Research on Informatization Teaching Ability of Mathematics Normal University Students—Taking H Normal University as an Example

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Abstract: The development of education informatization in the new era requires that mathematics normal university students have high informatization teaching ability and be able to continuously promote the integration and application of information technology and mathematics teaching to innovative development. To fully improve the informatization teaching ability of mathematics normal college students, this paper uses a questionnaire survey, mathematical statistics, and other methods to conduct a sample survey on the current situation of informatization teaching ability of mathematics normal college students in H Normal University. The results show that: Mathematics normal students think that information technology is critical in mathematics teaching, mathematics normal students have a low grasp of information technology, and mathematics normal students have a good ability to use information technology to carry out teaching activities. Based on this, it is proposed to construct the dynamic mechanism of teachers using information technology to integrate mathematics classroom teaching and enhance the demonstration role of teachers; To improve the information technology learning environment of mathematics normal university students and improve their learning initiative; To carry out information technology application courses and improve mathematics students' informatization teaching ability.

Keywords: normal mathematics student; information technology; teaching competence

1. Preface

Information-based teaching ability is a necessary ability of normal university students. Using information technology can effectively promote the reform and development of education. The promulgation of the Education Informatization 2.0 Action Plan in 2018 shows that teaching and information technology will reach a new stage of innovative integration. The unprecedented development of information-based teaching requires normal university students to have the ability of information-based teaching to promote the integration of information technology and mathematics classrooms. Mathematics normal university students are the organizers and guides of mathematics education and an important force in promoting the development of mathematics education informatization. The informatization teaching ability of mathematics normal university students plays an important role in improving the mathematics classroom effect and transforming the students' learning mode, and informatization teaching ability is an essential ability of normal mathematics university students. Therefore, this study takes H Normal University as an example, through the investigation of mathematics and applied mathematics (normal) undergraduate students, to understand the ability of mathematics normal university students to conduct information teaching and to give personalized suggestions for different situations.

2. Formulation of the problem

The development of information technology has promoted changes in the field of education. "Mathematics Curriculum Standards for Senior High Schools (2017 edition)" put forward teaching suggestions of "attaching importance to the application of information technology and realizing the deep integration of information technology and mathematics curriculum"[1]. The "Compulsory Education Mathematics Curriculum Standards (2022 edition)" puts forward teaching suggestions for teachers that

"teachers can use information technology to comprehensively process text, images, sounds, animations, etc."[2]. In the Education Informatization 2.0 Behavior Plan issued by the Ministry of Education in 2018, it is pointed out that "it is necessary to innovate the training program of normal university students, improve the curriculum system of normal education, and strengthen the cultivation of information literacy and information-based teaching ability of normal university students"[3]. Therefore, under the background of the development of educational informatization in the new era, excellent mathematics teachers and even their reserve force, mathematics normal university students, should have skilled and superb informatization teaching ability to continue to promote the integration of information technology and mathematics teaching from the application to innovative development.

Liu Zhe et al believe that the essence of information-based teaching ability is to use ICT to "transform" subject knowledge into a knowledge and ability structure effectively obtained by students in real teaching situations, to realize technology-facilitated learning. Through a questionnaire survey and empirical research of classroom observation, Liu Zhe et al obtained the development status of information-based teaching ability of mathematics normal university students, and finally put forward suggestions[4]. Chen Xiaoyu believes that information-based teaching ability specifically refers to teachers' ability to use various information technologies to obtain teaching information, integrate, process and analyze it, and has such essential attributes as "regional", "integration" and "generation". In combination with the essential attributes of teachers' information-based teaching ability, this paper analyzes the problems of improving information-based teaching ability. Put forward scientific and reasonable coping strategies[5]; East China Normal University, together with six universities, jointly developed the "Standard of Information Technology Teaching Ability of Normal College Students"[6] and the "Self-assessment tool of Information Technology Application Ability of Normal college students"[7], and established the structure framework of information technology teaching ability of normal college students, which includes three core dimensions: basic technical literacy, technology-supported learning, and technology-supported teaching. It is helpful to deeply understand the concept connotation of information-based teaching ability of normal university students and provides an important reference for teacher educators to carry out diagnostic evaluation, curriculum development, teaching method innovation, and so on. Given the teaching dimension of technology support, mathematics normal university students should integrate information technology and teaching in depth. They should not only use information technology as a means to optimize teaching but also consider how to promote the change in students' learning styles and help students understand mathematics, explore mathematics, and do mathematics.

Based on the existing research, this study analyzes the cognition, grasp, and application of information technology in teaching mathematics normal students at H Normal University through a questionnaire survey, and puts forward scientific and reasonable suggestions for improvement, to promote the modernization of teachers and boost the construction of education informatization.

3. Study design

3.1. Subjects of study

This research mainly focuses on the informatization teaching ability of mathematics students in H Normal University (hereinafter referred to as mathematics normal students) under the background of the new era. To make the research results scientific, the research object is finally selected as the undergraduate students of mathematics and applied mathematics (normal class) in H Normal University, with a total sample size of 102. Due to the reason of normal colleges and universities, there are more women, 86 people, accounting for 84.31%, while there are fewer men, 16 people, accounting for 15.69%.

3.2. Research methodology

3.2.1. Literature method

Using the library, China Knowledge Network, Wanfang, and other literature search platforms, search for relevant literature with the keywords "informatization teaching" and " normal mathematics student ", including journal papers, master and doctoral dissertations, etc., based on which, the collected literature is classified and organized to provide theoretical support for the writing of the thesis. Based on this, the collected literature is classified and organized to provide theoretical support for the writing of the thesis.

3.2.2. Questionnaire method

The questionnaire was designed according to the research objectives based on reading relevant literature on "information technology", "information technology teaching ability" and "normal university student", and then modified and improved according to the experts' opinions. The questionnaire was designed according to the research objectives; then modified and improved according to the experts' opinions; finally, the questionnaire was distributed and collected in a mixed way online and offline, and then counted, sorted, and analyzed at[8].

3.2.3. Mathematical and statistical methods

The required data obtained through relevant surveys, the data obtained were analyzed using EXCEL software to obtain relevant results[9].

4. Analysis of the results of the study

4.1. Cognition of information technology in Mathematics teaching among mathematics normal university students

4.1.1. The cognition status of the importance of information technology to mathematics teaching

According to the survey and analysis, mathematics normal students think that information technology is very helpful to mathematics teaching, and 64.71% of normal students think that it can improve the efficiency of classroom teaching and is of great help to teaching; The proportion of normal university students who thought it was helpful but had some difficulties in the actual mathematics teaching process accounted for 29.41%; 3.92% of normal university students agree more with traditional teaching methods; 1.96% of normal university students are not sure whether information technology can promote mathematics teaching, because they do not know enough about information teaching and its role. To sum up, most mathematics students believe that information technology plays an important role in mathematics teaching, and there are still very few students who do not understand information teaching.

4.1.2. Whether the use of IT resources to organize teaching and learning activities changes the perceived status quo of traditional teaching methods

According to the analysis, 29.41% of mathematics normal university students believe that using information technology resources to arrange mathematics teaching activities can completely change the traditional teaching methods and realize the optimization of teaching; 66.67% of mathematics normal college students think that it has changed to some extent, but think that this teaching method can not adapt to the exam-oriented education system; There are no mathematics students who think that the information technology resources arrangement of teaching activities has not changed the traditional teaching methods, but there are 3.92% mathematics students who do not understand the information teaching.

4.1.3. The function cognition of information-based mathematics teaching

According to the analysis, 80.39% of mathematics normal students believe that information-based teaching is conducive to teachers' realization of teaching objectives, 72.55% of mathematics normal students believe that information-based teaching is conducive to presenting teaching focuses and breaking through teaching difficulties, and 74.51% of mathematics normal students believe that information-based teaching is conducive to improving teaching methods. 62.75% of mathematics normal students believe that information-based teaching can help deepen students' understanding of knowledge and methods, 68.63% of mathematics normal students believe that information-based teaching can improve students' attention in class, 58.82% of mathematics normal students believe that information-based teaching can promote the interaction between teachers and students in class. 49.02% of mathematics normal university students believe that information-based teaching can produce good teaching results. To sum up, information-based teaching can better help teachers achieve teaching objectives, optimize teachers' teaching methods, and make teaching important and difficult points more clear, ranking the top three. In general, mathematics normal college students have a high recognition of information-based teaching.

4.2. The mastery of information technology in mathematics normal university students

4.2.1. Computer rating level

About 31.00% of mathematics students are at the level of computer level, and can only be familiar with the general theoretical knowledge and simple operation of computers. The mathematics students who have achieved the level of computer II account for 47.00%, but basically, they only can make PPT, use Excel to make charts and simple mathematical programming, and cannot still combine teaching software in classroom teaching. Only 6.00% of the students who can skillfully use computer technology and can carry out teaching design according to different information teaching equipment obtain the level 3 of computer grade. Among them, 16.00% of normal university students did not systematically learn computer knowledge theory. To sum up, most normal university students mainly stay at the level of computer level Two, but their ability to use relevant mathematics teaching software is still relatively simple and lacking.

4.2.2. Mastery of the use of information technology tools

For most normal mathematics students, being able to skillfully use search engines (such as Baidu and Google search) accounts for 94.12%, accounting for a relatively large proportion, which is a skill that most normal mathematics students have. Normal university students who can use file download software (such as thunder download, etc.) accounted for 45.10%, and the number of master is average; 80.39% of normal university students can use Word processing software (such as Word); The number of normal university students with network communication software (Email, wechat, QQ, etc.) accounted for 68.63%; 62.75% of normal university students can use data processing software (such as Excel, etc.) for data analysis, drawing and table making, and have the use of courseware making tool PowerPoint; 23.53% of normal university students can use the courseware making tool Flash for teaching design; The proportion of normal university students with the ability to use geometric drawing board is 39.22%; The proportion of normal students who can skillfully use graphing calculator is only 9.80%; The students who mastered Matlab skills accounted for 17.65%; Few normal students can use MathType software, accounting for 5.88%; Normal university students who can use wechat, Weibo and other information publishing tools account for 50.98%. To sum up, most the mathematics normal college students have a low grasp of the information software tools that assist teaching. On the whole, the informatization ability of mathematics normal college students still has a certain potential to be cultivated.

4.2.3. Mastery of information technology teaching equipment

The proportion of mathematics students who can use a whiteboard for teaching is 74.51%, only a few students can not use whiteboard teaching equipment; And 94.12% of the students at normal mathematics universities can use multimedia projection for teaching, and all the students of normal mathematics university have this ability. However, for the new information teaching equipment, the mastery of physical projection is only 23.53%, the proportion of normal students who can use pinhole cameras is only 9.80%, and the proportion of normal students who can use subject innovation laboratories is the least, accounting for only 7.84%. To sum up, mathematics normal college students can master the most basic information teaching equipment, but they have a low understanding and mastery of the latest equipment, such as physical projection, pinhole camera, subject innovation laboratory, and other related equipment, and need to further learn, to improve their information teaching ability.

4.3. Mathematics normal university students can use information technology to carry out teaching activities

4.3.1. Integration of the mathematics teaching curriculum using information technology

The ability of normal university students to use information technology to integrate mathematics teaching courses is an important part of information teaching ability. The current timeliness and timeliness of Internet access to information provide better and more convenient conditions for the continuous innovation of mathematics teaching courses. According to the analysis, 54.90% of normal university students often use computers and can skillfully use the network to collect, learn from, and use related mathematics teaching resources, indicating that more normal university students often use information technology to integrate mathematics teaching courses. The proportion of normal students who occasionally search for relevant teaching resources on the Internet and use multimedia projection is 39.22%, the proportion of normal students who rarely use information technology to integrate mathematics teaching courses is 5.88%, and the proportion of normal students who never use information technology to integrate mathematics teaching courses is 0.00%. To sum up, most mathematics students

can use information technology to integrate mathematics teaching courses, which indicates that mathematics students' understanding and use of information technology is still a certain foundation.

4.3.2. The situation of information AIDS commonly used by mathematics normal university students in teaching design

56.86% of mathematics students will use the form of making a micro-lesson video to assist teaching in the teaching design of mathematics; 35.29% of mathematics students use geometric drawing board to assist teaching; Only 1.96% of mathematics students choose to use graphing calculator for auxiliary teaching; However, 5.88% of normal university students are not good at using information technology AIDS for teaching. To sum up, only a few normal mathematics students at H Normal University are not good at using information technology AIDS, and most of them can use information AIDS to help them improve their teaching design. Therefore, the use of information AIDS to improve the teaching design of mathematics for normal students needs to be further popularized.

4.3.3. The proficiency level of mathematics students in using information technology AIDS

This study mainly analyzes the current situation of proficiency of mathematics normal students in using information technology AIDS through three kinds of information technology-assisted teaching: using a geometry drawing board to study function images, using a graphics computer to study quadratic function dynamic geometry problems, and using micro-class to teach mathematics. It can be seen from the analysis that only 17.65% of normal mathematics students can use the geometric drawing board to study the image of function, an information technology auxiliary tool; Among them, 25.49% are proficient, but do not use the nature of their research; At present, 39.22% of normal university students are studying geometry drawing board. And 17.65% of normal students can't use geometry drawing boards.

Only 25.49% of normal mathematics students can use the graphics computer to study the dynamic geometry problems of quadratic functions, and can study the difficult dynamic geometry problems of functions by this means; 33.33% of normal students can only design some simple functional dynamic problems through graphical computers; There are also 21.57% of normal mathematics students in the process of learning graphing calculators and 19.61% of normal mathematics students can not use graphing calculators.

As for the situation of mathematics students mastering the teaching form of micro-class and mathematics teaching skills, 39.22% of normal students can not only make relevant videos by themselves but also cooperate with others to make them; Among them, 41.18% of the mathematics students can only make their teaching videos of mathematics micro-lessons; The remaining 7.84% of mathematics students will make micro-lessons.

To sum up, as for the application of information technology assistance tools by mathematics normal students, it can be seen that most normal students can use geometric drawing boards, graphing calculators, and other information technology assistance tools to help improve teaching, but few normal mathematics students can master it proficiently. At present, there are still some normal mathematics students who cannot master information technology assistance tools. Therefore, mathematics students need to further improve in the use of information technology AIDS.

5. Conclusions and recommendations

5.1. Conclusion

5.1.1. Mathematics normal university students believe that information technology is critical in mathematics teaching

Judging from the cognition status of the importance of information technology to mathematics teaching, most normal university students believe that information technology plays an important role in mathematics teaching, but there are still a few students who do not understand information teaching; Given the cognitive status of whether the use of information technology resources to arrange teaching activities changes the traditional teaching methods, most normal university students believe that the use of information technology for teaching can change the traditional teaching methods to a certain extent, and no normal university students believe that information technology cannot change the traditional teaching methods. From the perspective of the function cognition of information-based mathematics teaching, most normal university students believe that information-based teaching plays a very important role in teaching objectives, teaching difficulties, teaching methods, teacher-student interaction, and so

on.

5.1.2. Mathematics Normal college students have a low mastery of information technology

From the perspective of computer level, nearly half of normal university students are at the level of computer level II, but most of them are still short of the ability to use relevant mathematics teaching software. In terms of the mastery of information technology tools, most mathematics students can only use simple information technology tools such as search engines, Word, Excel, etc., and have a low mastery of information software tools that assist teaching. Judging from the mastery of information teaching equipment, most normal students can skillfully use simple information teaching tools and equipment such as whiteboard and multimedia projection but have a low understanding and mastery of the latest equipment such as physical projection, pinhole camera, and subject innovation laboratory.

5.1.3. Mathematics normal university students have a better ability to use information technology to carry out teaching activities

From the situation of using information technology to integrate mathematics teaching courses, most mathematics students have the ability to use information technology to integrate mathematics teaching courses, and there is no situation of normal mathematics students not using information technology to integrate mathematics teaching courses; From the situation that mathematics normal university students commonly use information AIDS in teaching design, most normal university students use information AIDS to help themselves improve teaching design, only a few normal university students are not good at using information technology AIDS in teaching design; In terms of the proficiency level of mathematics normal students in using information technology AIDS, most of them can use geometric drawing boards, graphing calculators and other information technology AIDS to help improve teaching, but there are few mathematics normal students who can master it skillfully, and there are still some mathematics normal students who cannot master information technology AIDS.

5.2. Recommendations

5.2.1. To construct the dynamic mechanism of teachers using information technology to integrate mathematics classroom teaching, and enhance the demonstration role of teachers

Bandura's social learning theory proposes that observational learning is an important way of human behavioral learning, that is, a learning way in which learners acquire relevant behaviors by observing the demonstrator's actions or demonstrating actions[10]. Mathematics normal students are in the primary stage of teacher training, and observing the teaching of teachers is an important way for mathematics normal students to directly learn teaching experience and skills. Therefore, it is necessary to build a dynamic mechanism for teachers to integrate mathematics teaching classrooms with information technology, and teachers should actively use information teaching modes in daily teaching to give full play to their exemplary role.

If teachers use information technology to integrate teaching classes during their college years, it will play a good role in demonstrating normal students. For example, a super complex geometric figure can be integrated by information technology and displayed vividly by combining various animations, which is not only conducive to normal students' understanding but also attracts their interest[11]. For another example, some teachers' classrooms are full of information teaching elements, and they can not only skillfully use PPT, but also use a variety of modern teaching modes, such as flipped classrooms. Some teachers even informationize assessment and class attendance. Even some teachers will study assessment, class attendance, and so on are informationized. They are not only using information teaching but more importantly, using this form to instill the idea of information teaching to students. The demonstration role of teachers plays a significant role in improving the informatization ability and consciousness of mathematics normal college students, so the school should strengthen the guiding role of mathematics normal college students.

5.2.2. To improve the information technology learning environment of mathematics normal university students and improve their learning initiative

In the context of the popularization of the Internet, some colleges and universities have the infrastructure to carry out information-based teaching, but generally lack the software and hardware environment applied to teaching[12]. With the advent of the intelligent age, colleges and universities should optimize the teaching environment and update various teaching equipment. To improve the learning environment of normal college students, some information-based teaching classrooms should be built for normal college students to use to maximize the information-based teaching ability of

mathematics students.

Therefore, for the training of normal students, schools should strengthen the construction of teaching equipment, so that normal students can have more opportunities to contact new teaching equipment, such as creating microclassrooms for normal students to train and improve their professional ability. To avoid the occurrence of the situation that normal university students have not conducted the training of information teaching ability before the practice, but only the teacher gives simple guidance. Both the government and universities should make some efforts to this end. The government should make important guarantees for education funds and supervise the use of funds of various departments. Colleges and universities should focus on solving the problem of campus network and upgrading the current campus network. Colleges and universities can provide some foreign teaching resources and open foreign network teaching platforms to provide better and more comprehensive learning resources for normal students.

5.2.3. To carry out information technology application courses and improve mathematics students' informatization teaching ability

The application of information technology is highly professional, and it is difficult for mathematics normal university students to master the application of information technology only through personal learning and exploration. Therefore, for the training of normal university students, schools should set up special information technology application courses based on teaching rules and teacher development rules, to help mathematics normal university students improve their information-based teaching ability.

The application of information technology courses for mathematics students and the teaching methods of teachers need to be further improved. First, educational technology courses should not be limited to the basis of modern educational technology and computer culture; secondly, normal students should combine learning and doing, not only learning knowledge but also real operational training; Finally, teachers should pay attention to the methods of teaching such courses to attract students' interest and enhance the professionalism of learning content for different normal students[13].

References

[1] Ministry of Education of the People's Republic of China. Curriculum standard for general senior high school mathematics (2017 edition) [S]. Beijing: People's Education Press, 2017.
[2] Ministry of Education of the People's Republic of China. Mathematics curriculum standards for compulsory education (2022 edition)[M]. Beijing: Beijing Normal University Press, 2022.
[3] Ministry of Education. Notice of the Ministry of Education on the Issuance of the Action Plan for Education Informatisation 2.0 [EB/OL]. http://www.moe.gov.cn/srcsite/A16/s3342/ 201804/t20180425 ___334188.html, 2023-08-30.
[4] Liu Zhe, Lian Feiyun. Research on the development of mathematics teacher trainees' informatization teaching ability - a perspective based on empirical analysis[J]. Journal of Mathematics Education, 2021, 30(01): 91-96.
[5] Chen Xiaoyu. Research on the development strategy of teachers' informatization teaching ability in the Internet era[J].Journal of Hubei Open Vocational College,2024,37(08):163-164+167.
[6] Ren Youqun, Yan Hanbing, Li Xiaoxing. Interpretation of the Standard of Informatisation Teaching Competence for Teacher Trainees[J]. Research on Electrochemical Education, 2018(10): 5-14.
[7] Yan Hanbing, Ren Youqun, Li Xiaoxing. Development and validation of self-assessment tool for teacher trainees' IT application ability[J]. Research on Electrochemical Education, 2018(1):98-106.
[8] Wu Ying, Liu Liu. Research on the development strategy of informatisation teaching ability of higher vocational teachers[J]. Journal of Liuzhou Institute of Vocational Technology, 2021, 21(06): 82-87.
[9] She Yabin, Qin Xiuyu, Zhu Yuxian. Current status and future prospect of research on informatisation teaching ability in China[J]. Higher Education Forum, 2021(12): 49-53.
[10] Wang Wei, Yan Hanbing, Wei Fei et al. Developing teacher trainees' informatisation teaching ability: supporting elements, key issues and possible paths - an analysis based on research data from 20 teacher training colleges [J]. Teacher Education Research, 2021, 33(02):38-44.
[11] Guo Wenwen. Research on the Status Quo of Teacher Students' Informatisation Teaching Ability

and Development Strategies [D]. Liaocheng: Liaocheng University, 2019.

[12] Ma Kuanbin, Huang Lili. Enhancement of teachers' informatisation teaching ability in vocational colleges and universities: connotation, problems and strategies [J]. Vocational Education Forum, 2021, 37(09): 90-97.

[13] Gao Yuefei, Zhao Dan, Wu Zhongda. Implications of teachers' information technology application ability enhancement training for teacher training students[J]. China Education Technology Equipment, 2019(02): 22-23, 28.