Modeling Virtual Learning Communities for Teacher Online Education

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Abstract-In the Internet era, the development of network technology has brought new changes to teacher training. From the perspective of teachers' online education, we investigated Chinese teachers' feedback on the reality of the current online education and training situation (N=163) and explored the reality of the dilemma that exists in online education and training. Because of the real problems reflected in the network course resources, online learning support, and network community functions, set up a three-dimensional virtual learning community model for teachers' online learning functions, social functions, and cognitive functions, to provide teachers with the best online education and training experience.

Keywords-teacher online training; virtual learning community; descriptive analysis; modeling

1. INTRODUCTION

In the context of lifelong education, vigorously carrying out teachers' network education and training has become the trend of education development in today's world. Network education emerged in the 1990s, and is a new form of education born with the development of information technology[1]. Virtual learning community is based on constructivist learning theory, based on computer information processing technology, computer network resource sharing technology, and multimedia information display technology, distance education network teaching support community, increasingly has become a new network of teachers training methods[2].

In the virtual learning community, learners can learn at different times and in different places, breaking the traditional time and space limitations, and learners enjoy the rights of freedom, equality, and resource sharing[3]. At present, the research on network teaching from the perspective of students has achieved fruitful results, but the research on the network education and training mode for teachers is still in the exploratory stage. This paper investigates the current implementation of primary and secondary school teachers' online training using a questionnaire survey, from the perspective of the participating trainees, objectively, realistically, and effectively understand the current problems and dilemmas of teachers' online education and training, and based on the results of the survey, constructs a learning community model that effectively promotes the innovation and collaborative development of teachers' virtual learning, meets the personalized needs of learners, and realizes win-win situation for all parties [4].

2. RESEARCH DESIGH

2.1. Objects of study

A five-point Likert scale was used to design the "Teachers' Feedback Questionnaire on the Use of Online Education and Training", which included four parts, namely, basic information of respondents, online course resources, online tutoring support, and survey on the functions of the online community, with a total of 22 questions. Simple random sampling method was used to select primary and secondary school teachers in Shaanxi Province who participated in the training for more than 7 days each time as the subjects, 170 online questionnaires were distributed, and 163 valid questionnaires were recovered. Among them, 56 were male teachers and 107 were female teachers. The questionnaires were subsequently analyzed using SPSS 26.0.

2.2. Measuring tools

This study draws on domestic and international research in the field of online education for teachers, including the questionnaires of Muilenburg and Berge, Feng Kun et al. Combined with the implementation of online training, this study designs questionnaires that include three dimensions from online course resources, online learning community support, and online community functions.

2.3. Questionnaire reliability and validity

Correlation analysis was used to check the correlation of each question item with the total score. All questions had very high discriminatory power (r-values between 0.542 and 0.789, all $p<0.001$). The KMO value of the statistical indicator was 0.874, which is a good standard. Cronbach's alpha coefficient was used to test the reliability of the questionnaire. The results showed that the Alpha coefficients of online course resources, online learning support, and online community function dimensions were 0.840, 0.913, and 0.937, respectively, and the Alpha coefficient of the total questionnaire was 0.944, which indicated that the questionnaire reliability and validity were good.

3. FINDINGS

3.1. Demographic findings

The basic personal information is mainly surveyed in terms of gender, teaching time, school region, education obtained, number of times attended, online learning skills, and online training effect, and the specific statistical results are shown in Table 1.

Table1 Descriptive analysis of respondents' basic information (N=163)

Variant	Form	Frequency	Proportion (%)
distinguishing between the sexes	male	56	34.35%
	women	107	65.65%
Have you been	be	70	42.94%

teaching for more than five years	clogged	93	57.06%
Region of teaching	municipalities	44	26.10%
	county seat	69	42.33%
	townships	50	30.67%
Final qualification	Specialized and below	30	18.40%
	undergraduate (adjective)	100	61.34%
	Master's degree or above	33	20.26%
Number of training/year	0	5	3.08%
	1-2	57	34.96%
	More than 3 times	101	61.96%
Training Effectiveness	ineffective	98	60.12%
	general	36	34.09%
	effective	29	5.79%

From the data in Table 1, it can be seen that the number of female teachers exceeds that of male teachers, which is related to the gender structure of the teachers themselves; from the viewpoint of teaching time, the number of people who have been teaching for less than five years to participate in the training is higher, which is related to the local policy, some regional education departments require new teachers to participate in specific training courses; from the viewpoint of the region where the school is located, the teachers in the county and the district accounted for the largest share of the teachers, which amounted to 42.33%; from the viewpoint of the last obtained education, the bachelor's degree is the main one, accounting for 61.34%; from the viewpoint of the number of times participating in online training, most of the teachers have online training experience, with 61.96% of teachers participating three times or more per year, and only 3.08% of teachers have no online training experience; from the viewpoint of the effect of online training, 60.12% of the respondents think that the effect of online training is not as good as that of offline centralized training. Those who thought the effect was average and better accounted for 34.09% and 5.79% respectively. Overall, the number of participants in teachers' e-learning is high and the effect of training and learning is unsatisfactory.

3.2. Descriptive analysis of the current status of teachers' online training

1) For web-based training community functions

As can be seen from the data in Table 2, A3 and A5 have high mean values, and there are more problems with the online learning system directly related to the training and learning activities, as well as a lack of proficiency in mastering the related software. The rest of the questions also reach a medium level, and network transmission and computer level also affect online training activities to a certain extent. The mean values of this dimension are all close to 3, and the experience and satisfaction of using the platform are not satisfactory.

Dimension	Theme	Mini-value	Maxi-values	Average value	Standard deviation
Web-based Training Platform Functions	A1. The system transfer speed of the e-learning community is too slow, which delays my online learning time	1.0	5.0	3.043	.8513
	A2. My computer skills are very low and I don't know how to use many features of the online learning community	1.0	5.0	3.057	.8404
	A3. The online learning system often breaks down, affecting my online training	1.0	5.0	3.125	.9140
	A4. I am not good at using new online learning tools	1.0	5.0	2.989	.9065
	A5. I am not yet proficient in the functionality of the software for cell phones	1.0	5.0	3.146	.9507

2) Online learning support

As shown in Table 3, this dimension has greater difficulties. The dimension of training support and service is investigated from five aspects: teaching methods, interaction and communication, guidance, and emotional support of personnel. B1 reflects that the teaching methods of online learning are single, which leads to a decline in interest in learning and study; B2 reaches a mean value of 3.446, which indicates that trainees believe that communication and interaction between trainees are greatly affected during online training; B3 jointly indicates that there is a lack of communication between teachers and students, which affects the trainees' training ; B4 indicates that the trainees have certain requirements for online learning method guidance, which are not met during the training; B5 indicates that the relevant management personnel do not provide enough technical support for online teaching.

Table3 Descriptive analysis of online learning support (N=163)

Dimension	Theme	Mini-value	Maxi-values	Averag e value	Standard deviation
E-Learning Support	B1. The teacher's explanation in the online course is boring.	1.0	5.0	3.043	.8924
	B2.I can't communicate and learn well with other trainees in the online training and lack of training communication experience.	1.0	5.0	3.446	.9251

	B3. I ask my teachers for help with problems on the Internet and often get no feedback	1.0	5.0	3.125	.8939
	B4. Teachers only focus on the teaching of knowledge and do not provide guidance on learning methods	1.0	5.0	2.989	.9065
	B5. The management service staff lacks responsibility and does not answer my questions in a timely manner	1.0	5.0	3.057	.9507

3) Web-based course resources

Table 4 Descriptive analysis of online course resources (N=163)

Dimension	Theme	Mini-value	Maxi-values	Average value	Standard deviation
	C1There are so many online training resources that I have a hard time determining which ones are primary and which ones are secondary.	1.0	5.0	3.043	.9124
	C2. The learning resources are not organized or sequenced in a way that matches my learning ability and I find it difficult to complete all the learning tasks.	1.0	5.0	3.446	.8251
Online Course Resources	C3.The course content is too theoretical and disconnected from real work and life, which affects my interest in learning.	1.0	5.0	3.125	.8239
	C4. The content of the training course did not clearly communicate the main points of the course and I had difficulty in completing the learning activities.	1.0	5.0	2.189	.9365
	C5. The use of online course resources lacks autonomy and is too rigid.	1.0	5.0	2.057	.9127

The data in Table 4 shows that C2 has the highest mean value, which indicates that the setting of learning resources may not take into account the different needs and levels of different learners, and that online courses do not provide personalized learning paths or teaching methods, thus making it more difficult to complete the learning.C1 and C3 indicate that some online courses are ponderous and overly theoretical, emphasizing abstract concepts without considering the

practical context, making it difficult for students to relate the theoretical knowledge they have learned with their daily work or life. C4 and C5 mean scores are below 3, and most of them think that online course resources are different from offline courses in that they can convey the key points of the course.

4) Online learning communities for teachers

Comprehensively analyzed above, the three dimensions of data show that there are major problems in the functional aspects of teachers' online learning communities（Table 5）: poor support and services of online learning communities, online course resources that do not have autonomy, which cannot stimulate teachers' interest in learning, and poor functionality, which directly affects teachers' learning experience. Accordingly, we should establish a virtual learning community for teachers, which can provide personalized support to ensure that each teacher can learn according to his or her own needs and has incentives to maintain learning motivation. In this community, teachers can learn from each other, share resources and experiences, and improve their professional knowledge and skills[5].

Table 5　Descriptive Analysis of Overall Feedback on Online Training for Teachers

Dimension	Mini-value	Maxi-values	Average value	Standard deviation	Arrange in order
Web-based training community features	1.46	5.0	3.583	.6348	1
E-Learning Support	1.38	5.0	3.227	.5983	2
Online Course Resources	1.12	5.0	3.126	.6343	3

4.　VIRTUAL LEARNING COMMUNITY BUILDING

As shown in Figure 1, the virtual learning community is divided into three segments, targeting issues such as network course resources, online learning community support, network community functions, and designing a complete collaborative communication teacher learning community system from the perspective of learning function, social function and cognitive function, in which teachers can fully participate in the whole process of training and learning, and develop learning based on the virtual learning community with the purpose of academics and the interest of the link. The teachers can fully participate in the whole process of training and learning with academic purposes and interests, and use the virtual learning community as the basis to carry out learning.
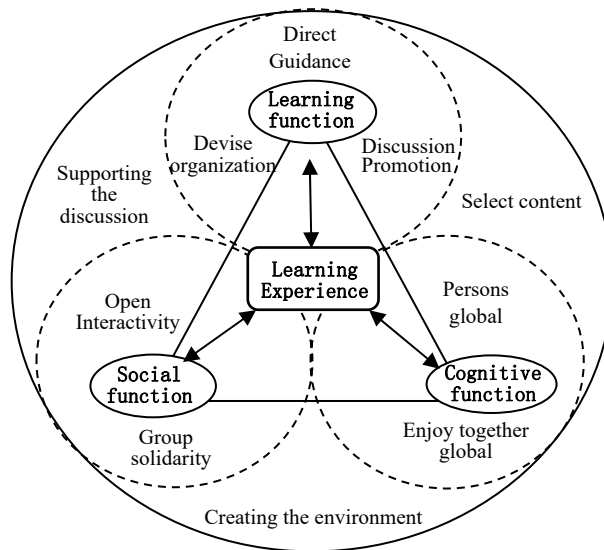
Figure1 Framework model for quality learning communities

From the perspective of the learning experience, a quality virtual learning community should form a cyclic model in which each core element supports each other. Social, cognitive, and learning functions are the three elements of the community framework, and each function represents the corresponding category, which is internally interdependent and produces the common effects of "supporting discussion", "selecting content", and "creating an environment". "selecting content" and "creating an environment"[6]. Specifically for the three functions (Figure 1), the categories of the social function include open interaction, close response, and connection between individuals. These domains are dynamic and progressive and form the basis for building, maintaining, and developing virtual learning communities. The social function is the foundation of virtual learning communities, which give participants a sense of belonging, support faculty in freely expressing their academic views, and maintain community cohesion. Cognitive function is an important manifestation of learning communities. Cognitive function integrates the whole process of the learning cycle, starting from experience, going through reflection and conceptualization, and then progressing to action[7]. Building and sustaining cognitive functions in a community spotlights formal, purposeful online teacher-learning communities[8]. Learning functions can effectively combine social and cognitive functions to create courses, teaching pathways, and methods while moderating, guiding, and focusing on teacher learning discussions and task completion[9].

5. CONCLUSION

Entering the new era, curriculum reform and the development of new technologies, especially network technologies, have put forward higher and newer requirements for teachers' concepts and methods[10]. Teachers' virtual learning community utilizes a variety of teaching methods and technical means to improve teachers' teaching ability and level by combining online and offline. The teaching profession is special and developmental, and virtual learning communities

fulfill teachers' pursuit of professional development, improve their learning power, and provide space for their continued growth. There are still many problems in today's teachers' virtual learning community, such as the inconvenient operation of the online community, the lack of fun, and the low utilization rate of network resources. This paper constructs a virtual learning community model for teachers, which is designed with flexible and open concepts to provide teachers with diversified and personalized learning resources and services, and to promote exchanges and cooperation among teachers, so as to form a learning community and a cooperative learning environment. In the future, the virtual learning community should continue to rely on the network, establish learning communities, and form interactive cooperative learning groups with multi-region, multi-faceted, and multi-disciplinary components, so as to promote teachers' in-depth learning. We should believe that in the Internet era, virtual learning is not only a trend in education and teaching, but also a necessary tool for modern teaching methods, and the flexibility of the virtual learning model and the diversity of methods will certainly contribute to the creation of a high-level, high-quality teaching force.

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