Influence of Teachers' Effective Teaching Behavior on Knowledge Transfer of Students in Online Teaching

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Abstract—With the rapid development of information technology, the online education environment has become a reality. In specific online education practices, most teachers exhibit effective teaching behaviors by using multimedia technologies positively to stimulate the learning initiative of students, improve their learning performances, and promote their knowledge transfer. Based on theories of knowledge transfer and effective teaching behaviors, a measurement model that focuses on the effects of effective teaching behaviors of teachers on knowledge transfer of learners was constructed in this study. Moreover, the influencing mechanism of effective teaching behaviors of teachers (clear teaching, diversified teaching, task orientation, and guidance of student engagement) on knowledge transfer of students was discussed through questionnaire survey and multiple regression analysis. In addition, differences in knowledge transfer caused by different online learning platforms were analyzed. Results demonstrate that for the designed questionnaire, the general Cronbach's α=0.796 and KMO values 0.820, indicating that the designed questionnaire has very good reliability and validity. Four aspects of clear teaching, diversified teaching, task orientation, and guidance of student engagement have significant positive correlations with knowledge transfer. Diversified teaching, task orientation, and guidance of student engagement can also promote knowledge transfer of students significantly. According to the Kruskal-Wallis test statistics, online learning platforms have significant effects on the knowledge transfer at the 0.05 level. Research conclusions have important references to recognize components of effective teaching behaviors of teachers, promote knowledge transfer improvement of students comprehensively, and facilitate the positive transformation of teachers to online teaching modes and strategies.

Keywords—online teaching, effective teaching behaviors, knowledge transfer

1 Introduction

At present, most teachers in different types of schools at different levels have the initiated the use of multimedia technologies in teaching activities of professional courses. The applications of multimedia technologies can not only enrich teaching content but also can stimulate the learning enthusiasm of students. More importantly,

multimedia technologies can make students willing to reach resources of different courses, thereby improving their learning level comprehensively. The current teaching reform is suited to multimedia teaching, so that teachers can collect various teaching resources through networks and share resources comprehensively with useful teaching data. On one hand, the teaching quality of blended teaching of courses is improved. On the other hand, the unique charm of course knowledge in teaching practicability, intelligence, and interestingness is represented, and students' personality and independent learning are continuously strengthened. Online teaching is a teaching mode that helps students to make independent learning online by using modernized multimedia information technology. Such teaching mode emphasizes the teaching philosophy of student-centered and teacher assistance and is conducive to strengthening the learning ability and comprehensive quality of students. Effective classroom teaching interaction in online teaching is a new teaching mode that increases teaching efficiency. The essence of effective teaching behaviors of teachers is behaviors that increase measurement standards of students' knowledge and skill mastering, promote teaching activities and improve the learning effect of students.

The fundamental goal of effective teaching behaviors is to help students develop the correct value, have good emotional attitudes, and gain progresses in the process of knowledge and skill learning. Effective teaching behaviors are not specific behaviors but are a set of behaviors that everyone can promote academic development and individual progress of students. They are a comprehensive evaluation of the teaching level and management ability of teachers. In online teaching, teachers use effective teaching behaviors can promote knowledge transfer of learners, so that existing knowledge and skills of learners can influence the learning of new knowledge and new skills. Through proper knowledge transfer, students can make full use of existing knowledge draw inferences, and make connections of one case in the learning of new knowledge, thus generating positive transfer initiatively. Effective teaching behaviors of teachers in online education have positive effects on mastering the knowledge skills of learners and improving their learning efficiency. They promote students to transfer new knowledge into the learned knowledge through the same form and let new knowledge become the old and familiar knowledge. Through comparison of new and old knowledge, the learning process of new knowledge is simplified and the learning quality and learning effect of learners to new knowledge is improved. Effective teaching behaviors can strengthen the training of skills and basic scientific thinking methods of students in the process of knowledge acquisition so that students apply the mastered potential knowledge into learning process and experience and summarize a set of self-learning experiences and methods during continuous learning activities, which will influence their follow-up learning and promote the improvement of knowledge transfer ability. Improving the teaching effectiveness of teachers requires timely feedback and reflection on classroom effective teaching behaviors of teachers. In the process of online teaching, it has to investigate not only students' comprehension and skilled use of knowledge points, but also their learning attitudes in the classroom, online learning, and operation levels, and practical use of the English language, thereby giving students comprehensive and objective assessments and promoting their comprehensive development. Different types of schools at different levels have to

adopt diversified evaluation mechanisms and integrate mutual assessments of students and teachers. Mutual understanding of students is better than an understanding of teachers and it is easy to discover disadvantages of blended teaching. Students' assessment of teachers can help teachers improve themselves continuously and recognize and correct their teaching shortcomings, thereby enabling to improve teaching effectiveness.

2 Theoretical bases and proposal of hypotheses

Knowledge transfer refers to the effects of one learning activity on the other learning activity. In the continuous process of learning, any learning activities are carried out based on existing knowledge experiences and cognitive structures, acquired action skills, and attitudes to the acquisition of learners. Pea [1] determined specific features of thinking skill teaching that promotes transfer effectively, including learning and practicing knowledge applications in several service environments, participating in linkage teaching of trans-school and non-school scenarios constructively, teaching thinking and self-management skills in the field, and collaborative integration of learning of different disciplines. He also proposed suggestions for developing new learning technologies to strengthen knowledge transfer. Argote et al. [2] believed that knowledge transfer became increasingly important in organizations and they provided empirical evidence to investigate the effective mechanism of knowledge transfer as well as barriers and promoters.

With the continuous integration of modern information technology and education, online teaching has developed quickly and the learning effect of students has not been ideal. Thus, the learning outcome of students has not been satisfactory, as indicated by the insufficient depth of learning process and outcome, poor learning efficiency, and weak independence. Students have difficulty engaging in deep learning and it is impossible to guarantee that they can realize knowledge transfer effectively. Relevant studies have found that effective teaching is the most important factor that influences online learning performances. In the online teaching environment, a huge gap can be observed in the study of the effects of effective teaching on knowledge transfer from the perspective of teachers.

In terms of how clear teaching influences knowledge accumulation, knowledge transfer, and learning performances, Doyle [3] deemed that effective teaching was concerned mainly with an education activity better promotes ideal learning of students. Effective teaching requires teachers to adopt clear teaching behaviors and concern realization of teaching objectives through their good teaching characteristics and quality, professional knowledge, and effective teaching behaviors. The evaluation standards of effective teaching not only emphasize the teaching behaviors of teachers but are more concerned with the growth and progress of students. Harris [4] analyzed a range of applications of effective teaching. Through abundant literature review, he believed that effective teaching behaviors can be measured by teaching effect, teaching mode, and artistic properties. Chesebro [5] designed a scale of clear teaching of

teachers, and research results demonstrate that this scale could measure the clarity of teaching content and teaching process effectively.

Therefore, H1 is proposed as follows:

H1: Clear teaching could promote knowledge transfer of learners significantly.

Kuyini et al. [6] pointed out that diversified teaching was a major cause that promotes effective teaching practices of teachers. Behets [7] demonstrated that diversified teaching of teachers could be measured by students' progress in gym skill learning. The most effective teachers gained significantly high scores in positive learning time. It required basic teaching strategies and behaviors before teachers may be developed to more complicated teaching behaviors. Tremblay-Wragg et al. [8] showed out that teachers could improve the learning motivation of students effectively by using 6–9 teaching strategies.

Hence, H2 was proposed as follows:

H2: Diversified teaching can promote knowledge transfer of learners significantly.

Wetherbee et al. [9] found that the years of experiences of clinicians as clinical lecturers were positively related with their more effective teaching behaviors, and clinical lecturers could use task orientation teaching mode more by implementing effective teaching behaviors, thereby promoting medical students to master clinical skills more quickly. Faucette et al. [10] discovered that experts could improve the attention of learners by using a more obvious task orientation teaching mode. Griffin et al. [11] demonstrated that the task-oriented teaching mode of class teachers was beneficial for the expansion and construction of the knowledge system of students. Barson et al. [12] believed that task-orientation learning through remote communication applied to different course levels and it possessed considerable advantages as a teaching method.

Hence, the following hypothesis is proposed:

H3: Task orientation can promote knowledge transfer of learners significantly.

Harbour et al. [13] argued that when using effective practices, teachers could improve the possibility for students to participate in teaching positively to the maximum extent and guide them in increasing learning engagement and improving their learning performances. Schönwetter et al. [14] found that effective teaching behaviors of teachers include lecture teaching, the enthusiasm of teachers, feedback, teaching language, learning opportunities, structured comments, and task orientation. Results demonstrated that some factors of effective teaching behaviors of teachers could significantly affect the academic performances of students. MacSuga-Gage et al. [15] believed that guidance of student engagement was a major factor that guaranteed the learning performances of students. It also guaranteed that learners had a good positive learning atmosphere. Herrenkohl et al. [16] disclosed that learning engagement growth based on teaching guidance was a key measure for students to maintain a relatively high learning performance level.

Hence, the following hypothesis is proposed:

H4: Guidance of student engagement can promote knowledge transfer of learners significantly.

3 Methodology

3.1 Questionnaire design

In this study, a questionnaire of Influences of Effective Teaching Behaviors of Teachers on Knowledge Transfer of Students in Online Teaching was designed. The questionnaire was composed of 27 items of three parts. Part I was general information statistics of respondents, including gender, grade, online learning platform, and online learning hours. Part II pertained to the effective teaching behaviors of teachers. Because the measurement of effective teaching behaviors of teachers during online teaching of universities takes various aspects into account, this study measured effective teaching behaviors of teachers from four perspectives of clear teaching, diversified teaching, task orientation, and guidance of student engagement. These four aspects had 4, 4, 5, and 4 items, respectively. Clear teaching refers to teaching in a gradual logical order that can be easily understood without distracting the attention of students. Diversified teaching refers to diversified teaching materials, questions, feedback, and teaching strategies. Task orientation refers to achievement orientation rather than process orientation to cover contents as wide as possible and teaching time as much as possible. Guidance of student engagement refers to the restriction of distraction opportunities, which helps students to operate, think and explore the teaching content. Teachers play the role of guidance, organization, advice, and catalysis in the teaching process. Part III is knowledge transfer. Knowledge transfer refers to understanding and realizing the perceptibility of the training objective of students, and realizing specific teaching objectives of teachers. It is the ability of students to acquire knowledge and problem-solving after effective teaching behaviors of teachers. In this study, six questions were used to measure knowledge transfer. All problems were measured by the seven-point Likert scale.

3.2 Research objects

The Ministry of Education of Jilin Province, China facilitated resource sharing by strengthening the construction of education platforms and forming high-quality resources dynamic integration and optimal allocation following practical teaching and learning demands of teachers and students based on the opening and applications of online learning spaces. Through forms, such as the urban-rural synchronous classroom, remote theme classroom, online lessons of famous teachers, and network research and studies of teachers, the Ministry of Education of Jilin Province, China is accelerating the construction of education platform and promoting co-construction and sharing of high-quality educational resources. Changchun Institute of Science and Technology is a private undergraduate university in Jilin Province. It attaches considerable importance to online teaching during the COVID-19 pandemic. The Language Culture School implemented online teaching through mainstream live teaching platforms in China (e.g. Dingding, Tencent Meeting, Tencent Classroom, and QQ group), which have achieved obvious teaching effects and good academic performances. In this study, a total of 271 paper questionnaires were sent and 248 were collected. After

deleting invalid questionnaires, 228 questions were retained, which had an effective collection rate of 84.13%. Table 1 shows that the proportion of different items of survey samples conform to the general structural proportions of undergraduate students in Changchun Institute of Science and Technology. The online platforms were mainstream online live teaching platforms in China. Survey results in this study were representative.

Table 1. Descriptive statistical results

Name	Items	Number of frequency	Percentage	Cumulative percentage
Gender	Males	81	35.53	35.53
	Females	147	64.47	100
Major	International Chinese	28	12.28	12.28
	Korean	36	15.79	28.07
	English	85	37.28	65.35
	Japanese	47	20.61	85.96
	Russian	32	14.04	100
Grade	Freshmen	47	20.61	20.61
	Sophomore	118	51.75	72.37
	Junior	33	14.47	86.84
	Senior	30	13.16	100
Online learning platforms	Dingding	46	20.18	20.18
	Tencent Meeting	51	22.37	42.54
	Tencent Classroom	79	34.65	77.19
	QQ group	40	17.54	94.74
	Others	12	5.26	100
Total		228	100	100

4 Results analysis

4.1 Reliability and validity test

The reliability of the questionnaire refers to the consistency, stability, and reliability of test results, and it is usually expressed by internal consistency. The higher reliability coefficient indicates the higher consistency, stability, and reliability of test results. This reliability is usually measured and expressed by Cronbach's α.

Table 2 shows that SPSS26.0 software was used in this study to conduct a reliability analysis. The overall reliability of the questionnaire and reliabilities of different factors were tested. The Cronbach's α is 0.796, indicating that the questionnaire has very high general reliability.

Table 2. Reliability test results

Name of variables	Question No.	CITC	Cronbach's α	Cronbach's α
Clear teaching	A1	0.853	0.941	0.796
	A2	0.873		
	A3	0.849		
	A4	0.862		
Diversified teaching	B1	0.885	0.948	
	B2	0.878		
	B3	0.879		
	B4	0.854		
Task orientation	C1	0.656	0.883	
	C2	0.747		
	C3	0.789		
	C4	0.773		
	C5	0.635		
Guidance of student engagement	D1	0.798	0.914	
	D2	0.816		
	D3	0.806		
	D4	0.797		
Knowledge transfer	Y1	0.633	0.835	
	Y2	0.607		
	Y3	0.644		
	Y4	0.539		
	Y5	0.629		
	Y6	0.609		

Table 3 shows that the KMO value of the SPSS test is 0.820 (P<0.001), indicating that the data validity is very good, and it can present data of value and influence well.

Table 3. KMO and Bartlett test

KMO		0.820
Bartlett's test	Approximate chi-square	4018.217
	df	253
	p-value	0.000

4.2 Correlation analysis

Figure1 shows that factor5 presented significant correlations with factor1, factor2, factor3, and factor4, and the correlation coefficients were 0.6882, 0.5302, 0.6980, and 0.5042. Moreover, the correlation coefficients were all higher than 0, indicating that factor5 had positive correlations with factor1, factor2, factor3, and factor4.

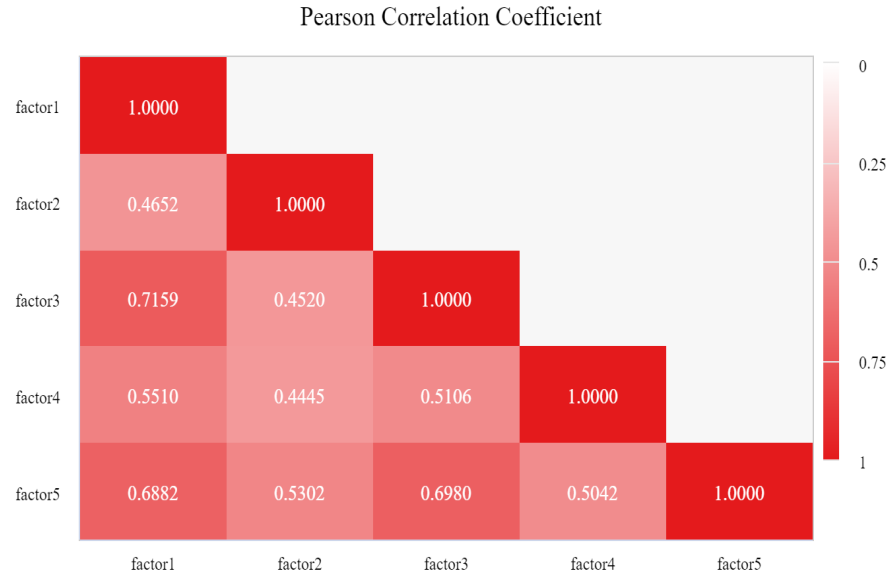

Fig. 1. Correlation coefficient

4.3 Regression analysis

Table 4 shows that the R2 of the model is 0.597, indicating that four independent variables could elaborate 59.7% variations of explanatory dependent variables. The results show that the model passed through the F test (F=82.528, p=0.000<0.05). Moreover, the multiple nonlinearity test of the model shows that VIF values in the model were all smaller than 5, indicating the absence of nonlinearity problems. The D-2 values were about 2, indicating that the model had no autocorrelation and no correlation with the sample data. The model was relatively good.

Table 4. Regression results

Influencing factors	Standardized coefficient	T	P	VIF□	Adjust R^2	F
Constants	-	2.630	0.009**	-	0.590	F(4,223)=82.528, p=0.000
Clear teaching	0.066	1.244	0.215	1.575		
Diversified teaching	0.357	5.679	0.000**	2.185		
Task-orientation	0.198	3.940	0.000**	1.396		
Guidance of student engagement	0.304	4.692	0.000**	2.323		

D-W:1.910
* p<0.05 ** p<0.01

H1 is not true. Thus, clear teaching cannot significantly promote knowledge transfer of learners, which might be because clear teaching requires teachers to have a very

detailed teaching plan and objective and a comprehensive and profound understanding of the whole teaching arrangement. Therefore, a clear and explicit teaching plan is related to the realization of the course teaching objective and knowledge transfer of learners. However, many universities in China, particularly the application undergraduate programs represented by the survey university in this study, still have extensive philosophy of emphasizing scientific research and ignoring teaching. Teachers have not carried out high-quality development of online courses effectively. The characteristics of online teaching have not been considered fully in curriculum settings and content design. Moreover, a major reason is that online learning resources are considered to have been developed from nothing and teachers are used to the classroom teaching mode. Teachers have no more time for more thorough preparation because of the massive online teaching tasks and they neither made scientific design over teaching process. As a result, teachers can easily digress from the subject during online teaching, and language exceeds the understanding level of students, or their speech way weakens clarity of content representation. It also enlightens the university teaching management department to pay considerable attention to the following problems: construction of informatization course resources requires the power of the teacher team. Comprehensive English teachers should build their teams and strengthen resource construction in the aspects of multimedia courseware and elements, fine course construction, flipped classroom, and MOOC.

H2 is true. Diversified teaching can promote knowledge transfer of learners significantly. Major reasons are elaborated as follows. At present, most online teaching platforms are equipped with realization modes of diversified teaching ways, such as guiding students to make vocabulary cards with Quizlet and assisting vocabulary memory with pictures and voices by using various foreign language learning apps. Brainstorming activities were also designed. Through reasoning and analysis, deep construction of new knowledge of students is realized, which trains their cognitive strategies, collects their online learning experiences and reflections, discovers problems through continuous reflection and review of the language acquisition process, and corrects them in a timely manner, thereby improving the metacognitive strategies of students. Moreover, it can build a virtual reality (VR) learning environment based on intelligence technology, use context teaching methods skillfully, and use the online classroom as the real experiencing platform of language knowledge deep processing to improve their ability in solving practical problems in the second foreign language context. Concerning the implementation of courses, discussion-based teaching, small research project, project studies are applied, which can help postgraduates to provide mutual enlightenment and help each other based on independent thinking over a specific topic. In this way, they can be nourished by team knowledge while contributing individual unique knowledge to deepen understanding of the problem and stimulating innovative inspirations.

H3 is true. Task orientation can promote knowledge transfer of learners significantly. The maximum changes of online education and traditional classroom teaching lie in the realization of the "student-centered" teaching mode. If the teaching time of teachers is too long, it will occupy classroom time and affect the input of other teaching behaviors, which will have negative influence on learning acquisition. Hence,

online teaching focuses on students' accomplishment of tasks of a teaching unit and explosive learning under the assistance of classroom teaching, which fully stimulates the enthusiasm and initiative of learners. In particular, doubts as the link between students and criticism teaching and the link between thinking training and teaching practice should be added to the online course teaching in application undergraduate universities, thereby combining theoretical knowledge and practices. To guide students to finish practice projects or course practice links, a professional laboratory for experimental activities of undergraduates should be built, establish close relations with enterprises, and carry out joint training of undergraduates. With the assistance of information technology, it can design online learning task navigation, determine task outcomes, and guide the thinking, emotion, and behaviors of students toward the realization of the learning objective. For instance, teachers can shift students' attention from language knowledge to contained thought through analysis, discussion, and discrimination, and guide the spiral growth of cognition. Moreover, open subjective problems concerning evaluation, analysis, and integration of students should be increased.

H4 is true. Guidance of student engagement can promote knowledge transfer of learners significantly. Teachers can dynamically adjust their teaching plans and contents based on learning feedback data of platforms, design personalized learning tasks for students, and implement personalized accurate teaching with gradient characteristics. Teachers should emphasize the training of high-order thinking ability to high-level students, and assign high-order team tasks, such as organization, communication, summary, etc. By organizing online teaching activities with teacher-student and student-student deep interaction, teachers can guide students to make multi-dimensional interactions through voices, bullet screens, and annotations, increase their participation and experience, stimulate their learning motivations and prevent online teaching from transforming into a bad teaching state of passive listening and PPT watching of students. Based on social communication software, a learning support group can be established and an online learning community with a high degree of participation and strong interaction can be created. By sharing individual language learning experiences, it can recommend English learning methods and interesting news to students, create a positive and harmonious learning atmosphere, maintain timely communication between teachers and students, encourage students to overcome difficulties in language learning, promote student-student interaction and cooperation, and strengthen learning community attachment and acceptance of students. The diversified language learning motivations are stimulated, thereby driving students to increase learning engagement and improving knowledge transfer of learners effectively. It also reminds teachers to change online teaching into a platform that facilitates cultural communication and improves humanistic quality, increases intercultural communication competence of students, and sets up an international view of students. Process evaluation is the major method used, including self-assessment of students, mutual assessment in the group, and platform data. Diversified incentive mechanisms are applied, such as language encouragement and praise, positive feedback, and concern, which stimulates learning enthusiasm and engagement of students.

4.4 Difference analysis of knowledge transfer on different teaching platforms

In this study, differences in learning acquisition on different online learning platforms were investigated using a non-parameter test. Figure 2 shows that the online learning platform is composed of more than two groups of components. Therefore, Kruskal-Wallis test statistics were chosen for analysis. The influences of online learning platforms on knowledge transfer are significant at the 0.05 level ($p=0.018<0.05$). Differences can be analyzed by comparing the medians. Kruskal-Wallis test statistics could be used in the analysis. Tencent Classroom is the most popular platform among students and its knowledge transfer score is far higher than those of other platforms, which might be because of the large population of students on Tencent Classroom who share their good experiences on the platform, which influences the subjective assessment of students who use other platforms on the knowledge transfer. An evident "halo effect" of high-quality platform use is generated. It also makes it easy to attract more teachers to Tencent Classroom and decrease the difficulties of students in their platform choice.

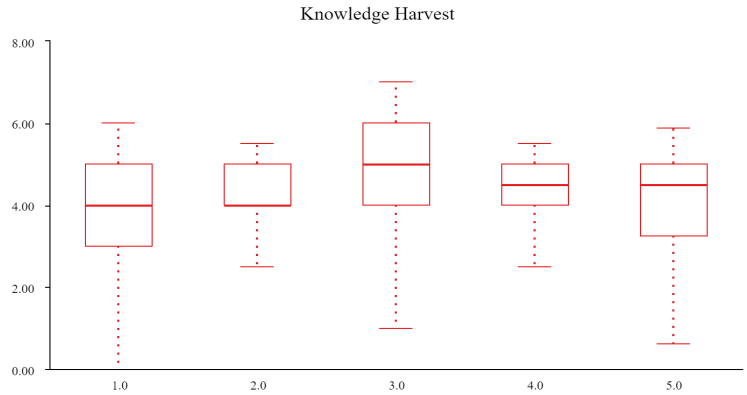

Fig. 2. Differences of learning acquisitions on different online learning platforms

5 Conclusions

Internet and information technology transcend time and space limitations in traditional teaching mode. Online teaching resources have richer and more diversified forms. Teachers and students can access abundant teaching resources in different forms from the Internet and resource-sharing platforms. Teachers collect various teaching data through the network, improve online teaching quality by effective teaching behaviors, strengthen personalization and independent learning of students continuously, and realize knowledge transfer of learners. Questionnaires and multiple regression analysis were applied to explore the mechanisms of effective teaching behaviors (clear instruction, diverse instruction, task orientation and guided student engagement) on learners' knowledge transfer. Moreover, differences in knowledge

transfer caused by using different online learning platforms are analyzed. The Cronbach's α=0.796 and KMO=0.820 (P<0.001) of the designed questionnaire indicate very good reliability and validity of the questionnaire. Diversified teaching, task orientation, and guidance of student engagement can significantly promote knowledge transfer of learners. The influences of online learning platforms on knowledge transfer are significant on the 0.05 level (p=0.018<0.05). Deep studies on knowledge transfer evaluation driven by data of online teaching platforms, proposing incentive measures of online teaching elements and resource development of teachers, and creating online learning communities with strong interactions are needed in the future.

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