INTERNATIONAL JOURNAL OF RESEARCH AND INNOVATION IN SOCIAL SCIENCE (IJRISS)
ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue I January 2026

Evaluating the Impact of Collaborative Hyflex Training (CHT) on Teaching Effectiveness: Evidence from Student Course Experience

Yeqing Fan [1,2], Norah Md Noor [1]

[1]School of Graduate Studies, Universiti Teknologi Malaysia, 81310 Skudai, Johor Bahru, Johor, Malaysia

[2]Hangzhou Dianzi University Information Engineering College, 311305 Hangzhou, Zhejiang, China

DOI: https://doi.org/10.47772/IJRISS.2026.10100500

Received: 25 January 2026; Accepted: 30 January 2026; Published: 14 February 2026

ABSTRACT

This study evaluates the impact of cross-institutional Collaborative HyFlex Training (CHT) on university teachers' instructional effectiveness through student course experience. The Course Experience Questionnaire (CEQ) was administered to 755 students taught by three teacher groups (CHT group, n=263; Control A, n=244; Control B, n=248), with confirmatory factor analysis confirming scale validity. Due to violations of parametric test assumptions, Kruskal-Wallis H tests and Dunn's post-hoc tests with Bonferroni correction were employed. Results demonstrate that the CHT group significantly outperformed both control groups across all CEQ dimensions ($p<0.001$), with medium to large effect sizes ($\delta=0.28$-0.69). The most substantial improvements relative to Control B were observed in Good Teaching (GTS, $\delta=0.69$), Generic Skills (GSS, $\delta=0.58$), and Empowering Learners (ELS, $\delta=0.61$). Notably, the CHT group significantly exceeded the high-performing Control A group (GTS: $\delta=0.48$; Total CEQ: $\delta=0.44$), confirming the model's incremental value for teachers with diverse baseline competencies. The research reveals CHT's dual-effect mechanism: "promoting equity" by elevating underperforming instructors while "enhancing excellence" among accomplished educators, providing empirical evidence for reconstructing faculty development systems during higher education's digital transformation.

Keywords: intercollegiate collaboration; HyFlex training; course experience; teaching effectiveness; non-parametric tests; effect size assessment; higher education

INTRODUCTION

With the rapid advancement of digital-intelligent technologies and the deepening transformation of higher education toward digitalization, an increasing number of frontline teachers are encountering new challenges in their capacity to effectively integrate digital technologies to enhance teaching (Yu, 2023). Studies have pointed out that providing teachers with technology access, training and support, as well as creating opportunities for cooperation with technical experts, will help promote the successful application of technology and classroom integration, and improve teachers' digital teaching ability (King & Boyatt, 2015). In fact, there is still an obstacle for teachers to carry out continuous professional development training, that is, "teachers' spare time is insufficient". Although they hope to communicate with early adopters in the field of technology and seek help and services to make better use of technology to improve teaching; However, due to the lack of spare time, they need more flexible, independent and fair access to training resources and support (Uzorka et al., 2023).

However, the traditional teacher training system faces multiple challenges in supporting teachers' sustainable growth: first, the structural imbalance of training resources leads to uneven development opportunities. High quality teaching development resources are scarce. In particular, cutting-edge educational technology and teaching innovation cases are distributed in a "center edge" manner among colleges and universities. Teachers' professional growth in ordinary colleges and universities is facing a "resource depression", which makes it difficult to systematically access high-quality professional development support (Wang & Guo, 2022). Second, the traditional centralized and indoctrinated school-based training organization mode is rigid, which is difficult to meet the personalized and situational learning needs of teachers in the digital era in time, space and content (Yu, 2023); This "supply oriented" training mode is difficult to support teachers to build sustainable professional ability to adapt to the new normal of mixed teaching and human-computer cooperation (Zhu & Hu, 2021); Third, the effect evaluation is not in-depth, most training evaluations stop at the level of immediate response and satisfaction, and lack of tracking verification on the improvement of teaching behavior and its continuous impact on students' learning experience (Kirkpatrick & Kirkpatrick, 2016).

In response to the aforementioned challenges, a novel teacher development framework known as Collaborative HyFlex Training (CHT) has emerged, which integrates theories such as Distributed Leadership, Learning to Teach, Communities of Practice, and HyFlex Learning (Hybrid-Flexible learning). This cross-institutionally collaborative approach demonstrates significant potential. The theoretical conception of the framework is to create an open and collaborative ecosystem for teachers' professional development by giving full play to the intercollegiate resource sharing and flexible participation mechanism through system design and technology empowerment. In this system, teachers in ordinary colleges and universities can deeply integrate into the real teaching scene and teaching and research culture of famous universities in multiple ways, such as synchronous online (such as Clone Class observation), asynchronous online or limited offline, and experience the complete closed loop of "observation reflection practice", so as to realize the internalization of teaching philosophy and the transfer of teaching behavior (Li & Qiao, 2020).

Although the model is attractive in theory, its empirical effect, especially the medium-term teaching effect, is still lack of rigorous verification. Existing studies are mostly limited to model description, technology implementation or short-term feelings of participants, and fail to systematically test the continuous effect of training on the improvement of teachers' classroom teaching behavior from the perspective of students by using evaluation tools with good reliability and validity. Originated from the theory of "Learning to Teach", the Course Experience Questionnaire (CEQ), which is widely used internationally, and the dimension of "Empowering Learners", which is expanded to adapt to the digital environment, provide the possibility of accurate evaluation from the perspective of students, but its effectiveness in the complex situation of Chinese universities still needs to be further verified (Ramsden, 1991; Lu & Li, 2020; Huang et al., 2021).

Therefore, this study faces the core concerns and the theory practice fault zone in the field of teachers' professional development, and aims to explore a problem with high theoretical significance and practical urgency through a rigorous quasi experimental study: whether intercollegiate Collaborative HyFlex Training (CHT) can have a significant and sustainable positive impact on the teaching effect of participating teachers; At the same time, the applicability of the internationally widely used and locally revised Course Experience Questionnaire (CEQ) in the context of colleges and universities in China is verified, in order to provide an empirical basis for the model innovation and scientific evaluation of teachers' professional development.

LITERATURE REVIEW

Theoretical Foundations and Practical Explorations of Cross-Institutional Collaborative Teacher Training

As a new professional development model, the core of intercollegiate collaborative teacher training is to go beyond the boundaries of a single school, and promote teachers' growth with collective wisdom through the construction of intercollegiate cooperation network and resource sharing mechanism. From a theoretical perspective, the CHT framework integrates the essence of the Distributed Leadership theory and the Community of Practice theory, emphasizing the role of Shared Instructional Leadership, building a cross university "Professional Learning Network" and promoting collaborative development (Spillane, 2005; Vescio et al., 2008).

First, Shared Instructional Leadership (SIL) provides an organizational and dynamic framework for intercollegiate collaboration. According to this theory, teaching leadership should not be limited to principals or school management, but should be distributed in a community composed of teachers, experts and managers from multiple schools (Spillane, 2005). The distributed leadership theory advocates sharing teaching leadership across organizational boundaries, making the high-quality practice of teachers in famous schools a public professional resource that can be circulated (Spillane, 2005; Harris, 2009; Timberley, 2005). Through intercollegiate collaboration, leadership can flow and share, so that high-quality teaching ideas, practices and resources (such as famous teacher courses and teaching research programs) can radiate from resource advantage schools to other schools, so as to systematically improve the overall teaching professional level in the region or the Alliance (Harris & Jones, 2010). This provides a direct theoretical basis for the collaborative model of “prestigious universities’ demonstration and ordinary colleges’ follow-up”.

Secondly, the theory of community of practice and social culture reveals the internal mechanism of collaborative learning. The concept of “Community of Practice” proposed by Lave and Wenger emphasises that learning occurs through social participation and the negotiation of meaning (Lave & Wenger, 1991). The theory of community of practice emphasises that in the process of intercollegiate composition, intercollegiate collaboration is to build a “Professional Learning Network” and “Teachers’ Professional Learning Community” across organisational boundaries. Around the common goal of teaching improvement, teachers carry out “legitimate marginal participation” through observation, discussion, collaborative lesson preparation and other activities, and ultimately realize the change of collective knowledge and practice and the improvement of cognition through social interaction and collaborative reflection (Lave & Wenger, 1991; Vescio et al., 2008). Researchers in the field of learning science advocate cultivating excellent teachers for the future in the way of “teachers and researchers’ collaborative design community of practice” (Cai et al., 2022; Gu & Bai, 2019). From the perspective of social culture, this synergy provides a “scaffold” for teachers to interact with “more capable peers” (such as famous teachers or experts in other universities), and promotes the internalization and development of their teaching cognition and ability (Vygotsky, 1978).

Moreover, there have been many forms of practice and exploration at home and abroad in giving play to high-quality resource sharing and promoting collaborative development. Internationally, the “Professional Learning Network” is a typical example. Schools form alliances to carry out long-term collaborative exploration and action research on specific teaching issues (Brown & Poortman, 2018). Domestic practice in China is often combined with policy driven, such as “U-S (University - Primary and Secondary School) cooperation”, “Education Collectivization” and “Regional Teaching and Research Community” (Cai et al., 2022; Zhao et al.,

2025). Specifically, in the field of colleges and universities, projects such as Clone Class and Cross University Virtual Teaching and research office have realized the real-time sharing of curriculum resources and the deep linkage of teaching and research activities through technology empowerment (Li & Qiao, 2020).

However, the existing research and practice on teacher development training framework still have obvious limitations. Most studies focus on the discussion of collaborative mechanism, participants’ satisfaction or short-term knowledge acquisition. There is a lack of micro process research on how collaborative training can be specifically transformed into the change of teachers’ daily classroom teaching behavior, and it is rare to track its medium-term impact on teaching effectiveness (especially students’ learning outcomes) through strict longitudinal design or comparative experiments (Desimone, 2009). This makes the value persuasion of intercollegiate collaborative training still insufficient, and empirical evidence is urgently needed to fill this gap.

Application of the HyFlex Instructional Model in Teacher Training

HyFlex teaching mode was formally proposed by Brian J. Beatty. Its core design principle is to provide learners with “mixed flexibility” choice, so that they can independently choose whether to participate in face-to-face teaching, synchronous online learning or step-by-step online learning in each learning topic or activity according to their own needs (Beatty, 2019). The inherent flexibility, inclusiveness and learner centered characteristics of this model make it an ideal framework for coping with multiple needs and improving the accessibility of participation, and gradually extend from student-oriented curriculum teaching to the field of teachers’ professional development (Armstrong, 2022).

The application advantages of HyFlex mode in teacher training are mainly reflected in three aspects: First, it greatly improves the accessibility and inclusiveness of participation. It breaks the rigid constraints of geography and time, enabling teachers in remote areas, those with family care responsibilities, and other groups to participate in high-quality training programs on equal terms (Byrne & Flood, 2003; Ramos, 2025). Second, it promotes the autonomy and engagement of participants. Giving teachers the right to choose the mode of participation is consistent with the self-directed characteristics of adult learners, and can enhance their intrinsic motivation and subjective consciousness of learning (Miller et al., 2021). Third, it demonstrates the practice of the blended teaching method for trainers. While experiencing the HyFlex learning process, the participating teachers are also intuitively learning how to design and implement such courses, which in itself is a kind of "learning by doing" teaching method training (Raes, 2022).

At present, HyFlex has various forms of application in teacher development projects, which are common in the branch venue of large academic conferences, series workshops and professional development courses lasting for several weeks (Mineshima-Lowe et al., 2024). Research shows that this model can effectively maintain a high attendance rate and participation, and the participating teachers generally give a positive evaluation of its flexibility; Compared with traditional instruction, HyFlex technology-based learning methods exert a significant influence on the professional academic achievement and attitudes of pre-service teachers (Amirova et al., 2023). However, the extent to which HyFlex mode teaching and learning experiences are truly effective (Miller et al., 2021), particularly regarding the effectiveness of cross-institutional collaborative HyFlex training in supporting "pedagogical transfer" and teacher professional development, remains inadequately explored.

Pedagogical transfer refers to the process by which teachers effectively apply knowledge gained from training to their authentic classroom teaching practices; this represents the ultimate standard for evaluating teacher training effectiveness (Kirkpatrick & Kirkpatrick, 2016). Cross-institutional collaborative HyFlex training involves multiple contextual transitions, such as remote observation and geographically distributed collaboration, making its mechanism for promoting changes in teacher instructional behaviors particularly complex. Consequently, there is insufficient evidence regarding its sustained impact on the continuous improvement of subsequent teaching effectiveness.

Teaching Effectiveness Evaluation and the Course Experience Questionnaire (CEQ)

The course experience questionnaire (CEQ), originated in Australia, is a widely used and influential standardised tool in the international higher education quality assurance and student evaluation system (Ramsden, 1991). Its core design concept is derived from the theory of "Learning to Teach", that is, effective teaching should be able to guide high-quality students' learning experience and results. The classic CEQ scale quantifies the overall quality of course teaching from the perspective of students' perception through a series of dimensions, which usually include: good teaching scale (GTS), clear goals and standards scale (CGSS), appropriate workload scale (AWS), appropriate assessment scale (AAS) and generic skills scale (GSS) (Wilson, Lizzio, & Ramsden, 1997). A large number of studies have shown that CEQ has good reliability and validity, and its score is significantly correlated with students' learning methods, learning satisfaction and academic achievement, which is an effective indicator to measure the teaching effect at the curriculum level (Byrne & Flood, 2003).

With the transformation of the educational environment to digital, the traditional teaching evaluation dimension needs to be expanded to adapt to new teaching modes such as online and hybrid. Therefore, this study introduces the incremental indicator of empowering learners scale (ELS). This indicator originates from the DigCompEdu framework developed by the European Commission, which emphasises teachers' capacity to foster students' digital learning experiences and autonomy development. It aims to evaluate the effectiveness of instruction in promoting students' digital literacy, self-regulated learning, collaborative inquiry, and personalised development. Integrating ELS into the CEQ framework will help to more comprehensively capture the new characteristics of effective teaching in the digital era.

The application of CEQ in the Chinese context faces the challenge of cross-cultural validity verification. Although some scholars have tried to introduce and revise CEQ (Lu & Li, 2020; Huang et al., 2021), the systematic test of its factor structure stability and predictive validity in Chinese universities, especially in different disciplines and types of universities, is still insufficient. Most of the domestic students' teaching evaluation tools are school-based development, which has limitations in theory construction, reliability and validity rigor and intercollegiate comparability. Therefore, applying the revised CEQ (including ELS dimension) in a rigorous intervention study can not only provide a powerful tool for evaluating the effect of specific training, but also an important test of the validity and practicability of the CEQ scale in the context of Chinese higher education.

Research Gaps

To sum up, the existing research provides a useful basis for understanding intercollegiate collaboration, HyFlex mode and teaching effect evaluation, but there are still research gaps at key intersections.

First, in terms of "evaluation tools", the adaptation verification of localisation and modernity is insufficient. The effectiveness of the internationally mature CEQ scale in the context of Chinese universities needs more empirical support, especially after it is incorporated into the incremental dimension of digital teaching empowerment; its structural validity and explanatory power need to be tested in the new teaching form. Applying the rigorously revised CEQ to the effect evaluation of a new teacher development model can not only test the local applicability of the tool, but also provide indicators with more theoretical depth and international comparability for the effect evaluation.

Second, in terms of "model mechanism" and "intervention effect", the integration efficiency of intercollegiate collaboration and HyFlex has not been clarified. Although HyFlex mode shows potential in improving teacher training participation, how its unique "flexible choice" mechanism operates in the specific situation of intercollegiate collaboration, and how it affects teachers' knowledge transfer and teaching innovation, is still a "black box". The current research fails to reveal whether the training under the CHT framework has a sustained medium-term instructional effects on the transfer and transformation of teachers' teaching ability in activities such as remote observation, intercollegiate reflection and asynchronous collaboration. This medium-term instructional effects evaluation based on student experience is the most powerful evidence to verify the final value of teacher development projects (Desimone, 2009).

The purpose of this study is to empirically test the sustained instructional effects of cross-university Collaborative HyFlex Training (CHT) on the teaching effectiveness of college teachers through a six-month (one semester) quasi-experimental study. The revised Course Experience Questionnaire (CEQ) was employed as the primary evaluation tool based on student perceptions, and the effectiveness of the CEQ (including the Empowering Learners Scale) was further examined in the Chinese higher education context, with the aim of providing empirical evidence for the innovation of teachers' professional development models.

Research Design

Research Questions

Based on the CHT training framework, this study advances intercollegiate collaborative teacher training activities in a HyFlex delivery format, fully leveraging mechanisms for sharing high-quality educational resources. It facilitates pedagogical modelling by faculty from prestigious institutions for teachers at ordinary universities and guides participating educators in self-reflection and improvement of their teaching practices. This study focuses on the following two research questions:

(1) Does the Course Experience Questionnaire (CEQ) demonstrate good reliability and validity in the context of Chinese higher education?

(2) Does the CHT-based training significantly enhance the teaching effectiveness of participating instructors, as evaluated by students?

RESEARCH METHODOLOGY

This study employs a quantitative, quasi-experimental, nonequivalent control-group design to validate the Collaborative Hybrid Training Framework (CHT), a widely used methodology for evaluating intervention effects using control groups (David A. Kenny, 1975). The implementation of the CHT program is the core step of this study. The training programs distinguish between two different implementation modes. The experimental group (HyFlex group) focuses on the teacher collaborative instructional training program, while the control group (Offline group) takes the traditional on-site, face-to-face training activities widely carried out in regular universities. Summary of the training arrangements is provided in Table3-1.

Table3-1 Summary of the Training Arrangements

Group	Enrollment	Intervention Duration	Training Mode and Content
Experimental	34	8-week, Structured training, with weekly classes on HyFlex Teaching platform; followed by a 3-month online video replay period	HyFlex: Under the CHT framework, participants observe and learn from the HyFlex teaching demonstration lesson in the Clone Class given by the lecturer from the leading uiversity
Control group	33	Non-structured training, Flexible topics, with a total of 16 instructional hours	Offline: Under the conventional training mode, take on-site, face-to-face training mostly;
			participated voluntarily

The core of the CHT framework consists of three integrated components: instructional modeling observation, pedagogical reflection, and teaching practice improvement.

- Instructional Modeling Observation: Using digital twin technology, physical classrooms of master instructors from leading universities are mirrored in the cloud as Clone Class. Participating teachers from partner institutions observe these Clone Class sessions either synchronously or asynchronously in remote settings.

- Pedagogical Reflection: Trainees engage in structured reflection on teaching practices, drawing connections between observed HyFlex instruction from exemplary instructors and their own teaching contexts.

- Teaching Practice Improvement: During and up to three months after the training, participants implement insights gained from observation and reflection into their own course instruction, thereby enacting meaningful pedagogical reform and innovation.

Participants and Experimental Procedure

In this study, teachers constitute the intervention group, and students constitute the evaluation sample used to measure teaching effectiveness. The experimental group consisted of faculty members from universities in Zhejiang Province, eastern China, who voluntarily participated in the Cross-institutional Hybrid Teaching (CHT) collaborative training program. These teachers engaged in a HyFlex teaching training intervention comprising an 8-week (16 instructional hours) intensive workshop on the HyFlex model, followed by a 3-month online video replay period after the training concluded. During the intervention, experimental-group teachers remotely observed authentic classroom instruction from prestigious universities via the online Clone Class and continuously engaged in personal teaching reflection throughout the training period, thereby promoting ongoing improvement in their taught courses.

In contrast, the control group received conventional professional development training in traditional formats. To compare the differential impact of the CHT intervention on teachers at different proficiency levels, the control group was further subdivided into Group A and Group B based on whether they had received teaching competition awards in the past three years; Group A comprised award-winning teachers.

In consideration of ethical concerns, video resources from the CHT program were made fully accessible to all control-group teachers within one month after the experimental period ended.

Research Instruments and Data Collection

The revised Chinese version of the CEQ scale was used in this study, including six dimensions such as Good Teaching Scale (GTS), Clear Goals and Standards Scale (CGSS), Appropriate Workload Scale (AWS), Appropriate Assessment Scale (AAS), Generic Skills Scale (GSS), and Empowering Learners Scale (ELS). The reliability and validity of the scale were verified by a pre-test. At the end of December 2025, the revised CEQ scale was administered to students who had completed a full semester of coursework taught by teachers from the experimental and control groups. All participating students had been taught continuously by the same instructors throughout the semester following completion of the CHT training. Data were collected only after students had experienced an entire instructional cycle under these teachers, ensuring that the survey reflected sustained instructional practice rather than short-term exposure. A total of 755 valid questionnaires were collected, including 263 in the experimental group, 244 in the control group A and 248 in the control group B.

Data Analysis Methods

This study employed RStudio for data analysis.

Step 1: Data preprocessing. The collected data underwent preprocessing to assess completeness and identify missing values. Duplicate responses from the same participant ID for the same course were examined, and logical consistency between scores on positively and negatively worded items was verified. These repeated evaluations, subscales with significant score disparities, or outliers were systematically reviewed and screened to determine their eligibility for inclusion in the final analytic sample.

Step 2: Reliability and validity analyses were conducted by calculating Cronbach's alpha coefficients, conducting inter-construct correlations, and applying confirmatory factor analysis (CFA) to assess structural validity. Assumption testing indicated violations of normality and homogeneity of variance; therefore, group differences were examined using the Kruskal–Wallis non-parametric test, followed by Dunn's post-hoc comparisons with Bonferroni correction. Effect sizes were also calculated to assess the magnitude of group differences.

FINDINGS

Participants' Demographics

Table 4-1 presents the demographic data statistical analysis of participants enrolled in the experimental and control groups. A total of 70 participants were initially recruited (35 per group). Three participants withdrew during the intervention, resulting in a final sample of 67 participants who completed both the pretest and posttest questionnaires. The effective sample comprised 34 participants in the experimental group and 33 in the control group. In terms of gender distribution, there were 28 male and 39 female teachers.

Table 4-1. Demographic Information of Teacher Groups (n=67)

Variable	Item	Number (n)	Percent（%）
Group	HyFlex (Experimental)	34	50.7
	Offline (Control A)	15	22.4
	Offline (Control B)	18	26.9
Gender	Male	28	41.8
	Female	39	58.2
Subject	Science & Engineering	31	46.3

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue I January 2026

	Social Sciences & Arts	36	53.7
Age	<30	16	23.9
	31-40	25	37.3
	>41	26	38.8
Experience	<3 years	30	44.8
	4-10 years	16	23.9
	>11years	21	31.3

Descriptive statistics indicated that the Experimental and Control groups were well balanced with respect to key demographic variables, including teaching discipline, age, and years of teaching experience.

Table 4-2 summarizes the demographic information of the 755 students who participated in the Course Experience Questionnaire survey. The sample included 482 male and 273 female students; 543 were from Science & Engineering, and 212 were from Social Sciences & Arts. By year of study, there were 514 freshmen, 142 sophomores, 70 juniors, and 29 seniors.

Table 4-2. Demographic Information of Students (n=755)

Variable	Item	Number (n)	Percent（%）
Group	HyFlex (Experimental)	263	34.8
	Offline (Control A)	244	32.3
	Offline (Control B)	248	32.8
Gender	Male	482	63.8
	Female	273	36.2
Subject	Science & Engineering	543	71.9
	Social Sciences & Arts	212	28.1
Grade	Freshman	514	68.1
	Sophomore	142	18.8
	Junior	70	9.3
	Senior	29	3.8

Evaluation of Teaching Effectiveness

All statistical analyses were conducted at the student level, with teacher groups serving as the grouping variable.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue I January 2026

Reliability and Structural Validity of CEQ Constructs

Cronbach's alpha coefficients were calculated for each dimension of the Course Experience Questionnaire (CEQ), and confirmatory factor analysis (CFA) was conducted to assess the reliability, structural validity and fit indices for the CFA models of the CEQ subscales (see Table 4-3).

The present study examined the construct reliability and structural validity of the Course Experience Questionnaire (CEQ) across its latent dimensions. As shown in Table 4-3, based on a valid sample of N = 755, all standardized factor loadings ranged from 0.561 to 0.929, with the majority exceeding the recommended threshold of 0.70, indicating that each item adequately represented its underlying latent construct.

Table 4-3. Construct Reliability, Structural Validit, and Fit Indices for CFA Models of the CEQ Subscales (N=755)

Con stru ct	Item	Standardized Loadings	Alp ha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)	Model Fit Indices
Con stru ct	Item	Standardized Loadings	Alp ha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)	Model Fit Indices
GTS	Q1-Q6	0.793-0.876	0.94	0.940	0.722	$\chi^2(9)=63.379$, $p<0.001$; CFI=0.986; TLI=0.976; RMSEA=0.089; SRMR=0.017
CG SS	Q7-Q10	0.564-0.878	0.81	0.823	0.538	$\chi^2(2)=1.359$, $p=0.507$; CFI=1.000; TLI=1.002; RMSEA=0.000; SRMR=0.008
AW S	Q11-Q14	0.561-0.805	0.80	0.840	0.563	$\chi^2(2)=14.397$, $p=0.001$; CFI=0.987; TLI=0.961; RMSEA=0.091; SRMR=0.022
AA S	Q15-Q17	0.577-0.866	0.79	0.834	0.593	$\chi^2(0)=0.000$, p=—; CFI=1.000; TLI=1.000; RMSEA=0.000; SRMR=0.000
GSS	Q18-Q23	0.842-0.900	0.95	0.952	0.767	$\chi^2(9)=233.872$, $p<0.001$; CFI=0.947; TLI=0.912; RMSEA=0.182; SRMR=0.033

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue I January 2026

ELS	Q24-Q30	0.861-0.929	0.97	0.972	0.849	$\chi^2(14)=203.956$, $p<0.001$; CFI=0.972; TLI=0.958; RMSEA=0.134; SRMR=0.017

Note: N= 755; α ≥ 0.79 and CR > 0.70 indicates excellent internal consistency, and AVE > 0.50 indicates adequate convergent validity (Nunnally, 1978; Tavakol & Dennick, 2011; Fornell & Larcker, 1981). Acceptability thresholds: CFI ≥ 0.90, TLI ≥ 0.90, RMSEA ≤ 0.08, SRMR ≤ 0.08 (Hu & Bentler, 1999).

Regarding reliability, Cronbach's alpha coefficients for all subscales ranged from 0.79 to 0.97, and composite reliability (CR) values varied between 0.823 and 0.972—both well above the commonly accepted criterion of 0.70—demonstrating excellent internal consistency across all constructs.

With respect to convergent validity, the average variance extracted (AVE) for each construct ranged from 0.538 to 0.849; All five subscales except CGSS exhibited AVE values substantially above the 0.50 threshold; Notably, GTS, GSS, and ELS achieved AVE values exceeding 0.70. Although CGSS had a relatively lower AVE of 0.538—just marginally above the critical criterion of 0.50—it still met the minimum requirement for acceptable convergent validity (Fornell & Larcker, 1981). This indicates that each latent variable accounted for more than 50% of the variance in its associated indicators, thereby satisfying the requirement for adequate convergent validity. In summary, the CEQ demonstrated robust psychometric properties in the current sample, supporting its use as a reliable and valid instrument for measuring students' course experiences in subsequent analyses.

Except for the Generic Skills Scale (GSS), the CFA fit indices for all other subscales reached acceptable levels. Among them, the Clear Goals and Standards Scale (CGSS) demonstrated the best model fit. Although the Appropriate Workload Scale (AWS) and the Empowering Learners Scale (ELS) showed slightly higher RMSEA values, their CFI, TLI, and SRMR indices were satisfactory. Considering the large sample size, their unidimensional structures were deemed acceptable. The Appropriate Assessment Scale (AAS), consisting of only a few items, formed a just-identified (saturated) model. Therefore, the validity of its structure was primarily supported by convergent validity indicators (CR = 0.834, AVE = 0.593).

Mean Comparison and Correlations of CEQ Subscales

Mean scores for each CEQ dimension across the valid sample (N=755) were calculated and visualized via scatter plots to assess overall differences in dimensional profiles (See Figure 4.1).

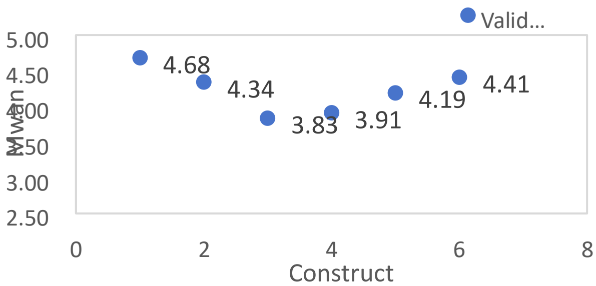
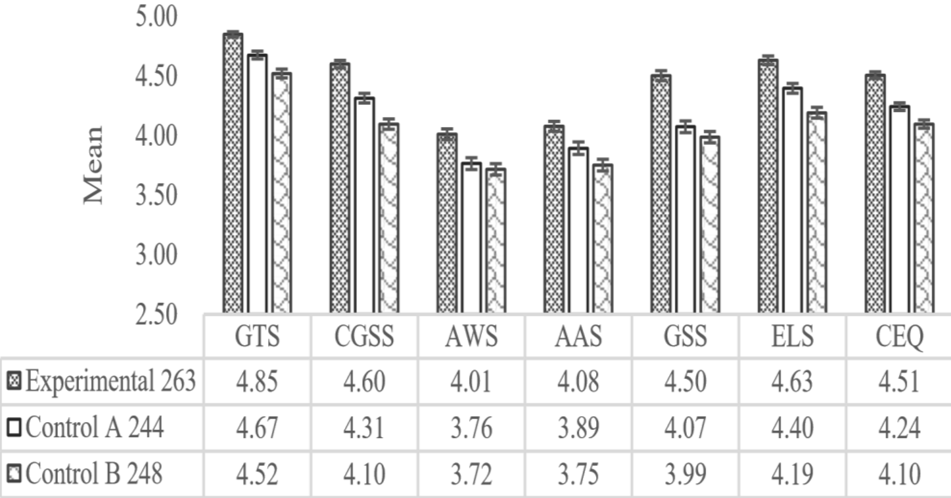


Figure4.1 Mean of CEQ Constructs (N=755)

Overall, students reported generally positive perceptions of their course experiences. The highest mean scores were observed for Good Teaching Scale (GTS: M = 4.68) and Empowering Learners Scale (ELS: M = 4.41), suggesting strong student endorsement of teaching quality and the extent to which instruction fosters learner autonomy and engagement. In contrast, Appropriate Workload Scale (AWS: M = 3.83) and Appropriate Assessment Scale (AAS: M = 3.91) received comparatively lower ratings, indicating that students perceive room for improvement in workload management and assessment practices.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue I January 2026

Mean scores for each CEQ subscale were computed separately for the three groups of teachers, and bar chart was generated to compare whether the dimensional score patterns across teacher groups aligned with those observed in the overall sample (See Figure 4.2). The overall CEQ score was calculated as the arithmetic mean of all 30 original items, consistent with the scale's validation protocol (Wilson et al., 1997).



	GTS	CGSS	AWS	AAS	GSS	ELS	CEQ
Experimental 263	4.85	4.60	4.01	4.08	4.50	4.63	4.51
Control A 244	4.67	4.31	3.76	3.89	4.07	4.40	4.24
Control B 248	4.52	4.10	3.72	3.75	3.99	4.19	4.10

Figure 4.2 Mean of CEQ Constructs of Three Teacher Groups

Across the teacher groups samples, the pattern of mean scores across all CEQ dimensions basically consistent with that of the overall score. For instance, the mean scores for the AWS and AAS dimensions were notably lower than those of other dimensions. Moreover, teachers in the intervention group consistently scored higher—both on the overall CEQ mean and across all individual dimensions—than those in the other two groups, with the Control B (regular faculty) group obtaining the lowest scores.

Table 4-4 presents inter-construct correlations for the Course Experience Questionnaire (CEQ) based on a sample of N = 755. All CEQ constructs were positively and significantly intercorrelated (all $p < 0.01$, inferred from context), with correlation coefficients ranging from 0.33 to 0.76. Notably, a strong association was found between Generic Skills Scale (GSS) and Empowering Learners Scale (ELS; $r = 0.76$), implying that students who perceive greater development of transferable skills also report higher levels of empowerment in their learning. Additionally, Good Teaching (GTS) showed a robust correlation with Clear Goals and Standards (CGSS; $r = 0.70$), underscoring the close linkage between effective teaching and the clarity of learning objectives and assessment criteria. Collectively, these moderate to strong positive correlations support the internal coherence of the CEQ framework while maintaining sufficient discriminant validity among its distinct dimensions.

Table 4-4. Correlations Among CEQ Constructs (N=755)

Construct	GTS	CGSS	AWS	AAS	GSS	ELS
GTS	1					
CGSS	0.70	1				
AWS	0.38	0.46	1			
AAS	0.36	0.38	0.45	1		
GSS	0.50	0.55	0.47	0.33	1	
ELS	0.59	0.57	0.41	0.41	0.76	1
Note: All correlations are significant at $p < 0.001$ (two-tailed).						

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue I January 2026

Group Differences Based on Non-Parametric Tests

Group differences in overall CEQ scores and subscale scores were examined across three teacher groups, defined by their participation in the CHT intervention rather than by course type. Specifically, instructors were categorised into:

- Experimental Group: teachers who participated in the specialised training (Clone Class) under the CHT framework.

- Control A Group: teachers participated in conventional training and had previously won teaching awards;

- Control B Group: teachers participated in conventional training with regular teaching competence.

The independent variable was CHT participation status. Preliminary assumption testing revealed significant violations of normality and homogeneity of variance; therefore, group comparisons were conducted using the Kruskal–Wallis non-parametric test, followed by Dunn's post-hoc comparisons with Bonferroni correction.

a. Assumption Testing for Parametric Group Comparisons

To ensure statistical rigor in comparing course experiences across instructor groups, this study evaluated the assumptions of normality and homogeneity of variance for all CEQ subscales and the total score among the three teacher groups ($N = 755$) (see Table 4-5).

First, Shapiro–Wilk normality tests revealed significant deviations from normality for all constructs—GTS, CGSS, AWS, AAS, GSS, ELS, and the total CEQ score (all $p < 0.001$; $W = 0.68–0.95$), indicating that CEQ score distributions were significantly nonnormal.

Second, Levene's test for homogeneity of variances (centered at the median) indicated that, with the exception of the Appropriate Workload Scale (AWS), all other dimensions exhibited significant heteroscedasticity across groups ($p < 0.05$). Specifically, violations were observed for GTS ($p < 0.001$), CGSS ($p < 0.001$), AAS ($p = 0.011$), GSS ($p = 0.014$), ELS ($p < 0.001$), and the total CEQ score ($p < 0.001$). Only AWS met the assumption of equal variances ($p = 0.543$).

Table 4-5. Results of Preliminary Assumption Tests for CEQ Subscales

Construct	Shapiro-Wilk	Levene's Test F (2, 752)	p-value	homogeneity of variances?
GTS	W statistic	30.612	< 0.001	×
CGSS	0.677	14.160	< 0.001	×
AWS	0.879	0.611	0.543	√
AAS	0.949	4.545	0.011	×
GSS	0.943	4.325	0.014	×
ELS	0.874	16.050	< 0.001	×
CEQ (Total)	0.809	9.941	< 0.001	×

Note: $N = 755$; df_group = 2 (3 teacher groups), df_error = 752; √ indicates that the assumption of homogeneity of variance was met ($p > .05$), × indicates a violation.

Given that the data violate both normality and, for most constructs, homogeneity of variances, the assumptions required for conventional one-way ANOVA are not satisfied. Therefore, a non-parametric approach is recommended: the Kruskal-Wallis H test should be used to examine differences in CEQ scores across the three teacher groups. If the omnibus test is significant, pairwise comparisons can be conducted using Dunn's post-hoc test with Bonferroni correction to control for Type I error inflation and ensure robust inference.

b. Kruskal-Wallis and Dunn's post-hoc

Based on a valid sample of 755 students, this study employed the Kruskal-Wallis H test followed by Dunn's post-hoc comparisons with Bonferroni correction to examine differences in Course Experience Questionnaire (CEQ) scores across three instructor groups: Experimental, Control A and Control B (See Table 4-6).

Table 4-6. Results of Nonparametric Difference Tests on CEQ Dimensions among Three Teacher Groups (Kruskal-Wallis + Dunn's post-hoc)

Construct	H (χ^2)	p	ε^2	Effect Size
GTS	61.70	< 0.001	0.082	Moderate
CGSS	78.48	< 0.001	0.104	Moderate
AWS	21.79	< 0.001	0.029	Small
AAS	22.47	< 0.001	0.030	Small
GSS	72.07	< 0.001	0.096	Moderate
ELS	60.25	< 0.001	0.080	Moderate
CEQ	84.42	< 0.001	0.112	Moderate
Note: N=755; df = 2; $\varepsilon^2 = \chi^2 / (N - 1)$; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Effect size: Small effect $0.01 \le \varepsilon^2 < 0.06$, Moderate effect $0.06 \le \varepsilon^2 < 0.14$, Large effect $\varepsilon^2 \ge 0.14$ (Cohen, 1988; Field, 2013).				

Results revealed highly significant differences across all CEQ subscales—including Good Teaching

(GTS), Clear Goals and Standards (CGSS), Appropriate Workload (AWS), Appropriate Assessment (AAS),

Generic Skills (GSS), Empowering Learners (ELS), and the total CEQ score (H = 21.79 to 84.42, $p < 0.001$).

Post-hoc analyses further showed that:

- The Experimental group scored significantly higher than both Control A and Control B on all dimensions ($p < 0.001$), indicating that the innovative training comprehensively enhanced students' course experience;
- Between the two control groups, significant differences were observed in GTS, CGSS, ELS, and the total CEQ score (p = 0.0015–0.0090), suggesting that even within standard training, prior teaching excellence (as reflected by award history) is associated with more positive teaching experiences;
- However, no significant differences emerged between Control A and Control B in AWS, AAS, or GSS ($p > 0.05$), implying that these aspects may be more sensitive to training design than to pre-existing teaching competence.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue I January 2026

In conclusion, the experimental training model demonstrates superior effectiveness in enhancing multidimensional teaching experiences compared to conventional approaches. Moreover, heterogeneity exists even within standard training cohorts, highlighting the role of baseline teaching quality as a moderating factor.

c. Pairwise Comparisons and Effect Sizes

Pairwise comparisons using Dunn's test with Cliff's delta effect sizes revealed nuanced differences among the three teacher groups (Experimental, Control A and Control B) across all CEQ subscales (See Table 4-7).

Table 4-7. Pairwise Comparison Results among Three Teacher Groups (Dunn's Test + Cliff's Delta Effect Size)

Construct	Comparison	Adjusted *p*-value	δ	Effect Sizes
GTS	Experimental vs. Control B	< 0.001	0.69	Large
	Experimental vs. Control A	< 0.001	0.48	Large
	Control A vs. Control B	0.0003	0.21	Moderate
CGSS	Experimental vs. Control B	< 0.001	0.63	Large
	Experimental vs. Control A	< 0.001	0.42	Moderate
	Control A vs. Control B	0.0015	0.19	Small
AWS	Experimental vs. Control B	< 0.001	0.35	Moderate
	Experimental vs. Control A	0.0005	0.28	Moderate
	Control A vs. Control B	0.7318	0.03	Negligible
AAS	Experimental vs. Control B	< 0.001	0.31	moderate
	Experimental vs. Control A	0.0258	0.16	Small
	Control A vs. Control B	0.0318	0.15	Small
GSS	Experimental vs. Control B	< 0.001	0.58	Large
	Experimental vs. Control A	< 0.001	0.45	Moderate
	Control A vs. Control B	0.2898	0.08	Negligible
ELS	Experimental vs. Control B	< 0.001	0.61	Large
	Experimental vs. Control A	< 0.001	0.38	Moderate
	Control A vs. Control B	0.0015	0.20	Moderate
CEQ	Experimental vs. Control B	< 0.001	0.65	Large
	Experimental vs. Control A	< 0.001	0.44	Moderate
	Control A vs. Control B	0.0090	0.17	Small

Note: Adjusted *p*-values were derived from Dunn's test with Bonferroni correction. Effect size: Negligible

$|\delta| < 0.147$, Small effect $0.147 \leq |\delta| < 0.33$, Moderate effect $0.33 \leq |\delta| < 0.474$, Large effect: $|\delta| \geq 0.474$ (Sawilowsky, 2009).

The Experimental group significantly outperformed both control groups on every dimension ($p < 0.001$), with medium to large effect sizes ($\delta = 0.28–0.69$). The largest gaps were observed between the Experimental and Control B groups in Good Teaching (GTS, $\delta = 0.69$), Generic Skills (GSS, $\delta = 0.58$), and Empowering Learners (ELS, $\delta = 0.61$), highlighting the intervention's strong impact on higher-order teaching competencies.

Between the two control groups, significant differences emerged only in GTS, CGSS, ELS, and the total CEQ score ($p = 0.0015–0.0090$), with small-to-medium effect sizes ($\delta = 0.17–0.21$), confirming that prior teaching excellence is associated with modestly better course experiences. However, no meaningful differences were found in Appropriate Workload (AWS) or Generic Skills (GSS) ($p > 0.05$, $\delta < 0.10$), suggesting these aspects are less influenced by individual teaching history and more contingent on structured pedagogical support.

Critically, the Experimental group also significantly surpassed Control A—the high-performing baseline group—with substantial effect sizes (e.g., GTS: $\delta = 0.48$; Total CEQ: $\delta = 0.44$). This indicates that the training model delivers added value beyond pre-existing teaching quality, enabling even accomplished educators to achieve further growth.

In sum, based on the data analysis of this experiment, the intervention demonstrates both equity-enhancing (lifting lower-performing teachers) and excellence-amplifying (advancing already strong teachers) effects, underscoring its potential as a scalable, high-impact approach to teacher professional development. The results of this study only reflect a localized experimental exploration conducted at universities in eastern China. The generalizability of the conclusions remains unknown and requires further verification through more experiments in the future.

CONCLUSION AND DISCUSSION

Main Conclusions

Through a 6-month quasi experimental design, this study systematically evaluated the medium-term impact of cross university Collaborative HyFlex Training (CHT) on the teaching effect of University Teachers' courses, and verified that the revised CEQ was suitable for the evaluation of the teaching effect of University Teachers' courses in China, and the Empowering Learners (ELS) dimension was appropriate for the times.

The CHT framework has a significant, extensive and substantial positive impact on improving the teaching effect of participating teachers. The experimental group's teachers' performance in all six dimensions of the Course Experience Questionnaire (CEQ) was significantly better than that of the two types of control group's teachers, and the overall effect reached a medium to large level ($\varepsilon^2=0.029 – 0.112$; $\delta=0.28 – 0.69$). This confirms that the training design integrating intercollegiate collaboration, HyFlex mode and the closed loop of "observation reflection practice" can effectively promote the deep transfer and medium-term maintenance of teaching philosophy to teaching behavior, and achieve the expected goal of training intervention.

KEY FINDINGS AND DISCUSSION

The effect of CHT model on the core dimensions of teaching is particularly prominent: the effect size analysis shows that the training has the most obvious improvement on "clear goals and standards (CGSS)" and "good teaching (GTS)" ($\varepsilon^2>0.10$). This is directly related to the training design that emphasises observing the authentic classroom (Clone Class) of prestigious universities to understand the teaching structure and demonstration, and internalising the teaching strategy through reflection. This finding echoes the theory of "core characteristics" of effective teacher professional development proposed by Desimone (2009), that is, focusing on teaching content, providing active learning opportunities and continuous training can better promote the change of teachers' cognition and practice. Through the specific form of Clone Class, our research provides new evidence of technological empowerment for the effective practice of "collaborative observation based on classroom reality" (Higgins & Simpson, 2011).

The CHT model has the dual value-added value of "bridging the gap" and "upgrading": the study found that the gap between the experimental group and the high starting point teachers (Control A) is much larger than that between the two types of control group teachers (Control A vs. Control B). This shows that the CHT model is not only a "make-up" for teachers with weak foundation but also can provide a new growth platform for teachers with good professional quality and promote their further leap forward in teaching ability. This finding goes beyond the limitation that most previous studies only focus on the impact of training on "average" or "specific groups" of teachers, and reveals the differential value-added potential of high-quality training. This is consistent with the views of Uzorka et al. (2023) on "technology access, training and support to improve teachers' digital teaching ability, and promote the successful application of technology and classroom integration". CHT, through the new perspective brought by intercollegiate collaboration and the flexible reflection space provided by HyFlex, just created this growth environment with challenges and support.

Interaction between individual basis and system intervention: the study confirmed the basic role of teachers' existing professional qualities (such as previous Awards) on teaching experience, but also found that in the dimensions of Appropriate Workload (AWS) and Generic Skills (GSS), the role of individual differences was not significant, while the effect of system training was significant. This indicates that some teaching abilities (such as curriculum design and balanced workload, high-level ability training) depend more on systematic, structured external support and training than on the accumulation of experience or individual teachers' talent. This conclusion partly responds to Kennedy's discussion on "how teachers' professional development really affects teaching practice" (Kennedy, 2016), and points out that for specific teaching skills, well-designed external intervention may be more efficient than relying on Teachers' personal exploration.

Research Limitations and Future Directions

This study primarily evaluated teaching effectiveness from the perspective of student perceptions. Although the analysis was based on a single evaluation period, the students who participated in the CEQ survey completed a full semester of learning under teachers who had implemented CHT-informed instructional practices for approximately five months following the training. Data were collected only after students had experienced sustained instructional exposure across an entire academic semester. Therefore, the evaluation reflects medium-term pedagogical effects rather than immediate or short-term reactions.

Future research could adopt a mixed-methods approach by incorporating classroom observations, teacher interviews, and objective student learning outcome data to triangulate and deepen understanding of how CHT influences instructional behaviour. In addition, extending the follow-up period across multiple semesters would allow examination of the stability and evolution of training effects over time. Finally, as the sample was drawn from universities in eastern China, the generalisability of the findings to other national or institutional contexts remains limited. Future studies are encouraged to replicate the model in diverse international settings to test the transferability and robustness of the CHT framework.

Funding This research was supported by the 2024 Zhejiang Province Education Science Planning Project

"Practice and Research on OBE-based Evaluation of Excellent Courses in Higher Education Institutions" (Project No. 2024SCG006).

Declarations

Conflict of interest The authors declare there is no conflict of interest.

REFERENCES

1. Amirova, A., Zhumabayeva, A., Zhunusbekova, A., Kalbergenova, S., Nygymanova, N., & Arenova, A. (2023). Effect of Using Hyflex Technology Learning on Preservice Teachers' Success and Attitudes. International Journal of Education in Mathematics, Science and Technology, 11(3), 623-642.
2. Armstrong, E. D. (2022). Gaps in professional development and knowledge of teaching HyFlex courses in higher education (Doctoral dissertation, University of the Southwest).

3. Beatty, B. (2019). Hybrid-flexible course design (pp. 31-31). London, UK: EdTech Books.
4. Brown, C., & Poortman, C. (Eds.). (2018).Networks for learning: Effective collaboration for teacher, school and system improvement. Routledge.
5. Byrne, M., & Flood, B. (2003). Assessing the teaching quality of accounting programmes: An evaluation of the Course Experience Questionnaire. Assessment & Evaluation in Higher Education, 28(2), 135-145.
6. Cai, H., Lu, L., Dong, H. , & Gu, X. (2022). A new approach to fostering teacher professional development in the intelligent era: Constructing a practice-based community through collaborative design between teachers and researchers. Journal of Distance Education, (6), 83–92.
7. David A. Kenny. (1975). A Quasi-Experimental Approach to Assessing Teatment Effects in Nonequivalent Control Group Designs. Psychological Bulletin, 82(3), 345-362.
8. Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. Educational researcher, 38(3), 181-199.
9. Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of marketing research, 18(1), 39-50.
10. Gu, X., & Bai, X. (2019). A new pathway for advancing educational informatization: Building a design-centered research–practice community. Open Education Research, (6), 66–74.
11. Harris, A. (2009). Distributed leadership: What we know. Distributed leadership: Different perspectives, 11-21.
12. Harris, A., & Jones, M. (2010). Professional learning communities and system improvement. Improving schools, 13(2), 172-181.
13. Higgins, S., & Simpson, A. (2011). Visible Learning: A Synthesis of over 800 Meta-Analyses Relating to Achievement. By John AC Hattie: Pp 392. London: Routledge.
14. Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural equation modeling: a multidisciplinary journal, 6(1), 1-55.
15. Huang, Y., Zhou, X., & Shi, J. (2021). The quality of undergraduate teaching and learning in China: a ten-year exploration based on China college student survey. Journal of East China Normal University (Educational Sciences), 39(1), 116.
16. Kennedy, M. M. (2016). How does professional development improve teaching?. Review of educational research,86(4), 945-980.
17. King, E., & Boyatt, R. (2015). Exploring factors that influence adoption of e-learning within higher education. British Journal of Educational Technology, 46(6), 1272-1280.
18. Kirkpatrick, J. D., & Kirkpatrick, W. K. (2016). Kirkpatrick's four levels of training evaluation. Association for Talent Development.
19. Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge university press.
20. Li, M., & Qiao, W. (2020). New exploration of the "synchronous remote" classroom teaching mode: taking the Tsinghua Clone Class as an example. China University Teaching,(10), 79-83.
21. Lu, G., & Li, L. (2020). The questionnaire design and basic characteristics of undergraduates' course experience: a survey of 2018 graduates in Shaanxi province. Journal of East China Normal University (Educational Sciences), 38(11), 78.
22. Miller, A. N., Sellnow, D. D., & Strawser, M. G. (2021). Pandemic pedagogy challenges and opportunities: Instruction communication in remote, HyFlex, and BlendFlex courses. Communication Education, 70(2), 202-204.
23. Mineshima-Lowe, D., Mihai, A., Le Bourdon, M., Pears, L., Bijsmans, P., Hadjipieris, P., & Lightfoot, S. (2024). Hyflex and hybrid teaching and learning in higher education: Evolving discussions in the post-Pandemic era. European Political Science, 23(3), 321-337.
24. Nunally, J. C., & Bernstein, I. H. (1978). Psychometric Theory (1978).New York.
25. Raes, A. (2022). Exploring student and teacher experiences in hybrid learning environments: Does presence matter?. Postdigital Science and Education, 4(1), 138-159.
26. Ramos, A. M., Lee, H., & Mabuan, R. A. (2025). Exploring the Relationship Among Preservice Teachers' E-Learning Readiness, Learning Engagement, and Learning Performance in HyFlex Learning Environments. International Review of Research in Open and Distributed Learning, 26(2), 89-110.

27. Ramsden, P. (1991). A performance indicator of teaching quality in higher education: The Course Experience Questionnaire. Studies in higher education, 16(2), 129-150.
28. Sawilowsky, S. S. (2009). New effect size rules of thumb. Journal of modern applied statistical methods, 8(2), 26.
29. Spillane, J. P. (2005). Distributed leadership. In The educational forum, 69(2), 143-150.
30. Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. International journal of medical education, 2, 53.
31. Timperley, H. S. (2005). Distributed leadership: Developing theory from practice. Journal of curriculum studies, 37(4), 395-420.
32. Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2007). Teacher Professional Learning and Development. Best Evidence Synthesis iteration (BES).
33. Uzorka, A., Namara, S., & Olaniyan, A. O. (2023). Modern technology adoption and professional development of lecturers. Education and Information Technologies, 28(11), 14693-14719.
34. Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. Teaching and teacher education, 24(1), 80-91.
35. Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes(Vol. 86). Harvard university press.
36. Wang, X., & Guo, S. (2022). The Practice and Enlightenment of Online and Offline Hybrid Learning in Tsinghua University. Modern Educational Technology, (4), 106-112.
37. Wilson, K. L., Lizzio, A., & Ramsden, P. (1997). The development, validation and application of the Course Experience Questionnaire. Studies in Higher Education, 22(1), 33-53.
38. Yu, X. (2023). The Development Process and Future Prospects of Digital Teaching in Higher Education. China Higher Education, (3/4), 4-7,11.
39. Zhu Z, & Hu, J.(2021). Technology-Enabled Educational Innovation in the Post-Pandemic Era: New Forms of Online Merge Offline Teaching. Open Education Research, 027(001), 13-23.