

Review and Reflection on the Research of Mathematics Problems in Junior High School

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Abstract: The problem of mathematics is an important teaching method of students' core qualities cultivation. Statistics and analysis of The master's thesis related to "junior high school mathematics" and "problem posing" in the past ten years were counted and analyzed from chronological distribution, institutional distribution and research topics and other dimensions. The research results: ignorance of domestic research on the textbook content; formalization of problem raising under the the guidance of theory; the opposite direction of demonstration and qualitative research; fuzzy and superficial results and countermeasures of research. Research reflection: broaden thoughts of the field, attach importance to the study of textbook content, and enhance the expression of the teacher's question raising; deepen the guiding ideas, reiterate the theory to guide the practice, reflect the complement of the theoretical practice; be rigorous about thoughts, attach importance to empirical and quantitative combination, improve scientific and appropriate research methods; develop the logical thinking, focus on the study of results and countermeasures, and manifest the value of research results.

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1 Problem raising

In recent years, with the field of mathematics education research in China unceasingly thorough and developing, the mathematics education discipline has shown a splendid scene. Fusion and innovation have drawn a beautiful blueprint for the development of disciplines, especially the solid foundation laid by the deep integration with new modern technologies and frontier knowledge of psychology for the prosperity of mathematics education. Sort out the literature in a certain period, describe a clear and comprehensive picture for accurate research in the later period, thus understanding the current status and deficiencies of research in this field, which can increase the value and significance of later research. To some degree, the master thesis can reflect the hot topics of mathematics education in a certain period, it is generally a more systematic and valuable essence under the serious guidance of a senior instructor. Therefore, all the master thesis on junior middle school mathematics problems posing in the past 14 years will be selected and retrospectively explored current status of the problem posing research through in-depth analysis, reflecting several major trends in future problem research.

Problem raising refers to the creation of a new problem from a mathematical situation or re-formulation of the problem in the process of problem-

solving (E.A. Silver, 1994). Mathematical problems are proposed to promote better solution, which is an essential way to develop students' creative ability, and is also the basis for lifelong learning and development^[1]. Throughout the mathematics education in countries around the world, the question raising has been in focus of everyone's attention^[2]. Mathematical questions are essential for cultivating students' problem awareness, encouraging students to be self-directed, stimulating their innovative potential, and improving mathematical understanding^[3].

"Compulsory Education Mathematics Curriculum Standards (2011 Edition)^[4]" emphasizes that the cultivation of innovative consciousness is the basic task of modern mathematics education which should be reflected in the mathematics teaching and learning process. "Ordinary High School Mathematics Curriculum Standards (Experimental Edition)^[5]" pointed out in the nature of the curriculum that the basic role of high school mathematics curriculum in understanding the relationship between mathematics and nature, mathematics and human society, the scientific and cultural value of mathematics, and enhancing the ability to raise, analyze and solve problems, forming rational thoughts, and developing intelligence and innovative consciousness. "General High School Mathematics Curriculum Standards (2017 Edition)^[6]" first proposed six core qualities of mathematics. Among these, there are problems finding and propositions raising mentioned in logical reasoning performance, problems finding and posing mentioned in mathematical modeling, and intuitive imagination defined as an important means of finding, asking analyzing and solving problems. It can be seen that the teaching value of mathematics problems posing was raised to an important position by the two reforms of the high school curriculum standards, especially that the main cultivation direction of core literacy is independent exploration and problems raising and solving of students in this revised standards.

Above all, mathematical problems raising has been given a major historical mission from the level of social development needs and national curriculum standards. Since the mathematics curriculum standards for compulsory education have been implemented for eight years, and the revision work for it is about to start, how is the current status of the research on the problem posing? Where need to be deepened for future research? These are all worthy of study, so this study will sorts out and analyzes the literature involving problem

presentation in the master's thesis over the past 14 years, aiming at clearly reviewing and expressing the research status of the questions raising and making a positive outlook for the future problem posing research.

2 Research design

The research value of literature data sorting lies in the selection value of literature data. After looking for related research, the master thesis from 2004 to 2017 were selected as the main object of the research in this article for the reasons that the master thesis can reflect the attention of the subject in a certain year and the master thesis has a high academic level and value.

A total of 18 excellent master thesis were obtained by searching "junior high school mathematics" and "problem raised" as keywords in the database of CNKI master thesis, then were sorted out and analyzed according to the year distribution, institution distribution the theme of the thesis and other four aspects through classified statistic method.

3 Results and Findings

3.1 Year distribution

Taking time (year) as the independent variable and the number of papers (the number of papers) as the dependent variable, it can be obviously seen the change in the number of research each year through the statistics of the chronological distribution of master's thesis on junior high school mathematics problems in the past 14 years. All of the thesis except for 6 years involved the topic in the past 14 years. Five articles appeared at the peak in 2014 though it is relatively weak in terms of total volume. According to the line chart, it can be roughly divided into four periods: the budding period (2004-2006), the growth period (2010-2014), the decline period (2014-2015), and the smooth transition period (2016-2017). It shows that the subject needs further research and development.

3.2 The distribution of paper institutions, citations and downloads

Institutional distribution can clearly illustrate the inheritance of a certain institution's research work on this topic. The master thesis in 14 years involve 12 college institutions, covering vast majority of normal undergraduate colleges and universities, indicating the attention and development of colleges and universities on this research theme. Universities that have two

papers are as follows: East China Normal University, Nanjing Normal University, Shaanxi Normal University, Inner Mongolia Normal University and Chongqing Normal University.

Citations and downloads can highly describe the academic application and impact value of the literature. At the same time, it can also highlight the attention paid to the research during this period. The superimposed statistics of cited and downloaded documents can clearly demonstrate the application and attention value of documents in each year. The cited quantity developed steadily, reaching a maximum of 39 times in 2012, which may be related to the newly issued standard for mathematics curriculum for compulsory education in 2011. The standard makes clear the requirement that “students’ finding and raising problems themselves are the basis for innovation”, causing the closeness of national basic courses in the selection of master thesis, which also confirms the rationality of selecting a master's thesis as a reason to be able to characterize a research hotspot in a certain period. At the same time, the number of downloads reached its height in 2012, 2270 times in total, which is a true reflection of the former.

3.3 Methods of thesis research

The level of research methods plays an important role in the scientific research level of mathematics education research. In terms of the research method, people can judge the scientificity of the research result, and can use the same research method to conduct experiments repeatedly as well in order to further verify this research result. As a result, it is really significant to sort out the research methods used in the master's thesis of statistics. It is found that the research methods involved are teaching practice experiment research method, test (scale), questionnaire method, interview, observation method (Classroom observation, video recording), comparison, action, case, literature analysis and other research methods. The research methods of thesis are diverse with empirical and qualitative research. One of the two most prominent peaks is the literature research method, there is no doubt that the inheritance and unique innovation of this research work can be seen through literature analysis of past research. Secondly, the usage frequency of interview method and the case study method rank high, the former method incorporates qualitative data into some questions of the questionnaire method to enrich and improve the reasonable and scientific nature of the survey data.

Similarly, the case study method also provides the research with real condition information.

3.4 Research themes

The topic was roughly divided into five research areas: comparison of textbooks for questioning, research on questioning ability from a theoretical perspective, practical research on question raising ability, research on the awareness of mathematical problems, and research on investigation strategies for question raising. The research topics cover 10 research topics, of which the most researches are on the status quo of questions, followed by the practical research on problem-posing in classroom teaching, the research on problem-awareness cultivation and the research on problem-proposing strategies. The other topics are all placed for just one article.

4 Reflection and outlook

It is not enough to conduct simple statistical analysis of the previous data for the literature review, it must have a reflection on the research status, that is, a reflection on the problem of insufficient research with necessary prospect of profound research on the subject in the future. Based on this research path, this section mainly reflects on the current problems in the research of master thesis, and proposes several directions for future research expansion, which is just for research reference.

4.1 Insufficiency of existing research

4.1.1 Ignorance of domestic research on the textbook content

Textbook research is a critical field in education and teaching research, it can clearly examine the static processes such as the layout of teaching content and the expression of text and language. However, there is only one in this field, and it is a comparative study involving international textbooks. Even though the comparison can draw some similarities and differences between the two countries in the textbooks, it provides some beneficial help for textbook compilation and teacher teaching. However, there is still a lack of comparison of the domestic textbooks contents. Obviously, the subject textbook field has not been ignored.

4.1.2 Formalization of problem raising under the the guidance of theory

Reviewing the research process under the guidance of the theory involved in the study, it can be seen that

after all the connotations and values of the theory are basically overview in detail first, and then the theory is infiltrated or directly applied to the teaching process of the question raising without mentioning the rationality of this kind of theoretical "grafting", it can be said that this is a powerful practical exploration or positive teaching attempt. However, there is no effective detection for the practical effect under the guidance of theory. Therefore, the questions raising under the guidance of theory is also formalized instead of focusing on the substance.

4.1.3 opposite direction of demonstration and qualitative research

Empirical research is conducted by researchers collecting observation data in order to put forward or test theoretical hypotheses, including mathematical empirical studies and case empirical studies. Qualitative research is a kind of activity that the researchers regard themselves as research tools to form conclusions and theories from the original data and interact with the research object to gain an explanatory understanding of its behavior and meaning. Obviously, looking back at the research over the past ten years, there are three types of empirical, qualitative and empirical qualitative, but for the third kind, there has been problems like unclear understanding of the essence and process elements in qualitative research leads to its shallowness without close integration of physical experience and qualitative research. Instead, it is contrary to the initial purpose of combining with discrete presentation and chaotic expression.

4.1.4 Fuzzy and superficial results and countermeasures of research

From the status quo, the conclusions of the countermeasures (strategy) research results, etc.: "empty" and meaningless guidance for actual teaching; "big" strategy for teaching guidance has not been implemented to the specific implementation link; The conclusion part is often generalized. The expression of conclusion hurriedly made part was not rigorous enough with no strategy pointed out currently of the investigation combined with specific teaching.

4.2 Prospects for future research

Broaden thoughts of the field, attach importance to the study of textbook content, and enhance the expression of the teacher's question raising. The richness of the research field is an important guarantee to promote the

development of research. The research on the junior high school mathematics problems posing should advocate thinking from several fields such as textbook compilation, teacher teaching, and student learning to broaden the research ideas. Textbook compilation should start from the content settings of various versions of textbooks, and textual language expression to provide the possibility of teaching problems; teacher teaching can start from teaching skills and classroom discourse system; students learning is mainly because of can seek student questions from a psychological perspective of the psychological mechanism and learning motivation.

Deepen the guiding ideas, reiterate the theory to guide the practice, reflect the complement of the theoretical practice; highlight the guiding ideas, reiterate the theory to guide practice, and reflect the complementarity of theoretical practice; The theory is indispensable for the guidance of practice, and the suitability and rationality of theory for practice require researchers' sincere and serious scientific research attitude. In fact, it can be put forward a theoretical support suitable for the teaching of problem raising from the perspective of philosophy, psychology, history, information technology and other disciplines in the future, showing the complementarity of theory and practical teaching.

Be rigorous about thoughts, attach importance to empirical and quantitative combination, improve scientific and appropriate research methods; The selection of research methods is a benign guarantee for the research process and conclusions. As a result, as the most important question in the mathematics teaching, the research on teaching link of problem raising should be the perfect combination of empirical and qualitative research, improving the rationality and effectiveness of the research through the empirical mathematics and qualitative data supplementary evidence is a good combination way to increase the research conclusion from singularity to diversity, which can provide specific and effective practical measures for teaching reference.

Develop the logical thinking, focus on the study of results and countermeasures, and manifest the value of research results. The design of the research and its process serve the research question, so the conclusion should fully indicate the value and significance of the research, and the correspondence between the questions and the conclusions should be logical instead of being ignored in a general way, the research conclusion should be able to promote the healthy development of

teaching. Therefore, the logical thinking of the research should be improved, fully demonstrating as the research value purpose.

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