Adult and Higher Education (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/aduhe.2025.070319
ISSN 2523-5826 Vol. 7 Num. 3

Research on the Behavioral Engagement of Online Training Workshops for Physical Education Teachers in Middle Schools of Hunan Province

Tang Jingen[1,a,*], Lin Yuande[2,b], Xiong Hailin[3,c]

[1]*School of Physical Education, Hunan Institute of Science and Technology, Yueyang, 414006, China*
[2]*Physical Education Team, Liancheng No. 1 Middle School, Longyan, 366200, China*
[3]*Physical Education Team, Yueyang No. 10 Middle School, Yueyang, 414006, China*
[a]*12002007@hnist.edu.cn*, [b]*1026635703@qq.com*, [c]*125122848@qq.com*
[*]*Corresponding author*

Keywords: Teacher Workshops; Online Training; Workshop Behavior Engagement

Abstract: Teacher workshops provide diverse training environments for teachers, but online training investment is not effective and insufficient in depth, which restricts the improvement of training quality. Based on social cognitive theory, self-efficacy theory and self-determination theory, the study analyzed the online training engagement of 467 participants in the Hunan Province Middle School Physical Education Teacher Workshop using literature review, questionnaire survey and mathematical statistics. This study investigates how social support influences online engagement in teacher workshop participants, while examining the sequential mediation effects of self-efficacy and autonomous motivation. The findings aim to provide actionable insights for optimizing online training quality in middle school physical education (PE) teacher development programs and advancing professional growth strategies.

1. Introduction

Teacher workshops assist teachers in knowledge building and professional growth through forms such as expert guidance, peer assistance, experience sharing, and lesson discussion. Its development is based on the maturity of Internet technology and stems from the promotion of online education and distance learning. Ma et al. [1] pointed out that the continuous investment of teachers as the main body of training is an important indicator for measuring the effectiveness of training, and the degree of investment directly affects learning outcomes Xie K [2]. Although some studies have focused on teachers' behavioral engagement in online training, there is still insufficient exploration of the differences in engagement caused by factors such as different academic backgrounds, teaching stages, gender differences, and training experience. At present, engagement in online training is influenced by a variety of factors such as social support and self-efficacy. Clarifying these influencing mechanisms can help optimize training strategies and enhance teachers' deep learning levels.

2. Research hypotheses

2.1 The direct effect of social support on investment in online training

Social support, as a multi-dimensional resource that individuals acquire from the external environment, mainly from social networks such as families, schools and communities, has a significant impact on teachers' professional development. Scholars Liu Shiqing and Huang Panpan et al. [3] found that support from family and colleagues can significantly increase teachers' learning engagement. Quan Xiaojie's [5] study shows that the teaching profession is characterized by significant high emotional consumption, and social support plays a key role in the professional development of teachers. Liu Shiqing's empirical research found that support from family members and colleague groups can significantly enhance teachers' enthusiasm for participating in training activities[4]. Based on this theoretical framework, this study suggests a significant positive correlation between social support and teachers' engagement in online training, and puts forward the following research hypotheses:

H1: Social support can positively predict online research engagement.

2.2 Mediating effects of self-efficacy

Self-efficacy is one of the core concepts of Bandura's social cognitive theory, specifically referring to an individual's assessment of their ability to perform a particular task and their judgment of beliefs. In the field of teacher professional development, it is manifested as the assessment of the ability of the trainee teacher to complete the task of blended learning. Research shows a significant positive correlation between self-efficacy and learning engagement. Rao et al. [6] found a positive correlation between students' self-efficacy levels and their online learning engagement, and further research by Wu et al. [7] confirmed that self-efficacy has a significant predictive effect on learning engagement. These findings provide an important theoretical basis for understanding the influencing factors of teacher engagement. Based on theoretical analysis and practical experience, this study hypothesizes that teacher self-efficacy in training plays a mediating role between social support and online training engagement, and puts forward the following research hypotheses:

H2: There is a mediating effect of self-efficacy between social support and engagement in online training.

2.3 Mediating Effect of Autonomous Motivation

According to the classification framework of self-determination theory, motivation can be divided into three types: autonomous, controlling, and demotivated. Among them, autonomous motivation is composed of internal drive, integrative regulation and cognitive regulation, and reflects a higher degree of self-integration. Research shows that learning autonomous motivation refers to the psychological tendency of an individual to identify with and actively pursue the intrinsic value of learning activities under the influence of external factors, and it is the main driving force for learning behavior. This kind of motivation not only sustains the continuity of learning behavior, but also has a significant regulatory function. High levels of autonomous motivation help learners stay focused and enhance task persistence throughout the long learning process. Based on the above theoretical analysis, this study suggests that autonomous motivation may play a mediating role in the relationship between social support and engagement in online study, and thus puts forward the following research hypotheses:

H3: There is a mediating effect of autonomous motivation between social support and engagement in online training.

2.4 Chain mediating effect between self-efficacy and autonomous motivation

This study theoretically constructs a chain mediating path model of the impact of social support on online training engagement, with self-efficacy and autonomous motivation as mediating variables respectively. Studies have shown that in the context of online learning, there is a significant correlation between learners' self-efficacy and their level of motivation. There is a significant association between academic self-efficacy and engagement in online study. By constructing a theoretical pathway of "academic self-efficacy, learning motivation, flow experience, online learning engagement", scholars systematically elucidate the multi-dimensional influence mechanisms among these variables, among which the predictive effect of academic self-efficacy on online learning engagement has been fully verified.

The empirical study by Li Chenglong [4] further found that learners with a higher sense of self-efficacy typically exhibit a stronger belief in success and study motivation, and tend to put in more effort when facing challenging tasks. This finding provides a new theoretical perspective for understanding the influencing factors of online study engagement. Relevant studies suggest that in the context of online learning, learning motivation plays an important mediating role in the relationship between self-efficacy and learning performance. This finding provides a new theoretical perspective for understanding the mechanism by which online learning performance is influenced. Based on the above analysis, this study suggests that the social support teachers receive during online training in teacher workshops may significantly increase their engagement in online training by enhancing their self-efficacy in online training, thereby stimulating their self-motivation. Therefore, this study puts forward the following hypotheses:

H4: Self-efficacy and autonomous motivation have a chain mediating effect between social support and engagement in online study (Fig. 1).

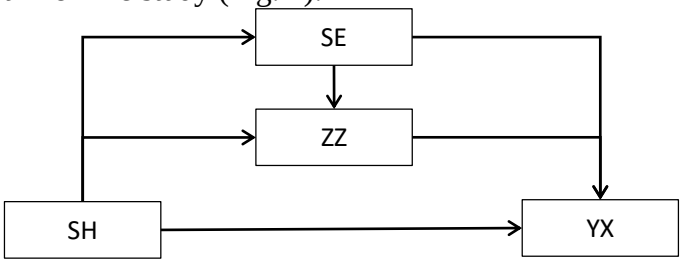

Fig.1 Theoretical Model of Research

3. Research methods

3.1 Scale Development

The Learning Engagement Scale was selected by Yu Qing [8], the Social Support Scale by Huang Panpan (2018), the Self-efficacy Scale by Kuo et al (2014), and the Autonomous Motivation Scale by Gagne et al. (2010). Based on the characteristics of the online training context and the professional characteristics of middle school physical education teachers, the item description was contextualized and revised. After the pre-research, the scale had good reliability and validity, providing a reliable measurement tool for the research.

3.2 Data Collection

The research subjects were the online training input of the participants of the Hunan Province Middle School Physical Education Teacher Workshop (referred to as: Teacher Workshop), and the research subjects were the participants of the Hunan Institute of Science and Technology who

undertook the Hunan Province "National Training Program" Middle School Physical Education Teacher Workshop in the past three years. The samples were from middle school physical education teachers in 13 prefecture-level cities and 1 autonomous prefecture in Hunan Province, including Changsha and Yueyang. A questionnaire survey was conducted between September 5 and 15, 2024. A total of 543 questionnaires were distributed through the online platform. After eliminating 76 invalid questionnaires, 467 valid questionnaires were obtained, with an effective recovery rate of 86%. Among them, there were 258 female teachers (55.46%) and 208 male teachers (44.54%); Junior high school teachers 222 (47.54%), senior high school teachers 245 (52.46).

3.3 Scale tests

The content validity (CVI≥0.78), structural validity (CFI≥0.90), and reliability (Cronbach'sα≥0.80) of the questionnaire were tested. The overall reliability Alpha coefficient of the scale was 0.954, and all subscales were above 0.8; The standardized path coefficients of each item on the factor to which it belongs are all above 0.6. In addition, the convergence validity (AVE) values of each variable reached the required level of 0.5; The combined reliability (CR) of each variable exceeded 0.7, indicating a reliable convergence validity. The study model had a good fit for indicators such as CMIN/DF (1.197), RMSEA (0.021), IFI (0.988), TLI (0.987), CFI (0.988), and GFI (0.922).

4. Research Results

4.1 Analysis of the online engagement level of participants in the Hunan Province Middle School Physical Education Teacher Workshop

4.1.1 Analysis of the overall level of online research and training investment of Teacher Workshop Participants

The average score for teachers' engagement in online training was (3.357±0.920), with a median of 3.333 and a variance of 0.847, and the score range was from 1.167 to 4.75. The results suggest that teacher engagement is generally above average, but there are differences among individuals, with some teachers having a higher level of engagement and others having much room for improvement.

4.1.2 Analysis of group differences in online research engagement among workshop participants

Using the independent sample t-test analysis, the online training engagement of male teachers (3.31±0.94) and that of female teachers (3.39±0.90) did not reach the statistical significance level (t=0.938, p=0.349). Junior high school teachers (3.45±0.92) and senior high school teachers (3.27±0.91) reached statistically significant levels (t=2.044, p=0.041).

4.2 Analysis of the Effect of Online training Engagement among workshop Participants of Physical education Teachers in Middle Schools in Hunan Province

4.2.1 Correlation analysis of Online training Input with various factors

Table 1 Correlations among the variables

Variables	YX	SH	SE	ZZ
YX	1			
SH	.526***	1		
SE	.475***	.470***	1	
ZZ	.463***	.396***	.465***	1

Notes: *p<0.05 **p<0.01 ***p<0.001

SPSS26.0 was used to analyze the correlations among the variables (Table 1), and there were correlations between the investment in online training and the variables.

4.2.2 Model Analysis of the Input Structure of online training

Through the structural model fit test, it was verified that the conceptual model proposed in the study could well reflect the relationships among the variables in the actual data. The standardized path coefficients between each variable and the network training input were all positive and significant, as shown in Table 1. Social support (SH) has a significant positive impact on online training input (YX) (0.324, Unstd 0.298, $p<0.001$), and hypothesis H1 holds. Additionally, the structural model R2=0.40 indicates that the model has a good explanatory power (Fig. 2).

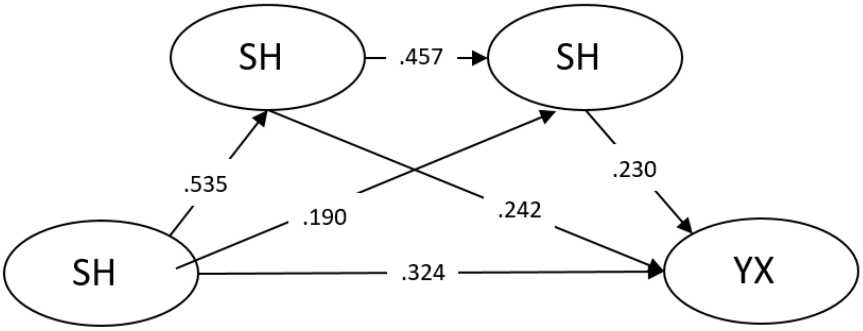

Fig.2 Study Structural Model

4.2.3 Mediating Effect experience and Difference comparison

Based on the requirements for sample size in Sobel M. E. (1982) coefficient product test, and considering that the product of the test statistic ab may differ from the normal distribution, Bootstrap sampling, which is suitable for medium and small samples, was chosen. After 5000 Bootstrap samples analyses, the results of the mediating effect test are shown in Table 2. According to the test statistic Z values, the total effect, direct effect, and total mediating effect Z values were all greater than 1.96, and the 95% confidence intervals estimated by Bootstrap did not contain 0, indicating the presence of mediating effects. H1, H2, H3 were valid. Among them, the SE mediating effect (.130) accounted for 23.30% of the total effect; The ZZ mediating effect (.044) accounted for 7.89% of the total effect; The SE→ZZ chain mediating effect (.057) accounts for 10.22% of the total effect. In terms of the proportion of mediating effects, self-efficacy (SE) has the highest proportion (Table 2).

Table 2 Comparison of experiences and Differences in mediating effects

Paths	Effect value	Bootstrap (5000)		PVE
		Bias-Corrected 95%CI	Bias-Corrected 95%CI	
		Lower	Upper	
Direct Effects	.324	.225	.431	58.60%
Total Indiredt Effects	.231	.163	.310	41.40%
SH→SE→YX	.130	.063	.208	23.30%
SH→ZZ→YX	.044	.015	.092	7.89%
SH→SE→ZZ→YX	.057	.028	.100	10.22%

5. Research conclusions

The overall level of investment in online training is above average, but there are differences among teaching stages. The overall level of engagement in online training for middle school physical education teachers' workshops in Hunan Province was above average (3.357±0.920), indicating that most teachers had a basic willingness to participate in the training. However, the score range (1.167-4.75) and variance (0.847) showed significant differences in engagement among individuals, and there was still considerable room for improvement in engagement among teachers. This confirms the reality of "insufficient depth of engagement in training". Gender is not an influencing variable that affects the online training engagement of middle school physical education teachers, but the online training engagement of junior high school teachers (3.45±0.92) is higher than that of senior high school teachers (3.27±0.91) to reach a statistically significant level (t=2.044, p=0.041). It is presumed to be related to the differences in physical education teaching tasks between junior and senior high schools (such as the compression of physical education class hours and the limited allocation of teachers' energy under the pressure of high school entrance examination), and the different matching degrees of training content with the teaching needs of the school stage.

Social support is an important external driving force for investment in online training. Social support has a significant positive direct impact on online training input (normalized coefficient 0.324, Unstd 0.298, $p<0.001$), with the direct effect accounting for 58.60% of the total effect (hypothesis H1 holds), and the structural model $R^2=0.40$ indicates that social support can independently account for 40% of the training input variation. This is in line with the findings of scholars such as Liu Shiqing and Quan Xiaojie that the profession of middle school physical education teachers is characterized by "high emotional consumption", and social support from family (time support), school (task coordination), and colleagues (experience mutual assistance) can directly alleviate the external pressure on teachers' training, enhance their participation initiative, and is the core external guarantee of training input.

Self-efficacy and autonomous motivation form a "progressive" influence effect. After 5,000 Bootstrap sampling tests, the total mediating effect accounted for 41.40%, and all three mediating pathways were significant (95% confidence intervals did not include 0), verifying the mediating role and chain mechanism of self-efficacy (SE) and autonomous motivation (ZZ) (hypotheses H2, H3, H4 hold). Self-efficacy (23.30 percent, effect value 0.130) : As a core variable of social cognitive theory, self-efficacy is the "key bridge" for social support to translate into training input. When teachers receive adequate social support (such as the school providing training time and colleagues sharing technical experience), they strengthen their belief in their ability to complete the training tasks, thereby reducing concerns about the difficulty of the training and increasing the level of engagement. This is consistent with the conclusion of Rao Aijing [6] and Wu [7] that "self-efficacy positively predicts learning engagement," and that this path has the highest proportion of mediating effect, indicating that teachers' judgment of their own learning ability is a more core mediating variable than motivation. Self-efficacy (7.89%, effect value 0.044) : According to the self-determination theory, social support can maintain the sustainability of research engagement by enhancing teachers' recognition of the value of research (such as perceiving that research can solve practical teaching problems), stimulating their autonomous motivation (internally driven rather than externally forced). But the path effect is the lowest, presumably because the motivation of middle school physical education teachers for training is more likely to be driven by "actual needs (such as solving classroom problems)", while the formation of self-motivation requires long-term value recognition, and short-term social support has limited stimulating effect on it. Self-efficacy → chain mediator of autonomous motivation (10.22%, effect value 0.057) : This pathway reveals a progressive mechanism of "external support → internal competence belief → internal motivation → behavioral

engagement" - social support first enhances teachers' self-efficacy in training, and higher competence belief further makes teachers more likely to identify with the intrinsic value of training (such as believing that they can improve their teaching ability through training and then actively pursue training goals), Ultimately, a positive cycle of "efficacy → motivation → engagement" is formed. This finding complements Li Chenglong's [8] research on "the correlation between self-efficacy and study motivation", clarifying the "chain linkage" relationship between the two in the influence mechanism of study engagement.

6. Research implications

This study breaks the previous limitation of "single factor influencing training engagement" and, through the chain mediation model, validates for the first time in the middle school physical education teacher group the multi-path mechanism of "social support → self-efficacy → autonomous motivation → training engagement", enriching the "social-psychology-behavior" integrated theoretical framework in the field of teacher training behavior It provides a reusable analytical paradigm for subsequent interdisciplinary research on teacher engagement, such as in Chinese and mathematics.

The findings provide a precise direction for improving the quality of physical education teacher training in middle schools - priority should be given to "enhancing self-efficacy" (such as designing stratified training tasks and providing technical assistance). While taking into account the targeted social support (such as reducing the teaching burden for high school teachers and optimizing the training schedule) and the long-term cultivation of self-motivation (such as designing training content in combination with the pain points of physical education teaching), avoid the "one-size-fits-all" training strategy and truly achieve the transformation of "external support → internal drive → deep engagement".

Acknowledgments

Project: Hunan Province Basic Education Teaching Reform Research Project "Research on Behavioral Input of Hunan Province Middle School Physical Education Teachers' Workshop Online Training"(Y2024997).

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