

A Study on the Construction of a Medical PADD Class Virtual Teaching and Research Community Based on "Integrated Research and Training"

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Abstract

The virtual teaching and research section represents a significant exploration of new-type grassroots teaching organizations in the information age. Focusing on the PADD Class teaching model, this paper explores the construction of an "integrated research and training" medical virtual teaching and research community. Grounded in learning community theory and supported by Tencent Meeting and the PADD Class teaching platform, this study designed and implemented a 14-week operational framework comprising three phases: "training, practice, and research." The effectiveness of the community was evaluated through questionnaire surveys and observational methods. The findings demonstrate that the "integrated research and training" virtual teaching and research community effectively promotes teachers' instructional improvement and professional development, providing valuable reference for the construction of grassroots teaching organizations in the medical field.

1. Introduction

University teaching and research sections have a history of more than 70 years in China and remain the primary form of grassroots teaching organizations to date[1]. Following the convening of the "New Era National Undergraduate Education Work Conference" in 2018, there has been a growing call nationwide to establish and improve grassroots teaching organizations, with various regions incorporating the strengthening of such organizations as a key component of their first-class undergraduate education action plans[2].

In July 2021, the Department of Higher Education of the Ministry of Education issued the Notice on Carrying Out the Pilot Construction of Virtual Teaching and Research Sections, proposing that virtual teaching and research sections represent an important exploration of new-type teaching and research community construction, emphasizing the full application of information technology to explore efficient, convenient, and diversified teacher research models that break through temporal and spatial limitations, and to continuously innovate research formats[3]. In February and May 2022, the Ministry of Education successively announced the first and second batches of pilot virtual teaching and research section construction lists, totaling 657 items, marking the entry of virtual teaching and research section construction into a phase of large-scale development[4–5]. Virtual teaching and research sections represent an innovative model of educational digital transformation, breaking down geographical and temporal barriers and promoting the synergy of teaching resources and the exchange of high-quality teaching[6].

However, two deficiencies exist in the current construction of virtual teaching and research sections. First, teaching research and reform-themed virtual teaching and research sections account for only 11.41%, with research themes still focusing primarily on curriculum and program construction, while research that genuinely addresses teaching method reform remains scarce[7]. Second, teaching and research activities often become mere formalities, influenced by factors such as individual backgrounds

and operational models, making it difficult to establish truly equal, cooperative, and interactive research relationships[8].

The PADD Class (Presentation, Assimilation, Discussion, Dialogue) is an original teaching model proposed by Professor Zhang Xuexin of Fudan University, comprising four components—Presentation, Assimilation, Discussion, and Dialogue—also known as the "four-element teaching" approach[9]. Cross-disciplinary online teaching and research based on the PADD Class model have been widely practiced nationwide, forming a relatively mature teaching and research community ecosystem[10]. Against this backdrop, this paper explores the construction model of an "integrated research and training" virtual teaching and research community centered on the discussion of the PADD Class teaching model, aiming to provide a reference for improving the quality of classroom teaching in the medical field and for the construction of grassroots teaching organizations.

2. Construction of the Medical PADD Class Teaching and Research Community

2.1 Theoretical Foundation

Learning community theory posits that teacher professional development requires peer interaction and collaborative reflection within authentic teaching contexts[10]. Virtual teaching and research communities utilize internet platforms to build teacher development communities, enabling teachers to exchange teaching knowledge and strategies in a timely and effective manner, update their teaching thinking models, consolidate professional knowledge and skills, and organically integrate the teaching process with personal career development[11].

Online teaching and research communities emphasize the construction of a virtual space for sustained collaborative reflection among teachers through platform development, content optimization, and mechanism guarantees[12]. The design of the teaching and research community in this study follows this approach, building a continuously operating research community through the "Tencent Meeting + PADD Class Teaching Platform." The "integrated research and training" concept focuses on classroom teaching, organically combining teacher research and training to achieve mutual coexistence and promotion. It is a new pathway for teacher professional development proposed in response to the isolation between research and training[13]. Its core lies in clarifying teacher training objectives before training, recording learning trajectories during training, assessing learning outcomes at the conclusion of training, and continuously tracking improvements in teaching practice after training ends.

2.2 Community Membership Composition

Members of the medical PADD Class teaching and research community were recruited nationwide by the National PADD Class Education Innovation Alliance, with selection criteria requiring that participants be teachers of medical-related courses in higher education institutions or vocational colleges who have practiced the PADD Class model for more than three years. Over four semesters from spring 2023 to

autumn 2024, a total of 52 participant-times were recorded. Members' disciplinary backgrounds covered basic medicine, clinical medicine, traditional Chinese medicine, nursing, pharmacy, and other medicine-related fields, ensuring the professionalism and diversity of the research content.

2.3 Platform Support

This study adopted a dual-platform support model of "Tencent Meeting + PADD Class Teaching Platform." Tencent Meeting provides real-time screen sharing and group discussion functions, supporting immediate cross-temporal interaction. The PADD Class Teaching Platform, adhering to the philosophy of "letting technology truly serve teaching," offers teaching functions such as assignment submission, peer evaluation, and discussion forums. With its robust storage and interactive capabilities, it provides informational technology support for real-time recording and feedback in this study.

3. Implementation of the "Integrated Research and Training" Research Model

3.1 Overall Design Concept

The core concept of the "integrated research and training" research model is to break the boundary between training and research, forming a closed loop. Specifically, it encompasses four key links: clarifying objectives before training, recording learning trajectories during training, assessing learning outcomes at the conclusion of training, and continuously tracking teaching improvements after training ends. The operational cycle of the teaching and research community spans 14 weeks each semester, divided into three phases: "training," "practice," and "research."

3.2 Specific Implementation Pathways and Thematic Design

Phase One: Training (Weeks 1–2). The training phase was delivered by Professor Zhang Xuexin, founder of the PADD Class model, who guided participants in theoretical learning. Week 1 focused on "Overview of PADD Class Theory," and Week 2 on "Key Operational Points of PADD Class," with each session lasting 1.5 hours. The training content covered the core concepts of the PADD Class, operational standards for the four-element teaching components, and application strategies across different disciplines. The training combined live lectures with online Q&A sessions, and participants could repeatedly watch recorded videos for internalization and absorption(See Table 1).

Phase Two: Practice (Weeks 1–14). The practice phase ran throughout the semester, during which participants conducted PADD Class teaching practice under the guidance of instructors while recording their practice in real time. Participants started with 10-minute "micro-PAD" sessions and gradually progressed to one-class, two-class, three-class, and even full-course PADD Class teaching practice. Participants were required to submit written assignments once per week, including records of PADD

Class teaching practice and teaching reflections. Instructors provided feedback on assignments and maintained regular communication with participants(See Table 1).

Phase Three: Research (Weeks 3–14). The research phase adopted a progressive thematic design: Weeks 3–4 focused on "Initial PADD Class Practice Sharing and Discussion," Weeks 6–7 on "Medical Course Focused Lecture Design Demonstration and Discussion," Weeks 9–10 on "Medical Course Independent Learning Assignment Demonstration and Discussion," Weeks 12–13 on "PADD Class Framework Design and Lesson Presentation," and Week 14 on "Participant Summary and Exchange." (See Table 1) The research activities were organized around the "four-element teaching" framework of the PADD Class model, with instructors moderating group activities through the following process:

Focused Lecture (approx. 15 min): Instructors or participants shared teaching practice themes.

Assimilation (approx. 10 min): Instructors and participants engaged in independent learning and submitted their learning outcomes to the PADD Class Teaching Platform.

Discussion (approx. 15 min): Group discussions were conducted using the breakout room function in Tencent Meeting.

Dialogue (approx. 20 min): Discussion outcomes were presented, followed by whole-group exchange.

Table 1
Implementation Arrangement of the "Integrated Research and Training" Research Model

Phase	Training		Practice	Research	
	Week	Theme		Week	Theme
Phase One	Week 1	Overview of PADD Class Theory	Participants conducted PADD Class teaching practice with real-time recording and submitted written assignments; instructors maintained regular communication with participants	Week 3	Initial PADD Class Practice Sharing
	Week 2	Key Operational Points of PADD Class		Week 4	PADD Class Re-practice Discussion
Phase Two	Week 5	Principles and Methods of Lecture Design		Week 6	Medical Course Lecture Design Demonstration
				Week 7	Medical Course Lecture Design Discussion
Phase Three	Week 8	Methods of Designing Independent		Week 9	Medical Course Independent
				Week 10	Medical Course Independent Learning Assignment Demonstration
Phase Four	Week 11	Whole-Course PADD Class Teaching Design		Week 12	Medical Course Independent Learning Assignment Discussion
				Week 13	PADD Class Framework Design
				Week 14	PADD Class Lesson Presentation

4. Effectiveness of the Teaching and Research Community Construction

4.1 Questionnaire Survey Results

At the end of each semester, survey questionnaires were distributed to participating teachers to evaluate the community across dimensions including participation, self-assessment of teaching improvement, peer interaction and reflection, and satisfaction. A total of 20 questions were designed, including 18

multiple-choice questions (each with five Likert-scale options) and 2 open-ended feedback questions. In the first semester, 15 questionnaires were distributed and 15 collected; in the second, 12 distributed and 11 collected; in the third, 13 distributed and 11 collected; and in the fourth, 12 distributed and 10 collected. A total of 52 questionnaires were distributed and 47 collected, yielding a response rate of 90.38%. After collection, responses A–E were assigned scores of 5, 4, 3, 2, and 1 respectively, and the mean scores and positive response rates for each dimension were calculated. The results of selected representative questions are presented below(See Table 2).

Table 2
Questionnaire Survey Results of the "Integrated Research and Training" Research Model

Assessment Dimension	Corresponding Question	Mean (Max 5)	A (Count)	B (Count)	Positive Rate (A + B)
Satisfaction and Overall Evaluation	Are you willing to continue participating in next semester's "integrated research and training" teaching and research community activities?	4.49	32	8	85.11%
Participation	How actively did you speak and interact during the teaching and research activities?	4.26	20	22	89.36%
Self-Assessment of Teaching Improvement	To what extent do you think the "integrated research and training" research model helps solve practical teaching problems?	4.66	36	7	91.49%
	Has your classroom teaching design improved through the teaching and research community activities?	4.13	14	27	87.23%
Peer Interaction and Reflection	How valuable do you think peer feedback is for your own teaching reflection?	4.23	23	14	78.72%
	Has your understanding of your own teaching problems become clearer through the teaching and research activities?	4.00	16	17	70.21%

Teachers demonstrated a strong willingness to continue participation, with a mean score of 4.49 and a positive rate of 85.11%. Among respondents, 32 (68.09%) selected A (very willing) and 8 (17.02%) selected B (comparatively willing), indicating that the vast majority of teachers recognized the sustained value of the model and were willing to adopt it as a regular pathway for their professional development.

Teachers showed high levels of initiative in speaking and interaction during research activities, with a mean score of 4.26 and a positive rate of 89.36%. Specifically, 20 teachers (42.55%) selected A (very

active) and 22 teachers (46.81%) selected B (comparatively active), together accounting for nearly 90%. This result indicates that the "integrated research and training" research model effectively stimulated teachers' enthusiasm for participation, shifting them from passive listening to active sharing, and substantively enhancing both the interactivity and depth of participation in research activities.

Recognition of the model's effectiveness in solving practical teaching problems was the highest, with a mean score of 4.66 and a positive rate of 91.49%. Of the respondents, 36 (76.60%) selected A (very helpful) and 7 (14.90%) selected B (comparatively helpful), ranking first among all four dimensions. This indicates that teachers generally believe the "integrated research and training" model can effectively address authentic teaching challenges and possesses strong practical guidance value.

The improvement in classroom teaching design was also significant, with a mean score of 4.13 and a positive rate of 87.23%. Among respondents, 14 (29.79%) selected A (greatly improved) and 27 (57.45%) selected B (noticeably improved), indicating that the vast majority of teachers achieved improvements in lecture design, independent learning task design, and classroom discussion organization through the teaching and research community activities, demonstrating the model's tangible effect on promoting changes in teaching behavior.

Peer feedback was also highly valued for its reflective value, with a mean score of 4.23 and a positive rate of 78.72%. Among respondents, 23 (48.94%) selected A (very valuable) and 14 (29.79%) selected B (comparatively valuable). This indicates that peer exchange and feedback based on authentic teaching challenges effectively promoted teachers' self-examination and teaching reflection, although 21.28% of teachers did not feel the value of peer feedback as deeply. It is suggested that future grouping mechanisms be optimized to enhance the relevance and depth of feedback.

Most teachers reported that their understanding of their own teaching problems became clearer through the research activities, though there remains room for improvement. The mean score was 3.83 and the positive rate was 70.21%, with 16 teachers (34.04%) selecting A (very clear) and 17 teachers (36.17%) selecting B (comparatively clear). While nearly 70% of teachers acknowledged the positive role of research activities in helping them identify and understand teaching problems, this dimension's positive rate was relatively low compared to "participation" (89.36%) and "teaching design improvement" (87.23%), suggesting that the model needs strengthening in promoting deep reflection on teaching problems. This result indicates that while teachers actively participate in research and perceive improvements in teaching design, a gap remains between "behavioral improvement" and "clarification of problem awareness." Future research activities could incorporate sessions such as teaching video replay analysis and before-and-after comparative reflection, helping teachers more explicitly connect "what improvements were made" with "what problems were solved," thereby promoting meta cognitive-level deep reflection.

All dimension mean scores exceeded 4.0, indicating that teachers generally held high satisfaction with the "integrated research and training" teaching and research community, and that the model possesses strong feasibility and potential for broader application.

4.2 Observational Method Evaluation

This study employed non-participant observation to systematically record and analyze the entire process of research activities. Taking a typical research activity in the autumn semester of 2023 as an example: a lead teacher from a normal university teaching the course Exercise Physiology used the one-credit content "Spinal Muscles" to demonstrate the complete process of focused lecture with designed gaps and student assignments. Participating teachers engaged in in-depth discussions on issues such as "how to balance focused lecture with designed gaps" and "how to design independent learning tasks that accommodate students at different levels." Through multiple rounds of iteration, the lead teacher increased classroom interaction rates from 32% to 78%, and the number of students' after-class questions significantly increased.

4.3 Typical Cases of Teaching Improvement

Participant A (Teacher of *acupuncture and moxibustion* at a TCM university)

Before joining the research community, the class was primarily lecture-based with low student participation. After the "integrated research and training" program, the teacher introduced the "Presentation—Assimilation—Discussion—Dialogue" four-element teaching approach into the classroom and designed "Bright Spots, Challenges, and Help" reflective assignments. After one semester of implementation, students' final exam scores increased by an average of 8.3 points, and course evaluation scores rose from 4.2 to 4.7 (out of 5).

Participant B (Teacher of *History of Chinese Medicine* at a medical university)

Previously, research activities consisted mainly of "listening to lectures and taking notes," with little translation into classroom improvement. Through the group discussion sessions of the research community, the teacher received feedback and suggestions from colleagues at different institutions. Through three rounds of iteration, the teacher redesigned the teaching plans for the chapters "The Maturation and Innovation of Chinese Medicine" and "The Intersection and Conflict of Chinese and Western Medicine," transforming abstract concepts into case-driven PADD Class teaching designs. After implementation, students' classroom participation, engagement, and attention rates significantly improved, and the teaching plan won first prize in a university-level teaching competition.

5. Discussion

5.1 Advantages of the "Integrated Research and Training" Research Model

This research model achieves a transformation from "one-off training" to "sustained development." Traditional teacher training often ends with the conclusion of the course, whereas "integrated research and training" ensures that training outcomes are truly implemented through continuous tracking of

teaching improvements. It also establishes an inter-institutional teacher learning community, with members from different institutions breaking down disciplinary and geographical barriers to achieve shared construction of research resources[14]. Similar practices have demonstrated that virtual teaching and research sections can transcend geographical limitations and promote collaborative teaching and resource sharing among teachers from different institutions[6]. The thematic design centered on the teaching model in this study effectively addresses the current deficiency in virtual teaching and research section construction, where "research on teaching method reform is scarce"[7].

5.2 Existing Problems and Directions for Improvement

The member engagement sustainability in the "integrated research and training" research community still needs enhancement. Some teachers struggle to maintain full participation due to heavy teaching workloads. It is recommended that more flexible participation mechanisms be established, such as offering a combination of required and elective research modules. The scientific rigor of the teaching improvement self-assessment tools also requires refinement; the reliability and validity of the "Two-Level Qualitative Assessment Tool" need further validation. In the future, a diversified evaluation system combining quantitative and qualitative methods could be developed. Additionally, the functions of the digital platform need optimization, such as enhancing intelligent recommendation and retrieval capabilities for research resources.

5.3 Implications for the Construction of Grassroots Teaching Organizations

The "integrated research and training" virtual teaching and research community model provides a replicable framework for the construction of grassroots teaching organizations. First, research activities should be oriented toward solving practical teaching problems to avoid becoming mere formalities. Second, the use of information technology to break temporal and spatial limitations and achieve inter-institutional collaboration is an effective pathway to improving research quality[15]. Third, teacher professional development requires a closed-loop mechanism of "training—practice—reflection—improvement," and "integrated research and training" represents the institutionalized implementation of this mechanism.

6. Conclusion

This paper has explored the construction of a medical virtual teaching and research community centered on the PADD Class teaching model with an "integrated research and training" approach, forming a replicable operational plan comprising three phases—"training, practice, and research"—over a 14-week cycle. Practice has demonstrated that this model effectively promotes teachers' instructional improvement and professional development, providing a useful reference for innovation in grassroots teaching organizations in the medical field. Future research could further expand the scale of participation and refine the evaluation system, advancing virtual teaching and research communities from experience-based exploration to institutionalized development.

Declarations

Consent to Participate:

All participants were fully informed of the study purpose, the voluntary nature of their participation, and the measures taken to ensure anonymity and confidentiality prior to the survey. Informed consent was obtained from all participants at the beginning of the questionnaire. Participants indicated their consent by voluntarily completing and submitting the questionnaire.

Ethics approval and consent to participate

This study involved an anonymous questionnaire survey among medical teachers. According to the regulations of the Institutional Review Board of Chengdu University of Traditional Chinese Medicine, ethical review and approval were waived for this study because the survey was anonymous, did not collect any personally identifiable information, and posed no foreseeable risks to participants.

All participants were fully informed of the study purpose, the voluntary nature of their participation, and the measures taken to ensure anonymity and confidentiality. Informed consent was obtained from all participants at the beginning of the questionnaire. Participants indicated their consent by voluntarily completing and submitting the questionnaire.

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Human Ethics and Consent to Participate declarations:

not applicable.

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Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Z.X.H. conceived and designed the study, conducted the questionnaire survey, analyzed the data, and drafted the manuscript. Z.L. participated in the design of the research activities and contributed to data collection. L.T.H. contributed to the interpretation of the results and revised the manuscript critically. Z.S.Y. supervised the project and provided substantial intellectual input. All authors read and approved the final manuscript.

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