

Research on the Impact of Digital Teaching Resources on the Learning Engagement of Chinese Language Learners and the Path to Improvement

Yang Lixuan, Liang Xiangdong*

College of Humanities and Education, Liaodong University, Dandong, Liaoning 118003, China.

*Corresponding author. E-mail: 1773563426@qq.com

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Abstract: Based on theories such as Chinese learning engagement, the self-system of Chinese motivation, perceived school style, professional commitment, Chinese learning efficacy and Chinese learning burnout, this study takes 500 samples as the basis of empirical research, establishes a theoretical model of how digital teaching resources affect learners' engagement, and uses techniques such as the structural equation model to reveal the internal mechanism of each element. Furthermore, specific improvement paths are proposed to verify the promoting effect of digital teaching resources on learners' engagement, which has high reference value for the practice of teaching Chinese as a foreign language.

Keywords: Digital teaching resources; TCSOL; Structural equation model

0. Introduction

With the rapid development of information technology, digital teaching resources have gradually become important resources for teaching Chinese as a foreign language. The engagement level of learners of Chinese as a foreign language is an important factor restricting the learning effect of Chinese as a foreign language. A high engagement level is conducive to improving learners' learning participation and bringing good learning effects. However, the impact of digital teaching resources on students' engagement and the specific ways to enhance engagement are still in a state of vague understanding. An in-depth exploration of this issue has very important practical significance, which is of practical significance for the optimization of the teaching mode of Chinese as a foreign language and the improvement of the teaching effect.

Theoretically speaking, theories such as Chinese learning engagement, the self-system of Chinese motivation, perceived school style, professional commitment, Chinese learning efficacy, and Chinese learning burnout are all the basis of this study. Chinese learning engagement refers to the learning engagement scale of learners, indicating the physical and mental engagement status of learners during the learning process. The self-system of Chinese motivation refers to explaining the process of the formation of language learning motivation from the perspective of psychoanalysis. Perceiving the school style refers to the subjective conscious experience of the school. Professional commitment is the learner's dedication and loyalty in their major. The sense of efficacy in learning Chinese affects the self-learning confidence of Chinese learners. Learning burnout in Chinese is a negative manifestation of learning engagement. Five theories such as Chinese learning engagement can influence each other and affect the engagement degree of learners. Digital teaching resources have a huge regulatory and promoting effect on these five theories.

1. Literature Review

Learners' engagement in Chinese refers to the process of learners' engagement in learning in terms of cognition, emotion and behavior, which is influenced by multiple factors. The theory of student learning engagement holds that the level of students' academic engagement directly

affects learning outcomes. Tang, X... (2025) pointed out that in the learning of Chinese as a foreign language, the degree of learners' engagement is manifested in aspects such as learners' exploration of Chinese knowledge, emotional experiences during the learning process, and real Chinese language learning behaviors.

The motivational self system, namely the three-level motivational system of the ideal self, the Ought-to Self and the real self proposed by Dornyei (2009), refers to the composition of learners' motivation including three levels: the ideal self, the Ought-to Self and the real self. Among them, the ideal self is the ideal state of the learner; The self should be the state that learners think they should reach. The real self refers to the current actual state of the learner. The distances among the three states will lead to the learner's learning motivation, and learning engagement will be affected by it (Xu, Y., & Lai, C.S., 2024).

Perceived school style refers to learners' subjective perception of aspects such as the teaching style and management mode of the school. A good perception of the school style can create a positive learning atmosphere and enhance learners' motivation and engagement in learning. Professional commitment refers to the degree of recognition and dedication of learners to their major. Learners with high professional commitment are more willing to invest time and energy in their studies (Du, H, 2023).

The sense of efficacy in learning Chinese refers to the subjective prediction of learners about whether they can successfully complete the tasks of learning Chinese. The theory of self-efficacy holds that self-efficacy will affect an individual's behavioral orientation, effort level and persistence. Learners with a higher sense of efficacy in learning Chinese are more confident and have a higher level of engagement when facing learning difficulties. Chinese learning burnout refers to the fatigue and aversion to learning emotions that learners experience during the learning process, which is negatively correlated with the degree of learning engagement (Zhu, X., Chan, S. D., Yao, Y., & Zhu, S., 2024).

2. Research Hypothesis

Based on the above theory, the following research hypotheses are proposed:

H1: Digital teaching resources have a significant positive impact on the engagement of learners of Chinese as a foreign language.

H2: The self-system of Chinese motivation plays a mediating role between digital teaching resources and learners' engagement.

H3: Perceiving the school style plays a mediating role between digital teaching resources and learners' engagement.

H4: Professional commitment plays a mediating role between digital teaching resources and learners' engagement.

H5: The sense of efficacy in learning Chinese plays a mediating role between digital teaching resources and learners' engagement.

H6: Chinese learning burnout plays a moderating role between digital teaching resources and learners' engagement.

3. Research Design

3.1 Research Subjects

This study selected 500 learners of Chinese as a foreign language as samples. The samples of learners of different ages, nationalities, learning stages and learning purposes basically covered

different research subjects, so as to ensure that the results of this study have high universality and representativeness. In terms of age, it includes those aged 18 to 60, mainly young learners aged 18 to 35, who constitute the main body of the group of learners of Chinese as a foreign language and have a relatively large learning demand.

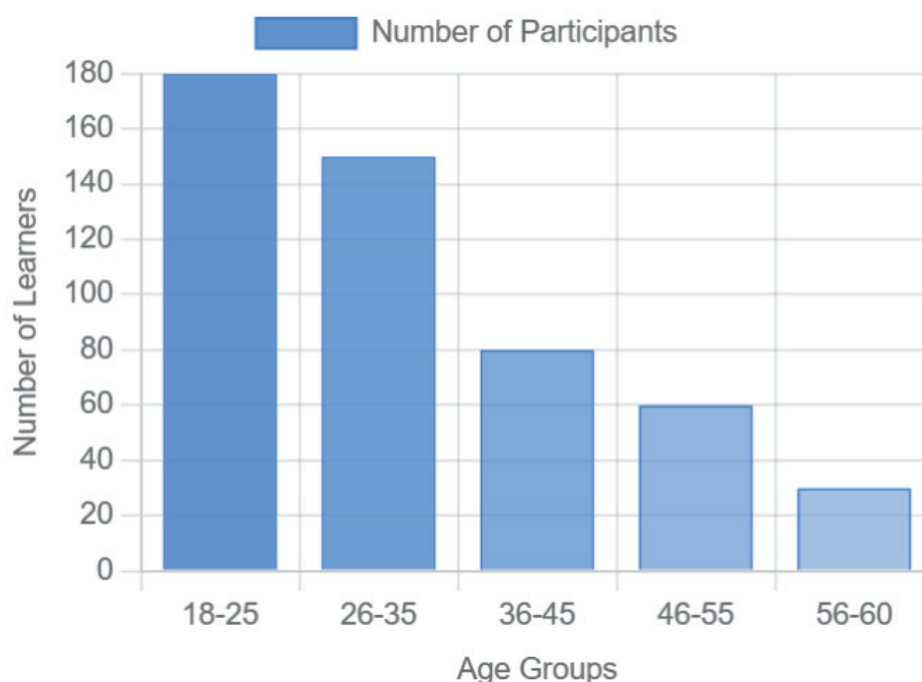


Figure 1 shows the age distribution of the research samples

In terms of nationality, multiple different regions such as Asia, Europe, America and Africa are chosen to avoid the uniformity of cultural background.

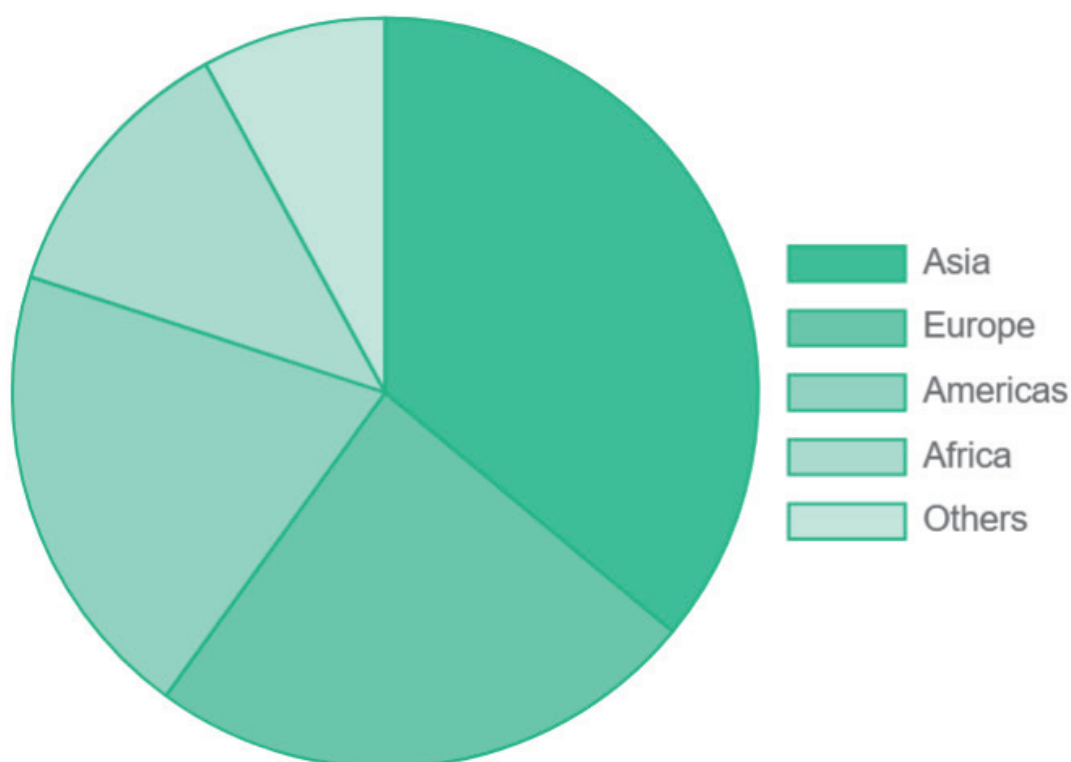


Figure 2 shows the nationality distribution of the research samples

In terms of learning stages, it includes beginner, intermediate and advanced learners. Among them, beginner accounts for approximately 30%, intermediate for about 50%, and advanced for about 20%. This proportion setting is conducive to the author's analysis of the impact of different digital teaching resources on learners' engagement at different learning stages.

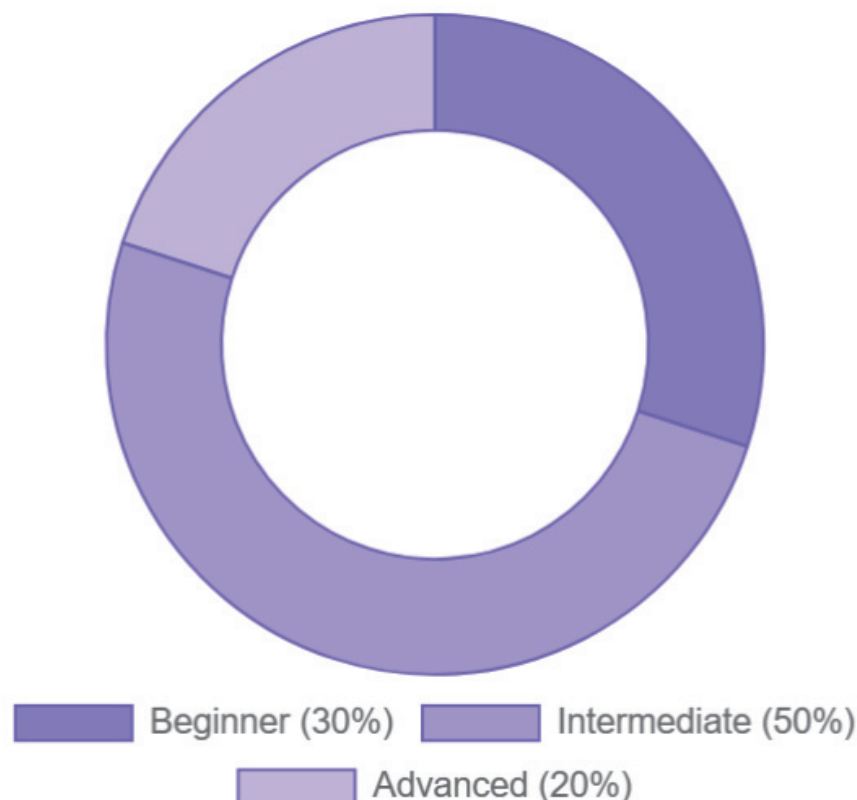


Figure 3 shows the distribution of the learning stages of the research samples

In terms of learning objectives, it covers people with learning purposes such as business, cultural interests, and academic requirements, so that the research can reflect as comprehensively and truly as possible the mechanism of the role of digital teaching resources in different learning purpose environments.

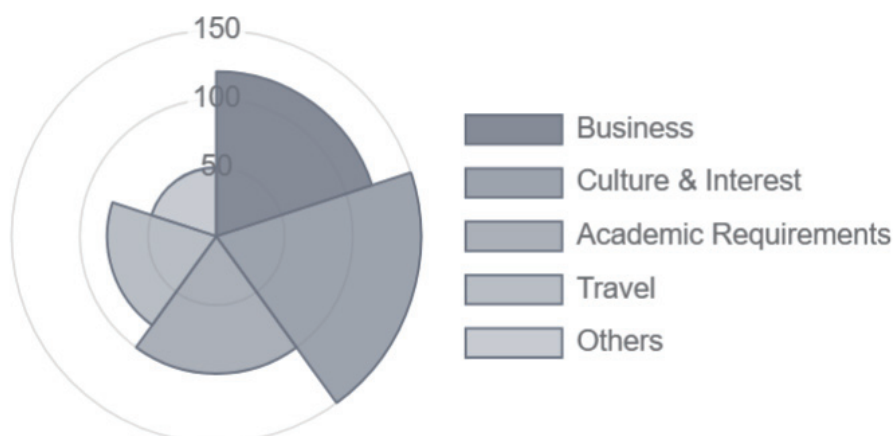


Figure 4 shows the distribution of learning purposes of the research samples

3.2 Research Tools

This study obtained research data through questionnaire surveys. The questionnaires included contents such as the use of digital teaching resources, engagement in Chinese, self-system of Chinese motivation, perception of school style, professional commitment, sense of efficacy in Chinese learning, and Chinese learning burnout. The questionnaire is scored on a 5-point Likert scale, with 1 indicating "strongly disagree" and 5 indicating "strongly agree".

The scales used in the questionnaire have all been verified by scholars at home and abroad and have good reliability and validity. The Chinese Learning Engagement Scale is adapted by referring

to the Fredricks (2004) Student Engagement Scale. The Chinese Motivational Self-System Scale refers to the scale developed by Dornyei (2009); The Perceived School Style scale refers to the School environment scale compiled by Moos (1979); The professional commitment scale was adapted by referring to the organizational commitment scale compiled by Meyer (1993); The Chinese Learning Efficacy Scale was compiled with reference to Bandura's (1977) theory of self-efficacy. The Chinese learning Burnout Scale was developed by referring to the job burnout scale compiled by Maslach (1981).

3.3 Data Analysis Methods

The data collected in this research were analyzed using SPSS26.0 and AMOS24.0 software. Through reliability and validity analysis, the reliability and validity of the questionnaire data were examined. The basic characteristics of the samples and the distribution of each variable were analyzed through descriptive statistics. The correlations among various variables were tested through correlation analysis. By using the structural equation model to test the research hypotheses, the direct and indirect influence paths of digital teaching resources on students' engagement were analyzed.

4. Data analysis and results

4.1 Reliability and validity analysis

This study uses Cronbach's α coefficient to test the reliability of the questionnaire. The formula is:

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum_{i=1}^k S_i^2}{S_T^2} \right) \quad (1)$$

where k is the number of items in the scale, S_i^2 is the variance of the score of the i -th item, and S_T^2 is the variance of the total score of the scale. After calculation, the Cronbach's α coefficients of each sub-scale, such as the use of digital teaching resources and the engagement in Chinese learning, are all above 0.7, and the α coefficient of the total scale reaches 0.85, indicating that the questionnaire has good internal consistency reliability.

For validity testing, the KMO (Kaiser – Meyer – Olkin) test and Bartlett's test of sphericity are used. The formula for calculating the KMO value is:

$$KMO_{ij} = \frac{\sum_{k \neq ij} r_{ik}^2 r_{jk}^2}{\sum_{k \neq ij} r_{ik}^2 r_{jk}^2 + \sum_{k \neq ij} u_{ik}^2 u_{jk}^2} \quad (2)$$

where $r_{ik}r_{jk}$ are the correlation coefficients between variables, and $u_{ik}u_{jk}$ are the partial correlation coefficients between variables and other variables. In this study, the KMO value is 0.82, which is greater than the critical value of 0.7, and the chi-square value of Bartlett's test of sphericity is 1256.32 ($p < 0.001$), indicating that there is a significant correlation between variables, and factor analysis is suitable. In addition, through exploratory factor analysis, the loadings of each item on the corresponding factor are all greater than 0.5, verifying that the questionnaire has good construct validity.

4.2 Descriptive Statistical Analysis

This study conducts descriptive statistics on each variable and calculates indicators such as the mean and standard deviation. The formula for calculating the mean is $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$, which is used to reflect the average level of the variable; the formula for calculating the standard deviation is

$$S = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2}, \text{ which measures the degree of data dispersion.}$$

After calculation, the mean of the frequency of using digital teaching resources is 3.65 (with a standard deviation of 0.82), indicating that the overall use of digital teaching resources by the sample is at a moderately above – average level, although there are certain differences among individuals. The mean of the engagement in Chinese learning is 3.58 (with a standard deviation of 0.79), indicating that the overall engagement of learners is fairly good. The remaining variables include the mean of the Chinese motivation self – system being 3.42 (with a standard deviation of 0.75), the mean of the perceived school style being 3.38 (with a standard deviation of 0.73), the mean of professional commitment being 3.35 (with a standard deviation of 0.70), the mean of the sense of efficacy in Chinese learning being 3.45 (with a standard deviation of 0.78), and the mean of Chinese learning burnout being 2.20 (with a standard deviation of 0.68), etc. The specific statistical results are shown in Table 1.

Table 1 Results of descriptive statistical analysis

Variables	Mean	Standard Deviation
Frequency of Digital Teaching Resources Use	3.65	0.82
Chinese Learning Engagement	3.58	0.79
Chinese Motivational Self - System	3.42	0.75
Perceived School Style	3.38	0.73
Professional Commitment	3.35	0.7
Chinese Learning Efficacy	3.45	0.78
Chinese Learning Burnout	2.2	0.68

4.3 Correlation Analysis

Correlation analysis was conducted on each variable, and the results are shown in Table 2. It can be seen from the table that the usage frequency of digital teaching resources is significantly positively correlated with the engagement degree in Chinese learning ($r=0.45$, $p<0.01$), verifying H1. In addition, the frequency of using digital teaching resources is significantly positively correlated with the self–system of Chinese motivation, perceived school style, professional commitment, and sense of efficacy in Chinese learning, and significantly negatively correlated with Chinese learning burnout. The correlations among various variables also support the research hypothesis to a certain extent. The specific correlation coefficients are shown in Table 2.

Table 2 Correlation Number Table of each variable

Variables	1	2	3	4	5	6	7
1. Frequency of Digital Teaching Resources Use	1						
2. Chinese Learning Engagement	0.45**	1					
3. Chinese Motivational Self-System	0.38**	0.42**	1				
4. Perceived School Style	0.35**	0.39**	0.40**	1			
5. Professional Commitment	0.33**	0.37**	0.36**	0.38**	1		
6. Chinese Learning Efficacy	0.36**	0.41**	0.39**	0.42**	0.38**	1	
7. Chinese Learning Burnout	-0.32**	-0.34**	-0.30**	-0.31**	-0.28**	-0.33**	1

Note: ** indicates $p < 0.01$

4.4 Structural Equation Modeling Analysis

The research hypotheses were applied to the structural equation model, and the operation results are shown in Figure 5. The model fits well, with $\chi^2/df=1.92$, RMSEA=0.06, CFI=0.93, and

TLI=0.91. It can be seen that the direct effect path coefficient of digital teaching resources on learners' engagement is 0.35($p<0.01$), supporting Hypothesis H1. Meanwhile, digital teaching resources have an indirect impact on learners' engagement through the self-system of Chinese motivation, perception of school style, professional commitment, and sense of efficacy in Chinese learning. The indirect effect path coefficients are 0.12($p<0.01$), 0.10($p<0.01$), 0.09($p<0.01$), and 0.11($p<0.01$), respectively. Support hypotheses H2–H5. Meanwhile, the moderating effect of Chinese learning burnout on digital teaching resources and learners' engagement is significant, with a moderating effect path coefficient of -0.15 ($p<0.01$), supporting Hypothesis H6.

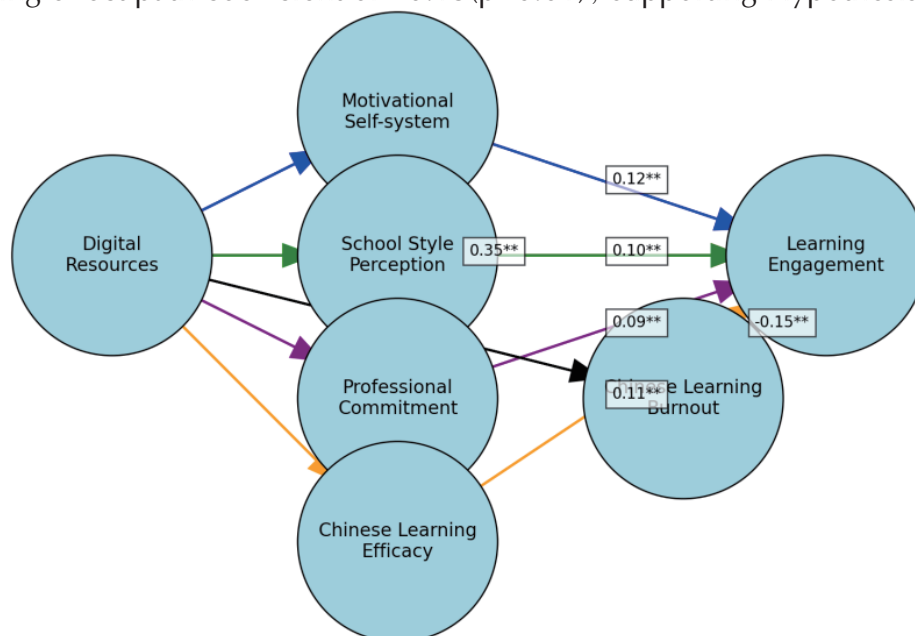


Figure 5 Structural equation model path diagram

Based on the analysis results of the structural equation, the total effect, direct effect and indirect effect among each variable were calculated. The results are shown in Table 3. It can be known from the table that the total effect of digital teaching resources on learners' engagement is 0.77, among which the direct effect is 0.35 and the indirect effect is 0.42. Each mediating variable and moderating variable plays an important role here.

Table 3 Analysis Results of the Effects of each variable

Variable Path	Total Effect	Direct Effect	Indirect Effect
Digital Teaching Resources → Learner Engagement	0.77**	0.35**	0.42**

Note: ** indicates $p < 0.01$

Table 4 Effects of Digital Teaching Resources on Learner Engagement through Positive Mediating Variables

Variable Path	Total Effect
Digital Teaching Resources → Chinese Motivational Self-System → Learner Engagement	0.12**
Digital Teaching Resources → Perceived School Climate → Learner Engagement	0.10**
Digital Teaching Resources → Professional Commitment → Learner Engagement	0.09**

Note: ** indicates $p < 0.01$

Table 5 Effects of Digital Teaching Resources on Learner Engagement through Learning Psychology Mediating Variables

Variable Path	Total Effect
Digital Teaching Resources → Chinese Learning Efficacy → Learner Engagement	0.11**
Digital Teaching Resources → Chinese Learning Burnout → Learner Engagement	-0.15**

Note: ** indicates $p < 0.01$

5. Pathways to Promote the Learner Engagement of Teaching Chinese as a Foreign Language through Digital Teaching Resources

5.1 Optimizing the Design of Digital Teaching Resources to Enhance Resource Attractiveness and Adaptability

The form and usability of multimedia teaching materials will directly affect students' interest in learning. The application of multimedia and the processing of resources should fully reflect the characteristics of multimedia in the content. Its forms should include various forms such as video, audio and animation. VR(Virtual Reality) and AR(Augmented Reality) can be applied to create a real Chinese learning environment. For example, VR technology can be used to restore the scenes of ancient Chinese markets and Chinese festivals. Enable learners to engage in interactive Chinese dialogues and study traditional Chinese culture as if they were on the spot. Use AR technology to scan text cards to display the evolution of the development forms of Chinese characters, enhancing their interest in learning and memory strength. Moreover, a series of micro-lessons can be designed based on various learning themes. The content can be selected in the form of business Chinese negotiations or Chinese tourism dialogues. It can also be presented in the form of short videos to meet the needs of fragmented learning.

In terms of functional design, the interactivity and personalization of resources should be enhanced. Develop an intelligent learning platform, utilize artificial intelligence algorithms to analyze students' learning behaviors, mastery levels and learning interests, and provide students with personalized learning resources and learning navigation. For example, if it is found that the student's Chinese listening ability is weak, the system will automatically provide the student with listening training resources, and at the same time automatically adjust the learning pace and learning difficulty. Enrich the online practice and real-time online feedback functions, set up various interactive question types, such as voice repetition scoring, situational dialogues, etc., and provide students with detailed practice feedback and suggestions in a timely manner; Enhance the activity level of the learning community, enabling communication and interaction among students and between students and teachers through instant messaging and other means. Let students freely share their learning experiences and discuss questions, creating a good learning atmosphere and encouraging students to study and participate actively.

5.2 Stimulating the Chinese Motivational Self-System to Clarify Learning Goals and Motivation

Activating the self-system of Chinese motivation plays a fundamental role in the motivation system. Teachers should do a good job in guiding learning planning and provide learners with a goal framework. At the early stage of enrollment, learners should be allowed to formulate short-term, medium-term and long-term goals based on their personal learning objectives, career development and interests. For example, for learners with business purposes, their long-term goal can be set as being able to conduct international business negotiations fluently. The medium-term goal is to develop detailed professional learning abilities such as writing business contracts and presiding over business meetings; The short-term goal can be detailed as how many business-related phrases and sentences can be mastered in one week of study. This kind of detailed and clear learning goal can enable people to know what they are going to do during the learning process and make learning highly motivated.

In the teaching process, teachers should pay attention to giving students timely and effective feedback and encouragement. Establish a multiple evaluation mechanism, attaching importance not only to the results of learning but also to the efforts and progress in the learning process; For every progress made during the learning process, such as boldly completing more challenging oral expressions or participating in in-class communication, give clear praise and affirmation to enhance students' experience of active learning. In addition, help students objectively view the completion degree of their learning goals, sort out the strengths and weaknesses in the learning process, urge them to constantly adjust their learning methods, and gradually eliminate the gap

between the real self, the ideal self and the self they should be. It is also possible to invite Chinese language learners with excellent academic performance or learning ability to share their stories of how they learned Chinese and their growth experiences, so as to achieve the effect of role model motivation, further awaken students' internal drive to learn Chinese, and encourage students to participate in Chinese language learning more actively and proactively.

5.3 Alleviating Chinese Learning Burnout and Focusing on Learners' Mental Health and Learning Experience

Fatigue in learning Chinese is a serious dynamic negative psychological factor that affects learners' engagement in learning Chinese and needs to be effectively eliminated from multiple perspectives. Teachers should pay attention to grasping the Chinese learning emotions and psychological conditions of learners and establish a regular communication mechanism. Regular one-on-one communication with learners is conducted to promptly address the problems, pressures and confusions they encounter during the process of learning Chinese, and targeted psychological counseling and learning guidance can be provided. For instance, when learners feel anxious due to the complexity and difficulty of Chinese grammar, teachers can patiently explain the internal logic of Chinese grammar, introduce effective and scientific learning methods and memory techniques, and encourage learners to start with the language usage of simple Chinese sentences to cultivate their confidence in learning Chinese.

It is necessary to reasonably formulate learning tasks and schedules. Avoid causing excessive, overly difficult or monotonous learning tasks, and rationally carry out a progressive and well-balanced learning arrangement. Divide the complex learning project into several learning units, set learning goals and reasonable learning time limits for each learning unit, so that learners can gain a sense of pleasure while completing one small goal after another. Set up diverse learning activities such as group competitions, cultural experience activities, role-playing games, etc., to eliminate the dullness and boredom of learning, and enhance the interest and novelty of learning. Meanwhile, school authorities and educational institutions attach great importance to students' mental health education. They organize mental health education lectures, offer mental health counseling courses, and teach students methods for emotional guidance and stress regulation, such as meditation relaxation and time planning skills. This helps students establish a healthy learning attitude, effectively reduces the level of learning burnout, and enhances their learning engagement.

6. Research Conclusions and Prospects

In this study, with the participation of learners of Chinese as a foreign language (500 empirical samples), the influence mechanism of digital teaching resources on the engagement of learners of Chinese as a foreign language was investigated to test and confirm the research hypotheses, and to clarify the path and mechanism by which digital teaching resources affect the engagement of learners of Chinese as a foreign language.

Research shows that digital teaching resources have a significant positive impact on the engagement of learners of Chinese as a foreign language. They play a role as mediating variables, such as the self-system of Chinese motivation, perception of school style, professional commitment, and sense of efficacy in Chinese learning, while Chinese learning burnout plays a moderating role. Based on the research conclusions, specific improvement paths such as optimizing the design of digital teaching resources, enhancing the self-system of Chinese language motivation, creating a good perceived school style, strengthening professional commitment and the sense of efficacy in Chinese language learning, and reducing the sense of burnout in Chinese language learning are proposed.

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