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Factors Affecting the Use of ICT by Teachers at Nan Yang Technician College, China

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Abstract

Background and Aims: Nowadays, the application of information and communication technology in education is becoming increasingly widespread, which poses new requirements for the ICT application ability of teachers. The aim of this study is to explore: (1) The ICT ability level of teachers at Nan Yang Technician College; and (2) Factors affecting the ICT ability of teachers at Nan Yang Technician College.

Methodology: The data was collected from 185 Chinese teachers from a technician school engaged by using the questionnaires and analyzed by Mean, standard deviation, and one-way ANOVA.

Results: Research has found that: (1) The overall ICT application ability of teachers at Nan Yang Technician College is at a good level (M=3.56). From the five dimensions, only the evaluation and diagnosis dimensions are at a poor level (M=2.68; SD=0.92). The Technician literacy dimension (M=3.86; SD=0.65) and the learning and development dimension scored the highest (M=3.87; SD=0.62), both reaching a good level. The dimensions of planning and preparation (M=3.19; SD=0.64) and organization and management (M=3.35; SD=0.98) are at a moderate level. (2) There are significant differences in ICT application abilities among teachers of different age groups. The overall level of young vocational school teachers is higher than that of older teachers, especially in terms of planning and preparation, as well as organization and management. There is no significant difference in ICT application ability among teachers of different genders, educational levels, and teaching majors.

Conclusion: The overall score of ICT application ability of teachers at Nanyang Technician College is at a good level, but it is relatively low compared to teachers from similar schools. The evaluation and diagnosis dimensions are at a poor level. In terms of influencing factors, age has a significant impact on the teachers of Nanyang Technician College. The ICT application ability score of older teachers is significantly lower than that of younger teachers. The ICT application ability of older teachers needs to be paid attention to. Other factors such as gender, education level, and the courses taught have no significant impact on the ICT application ability of teachers. Based on the analysis of research results, this study suggests that unique ICT enhancement strategies should be developed for different age groups of teachers. The development of learning activities should be based on the analysis of the teacher's situation, such as strengthening the evaluation and diagnostic abilities of teachers.

Keywords: Current Situation Evaluation; ICT application ability; Influence Factor

Introduction

The rapid development of information and communication technology today has promoted the development of school education and teaching, resulting in profound changes in teaching modes. The application of ICT plays an important role in the field of secondary vocational education. It can change the educational concept of secondary vocational schools, make teachers pay more attention to improving their abilities, and establish a student-centered educational concept. Enrich the educational and teaching resources of vocational schools, attract students' interest in learning, and improve the quality of teaching (Hew & Brush, 2007).

With the deepening of the concept of "educational informatization", the Chinese government and education departments at all levels attach greater importance to the informatization process of primary, secondary, and tertiary education, as well as the cultivation of teachers' information technology application abilities. With the increase in financial investment, the software and hardware environment has been greatly improved, and the information technology training for teachers has also been done well. However, secondary vocational schools, due to the severe shortage of student resources in the past, prioritize enrollment and employment-related work. The school does not attach enough importance to educational information technology, and the cultivation of information technology application ability for secondary vocational teachers has not been given enough attention by the government and schools. As an important

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component of the national education system, secondary vocational education still has a long way to go in terms of informatization. Since 2010, with China's increasing emphasis on the informatization of vocational education, various levels of departments have successively introduced policies and plans to support the development of vocational education, providing guidance and support for the informatization of vocational education (Gu, 2018).

How is the ICT application of college teachers after years of development? What are the factors that affect the application of ICT by teachers? To explore these issues, the research aims to set the following:

1. To study the ICT ability level of teachers at Nan Yang Technician College.
2. To explore the factors affecting the ICT abilities of teachers at Nan Yang Technician College in China.

Literature Review

The study analyzed the evaluation criteria for teachers' information and communication technology capabilities at home and abroad through literature analysis, as well as the factors that affect teachers' information and communication capabilities. Taking Nanyang Technician College as a case study object, this paper conducts an in-depth study on the current situation of information capability construction for teachers in Nanyang Technical College and analyzes the factors that affect the information ability of teachers at Nanyang Technician College. A template has been proposed for the evaluation of information and communication technology capabilities of secondary vocational and technical teachers, providing a reference for the evaluation, and influencing factor research of ICT capabilities of teachers in local education management departments and similar schools.

In terms of the evaluation criteria for teacher ICT capabilities, countries also attach great importance to the research on the standards for teacher information and communication technology application capabilities and use them as the basis for evaluating teacher information and communication technology application capabilities. The UK Education Technology and Communications Agency released the 21st Century Teacher Handbook, which elaborates on the requirements for the development of information and communication technology capabilities of 21st-century teachers from three aspects: learning and teaching, planning and management, and evaluation and reporting (Jiang, 2011).

ISTE revised the 2000 version of the NETS-T standard, which included five competency dimensions and twenty competency indicators. Ability includes promoting and stimulating students' learning and creativity; Design and developing learning experiences and assessment tools for the digital age; Showcasing work and learning in the digital age; Promoting and showcasing civic literacy and a sense of responsibility in the digital age; Participating in professional growth and leadership development. It has shifted from focusing on teachers' mastery of technology-related knowledge and skills to how teachers can improve students' effective learning abilities in the digital age (ISTE, 2008).

UNESCO launched the second version of the Teacher Information and Communication Technology Competency Framework, which consists of three primary teaching methods: technical literacy, knowledge deepening, and knowledge creation. A teacher competency system consisting of 18 modules was constructed based on the secondary framework of understanding six key areas of education, including ICT, curriculum and evaluation, teaching methods, and information and communication technology organization and management of teacher professional learning (UNESCO, 2011).

China drew on the experiences of other countries and its reality and issued the "Information Technology Application Ability Standards for Primary and Secondary School Teachers (Trial)" in 2014, dividing information technology application ability into five dimensions: technical personnel literacy, planning and preparation, organization and management, evaluation and diagnosis, and learning and development; And evaluate it from two aspects: optimizing the classroom through the use of ICT by teachers and helping students change their learning methods through the use of ICT. The basic requirement is the ability to apply information technology to optimize classroom teaching, which mainly includes the abilities that teachers should possess in using information technology to explain, inspire, demonstrate,

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guide, evaluate, and other teaching activities; The ability to apply information technology to transform learning methods is a developmental requirement, mainly aimed at the ability of teachers to use information technology to support students in independent, cooperative, and exploratory learning activities, provided that students have a network learning environment or corresponding equipment (Ministry of Education, 2014).

Many scholars have researched the influencing factors of teachers' ability to apply information and communication technology. For example, Afshari et al (2009) believe that age, teaching age, gender, and educational experience are the main key factors affecting teachers' information and communication technology capabilities. Blankenship believes that the age, gender, grade, and curriculum taught by teachers, attitudes towards the use of information technology, access to computers, relevant support, and training are factors that affect the use of technology by teachers (Blankenship et al, 1998).

In general, scholars often classify the influencing factors of teacher information technology literacy into manipulative factors and non-manipulative factors. Manipulative factors refer to factors that are influenced by the external environment, such as information technology resources, location, and school size at the school level; The teacher level includes cognitive level, self-efficacy, teacher attitude, etc.; Other aspects include the education system, relevant policies at all levels, and information technology training at all levels (Drent & Meelissen, 2008). Nonmanipulative factors refer to factors that are not affected by external environments, such as the age, gender, educational background, work experience, etc. of teachers (Afshari et al (2009)

Conceptual Framework

This study focuses on the impact of non-manipulative factors on teachers' ICT application ability. Set the gender, age, education level, and courses taught by the teacher as independent variables and the teacher's ICT application ability as the dependent variable for the study. The specific content is shown in the following figure:

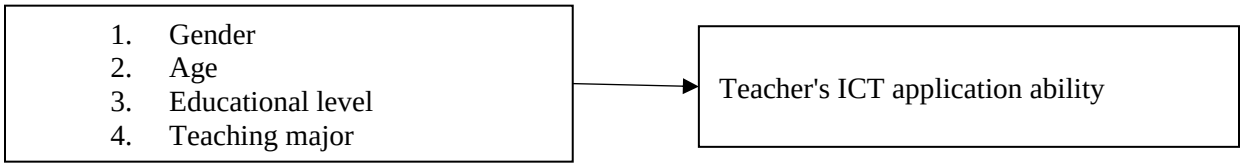

Figure1: Research framework diagram

Methodology

This study adopts the research method of questionnaire survey. The convenience sampling method was used to select all teachers from Nanyang Technician College as the research subjects, with a total of 185 teachers. A survey questionnaire on the application ability of information and communication technology for teachers was developed, which includes two parts: basic information of teachers and testing of the level of information and communication technology application ability.

The ICT application ability level test for teachers is based on the specific requirements of The Standard of Teacher's Ability to Applying Information Technology in Primary and Secondary Schools (Trial) regarding the five dimensions of teacher ICT (Ministry of Education, 2014). Corresponding questions have been formulated, with 5 questions for each dimension, totaling 25 questions. The rating of the question was designed using the Likert five-component scale method. Teachers rate themselves based on the questions, with scores ranging from 5 to 1, representing scores from high to low.

The validity of the questionnaire was tested using the IOC method, and 5 relevant Chinese experts were invited to rate the relevance of the questions. The results showed that the IOC values of all 25 questions were greater than 0.6, indicating good validity of the questions. Then, 30 teachers from other

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colleges and universities were randomly invited to conduct a pre-test on the questions. The results show that the reliability coefficient of the questionnaire is Alpha=0.81>0.7, so the reliability coefficient of the questionnaire meets the standard (Johnson, R. B.,2016).

Reference data types, descriptive statistics, t-tests, and one-way ANOVA are utilized. Research using SPSS for data analysis. Use the mean and standard deviation to represent the ICT application capability level of teachers and divide the proficiency level into very good (4.21-5.00), good (3.41-4.20), moderate (2.61-3.40), poor (1.81-2.60), and very poor (1.00-1.80) (Srisa-ard, B., 1996). Use t-tests to analyze the differences in ICT application ability levels among teachers based on gender and Teaching Major. Use one-way ANOVA to analyze the differences in ICT application levels among teachers based on age and educational level.

A total of 185 questionnaires were distributed to all teachers at Nanyang Technician College. A total of 172 valid questionnaires were collected, with a questionnaire response rate of 92.97%. Descriptive analysis will be conducted on the basic personal information of teachers. The results are shown in the table below:

Table 1 Basic information of teachers

tems	ı	ercentage (%)
ender:		
lale	3	2.44
emale	9	7.56
ge:		
0-30 years old	3	5.00
1-40 years old	3	0.81
1-50 years old	4	1.40
1 years old and above	2	2.79
ducational level:		
ssociate degree	2	.98
achelor's degree	46	4.88
laster's degree and above	4	.14
eaching major:		
ultural majors	2	6.05
echnician majors	10	3.95
otal	72	00

As shown in the table, a total of 172 people were collected, of which female teachers accounted for 57.56% and male teachers accounted for 42.44%. From the perspective of teacher age, 25% of teachers are between the ages of 20 and 30; Teachers aged 31 to 40 account for 30.81%; 31.40% of teachers are aged between 41 and 50 years old; Teachers aged 51 and above account for 12.79%.

From the perspective of the education level of teachers, most of them hold a bachelor's degree, accounting for 84.88%. 6.98% of teachers have an associate degree; Teachers with a master's degree or above account for 8.14%. Of the courses taught by teachers, cultural teachers account for 36.05%; Technical teachers account for 63.95%.

Results

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Use descriptive statistical analysis methods to analyze the questionnaire. Using mean (M) and standard deviation (SD) to analyze and calculate the ICT proficiency level of teachers, the analysis results are shown in the table below:

Table 2 Description of the overall level and dimensions of ICT application ability of teachers

Items	M	SD	Level
'echnology Literacy	3.86	0.65	Good
'lanning and Preparation	3.19	0.64	Moderate
)rganization and Management	3.35	0.98	Moderate
ıssessment and Diagnosis	2.68	0.92	Poor
,earning and Development	3.87	0.62	Good
CT application capability	3.56	0.61	Good

As shown in the table, overall, the ICT application ability of teachers at Nan Yang Vocational and Technician College is at a good level (M=3.56; SD=0.61). From the five dimensions, only the assessment and diagnosis dimensions are at a poor level (M=2.68; SD=0.92), indicating that the teacher level in this dimension is relatively low. The Technician literacy dimension (M=3.86; SD=0.65) and the learning and development dimension scored the highest (M=3.87; SD=0.62), both reaching a good level. The dimensions of planning and preparation (M=3.19; SD=0.64) and organization and management (M=3.35; SD=0.98) are at a moderate level.

Use the independent sample t-test method to analyze the differences in ICT application ability among teachers of different genders. The analysis results are shown in the table below:

Table 3 Differential Analysis of Teacher Gender and Its ICT Application Ability

Items	Gender	TP	
'echnology Literacy	Male Female	0.46	0.32
'lanning and Preparation	Male Female	0.97	0.16
)rganization and Management	Male Female	0.73	0.23
ıssessment and Diagnosis	Male Female	1.23	0.11
,earning and Development	Male Female	0.98	0.16
CT application capability	Male Female	0.89	0.18

From the table, the $p>0.05$ of different genders in various dimensions and overall, so there was no significant difference in the overall ability of teachers to apply information technology and various dimensions in different gender variables.

Use one-way ANOVA to analyze the differences in ICT application abilities among teachers of different ages. The analysis results are shown in the table below:

Table 4 Differential Analysis of Teacher Age and ICT Application Ability

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Items	Age	F	P
'echnology Literacy	20-30 years old 31-40 years old 41-50 years old 51 years old and above	3.17	0.02
lanning and Preparation	20-30 years old 31-40 years old 41-50 years old 51 years old and above	4.37	0.005
)rganization and Management	20-30 years old 31-40 years old 41-50 years old 51 years old and above	4.70	0.003
ıssessment and Diagnosis	20-30 years old 31-40 years old 41-50 years old 51 years old and above	1.67	0.17
,earning and Development	20-30 years old 31-40 years old 41-50 years old 51 years old and above	3.73	0.01
CT application capability	20-30 years old 31-40 years old 41-50 years old 51 years old and above	3.89	0.01

As shown in the table, we found that from the overall level of information technology application ability, as the age stage increases, the overall level shows a downward trend. From the results of one-way ANOVA, p=0.17>0.05 within the evaluation and diagnosis dimension group, indicating that there is no significant difference in age factors under this dimension. However, other dimensions and overall P<0.05 indicate significant differences among different age groups. After further comparison, the differences between the groups were also significant. Specifically, the overall level of the 20-30-year-old group is significantly higher than that of the 41-50-year-old group and the group over 51 years old, and there is a significant difference; The overall level of the 31-40-year-old group is significantly higher than that of the 41-50-year-old group and the group over 51 years old, and the difference is significant; However, there was no significant difference in the overall level between the 41-50-year-old group and the 51-year-old and above group.

Use one-way ANOVA to analyze the differences in ICT application abilities among teachers of different educational levels. The analysis results are shown in the table below:

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Table 5 Differential Analysis of Teacher's Educational Level and ICT Application Ability

Items	Educational level	F	P
'echnology Literacy	Associate degree Bachelor's degree Master's degree and above	1.48	0.23
lanning and Preparation	Associate degree Bachelor's degree Master's degree and above	1.75	0.17
)rganization and Management	Associate degree Bachelor's degree Master's degree and above	1.60	0.20
ıssessment and Diagnosis	Associate degree Bachelor's degree Master's degree and above	0.85	0.42
,earning and Development	Associate degree Bachelor's degree Master's degree and above	2.35	0.43
CT application capability	Associate degree Bachelor's degree Master's degree and above	1.77	0.17

As shown in the table, the ICT application ability of teachers with different educational backgrounds is p>0.05 in overall and various dimensions, indicating that there is no significant difference in the ICT application ability of teachers with different educational backgrounds.

Use one-way ANOVA to analyze the differences in ICT application abilities among teachers from different teaching majors. The analysis results are shown in the table below:

Table 6 Differential Analysis of Teacher's Teaching Major and Its ICT Application Ability

tems	Teaching major	T	P
'echnology Literacy	Technician majors Cultural majors	0.47	0.31
lanning and Preparation	Technician majors Cultural majors	0.95	0.17
)rganization and Management	Technician majors Cultural majors	0.35	0.36
ıssessment and Diagnosis	Technician majors Cultural majors	0.18	0.42
,earning and Development	Technician majors Cultural majors	2.04	0.02
CT application capability	Technician majors Cultural majors	0.81	0.21

As shown in the table, we found that the learning and development dimensions of ICT application abilities of teachers in different teaching subjects have p=0.02<0.05, indicating significant differences in ICT application abilities among teachers in different teaching subjects. Teachers in Technician subjects have significantly higher scores than those in cultural subjects. However, there was no significant difference in other dimensions and overall p>0.05.

Conclusion and Discussion

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To explore the research objective (1) The ICT proficiency level of teachers at Nanyang Technician College. Analysis of questionnaire data reveals that the overall ICT application ability of teachers at Nanyang Vocational and Technical College is at a moderate level (M=3.56). By comparison, using similar survey evaluation methods, the ICT application ability scores of vocational schoolteachers in other developed cities in China are as follows: Wuhan (M=4.3), and Shanghai (M=4.1). The ability level of teachers in vocational schools of Nanyang Technician College is relatively low compared to that of learning teachers in developed cities. From the five dimensions of ICT ability, teachers scored poorly in the evaluation and diagnosis dimensions (M=2.68), indicating that their level in this dimension is relatively low (Wang, 2018) (Cao, 2019). This may be related to the current evaluation system of Nanyang Technician College. Except for the practical courses for technicians, most of the daily homework content and phased assessment tests in the college are still mainly in paper form. Due to restrictions on the use of personal mobile phones by students and the inability of schools to provide electronic devices for daily learning for each student, it is difficult to achieve information-based evaluation of students. Therefore, most teachers have little exposure to information evaluation and diagnostic systems and have not formed an awareness of information-based evaluation.

The scores for the planning and preparation dimensions (M=3.19) and organizational management dimensions (M=3.35) of teachers' information technology application ability are also relatively low. This indicates that teachers have weak practical abilities in applying information technology to daily lesson preparation teaching, which may be related to the existing lesson preparation system of the college. The college still requires teachers to mainly prepare course plans in paper form, and some departments still require course plans to be handwritten. Although the classroom is equipped with multimedia systems, it can still be seen that some teachers use chalk handwriting as the teaching mode during the teaching process, without using information technology equipment.

By analyzing the technician literacy dimension (M=3.86) and learning and development dimension (M=3.87) of teachers' information and communication technology application abilities, the scores were relatively high. Teachers have a good understanding of the application and teaching of information and communication technology and are willing to learn relevant knowledge. However, the overall level of information and communication technology application among teachers is relatively low, indicating that teachers have not taken effective measures to improve their personal information and communication technology application abilities.

To explore the research objective (2) Factors affecting the ICT ability of teachers at Nan Yang Technician College. Data analysis was conducted on the differences in information and communication technology application abilities among teachers based on their gender, age, education level, and courses taught, to determine whether these factors have an impact on their information and communication technology application abilities.

According to the data analysis results, firstly, there is no significant difference in the ICT application ability of teachers at Nanyang Technician College among different genders, educational levels, and courses taught. Indicating that the overall ICT application abilities of both men and women, as well as teachers with different levels of education and courses taught, are similar. These three factors did not have a significant impact on the ICT application ability of teachers at Nanyang Technician College. The results are consistent with some studies but different from others (Nurhabibah et al, 2018) (Wang & Tian, 2023). The research findings provide a reference for other studies.

Secondly, there are significant differences in the information and communication technology application abilities of teachers of different age groups at Nanyang Technician College. According to data analysis, as the age group increases, the overall level shows a downward trend. Specifically, the overall level of the 20-30-year-old group is significantly higher than that of the 41-50-year-old group and the 51-year-old and above group, and there is a significant difference; The overall level of the 31-40-year-old group is significantly higher than that of the 41-50-year-old group and the 51-year-old and above group, with significant differences; However, there was no significant difference in the overall level between the

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41-50-year-old group and the 51-year-old and above group. The results are consistent with some studies but different from others (Liu et al, 2018) (Yang, 2022). The reason for this result may be related to the development time of information technology in China and the characteristics of teachers in schools. Older teachers are unable to receive systematic information technology-related learning during their studies and can only improve their level of information and communication technology application through self-study or school-provided training. Busy work and unsatisfactory training may lead to lower information and communication technology application abilities for older teachers. Therefore, age is an important factor affecting the ICT ability level of teachers at Nanyang Technician College.

Through the analysis of the results of this study, it can be seen that there are significant differences in the application ability of information and communication technology among teachers of different age groups at Nanyang Technician College, with most teachers having lower evaluation and diagnostic abilities. Therefore, based on the ICT ability of teachers in this school, attention should be paid to the improvement of the ICT ability of elderly teachers and the evaluation and diagnostic ability of all teachers. Learning activities can be divided into groups based on different age groups. Meanwhile, the development of learning activities requires a people-oriented approach and personalized teaching. Inviting training companies to develop targeted training plans and learning activities while clarifying the shortcomings and training needs of teachers. Such learning activities tailored to the individual situation of teachers should be more helpful in improving their ICT application abilities.

Recommendation

This study evaluates the ICT application ability of teachers at Nan Yang Technician College, explores the influencing factors of vocational school teachers' abilities, and provides development suggestions. The object of this study is only aimed at vocational school teachers in the Nan Yang area. Subsequent research can continue the method used in this article in various urban areas of Henan Province, evaluate the ICT application ability of vocational school teachers, and then analyze and compare the differences and characteristics between regions.

Secondly, it is necessary to constantly track and pay attention to the dynamic changes in the ICT application capabilities of vocational school teachers in Nan Yang Technician College, as well as the implementation of recommendations, to provide reasonable data support for the evaluation of the information development of the entire region.

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