give a chance for students for voice out their additional views.

For non-student interviews, also divided into three parts with a total of 17 questions. The first part introduces the interviewee to the background and basic requirements of this interview. The four questions in the second part focus on personal information such as gender, working experiences, professional title, academic qualifications, etc. The third part includes 13 questions, which refines the question setting like that of student interviews, aiming to collect non-student groups' opinions on the current online learning status and improvement suggestions, and further enrich the research content.

To ensure the rigor and comprehensiveness of the interview survey, this study designed two types of guides for student interviews and non-student interviews.

2.2 Procedures of Conducting the Interview

2.2.1 Based on the information obtained through the research and analysis of relevant basic data, an interview framework related to the elements of the online education evaluation model was established to solicit opinions.

2.2.2 Adopt interviews to listen to the opinions of the interviewees on the "Online Learning Evaluation Model Development Guide" and submit them to the interviewees for review and improvement based on the suggestions.

2.2.3 Bring the interview form and have each item checked for content validity and

language appropriateness by 3 experts. and complete clarity, completeness, and coverage of the questions and then use the advice gained to improve upon the suggestions before using them for the actual interview

3. Research Procedure

3.1 Data Collection

In order to ensure the scientificity and accuracy of the interview, the researcher conducted a series of preparatory work. Taking advantage of the researcher's status as a teacher in a higher education institution, the researcher explained the research purpose and needs to the school teaching management department. After receiving recognition and support from the management, the researcher obtained the contact information of a randomly selected group of students and teachers, managers and experts.Subsequently the researcher sent an interview form the opinions of the sample group, the research proposal, the research concept framework, and interview documents for the opinions of the sample group were given to the sample group in advance, and contact to request an interview appointment along with taking notes and recording audio. Before the interview ended, the interviewees were also asked to confirm the content of the interview.

3.2 Data Analysis

The researcher obtains the data from the interviews, analyzes the opinions of the sample group, categorizes the data types based on content consistency, compares the principles, concepts, and theories related to the researcher's interview questions, and then considers their applicability and consistency of the data, For information on the components of the online learning evaluations model.

After filtering the collected data, all selected data is accurately processed and analysis in an Excel spreadsheet. For the questions using the five-point Likert rating scale, the values of 1 to 5 refer to level of strongly disagree to strongly agree. Then, using SPSS 24.0 statistical software, the data was averaged to reflect the overall attitudes of teachers and students towards various issues. For the remaining issues, a binary classification approach is adopted, assigning a value of 1 to the selected options and 0 to the unselected options. These data were then subjected to frequency analysis in SPSS 24.0 software to reveal the distribution of respondents' choices on relevant questions.

Results

Problems in the development of online learning: Through interviews with 21 respondents, it was found that there are 8 problems existing in the current development of online learning including low student engagement and motivation, limited teaching content and methods, inadequate personalized teaching knowhow, insufficient online teaching capabilities, imperfect privacy and security, Technical environment and conditions miss matched, low quality online learning content, not available resource updates and sharing, etc., as shown in Table 2.

Table 2 Problems in the development of online learning

Item	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Low student engagement and motivation	19 (90.5%)	2 (9.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	21
Limited teaching content and methods	18 (85.7%)	3 (14.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	21
Inadequate personalized teaching knowhow	20 (95.2%)	1 (4.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	21
Insufficient online teaching capabilities	17 (81.0%)	4 (19.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	21
Imperfect privacy and security	14 (66.7%)	4 (19.1%)	2 (9.5%)	1 (4.8%)	0 (0.0%)	21
Technical environment and conditions miss matched	13 (61.9%)	5 (23.8%)	1 (4.8%)	2 (9.5%)	0 (0.0%)	21
Low quality online learning content	16 (76.2%)	2 (9.5%)	3 (14.3%)	0 (0.0%)	0 (0.0%)	21
Not available resource updates and sharing	14 (66.7%)	4 (19.0%)	3 (14.3%)	0 (0.0%)	0 (0.0%)	21

Table 2 presents the results of a survey on the current situation of online learning. Each aspect, respondents can express their view in five levels: Strongly Agree, Agree, Not Sure, Disagree, and Strongly Disagree. Among them, in terms of students, 90.5% of the respondents believed that students' participation in online learning was not high; 85.7% of the respondents believed that it was limited by the content and methods of online teaching, which restricted students' interest. Regarding teachers, 95.2% of the respondents pointed out that online learning cannot meet individual needs; 81.00% of the respondents believed that the current online teaching capabilities of teachers need to be further improved. In terms of technical support, 66.7% of the respondents believe that the privacy and security of online learning are not yet complete, and participants do not pay enough attention to privacy and security. 61.9% of the respondents believe that the current technical environment and conditions for online learning still have a lot of room for improvement. In terms of learning resources, 76.2% of the respondents believe that the quality of online learning content is not high; 66.7% of the respondents believe that the updating and sharing of online learning resources are not in place, which affects the effectiveness of online learning to varying degrees. resources will also affect the effectiveness of online learning.

The current problems in online learning can be attributed to many factors, firstly, low students' participation which may be due to the lack of corresponding teaching content and methods, secondly, teachers' online teaching capabilities are still not adequate, especially in meeting students' needs, thirdly, insufficient technical support which may be caused by the existing of technical errors and security protection failure, and finally, the insufficient and inappropriate of online learning resources will also affect the effectiveness of online learning.

Factors affecting online learning evaluation: From the interviews, it was found that students, teachers, technical support and learning resources are the four main parts of online learning evaluation, 17 factors affecting online learning evaluation were sorted out, and confirmed by relevant experts. Among them, 12 factors were unanimously approved, and items 4, 5, 8, 10, and 14 were adjusted due to low expert recognition, as shown in Table 3.

Table 3 Factors affecting online learning evaluation.

Items	Influencing factors	Md	Mo	IQR	Result
1	Learning engagement	5.0	5	0.0	Pass
2	Family support	5.0	5	0.0	Pass
3	Learning desire	5.0	5	0.0	Pass
4	Students' self-control ability	4.0	5	2.0	Modify
5	Students' psychological quality	4.0	4	2.0	Modify
6	Teaching method	5.0	5	0.0	Pass
7	Instructional design	5.0	5	0.0	Pass
8	Teaching style	4.0	5	2.0	Modify
9	Teaching feedback	5.0	5	0.0	Pass
10	Teacher treatment	3.0	3	2.0	Modify
11	Platform availability	5.0	5	0.0	Pass
12	Effective technical support	5.0	5	0.0	Pass
13	Technical security	5.0	5	0.0	Pass
14	Technical form	4.0	5	2.0	Modify
15	Appropriate content	5.0	5	0.0	Pass
16	Interactive tools	5.0	5	0.0	Pass
17	Shared resources	5.0	5	0.0	Pass

According to Table 3, it was found that 3 of the 5 factors that affect students' online learning evaluation showed high consistency with the interquartile range ($0.0 \leq IQR \leq 1.0$) or median ($4.0 \leq Md \leq 5.0$), indicating 60.00% A high degree of consensus was achieved on the influencing factors. The opinions that I strongly agree with are as follows: item 1 "Learning engagement" (Md=5.0, Mo=5, IQR=0.0), item 2 "Family support" (Md=5.0, Mo=5, IQR=0.0), The 3rd item "Learning desire" (Md=5.0, Mo=5, IQR=0.0); the 4th and

5th items (Md=4.0, IQR=2.0) show that there are significant differences in opinions among the interviewees.

Development of online learning evaluations model: Using the Delphi method, 21 experts, comprise of 5 teaching staffs, 5 psychologists, 5 education technologists, and 6 evaluation specialists, were invited to evaluate the online learning evaluation model. During this period, the 21 experts give exceptional support with a positive attitude. The final online learning evaluation model is shown in Figure 1.

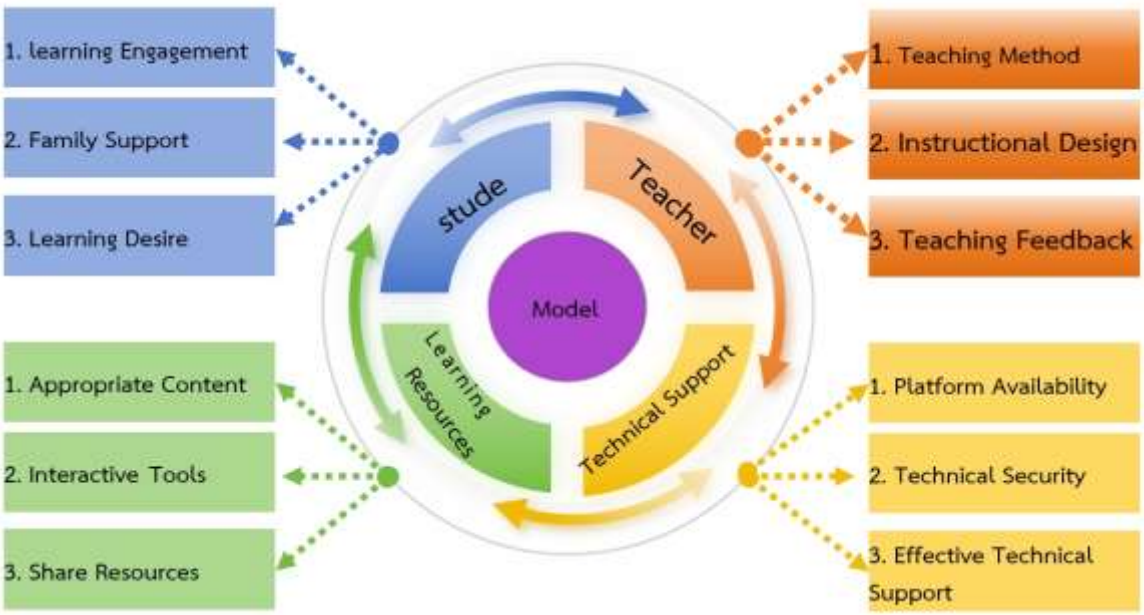


Figure 1 Online learning evaluation model

Model description:

This research includes 4 key links: target population and sample selection, application of research tools, data collection process, data analysis and statistical methods. The researchers aim to build an online learning evaluation model through multiple rounds of questionnaire surveys and expert consultation.

1. This model further clarifies that students, teachers, technical support, and learning resources are the core of online learning evaluation. Relationships among them influenced one another and jointly reflect the level of online learning quality.

2. "Student-teacher" relationship: Teachers are the guides and facilitators of students' learning process. Teachers provide personalized teaching methods to meet the different needs of students. Teachers help students understand their learning progress through feedback and assessment.

3. "Student-technical support" relationship: Technical support ensures that students can

access online learning resources without any barriers. Technology platforms provide interactive and collaborative tools to enhance students' learning experience. Technology tools can assist students in self-learning and management.

4. "Student-learning resources" relationship: Learning resources provide students with knowledge and information according to their learning styles through diverse learning materials (videos, articles, interactive tasks, etc.). Learning resources should be accessible and relevant to students' learning goals.

5. "Teacher-technical support" relationship: Technical support helps teachers efficiently transfer knowledge and monitor students' learning progress. Teachers need to master technology tools to better design and execute lessons.

6. "Teacher-Learning Resources" relationship: Teachers select and integrate learning resources according to course objectives and student needs. Teachers transfer knowledge through learning resources and may also create new learning materials.

7. "Technical support-learning resources" relationship: The technology platform provides support for the storage, distribution, and access of learning resources. Technical support is needed to ensure the accessibility and compatibility of learning resources.

8. In this model, all elements interact with each other. For example, the quality of technical support directly affects students' access experience to learning resources, while teachers' teaching methods and the selection of learning resources used will affect students' learning results. Therefore, this model emphasizes the interactions and dependencies between various elements in an online learning environment.

Discussion

Firstly, there is a need to shift teachers' perceptions of learning evaluation and encourage the use of a variety of evaluation methods in online teaching. Peng (2016) argued that traditional evaluation perspectives involve only teacher assessment of students, where students are seen as passive recipients of knowledge, and traditional learning evaluations predominantly adopt the form of teacher evaluations. Learning evaluations in current online teaching are influenced by traditional teaching methods, focusing mainly on teacher evaluations. However, considering that in online teaching, students' roles shift from passive receivers to active participants, learning evaluations should be student-centered. Teachers should step back from the dominant role in the teaching process and instead assume the roles of organizers, guides, and facilitators. They should employ student-centered evaluation methods (such as student self-assessment and reflection, goal setting, peer evaluation, etc.) and encourage active student participation in learning evaluation(Dolezal et al., 2018; Hammar & Griswold).

Secondly, the objectives and standards of evaluation in online teaching and learning should be diversified, promoting tiered evaluation and establishing a comprehensive evaluation mechanism. Student learning activities occur not only in the classroom but also after class. Learning behaviors that teachers cannot directly observe also accumulate and contribute to students' final learning outcomes. Therefore, teachers should not use a single purpose or standard for evaluating student learning. Additionally, in teaching, the focus and effort should always be directed towards all students. Teachers should also adopt different learning evaluation standards for students at different levels, that is, setting clear learning

objectives for students of varying levels so that students understand the goals they are expected to achieve (Jahns & Zintl, 2023).

Finally, it is crucial to stimulate students' enthusiasm for using various learning evaluation methods during the learning process. Students have become the main agents in learning evaluation and should play a central role in it. Although teachers are still the dominant figures in learning evaluation, it should be an autonomous and self-driven activity for students, with many methods requiring active and proactive participation from them. Zhang (2021) emphasized that a key feature of evaluations that promote student learning is advocating for shared evaluation responsibility between teachers and students, forming an effective learning community, and encouraging students to actively participate in the evaluation process to achieve autonomous learning (Zhang, 2021). Research on assessment for promoting student learning. Journal of Comparative Education, (01), 99-111). Additionally, the role of parents in evaluating students is often overlooked. However, the involvement of parents in students' evaluations significantly impacts their growth. Ellen Weber (2015) pointed out that parents, like teachers and students, play the role of evaluation partners in learning assessment. The more parents are involved in their children's learning, the greater the learning opportunities for the children (Weber, 2015). Moreover, during online teaching, as teachers' supervisory roles are diminished, it becomes even more important for parents to play their part and value their role as evaluation partners.

Conclusion

A survey of current problems and countermeasures in the development of online learning found that there are 8 main shortcomings: First, due to the limitations of online teaching forms, students are not actively participating enough. Second, compared with traditional methods, the content and methods of online learning are still limited to a certain extent. Third, the current standardized learning path of online learning is suitable for everyone, ignoring individual differences among students and lacking personalized teaching. Fourth, the online learning process is diversified, and teachers' online teaching capabilities are slightly insufficient. Fifth, online learning involves a large amount of data information, but the privacy and security protection mechanisms are not yet complete. Sixth, online learning has high technical requirements, and the current technical environment and conditions are not effectively matched. Seventh, there is a lack of effective quality control mechanism, resulting in low quality of online learning content. Eighth, it is limited by the construction quality of the online learning platform, and resource updating, and sharing are not in place.

References

Ally, M. (2004). Foundations of educational theory for online learning. ***Theory and practice of online learning, 2***(1), 15-44.

Baran, E., & Correia, A. P. (2014). A professional development framework for online teaching. ***TechTrends, 58***(5), 96-102.

Baran, E., Correia, A. P., & Thompson, A. (2011). Transforming online teaching practice: Critical analysis of the literature on the roles and competencies of online teachers. ***Distance education, 32***(3), 421-439.

Cui, Y. (2021). **An inquiry into online teaching strategies for high school solid geometry course**. (Master's Degree Thesis). Liaoning Normal University, Liaoning, China.

Ferguson, R. (2012). Learning analytics: drivers, developments, and challenges. ***International Journal of Technology Enhanced Learning, 4***(5-6), 304-317.

Hart, W.A. (2012). What Lessons Can We Learn? ***Journal of Philosophy of Education, 46*,** 663-673.

Hattie, J. (2008). **Visible learning: A synthesis of over 800 meta-analyses relating to achievement**. London, New York: Routledge.

Jonassen, D.H., & Ronrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environments. ***ETR&D, 47***, 61-79.

Kirkpatrick, D.L., & Kirkpatrick, J.D. (2006). ***Evaluating training programs***. San Francisco, CA: Berrett-Koehler Publishers.

McCarthy, E.D. (2005). ***Knowledge as Culture***. London, New York: Routledge.

Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? ***Contemporary issues in technology and teacher education, 9***(1), 60-70.

Liu, R., & Wang, Y. (2021). Analysis of research hotspots and trends in online education in the past decade abroad. ***Chinese Journal of Medical Education Technology, 35***(04), 414-421.

Means, B., Toyama, Y., Murphy, R., & Baki, M. (2014). The effectiveness of online and blended learning: A meta-analysis of empirical literature. ***Teachers College Record, 115***(3), 1-47.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). ***Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies***. U.S. Department of Education.

Moore, T. (2013). Critical thinking: Seven definitions in search of a concept. ***Studies in Higher Education, 38***(4), 506-522.

Owusu-Boampong, A., & Holmberg, C. (2015). ***Distance education in European higher education: The potential***. Oslo: International Council for Open and Distance Education.

Peng, V. (2016). ***Educational Technology and Network Teaching Resources Integration***. Beijing: Guangming Daily Publishing House.

Ryan, R.M., & Deci E.L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. ***American Psychologist, 55***(1), 68-78.

Vlachopoulos, D. (2020). COVID-19: Threat or opportunity for online education? ***Higher Learning Research Communication, 10***(1), 16–19.

Weber, E. (2015). **How to assess students effectively diverse assessment strategies for promoting learning [M]**. Beijing: China Light Industry Press.

Yu, Z. (2021). The effects of gender, educational level, and personality on online learning outcomes during the COVID-19 pandemic. ***International Journal of educational technology in higher education, 18*,** 1-17.

Zhang, C.H. (2021). Research on assessment for promoting student learning. ***Journal of Comparative Education,*** (1), 99-111.