

Research on the Current Status and Enhancement Strategies of Information Technology Teaching Competence Cultivation for Targeted Teacher Education Students

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Abstract: This paper investigates the issue of cultivating information technology teaching competence among targeted teacher education students in the context of Education Informatization 2.0 in the northwestern Guangdong region. A self-designed survey questionnaire was used to gather data from targeted teacher education students, analyzing the current status of their information technology teaching competence. The study explores the impact of different grades, teaching subjects, and computer proficiency levels on their information technology teaching competence. The research reveals that targeted teacher education students generally have a lower overall level of information technology teaching competence, with variations among different grades and influences from teaching subjects and computer proficiency levels. The paper emphasizes the significance of enhancing the information technology teaching competence of targeted teacher education students for the improvement of rural education quality and proposes relevant training strategies.

Keywords: targeted teacher education students, information technology teaching competence, northwestern Guangdong, Education Informatization 2.0

1. Introduction

Currently, as China undergoes profound changes through reform and the gradual integration of the third technological revolution, it finds itself in an era of rapid development in information technology. Education has entered the era of Informatization 2.0, presenting unprecedented opportunities and challenges. In February 2018, the Ministry of Education, in collaboration with the Ministry of Finance and three other departments, issued the “Teacher Education Revitalization Action Plan (2018-2022)” (hereinafter referred to as the “Revitalization Plan”). In this plan, the Ministry of Education and the other four departments emphasized the importance of giving sufficient attention to improving the information technology application capabilities of teacher education students. Simultaneously, they conducted investigations, specified standards for the information technology application capabilities of teacher education students, and aimed to enhance their information literacy and informatized teaching abilities through these measures [1].

In this era, cultivating the informatized teaching capabilities of teacher education students, especially targeted teacher education students, is particularly crucial. Targeted teacher education students, as the reserve force of rural teaching staff, directly impact the improvement of educational

quality and teaching effectiveness in rural areas of China. Enhancing the teaching skills and employability of targeted teacher education students not only makes them more competitive in their careers but also, through their influence, contributes to the improvement of informatized teaching capabilities among primary and secondary school teachers in northwestern Guangdong [2].

Upon reviewing existing research, it is evident that current studies primarily focus on exploring the informatized teaching capabilities of in-service teacher groups, with relatively lower attention to teacher education students. Particularly scarce are research articles specifically targeting targeted teacher education students. Additionally, despite considerable attention to training strategies for teacher education students, there is a lack of discussion regarding their current performance in informatized teaching. Furthermore, the research on teacher informatized capabilities has yet to distinguish between targeted and non-targeted teacher education students, necessitating further exploration. Targeted teacher education students, in contrast, exhibit distinct characteristics, such as being required to serve in impoverished mountain villages, lacking sufficient support for informatized teaching environments, and needing to fulfill six years of service in their designated areas. These traits determine that targeted teacher education students may exhibit a certain level of deficiency in information technology application and professional competence, a situation that will gradually become apparent over time. Therefore, conducting targeted investigations into the informatized teaching capabilities of targeted teacher education students is essential for regulating and guiding the improvement of their informatized teaching levels.

Addressing these issues, this study, from the perspective of informatized teaching capabilities, conducted a survey on targeted teacher education students in northwestern Guangdong through a self-designed questionnaire. The survey aimed to understand the current status of informatized teaching design in this group from four dimensions, identify differences between various demographic variables, reveal existing problems, and provide theoretical and practical references for enhancing the informatized teaching capabilities of targeted teacher education students in universities in Guangdong province.

2. Survey Design and Implementation

2.1. Questionnaire Compilation and Reliability Test

The questionnaire for investigating the informatized teaching capabilities of targeted teacher education students was compiled with reference to Ren Youqun's "Standards for Informatized Teaching Abilities of Teacher Education Students" and Zhang Ni's "Design and Test of Teacher Informatized Teaching Ability Scale" [3]. The questionnaire covered four dimensions: basic skill levels, informatized teaching design abilities, informatized teaching application abilities, and informatized teaching evaluation abilities, comprising a total of 22 questions. The demographic information of targeted teacher education students included gender, graduating institution, grade, and other details, with a total of 5 questions. The informatized teaching capabilities of targeted teacher education students comprised 22 questions, and except for questions 14 and 20, all other questions used the Likert scale scoring method, with 1 indicating complete non-compliance. After the Cronbach's alpha reliability test, the overall questionnaire had a coefficient of 0.903, indicating high reliability.

2.2. Implementation of the Questionnaire

This study selected targeted teacher education students from the 18th to the 22nd cohorts in five teacher training institutions in Guangdong province, directed to northwestern Guangdong. The participating students primarily belonged to the 18th and 19th cohorts. These institutions included one affiliated and four provincial universities. The questionnaire was distributed through an online

platform, and a total of 535 questionnaires were collected, of which 520 were deemed valid, resulting in an effective rate of 97.2%. Based on this data, an analysis was conducted on the factors influencing the employment intentions of students majoring in teacher education and their operating mechanisms. Following the classification method of Zhou Dongdai and Cui Yuping, the demographic variables of the participants, including gender, grade, and teaching subject, were categorized, and their composition is presented in Table 1 below:

Table 1: Basic Information of Survey Participants

	Variable Characteristics	Number	Effective Percentage
Gender	Male	113	21.73%
	Female	407	78.27%
Grade	18th Cohort	268	51.54%
	19th Cohort	252	48.46%
Teaching Subject	Humanities	260	50%
	Sciences	191	36.73%
	Arts and Physical Education	69	13.27%
Formally On Duty as a Teacher:	Yes	246	47.31%
	No	274	52.69%

3. Current Situation Study

3.1. Overall Analysis

On this basis, an analysis of the factors influencing the employment intentions of teacher education majors and their mechanisms was conducted. According to the classification method of Zhou Dongdai and Cui Yuping, the demographic variables of the subjects, such as gender, grade, and teaching subjects, were classified, and they are presented in the table below: The overall score of directed teacher education students in the northwestern part of Guangdong is $M=3.183$, $SD=1.102$, approximately equal to the average score of 3, indicating an overall “meeting” level [4]. This indicates that the information technology teaching ability of the subjects is generally not ideal and has a certain gap with practical requirements.

From five perspectives, the efficacy of information technology teaching ($M=3.246$, $SD=1.098$), application ability ($M=3.232$, $SD=1.092$), evaluation ability ($M=3.221$, $SD=1.167$), basic skill level ($M=3.022$, $SD=1.167$), and design ability ($M=3.004$, $SD=1.154$) are ranked in sequence. The study shows that the average values of the subjects in the efficacy of information technology teaching, application ability, and evaluation ability are higher than the overall average, indicating that they have the ability to apply and evaluate teaching informationization using the knowledge they have mastered, and they have obtained a good sense of teaching efficacy. In addition, there is a certain degree of difference between the five dimensions, indicating that different genders have an impact on the development of information literacy in students majoring in information technology education. Moreover, due to the relatively large standard deviations of the five dimensions, the level of information technology teaching ability of the subjects in the study shows a trend of dispersion and difficulty in cultivation, especially in the aspect of basic skill level, where the difficulty in cultivation is more significant.

3.2. Group Difference Analysis

3.2.1. Analysis of Information Technology Teaching Ability in Different Grades

Table 2: Comparison of Information Technology Teaching Ability of Students in Different Grades

Dimension	Grade	N	Average	Standard Deviation	F	P
Basic Skill Level	18th	268	2.999	1.163	0.216	0.643
	19th	252	3.047	1.172		
Information Technology Teaching Design Ability	18th	268	2.957	1.157	0.927	0.336
	19th	252	3.055	1.15		
Information Technology Teaching Application Ability	18th	268	3.274	1.167	0.831	0.362
	19th	252	3.187	1.008		
Information Technology Teaching Evaluation Ability	18th	268	3.193	1.169	0.312	0.577
	19th	252	3.25	1.167		
Information Technology Teaching Efficacy	18th	268	3.325	1.096	2.833	0.093*
	19th	252	3.163	1.097		

Note:***, **, * represent the significance levels of 1%, 5%, and 10%, respectively.

The results of one-way analysis of variance are shown in Table 2. The results indicate that there is no significant difference ($P < 0.05$) in the basic skill level, information technology teaching design ability, information technology teaching application ability, information technology teaching evaluation ability, and information technology teaching efficacy among different grades. By comparing the mean values, it is found that there is no significant difference between the 18th and 19th grades in terms of basic skill level, information technology teaching design ability, information technology teaching application ability, information technology teaching evaluation ability, and information technology teaching efficacy. However, for information technology teaching application ability and information technology teaching efficacy, the mean values of the 18th grade are higher than those of the 19th grade, while for other dimensions, the mean values of the 19th grade are higher than those of the 18th grade. Therefore, there is not a significant relationship between information technology teaching ability and grade.

3.2.2. Analysis of Information Technology Teaching Ability in Different Teaching Subjects

Table 3: Comparison of Information Technology Teaching Ability of Normal Students in Different Teaching Subjects

Dimension	Teaching Subject	N	Average	Standard Deviation	F	P
Basic Skill Level	Science Stream	191	3.105	1.184	0.837	0.433
	Arts and Physical Education Stream	69	2.294	1.16		
	Humanities Stream	260	2.987	1.156		
Information Technology Teaching Design Ability	Science Stream	191	3.157	1.139	4.03	0.0018**
	Arts and Physical Education Stream	69	2.714	1.168		
	Humanities Stream	260	2.969	1.147		
Information Technology Teaching Application Ability	Science Stream	191	3.396	1.092	8.954	0.000***
	Arts and Physical Education Stream	69	2.757	1.052		
	Humanities Stream	260	3.237	1.07		
Information Technology Teaching Evaluation Ability	Science Stream	191	3.288	1.177	1.506	0.223
	Arts and Physical Education Stream	69	3.005	1.187		
	Humanities Stream	260	3.228	1.152		
Information Technology Teaching Efficacy	Science Stream	191	3.409	1.11	8.253	0.000***
	Arts and Physical Education Stream	69	2.791	1.205		
	Humanities Stream	260	3.247	1.028		

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

The results of one-way analysis of variance are shown in the table. It indicates that there are significant differences in informatized teaching design ability, informatized teaching application

ability, and the sense of informatized teaching efficacy among different teaching subjects, while there are no significant differences in other dimensions. According to the LSD test, students in the science stream scored significantly higher in informatized teaching design ability and informatized teaching application ability compared to students in the humanities and arts and physical education streams. Arts and physical education stream students scored the lowest, and the difference with the other two subject groups is significant.

4. Discussion on Informatized Teaching Competence of Teacher Education Students

4.1. Research Conclusions

Firstly, the overall level of informatized teaching competence among targeted teacher education students in Northwest Guangdong is relatively low. The data above indicates that the average level of informatized teaching competence among targeted teacher education students barely reaches 3 points, with significant individual differences and an overall level that is not ideal. Secondly, there is no significant difference in the level of informatized teaching competence between different grades. Employed 18th-grade students performed better in informatized teaching application ability and the sense of informatized teaching efficacy than 19th-grade students. However, in other dimensions, 18th-grade students' informatized teaching competence is overall weaker than that of 19th-grade students. Furthermore, there are significant differences in informatized teaching design and application abilities among different teaching subjects. Students in science and engineering performed better, while students in arts and physical education demonstrated weaker informatized teaching competence.

4.2. Discussion of Reasons

Through interviews with some participants still in school, the author found that the reasons for the above phenomena are mainly:

1. The overall low level of informatized teaching competence among targeted teacher education students is related to the school's curriculum design, learning environment, and the level of teachers' informatized teaching competence.

The school's information technology curriculum is not well-planned, heavily relying on two courses: educational technology application and basic computer application. The courses are more general and lack targeted teaching for targeted teacher education students, with insufficient class hours to provide systematic knowledge. The school's information technology environment is poor, with outdated equipment in classrooms, slow computers, and insufficient quantity, unable to meet the daily training needs of students. The interviewed employed participants also mentioned the importance of informatized education received at school, which largely determines their post-employment level of informatized teaching. Additionally, the informatized teaching competence of university teachers also influences students. Teachers proficient in using information technology devices can set an example for students and promote their awareness of enhancing informatized teaching competence.

2. The significant difference in informatized teaching competence among targeted teacher education students is related to their educational practice experiences.

As the country increasingly emphasizes informatized education, the information technology equipment in primary and secondary schools is continuously updated and improved. Conducting informatized teaching has become an essential skill for frontline teachers. However, the equipment and technological concepts encountered in school are relatively outdated, even more backward than the current equipment in primary and secondary schools. For 18th and 19th-grade teacher education students, work and internship experiences provide them with opportunities to go beyond the school

environment, further deepening their understanding and recognition of informatized teaching competence. It can also provide them with a better judgment of their abilities [5]. However, 18th-grade teacher education students have already started working in rural areas, officially conducting teaching work. The 19th-grade students have only interned in urban schools near their university, leading to differences in how the two groups judge their own levels of informatized teaching competence.

During their internship, the 19th-grade teacher education students had exposure to better equipment and environments, which contributed to enhancing their teaching self-confidence. This, in turn, reflected in more positive self-evaluations. On the other hand, the working environment in the region where the 18th-grade students were placed was constrained, with equipment conditions not comparable to urban schools. This limitation led to psychological disparities upon employment, creating a sense of inadequacy in teaching efficacy and fostering doubts about their own informatized teaching capabilities.

3. The significant difference in informatized teaching design and application abilities among teacher education students from different teaching subjects is related to their basic abilities and interests in use.

Science and engineering education students are more willing to explore new technologies and information technology devices, while students in arts and humanities lack interest in information technology. Besides completing operations during educational technology practice courses and homework assignments, they rarely come into contact with information technology and are not willing to invest energy in exploring how to design and apply information technology in teaching. Interviewed students in humanities indicated that they often feel overwhelmed when learning information technology. Therefore, they tend to avoid using information technology in teaching design and application. Students in arts and humanities candidly stated that they rarely encountered information technology in university, and they barely use computers in daily life. Some of their classmates do not even have computers, and they have not used commonly used courseware production software. They feel confused about how to use information technology in teaching and believe that information technology is not necessary for teaching in arts and humanities.

5. Strategies for Enhancing Informatized Teaching Competence of Targeted Teacher Education Students

1. In order to meet the needs of targeted teacher education students in Northwest Guangdong, each cultivating institution should further improve the curriculum system based on students' characteristics and requirements. Additionally, upgrading both hardware and software facilities is essential to enhance the overall educational quality.

The quality of a school's infrastructure determines whether targeted teacher education students can achieve better development in informatized teaching competence and lays a solid foundation for promoting their competence to a higher level. Since students rarely have the opportunity to use information technology devices for teaching in campus life, the utilization of microgrid classrooms provided by the school for simulated teaching is crucial for informatized teaching practical activities [6]. Therefore, schools must focus on improving infrastructure construction, enhancing the teaching environment, and providing robust spatial support for the informatized teaching competence of targeted teacher education students [7].

2. Higher education institutions cultivating targeted teacher education students in Northwest Guangdong should provide students with graded and staged training goals, along with more internship and practical opportunities during their school years.

During the junior year, actively conducting internship activities, inviting targeted teacher education students to urban and rural primary and secondary schools for internships, experiencing

differences in different environments, learning practical experience from frontline teachers, and discussing how to deal with the sense of disparity, adapting work to local conditions. During the senior year internship, based on educational technology-related issues encountered during the internship, discussions should focus on how to enhance informatized teaching competence, such as optimizing teaching design using multimedia technology [8].

3. Higher education institutions cultivating targeted teacher education students in Northwest Guangdong should provide targeted guidance on how to use informatized teaching tools to assist teaching based on students' interests and majors.

Offering relevant elective courses based on students' major teaching and practice, and conducting direct assessments of learning success during the teaching process, aims to cultivate the informatized teaching skills that students need in subject teaching. Simultaneously, by offering practical courses in information technology capabilities, the deficiency in the application of information technology in subject teaching environments for teacher education students can be compensated, optimizing their ability to integrate information technology with subject courses [9].

4. Higher education institutions cultivating targeted teacher education students in Northwest Guangdong should encourage students to enhance their computer proficiency and improve informatized teaching competence. At the same time, targeted teacher education students should update their concepts and improve their understanding of information technology to adapt to the rapidly developing era.

5. Targeted teacher education students bear the noble mission of nurturing rural youth. Therefore, in addition to the continuous efforts of schools to enhance the informatized teaching competence of targeted teacher education students, they should also establish awareness of fully utilizing information technology to drive educational reforms. This is essential for adapting to future teaching activities. Currently, in some rural areas of China, due to the lack of emphasis on teacher information literacy and skills training, they cannot meet the requirements of new era educational development. Therefore, teacher education students must deeply recognize the crucial importance of information technology in education, establish teaching concepts that adapt to the informatized situation, actively learn and autonomously apply information technology to promote educational and teaching reforms [10].

6. Conclusion

In the era of Education Informatization 2.0, the trend of deep integration of information technology and education is increasingly evident. Accelerating the advancement of informatized teaching reform in basic education is an important means of deepening comprehensive educational reform and improving the quality of basic education. Targeted teacher education students are an important part of the basic education teacher team. Enhancing their informatized teaching competence is of great significance for the smooth implementation of the new curriculum reform in basic education. In the era of Education Informatization 2.0, to meet the development needs of informatized teaching in basic education in the new period, the cultivation of informatized teaching competence for targeted teacher education students should focus on enhancing their awareness of information technology application, improving their ability to acquire and integrate information resources, and strengthening their ability to integrate information technology with subjects. It is necessary to continuously improve the teacher informatized teaching competence training system, providing better talent support for promoting the reform of basic education curriculum.

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Yang Zhiyue, Jiao Zhijian, and Wu Zeying are the co-first authors of this article, Luo Bingrong is the fourth author, and Zhou Shuwen is the fifth author.

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