

The Research on Cultivation of Education Master Candidates Based on Data Analysis and Cultivation Ability Improvement

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Abstract

The data analysis literacy is one of the six core qualities of the mathematics discipline put forward by the education reform in China. For this cultivation of literacy, mathematics teachers should have corresponding teaching abilities. The education master candidates, as pre-service teachers, are the backbone of the future mathematics teaching. In the course of training the education master candidates, the university should focus on training their data analysis literacy, teach them related teaching theories and teaching methods, guide them to carry out the theoretical study of mathematics teaching and solve practical problems in teaching and skillfully use modern educational technology, so that they can adapt to the work of training students' data analysis literacy in the future.

Keywords

Data Analysis Literacy, Mathematics, Education Master Candidates, Training

Received: May 17, 2018 / Accepted: June 15, 2018 / Published online: July 23, 2018

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1. Introduction

The mathematics Curriculum Standards for Compulsory Education (2011 Edition) clearly stated that: in mathematics teaching, we must develop students' sense of number, symbol awareness, concept of space, intuitive geometry, data analysis concepts, operational capability, inferential ability and model thought. In order to adapt to the requirements of the development of the times, we should pay special attention to developing students' sense of application and innovation [1]. The standard of mathematics curriculum for ordinary high school (2017 Edition) (CS2017) put forward the core accomplishment of mathematics subjects including mathematical abstraction, logical reasoning, mathematical modeling, visual imagination, mathematical operation and data analysis. Both of these two documents clearly put forward the literacy of middle school students in the analysis of data. senior high school stage is a further in-depth study of

junior high school. Data analysis is an important mathematical technique for the study of random phenomena. It is the main method of mathematics application in the era of big data and the main method of the "Internet+" related field. Date analysis has penetrated into all aspects of science, technology, engineering and modern social life. Middle school students are the new force to make the future progress of science and technology and social progress in the motherland, so in the mathematics teaching of middle school, it is important to train the students' ability of data analysis. As a pre-service teacher, it is worth thinking and studying how to improve Data analysis and training ability of education masters candidates in the background of quality and training ability and help students adapt to the work and life of the future society.

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2. Related Concepts

The ability of data analysis and cultivation refers to the comprehensive quality reflected by the teachers' successful completion of the teaching goal of cultivating students' data analysis literacy. Teachers with data analysis training ability can better guide students to develop data analysis literacy and accomplish teaching goals. Mastering the knowledge of data analysis is the basic to cultivate the literacy of data analysis, the CS2017 pointed out: data analysis is to obtain data for the research object, to organize, analyze and deduce the data by mathematical methods, and to form the literacy of the research object knowledge. The process of data analysis mainly includes collecting data, organizing data, extracting information, constructing models, making inferences and obtaining conclusions [2]. Therefore, data analysis literacy mainly includes the following aspects:

2.1. Data Awareness

Data analysis needs to obtain data for the research object, which requires the researchers to have high data sensitivity to the research object, and realize that many problems in the reality can be collected and analyzed to solve the problem through investigation and research. Data consciousness is the premise of data analysis. Only when a person has data consciousness can he think about problems from the angle of statistics and solve the problems by using the knowledge of statistics.

2.2. Data Collection and Arrangement

Data collection and data processing is the first step in data analysis. They are the basis for data analysis. Different data processing methods should be chosen for different research. The data will be more systematic, organized, easier to understand and parse after proper processing [3].

2.3. Data Analysis

Data analysis is the process of extracting useful information and forming conclusions from the data. To be able to use a variety of methods to analyze the data, and to establish a substantive relationship between the various methods, we can choose the appropriate analysis method according to the different situations and the background of the problem [4].

2.4. Inference Conclusion

The ultimate goal of data analysis activities is to get certain conclusions and solve problems. The ability to infer data refers to the ability to interpret information in statistical charts or statistics smoothly [5]. With the ability to infer data, we can get the conclusion of the data to make all the work reflect the value.

2.5. Historical Culture Related to Data Analysis

History is the inheritance of culture and the trajectory of human civilization. Studying the history of a subject can help us to draw nutrients from historical materials, to make the past serve the present and to bring forth the new. It is essential to understand the statistics and probability historical culture related to data analysis.

2.6. Ability to Solve Problems

The purpose of learning knowledge is to apply it. Only applying theory to practice can reflect the value of knowledge. Therefore, the important point of having data analysis literacy is to have the ability of using data analysis knowledge to solve problems.

3. The Requirements for Middle School Mathematics Teachers

3.1. Mathematics Teachers Should Have High Quality of Data Analysis

The teacher could propagate the doctrine, impart professional knowledge, and resolve doubts. If the teacher wants to "preach the teaching" to the student, he must first know his "way". If teachers want to cultivate students' data analysis ability, they must first have a higher literacy of data analysis. In other words, teachers must have a strong sense of data, be able to properly collect and organize data, will choose the appropriate method for data analysis, inference conclusions, in addition master the history and culture related to data analysis, can use their own knowledge, solve the real problem.

3.2. Mathematics Teachers Should Master the Relevant Knowledge of Education and Teaching

Education and teaching knowledge is the theoretical foundation for teachers to engage in education work. It can give teachers effective and scientific guidance in the process of education and teaching. For mathematics education master candidates, in addition to mastering the basics of pedagogy, it is necessary to specifically study related theories of pedagogy and psychology related to mathematics education. Different knowledge of mathematics has different characteristics and should be flexibly taught according to the characteristics of knowledge. In the process of cultivating students' quality of data analysis, teachers should be able to select appropriate teaching methods and scientific evaluation criteria according to the relevant knowledge of education, and to guide the practice with theory, and to grasp the students' mastery of the situation accurately.

3.3. Mathematics Teachers Should Have Specialized Teaching Methods for Data Analysis Literacy Training

Different mathematical knowledge has different characteristics, and teachers should adopt the appropriate teaching method according to different mathematical knowledge. Statistics is a highly applied subject, and it is widely used in every aspect of life. Probability and statistics is a very important module in middle school, and it is an important part of developing students' data analysis literacy. For this knowledge, mathematics teachers should have special teaching methods. In view of the cultivation of data analysis literacy, teachers should start with the concept and introduce concrete cases to deepen the students' understanding of the concept on the basis of connecting with the reality of life and introducing concrete cases. At the same time, it can improve the students' ability to use what they have learned to solve practical problems, and stimulate students' interest by using advanced teaching equipment such as modern educational technology [6].

3.4. Mathematics Teachers Should Have a Flexible Mind and Ability to Solve Problems

Teaching is a complicated process. Its process includes the interaction between teachers and students. In the course of teaching, teachers should not only guide students to learn scientific and cultural knowledge, but also help students to complete the coordinated development of knowledge, emotion, meaning and practice and the formation of complete personality. Each student is an independent individual so teachers should respect students' personality in teaching. Based on this, teachers must have a flexible mind and problem-solving ability, have appropriate ways to deal with various problems that may occur in the classroom, and be able to teach students according to their personality characteristics and their mastery of knowledge in accordance with their aptitude.

3.5. Mathematics Teachers Should Have the Ability to Make Full Use of Teaching Materials

Nowadays, due to one-sided investigation of achievements and promotion rate, the research on relevant content is not enough, and the use of teaching materials is insufficient, which affects the cultivation of data analysis literacy of middle school students. The textbook was compiled by many education experts and front-line teachers according to the curriculum standards and the cognitive level of the middle school students. It is scientific. Therefore, teachers can cultivate students' core literacy of data analysis by making full use of teaching materials. First, teachers should make full use

of the exploration activities in the textbooks. The activities of "observing" and "exploring" in the textbooks are all very characteristic. There are allusions and common sense, which are important curriculum resources. Making full use of the inquiry activities in the teaching materials is the most basic task for students to put themselves in teaching situations, actively proactively identify problems, ask questions, and think about problems. The most important thing is to collect data, extract information and make it mathematical, so as to stimulate students' emotion of data analysis and guide them to observe the real world from a mathematical perspective. Secondly, teachers should make full use of the typical cases in the textbook. "Statistical teaching must be carried out through typical cases", according to the Mathematics Curriculum Standard of General Senior High School. Therefore, in the process of teaching, teachers should make students go through the whole process of data processing systematically, and in this process, they should focus on teaching some methods of data processing, so as to cultivate students' awareness of data analysis. Lead them to think about the real world with mathematical thinking [7].

3.6. Math Teachers Should Have the Ability to Use Modern Education Techniques to Develop Student Data Analysis Literacy

The introduction of modern educational technology has brought a lot of convenience to teachers' teaching and students' learning. The information technology can present the course content which is difficult to present in the past teaching. Mathematics teachers can use modern information technology to train students' big data thinking and literacy, and guide them to express the real world in mathematical language [7]. When studying statistics, we will encounter lots of random experiments, such as coin toss and dice tests. We should make full use of computer technology and multimedia technology for experimental demonstration to give students a more intuitive feeling [8]. When we are doing simple random sampling, we can use computer to generate random number sequences and extract random samples. In addition, when learning normal distribution and variable correlation, multimedia technology can better present the content.

3.7. Math Teachers Should Be Good at Teaching Design

Instructional design generally includes teaching objectives, teaching methods, teaching difficulties, teaching steps, etc. it is a systematic planning teaching process. Teachers who are good at teaching design require teachers to be able to assign appropriate teaching objectives, choose appropriate teaching methods, and arrange teaching procedures reasonably. Teachers who are good at teaching design can specify appropriate teaching objectives, choose appropriate teaching

methods, and arrange teaching procedures reasonably. Teachers should understand that there are many problems in real life should first do research, collect data, through analysis to make judgments, understand the information contained in the data, understand that there are multiple analytical approaches to the same data, and to select the appropriate method based on the background of the problem by analyzing the data analysis learn randomness. On the one hand, for the same experiment, the data collected each time may be different, on the other hand, as long as there is enough data, we can find out the rules. This requires mathematics teachers to be good at teaching design, to be able to determine different teaching objectives and difficulties according to the characteristics of different students' age characteristics, cognitive level, life experience and personality, and to choose appropriate teaching methods to help students to complete the knowledge and ability to master more smoothly.

4. Foster Education Master Candidates in College and University

Nowadays, there are more studies on the theoretical knowledge of the mathematics education master candidates in Colleges and universities, and the mastery of the students' knowledge of mathematics is poor. The ability of teaching practice is the shortcoming of the education master candidates, and the comprehensive quality still needs to be improved. Based on this, the following suggestions are offered for the training of mathematics education master candidates in universities.

4.1. Enhance in Professional Knowledge Quality of Data Analysis of Education Master Candidates

For the training of master degree of professional degree education, the vast majority of normal colleges and universities have made clear requirements: must have a relatively deep knowledge and a solid professional foundation, understand the research status and future research direction of their own subject; in the teaching practice, we can use the relevant educational theory to solve practical teaching problems; We have a certain understanding of basic education curriculum reform and grasp the new concept of educational reform [9]. For the mathematics education master candidates, the solid knowledge of mathematics and the current situation of education, psychology and mathematics curriculum reform related to mathematics are the basic knowledge base that the mathematics education master candidates must master. To foster students' literacy of data analysis, the education master candidates must have a higher literacy of data analysis.

Therefore, colleges and universities should set up relevant curriculum, in addition to strengthening the study of relevant theoretical knowledge of data analysis. Importantly, the education master candidates should master the specialized teaching skills and methods and carry out pertinent training. In addition, the education master candidates should study more about the requirements of the new curriculum, understand the specific requirements of the new curriculum standard for data analysis literacy, and better accomplish the teaching objectives.

4.2. Methods for Training the Education Master Candidates

4.2.1. Lecture Method

The lecture method is the most widely used teaching method in the teaching method based on language transfer, and the other various teaching methods are often combined with the lecture method in the process of application. In training the data analysis and training of the education master candidates, we should use the lecture method to teach the professional knowledge of data analysis and the content of the teaching theory of mathematics. The content of the professor should be comprehensive, specific and pertinent.

4.2.2. Discussion Method

The training of education master candidates is based on basic education. The professional postgraduate is based on basic education. Compared with academic postgraduates, the combination of theory and practice is more closely. Therefore, the practical ability of graduate students with master degree of education is more demanding. Pedagogical curriculum such as middle school mathematics research should be combined with teachers' lectures and classroom discussions [10].

4.2.3. Case Teaching Method

Case teaching method is a very effective way to foster education master candidates [11]. In fostering the ability of data analysis and training of mathematics education master candidates, the case teaching method can be used properly to achieve good teaching results. Colleges and universities can collect the classroom video of the national famous teachers about the teaching of data analysis as the material of teaching research. Teachers and students watch the teaching video together, analyze the teaching contents, teaching methods and valuable experiences on the teaching of data analysis, and improve ability about the data analysis and cultivation of the education master candidates.

4.3. How to Foster and Improve the Teaching Practice Ability of Education Master Candidates

The profession degree of education master candidates is to

provides for teachers with high theoretical level and strong teaching practice ability for basic education. As a teacher in the front line of education in the future, the ability of teaching practice is the most basic and most important ability. It includes the analytical ability of teaching materials, the understanding and innovation of knowledge, the ability to choose teaching methods, and the ability to organize classes. In view of the improvement of data analysis literacy training ability of the mathematics education master candidates, universities should first optimize the curriculum structure of the education master candidates, strengthen the practice curriculum to train the students to analyze and solve the problems in the data analysis teaching, and increase some of the case analysis and micro teaching research curriculum in the data analysis. The practice run through the whole curriculum system of education master candidates. Secondly, the content of the curriculum should be based on practical curriculum while taking into consideration theoretical knowledge. In the process of learning, studies the theoretical knowledge of data analysis while guiding practice with the knowledge, not only to deepen the understanding and memory of these knowledge, but also to guide the teaching practice, to improve the teaching practice ability of the education master candidates [12]. Finally, the “double tutor” is made for the training characteristics of the education master candidates. The extramural tutor has excellent teaching experience. The training of the education master candidates should make full use of this educational resource and give full play to the guiding role of the tutor [13].

4.4. Improving the Ability and Quality of the Master's Degree in Education

Teaching and educating people is a complex task. In this process, teachers should take various roles. In addition to the data analysis literacy and teaching practice ability mentioned above, the basic theory and method of data analysis teaching of education master candidates should also be cultivated.

4.4.1. Master the Basic Theory and Method of Data Analysis Teaching

The professional knowledge literacy of data analysis is the foundation of data analysis teaching for education master candidates. A good mathematician is not necessarily a good teacher. As the impartor of knowledge, teachers should master the way of teaching knowledge. In order to improve the ability of data analysis and training, university teachers should teach students knowledge of data and cultivate students with the training method of data analysis literacy. Such as: how to create effective data analysis activities to enable students to feel the role of data analysis, how to train the concept of data analysis throughout the course teaching content and how to carry out practical activities to make students form the

strategy to solve the problem [14].

4.4.2. Ability to Conduct Theoretical Research in Mathematics Teaching to Solve Practical Problems in Teaching

This is based on the education master's mastery of professional knowledge and teaching methods. In order to prevent the problem from happening again, the education master candidates should be able to find out the problem in time, analyze the reasons, come up with the countermeasures and carry out the essential investigation. For example, in the teaching of data analysis, a large number of experiments, discussion and communication are needed. Some problems may occur in the process, such as the failure of experiment, the confusion of teaching activities, the poor teaching effect and so on. Therefore, college teachers should cultivate students' ability to solve problems. In particular, it is necessary to find out the reasons why the teaching results are not good. Is it because teachers do not prepare enough lessons, or because the students' foundation is poor? Is it because the example is not typical, or is the teaching method inappropriate? So that they can solve problems according to various possible reasons, and achieve good teaching results.

4.4.3. Improve the Ability of Education Master Candidates to Use Modern Information Technology

Modern information technology can make more efficient use of classroom time and enhance students' interest. Especially for the teaching of data analysis, modern information technology can carry out vivid and visual experimental demonstration and animation effect, concise and perfect derivation and the sharing of network resources [8]. Mastering modern information technology can make the education master's future teaching progressing more smoothly [15, 16]. Colleges and universities should be precise and specific when developing modern educational technology. Such as: how to use scientific computer or Scilab software to generate random number table, how to draw frequency distribution histogram, normal distribution map and so on. Education master candidates itself should also strengthen learning and actively explore more functions of multimedia to serve education.

5. Conclusion

Data analysis literacy is an essential quality for students to adapt to the society of the future. Cultivating student data analysis and literacy puts higher requirements on mathematics teachers. Masters of mathematics education are pre-service teachers, and it is particularly critical to improve their ability in data analysis and cultivation. It requires the joint efforts of higher normal colleges and universities, university teachers,

and masters of mathematics education. It is necessary to strengthen mathematics education master data analysis literacy and related teaching theories and methods. In addition, it should also pay attention to improving the ability of the education master candidates to solve problems and the ability to use modern information technology so that they can better adapt to the future of education and teaching, and complete the training objectives of cultivating student data analysis literacy.

Fundings

This study was supported by the Shandong Provincial Education Department under grant number SDYY17127 and the Shandong Normal University under grant number 2016JG29.

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