

# Research on Cross-Boundary Invitational Learning Model for Pre-Service Science Teachers: From the Perspective of Self-Determination Theory

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## Abstract

Based on the Learning Community and Activity theories, the study has set up a new model of Cross-Boundary Invitational Learning for pre-service teacher education. From the Self-Determination Theory perspective, we conducted a questionnaire survey and interview on the participants in a university course teaching experiment. The results show that this model promotes understanding and mutual learning among participants, and it has a specific promotion value in higher education.

## Keywords

Pre-Service Teacher, Cross-Boundary Learning, Invitational Learning, Learning Community, Self-Determination Theory

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## 1. Introduction

Teachers' belief determines their professional orientation and educational practice (Aimin & Qun, 2020). As a suitable method, teaching observation and feedback discussion provide a learning space that is particularly important for teachers who cross boundaries from vocational contexts to learn to become teachers (Lahiff, 2015). Due to teachers' professional, practical, and situational nature, teachers often have the opportunity of cross-boundary learning (Zheng, Yin, & Wang, 2015). Interdisciplinary and cross-boundary learning is more popular, putting forward new requirements for pre-service teacher training in higher education.

## 2. Literature Review

There are apparent boundaries between educators, researchers, pre-service

teachers, and in-service teachers. The existence of the edge means the possibility of learning from each other. One of the essential purposes of cross-boundary learning between higher education is to influence the teachers' beliefs of the participants. Relevant research shows that cross-boundary learning is a necessary form of teacher learning. For example, from two perspectives of the community of practice and cultural-historical activity theory, [Zheng, Yin, & Wang \(2015\)](#) analyzed the boundary of teacher learning and the mechanism and strategy of cross-boundary learning. In the university school cooperation mode guided by the community of practice, boundary-crossing objects are often the joint research lessons. Simultaneously, cross-boundary learning based on the theory of cultural and historical activities aims to find the acceptable boundary between the two and realize their respective development in jointly constructing new boundary goals. Few studies show that the model of interdisciplinary cooperation and communication plays an essential role in promoting teachers' belief transformation, supporting them to integrate STEM into existing curriculum, and continuously improving their teaching ([Wang, Tamara, Gillian, & Mi, 2011](#)). The research findings ([Kurup, Li, Powell, & Brown, 2019](#)) show that, compared with in-service teachers, pre-service teachers have a weak understanding of science education. Still, they have a strong belief and willingness to explore new science education curriculum in their future career.

Although there is a possibility of cooperation among university education research groups (university teachers, graduate students), K12 in-service teachers (teachers, principals, teaching researchers), and pre-service teachers, cross-boundary learning is not necessarily helpful to each other. Self-Determination Theory, a motivational process theory about human self-determination behavior, was proposed by American psychologists Deci Edward L. and Ryan Richard M. in the 1980s, which helps understand why pre-service teachers and in-service teachers have significant differences in cross-boundary learning. According to this theory, learners have a natural tendency to explore their environment, growth, learning, and development. If you want people to be self-directed and lifelong learners, it is essential to understand their motivations. The theory of Self-Determination involves three basic psychological needs: autonomy, ability, and relevance. Each learner independently participates in learning situations that are valuable to them and absorbs what they need to control them. Therefore, the completeness of relevant measures can be diagnosed by observing the satisfaction degree of pre-service teachers' basic psychological needs. For example, based on self-determination theory and teacher interpersonal behavior model, [Korthagen & Evelein \(2016\)](#) found a quantitative relationship between the "internal personal experience" and the observable "external teaching behavior" of pre-service teachers. They believe that if the learning environment can provide a sense of choice, feelings of agency, and provide feedback, appreciate the efforts of students, and encourage practical help, we will cultivate students and teachers' healthy psychological devel-

opment and learning motivation to increase their chances of entering the teaching industry after graduation.

The existing studies often emphasize that teachers need to build relevant systems for cross-boundary learning, such as planning formal training, workshops, cooperative projects, etc. However, such system construction, on the one hand, often lasts a long time, requires high requirements for participants, and is challenging to change flexibly, so it cannot be widely promoted. “Invitational education” was proposed by Purkey & Novak (1992). The theory holds that the schools we need to establish should invite or enthusiastically encourage students to participate in the learning process. According to the theory of self-concept, everyone’s behavior is regulated by his or her personal opinions; a person tries to maintain a consistent self-concept by absorbing or rejecting the concepts that are suitable or unsuitable for prejudice, but one’s self-concept can be changed and developed by inviting or encouraging behaviors. If educators want to create engaging learning, they must determine in the learning environment which elements can promote students’ healthy self-concept and which way can interact with students’ ideas. These can be incorporated into the appropriate design of the learning environment, teaching plan, curriculum organization, and teaching methods, to promote the participants’ continuous understanding of each person’s value and unique potential (Novak, Armstrong, & Browne, 2014). Therefore, the invitational learning model and the construction of cross-boundary learning activities have the potential to promote the learning beliefs of all participants.

### 3. Problem Statement

This study focuses about the problem: Although higher education is trying to cultivate pre-service teachers with master’s degree, most of them are theoretical knowledge before they have gone through teaching practice, so they are easy to be divorced from reality, too ideal for teaching ideas, and challenging to understand the guiding significance of theory to practice.

To solve the students’ doubts about the new type of education, the research team used the “cultural and historical activity theory” to build a learning community, adopted the “invited learning” theory, invited practitioners in the education field to share cases in the curriculum, and constructed knowledge. Based on the above design, researchers pay special attention to the following issues from the perspective of self-determination theory:

- 1) What is the basic situation and learning experience of cross-boundary learning under the mode of invitational learning?
- 2) As an intermediary tool, how about the learning gains and curriculum satisfaction of cross-boundary learning participants?
- 3) What is the effect of the cross-boundary learning curriculum model constructed by invited learning and case sharing and the willingness of continuous learning?

## **4. Research Design**

### **4.1. Research Context**

Based on a University B course in the autumn of 2019, this study designed this experimental study. Before the class, the research team's teachers (including one professor, two co-researchers, and two research assistants) communicated with some graduate students. After understanding their internal thoughts on the necessity of curriculum learning and their professional orientation, the research team invited primary and secondary school teachers, Science and Technology Museum educators, and university teachers to participate in the curriculum activities, with more than 200 participants and more than 60 people have experienced in at least once. During the four months, six sessions of "Science Education Salon" (a total of 24 hours of open cross-boundary learning activities) were arranged, and two non-public teaching activities (a total of 8 hours of small-scale class teaching) were organized.

### **4.2. Conceptual Framework for Cross-Boundary Invitational learning**

In the form of building a cross-boundary learning community in universities, it can be regarded as a kind of partnership between universities, with open boundaries and vital inclusiveness. Various discourses and practices can be discussed and exchanged (Wang, 2015). This course's teaching is based on the learning community model, which fundamentally adjusts the way of curriculum setting and changes the time and space arrangement of learning and teaching. Set up the teaching situation to ensure the match between the participants' interactive styles. No matter what kind of teachers, when they enter the classroom with different contexts, goals, and characteristics of teachers, the key to stimulate their learning is the curiosity, acceptance, flexibility, enthusiasm and open attitude adopted in the process of teacher-student interaction, which can enable teachers to have a deeper understanding of the differences between learners, So that they can adjust their incentive strategies and preferences according to their emerging skills and interests. The course team instructs each group to analyze and elaborate on their understanding of the case from different angles in the seminar and use various strategic dialogue modes as much as possible.

#### **4.2.1. Special Interest Group as the Organizer of the Cross-Boundary Learning Community**

A Special Interest Group for cross-boundary learning acts as a boundary spanner. The prominent leader of the team is the course chair teacher, with five years of science education postgraduate training experience, and direct guidance and participation in many stem education projects and has rich teaching practice and research experience in science education and science and technology venues education in primary and secondary schools. Three graduate students from University B have played a significant role. One of them is a doctoral student in science education. The doctoral dissertation focuses on stem curriculum devel-

opment strategy, and the other two are sophomores. Their research directions are engineering design education and science essence education. They have more reading and analysis in science education academic articles, but they are not rich in practical experience in the current instruction. The other members are a science and technology venue teacher, a primary school science teacher, and a person in charge of a science and technology education company.

The course special interest group is responsible for sorting out the information shared by participants in previous activities, analyzing the issues concerned by participants, determining the theme of the next activity, selecting the invited sharers, and inviting university science education researchers, teacher educators, graduate students, primary and secondary school science teachers, course and teaching directors of science and technology education enterprises to communicate with them the key points. Each activity notice is released through WeChat and QQ group. The special interest group of the course will share with the interested participants in the early stage, do a warm-up work in advance before the activity, and collect, sort out and determine the practices, opinions, and experiences that can be mainly shared in the action.

#### **4.2.2. Invitational Learning and Case Sharing to Promote a Cross-Boundary Learning Community**

Guided by the theory of invitational learning, this course provides all participants with learning opportunities for professional development and inspires them to realize their potential. We believe that when cross-boundary participants have the chance to work together, they will have the ability to change their understanding of education and the potential to change students' learning. Although the setting of topics in each issue has absolute randomness, it also conforms to the continuous shift of participants' concerns.

To ensure that the participants can form a systematic and in-depth understanding in cross-boundary learning and the six theme activities, we also carry out collaborative knowledge construction with the goal of "Reflection and Refinement". The course team led the pre-service teachers to sort out the six theme activities and case contents, discuss the harvest and questions together, refine the main points of view, and try to build understanding and write standard academic documents to externalize individual cognition. The basic flows of two phases are shown in **Figure 1** and **Figure 2**.

The results of this stage will be fed back to the case sharers, and the pre-service teachers and case sharers will cooperate to improve the materials further. During this period, university educators will cooperate with them in the role of paper director and explore relevant issues combined with China's educational practice. This arrangement enables all members who have participated in the six theme activities to systematically review what they have heard, thought, know, believe, and reflect on the topics and issues discussed. The group members and case providers who have participated in the case discussion have become the main objects of the students' investigation. The process lasts until one

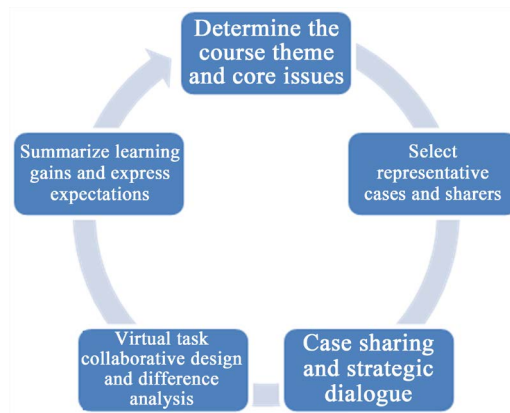


Figure 1. Phase 1.

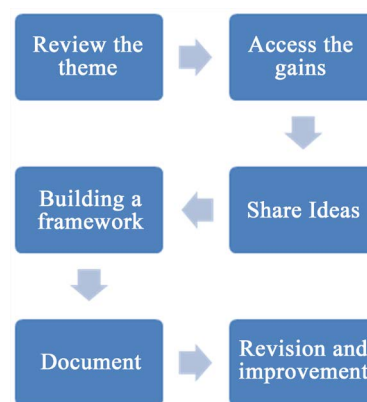


Figure 2. Phase 2.

month after the end of the course, and the result is jointly completed by the students participating in the course and the case provider.

### 4.3. Research Method

In this study, mixed research methods were used. The researcher enters the classroom and videos the whole teaching process, analyzes the group's cross-boundary communication behavior, and focuses on exploring the differences of views of different roles such as case sharer, discussor, host, and identifying the performance changes of representative participants in each course activity.

At the end of the course, the researcher designed a questionnaire for all participants, including necessary personal information, participation in the class, self-evaluation of learning effectiveness, course satisfaction, open questions, etc. The structure of the questionnaire is shown in **Table 1**. By analyzing the questionnaire's reliability, the Cronbach coefficient is 0.963, which shows that the questionnaire's measurement results have high stability and consistency.

The statistical results show that more than 60 people participated in the course. In this study, 40 participants were randomly selected as the subjects of the questionnaire survey. Finally, 30 valid questionnaires were collected (including 9 males and 21 females. The distribution of gender ratio conforms to the fact

**Table 1.** Structure of course questionnaire.

Survey category	Investigation contents	
Personal information	Name, gender, age, affiliation	
	Work experience and academic background	
	Willingness to communicate with others	
Attendance and participation	Number of times of participation in the course	
	The role of participation in the course	
	Degree of participation in interaction	
Learning effectiveness	Course module learning	
	Improvement of course modules	
	Case self competency assessment	
Course satisfaction	Course theme satisfaction	
	Career identity change	The choice and autonomy of curriculum provision
		The value of learning community to individual future
	Course learning experience	Learning pleasure
		The satisfaction of individual expectations
		The attraction of course content
		Suitability of course's difficulty
		Recognition of curriculum activities
	Recognition of learning community	The role of the teacher team
		Common interests
Open model		
Open issues	Mutual understanding	
	Challenge of the curriculum to individual	
	Value of the curriculum to individuals	
	Improvement of the curriculum model	

that there are more females in the education system). According to the information of the units to which the respondents belong, 70% come from higher education. Other units (primary and secondary schools, science and technology museums, social education institutions, and enterprises) account for 30%, which is in line with the characteristics of the venue of the activity in higher education. Besides, the subjects have multiple academic backgrounds. According to the number of subjects, they are Science (11), education (8), engineering (5), management (4), and others (2).

The research team selected five representative participants (CCJ, CRS, WF, WJF, zxl) and interviewed them after the course, to understand their academic background, motivation to participate in cross-boundary learning, learning gains and experiences, understanding of science education, recognition of cross-boundary learning, knowledge of cross-boundary learning community, and suggestions on community development.

## 5. Research Findings

The three groups involved in cross-boundary learning are all complex activity systems. Among them, as graduate students, pre-service teachers will be affected by their tutors, classmates, and professional positioning and need to deal with multiple tasks (such as CCJ and CRS) from curriculum learning, project research, individual career development, ability improvement, and so on. University educators (course teachers and researchers) need to shoulder the dual tasks of curriculum teaching and research. They are full of uncertainty about meeting the learning needs of pre-service teachers and form talents training collaborators with teachers from primary and secondary schools (such as WF). Educators from schools (primary and secondary schools, science and technology museums, and off-campus educational institutions) are invited to participate in cross-border activities. They need to obtain recognition from others and seek help (such as WJF and ZXL). Therefore, their performance in the cross-boundary learning community is different.

### 5.1. Basic Statistics of Cross-Boundary Learning and Learning Experience

#### 5.1.1. Personal Information

The questionnaire survey results show that only 26.7% of the people can participate in all the activities. Only one person can participate in the total number of times less than or equal to 2 times, and most people concentrate on 4 - 5 times. As a result, these course participants have high mobility, but most of them can participate in cross-border activities many times.

From the perspective of the role of participants in cross-boundary learning, the leading role is mainly college students, who are willing to ask others, speak on behalf of the group, and cooperate. However, K12 teachers, the science and technology museum system staff, other social education institutions and enterprises are more as case sharing and discussants.

Whether they are willing to communicate with cross-boundary learning, participants reflect their autonomy and self-confidence. During the course implementation, all participants in the “can actively speak” frequency from high to low: social education institutions and enterprise personnel, Science and Technology Museum teachers, other university students, B school students, primary and secondary school teachers. The questionnaire survey results showed that 70% of the participants reported that they would like to communicate with others, but 30% did not adapt to open communication with others during the course, which was also found in the interview. Most of the interviewees (CCJ, CRS, WF, WJF) said that the conversation and communication link created in the classroom is conducive to listening to others’ views and comparing their perspectives to share more insights and conduct in-depth discussions. Those who have many years of work experience (WJF, ZXL) can mobilize the participants to speak. Still, they are less likely to take the initiative to discuss the prob-



lems caused by educational administrative measures. They believe that it is not worth “wasting time” to talk about such unsolvable issues. The experienced participants (WJF) tend to explore some novel and creative activities rather than just tell the pre-service teachers about the traditional teaching methods. Exploring new solutions is the topic they are more willing to discuss. The results show that primary school teachers and pre-service teachers are generally not confident in the latest content of science education and innovative teaching practice.

### **5.1.2. Attendance**

This course activity has a good promotion for the participants’ learning. More than 50% of the participants indicated that their self-confidence, motivation, communication ability, intergroup cooperation ability, and autonomy had been significantly improved, and more than 70% of the participants said that their intergroup cooperation ability and autonomy had been considerably improved and learning pleasure had been improved. Most interviewees said that they did not expect that the university curriculum could be carried out in this way; Half a day’s study was quickly ended, and every time I felt like I was still in the end.

Both the questionnaire and interview data show that optimistic and positive affirmation and discussion are extremely positive encouragement to the invited sharers, further encouraging educators who are continually exploring and practicing in practice, making them feel achievement and enhancing their internal motivation. As the curriculum’s main body, pre-service teachers are more and more confident to participate in discussion with the curriculum’s implementation. Their communication with the workers in the field of educational practice is gradually increasing. They dare to ask some seemingly common but often difficult questions, leaving a deep impression on schoolteachers. In the interaction between the two sides, mutual understanding and trust are also increasing.

## **5.2. Course Satisfaction and Learning Effectiveness**

### **5.2.1. Course Satisfaction**

For the activity theme set in the course, it is desirable to the participants. All the case sharers, as well as more than 90% of the ordinary participants (including pre-service teachers, primary and secondary school teachers, and university educators), gave positive affirmation to case sharing and co-creation: most of the cases are impressive; the sharers have enough personal meeting to generate enough attraction and empathy for the audience; the case discussion is relatively in-depth, and triggered the participants to explore new ideas. Pre-service teachers are very shocked by many of these cases, which subverts their cognition of the traditional teaching methods of science education and makes them suddenly realize that teaching practice in basic education is characteristic and can attract students’ interest in learning, which also makes them interested in the profession of science education teachers.

Based on the interviews with pre-service teachers, it is found that they generally treat university teaching and primary and secondary school teaching differ-

ently, which are two completely different forms. However, the similarities and differences of curriculum design and teaching implementation between the two are not apparent. There is a lack of basic understanding and understanding of a good curriculum and designing a curriculum. Most of them have specific knowledge of the current education situation and hope to be improved; they also have lofty scientific education ideas, hoping to get more support from more people in the future education practice, and hope to have more exchanges between peers. Senior graduate students say that the experience from practice helps deepen their understanding of teaching theory; they are often trapped in the difficulty of regularizing innovative curriculum and cannot understand the fundamental reason teachers stick to the general mode. The experience of cross-boundary learning makes them realize that the thinking and exploration of practitioners from other fields also have a lot of inspiration for their area, making them produce a lot of new ideas.

### **5.2.2. Learning Effectiveness**

The investigated pre-service teachers (CCJ, CRS) said that due to the lack of pre-service “Inquiry Learning” experience, they did not know how to carry out teaching innovation and lacked the educational philosophy and belief of being a teacher; although they were students, they lacked the fundamental understanding of students, and lacked the knowledge of students’ learning tendency, methods, and differences; their experience of learning focused more on content. However, it ignores the situational, procedural, and generative nature of learning activities. The case sharing and collaborative co-creation link in the course exposed their shortcomings in these aspects, which also made them clear their efforts. However, their questioning and questioning caused other people’s discussion, to a certain extent, made them easy to find their ignorance, which made them feel “inferiority complex” to a certain extent, was not anticipated in this course. In addition to the six themes, pre-service teachers also need to go through the second stage of “reflection and refinement” activities. The three groups’ participants still can interact again, so their cooperation has entered a higher level.

Educators from schools (K12 schools, educational institutions outside the school) have strong autonomy, high self-confidence, substantial control over discussion, and their intrinsic motivation is undeniable. They play an essential role in the conversation and communication and control the development direction of the topic. Because this group of people is more likely to feel the respect, autonomy and self-confidence reflected in the invitation education, they can actively participate in the knowledge construction process in case sharing, virtual task co-creation and other links, enjoy the cross-boundary learning process, and have the highest learning satisfaction. Compared with this, the group of university educators and pre-service teachers is worse.

The cross-boundary special interest group has many feelings about the curriculum activities because of its organization and coordination role. On the one

hand, they gain many tasks from the organization and feel the value and significance of participating in the activities; on the other hand, they also realize a strong sense of belonging and are willing to continue this cross-border community.

### **5.3. Effectiveness and Sustainability of Cross-Boundary Invitational Learning Model**

#### **5.3.1. Effectiveness of This Model**

This research relies on a professional master's course in higher education. The course's teaching effect will also be reflected in whether the teaching mode of sustainable development has been formed.

Survey data show that, compared with activities, the course content is not necessarily the most important reason for their participation. In the two-stage curriculum model, case sharing, group discussion, collaborative co-creation, and content re-review are the key to attract them to participate. Through the interview, the participants showed confidence in their advantages and admitted their ignorance in some aspects. Therefore, they have a more comprehensive understanding of the cross-boundary learning problems and have more ideas for the follow-up development.

The interview data show that invitation in this model is more important for this course. Case sharing and discussion can help participants find out the problems in education and explore the root causes and solutions. They will be conducive to the development and improvement of teachers' beliefs. With the help of the partnership relationship formed with front-line teachers, through the analysis of practical cases in primary and secondary schools, the teachers' educators in higher education cooperate to promote the practice-oriented research activities by analysing the useful cases in primary and secondary schools, to support and guide the formation and development of pre-service Science Teachers' beliefs with convincing facts.

The interviewees approved the arrangement of the course activities. All the participants recognized the representativeness of the invited case sharers' institutions, the discussion questions' design, the structure of the discussion links, the summary, and reflection. The newcomers have not participated in such activities before, so they feel fresh and find this form extremely helpful. For senior students already have some professional knowledge, so they expect to cooperate with practitioners. For the front-line teachers and the public, their practical experience is vibrant, but the knowledge is not systematic enough, so they expect to have the opportunity to learn theory.

Participants deeply agree with the freedom of choice and autonomy provided by the curriculum, recognize the practice-oriented community constructed in the curriculum, especially the role of teachers' team in the curriculum and the arrangement of teaching activities (including the use of dialogue strategies); they have extensive and in-depth discussions on the cross-boundary learning community and give each participant more freedom of choice. It shows a high degree of recognition.

The cross-boundary learning community built by the course has got recognition. Everyone invited to share has brought unique content, which all parties have widely recognized. Through the study, the participants have more confidence in the future of science education than before. In particular, the cross-boundary learning community has made them feel “organized”, have a sense of belonging, and know who can seek help when they encounter problems. In particular, the pre-service teachers’ professional preparation has been significantly improved.

### **5.3.2. Sustainability of This Model**

Due to the short course time, not every course will have time to co-create content, and most people have no special direct cooperation content. However, they communicate with cross-border special interest groups and teaching teams much more than others. Therefore, the possibility of further cooperation and communication will be more substantial in the future.

The results show that only eight people (26.7%) can participate in all activities, which indicates that most people are difficult to guarantee to participate in all activities. Among all the cross-boundary learning activities, 10 (33.3%) summarized the group discussions’ results as representatives, and 3 (10%) only participated in the discussion but did not speak. The mobility of the students in this course is relatively large. Still, many people can insist on participating in the activities, and most of them hope to join in cross-boundary learning activities many times.

All respondents said that the summary and carding stage of the second stage of the course could allow them to interact with participants again and review the courses they have participated in before and gain from their experience. As a result, they are more willing to continue learning the course content.

## **6. Conclusion and Discussion**

### **6.1. Main Findings of the Research**

This educational experiment shows that the cross-boundary invitational learning model, which takes “Case Sharing-Group Discussion-Collaborative Co-creation-Reflection and Refining” as an important idea, not only achieves the curriculum objectives, but also experiences the construction process of practical knowledge, improves the understanding of education, internalizes learning motivation, and develops communication ability, critical thinking and analysis ability, The state of readiness for science education has also changed. In addition to the effectiveness of this course, the findings of this experiment are summarized as follows:

1) This teaching model can realize students’ goals from “knowing nothing” to “gradually understanding”. The introduction of cross-border communication in the curriculum, by the excellent front-line educators to all kinds of innovative practices and practical teaching challenges, through the in-depth conversation process, into the content that pre-service teachers can understand has a right

role in shaping educational beliefs. This mode is carried out according to the rhythm that students can accept, which helps learners form their views gradually, which is more in line with students' cognitive law.

2) All participants in the learning community agree and expect such a platform to share and exchange their ideas and actively listen to others' opinions. They can rethink their fields. Cross-boundary learning enables the three parties to understand each other's advantages, ignorance, and differences in their concerns. Understanding personal qualities (such as individual mind, trust, tolerance, respect, beliefs, and values) and their institutions' social and cultural factors can also lead to conflicts and conflicts. To carry out cross-boundary learning activities around topics of common concern is an effective way for the three groups to seek common goals and develop effective methods, realizing the concept of learning in reflection. The positive feedback among the three will enhance the participants' intrinsic motivation and the possibility of further cooperation between them.

3) In the actual process of cross-boundary learning, there are mainly two kinds of learning forms: the first is the recognition of their own identity and practice triggered by the participants, which partly believe in or change the previous cognition; the second is that different cross-domain exchanges and discussions enable them to have a new understanding of practices in other fields. Cross-boundary virtual task cooperation, review and reflection also promote the possibility of seeking new collaboration between cross groups.

## 6.2. Further Research Needed

At the same time, this experiment also reveals the following issues worthy of attention:

1) Pre-service teachers need to adapt to this mode for a long time and have higher requirements for their communication ability, critical thinking, and cooperation consciousness.

2) Those invited to share cases are generally under tremendous pressure. Although they can gain a lot in the end, many participants choose to participate in shallow level because they are worried that the practice is not innovative enough and the theoretical knowledge is not enough to meet the requirements of the activity.

3) Due to the diverse sources and high mobility of participants, it is difficult to ensure each group's fixed personnel to carry out in-depth communication and cooperation.

## 6.3. Prospects of the Cross-Boundary Invitational Learning Model

The practice of this study shows that a series of activities carried out around case sharing among pre-service teachers, university educators, and schoolteachers can be accepted and internalized by most people. The motivation of pre-service teachers' participation in activities is not dependent on external conditions such

as rewards and punishments but is driven by internalized life value orientation. Although this kind of motivation is external motivation, it can be compared with internal motivation because of its high internalization degree. Therefore, this study suggests that the appropriate design of cross-boundary invitational learning activities can promote learners' internal drive and achieve self-development.

Cross-boundary invitational learning does not happen naturally. The experimental research of this course teaching shows that there are many challenges in cross-boundary learning: usually, people tend to keep silent when they meet the boundary. Only when the boundary problem needs to be solved in cooperation can the dialogue be easily triggered. Based on these findings, the researchers believe that there is a need to define boundaries to facilitate group collaboration to focus on unfamiliar ideas and practices.

Teachers with rich experience hope to carry out innovative exploration activities when they enter cross-boundary learning. March (1991) once divided organizational learning into exploitative learning and exploratory learning. The former refers to the application and expansion of the original organizational knowledge, technology, and ability. The latter represents the experiment, exploration, and innovation of members' new knowledge and practice. As this study found, when participants are invited to participate in the learning process, their experience, skills, and abilities will be based on cross-boundary learning. They are more inclined to communicate and cooperate with others in the mode of exploratory learning.

The researchers of this study have reason to be optimistic, the new teaching mode constructed by integrating the concept of invitation education and the cross-border learning mode has a certain promotion value in colleges and universities. It is hoped that more researchers and practitioners in the future will verify the new teaching mode based on the findings of this study. We encourage others to test the model, evaluate it and further contribute to the knowledge base around cross-boundary invitational learning.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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