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Research on Attribution and Countermeasures of Students with Learning Difficulties in Mathematics

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Abstract

In the practice of mathematics teaching, some students have difficulties in mathematics learning. The learning efficiency and effect of these students are far away from the ideal state. Therefore, there are a lot of studies on the phenomenon of mathematics learning difficulties but almost no comprehensive and general study on this subject. By using literature method, this paper summarized the related studies on the students with mathematics learning difficulties in China and came to the following conclusions: (1) In recent years, the studies on the attribution of students with mathematics learning difficulties are mainly divided into three aspects: students' attribution, objective environment attribution and school curriculum teaching attribution; The studies on the countermeasures of mathematics learning difficulties are mainly divided into two aspects: guiding students to adjust themselves and aiming at mathematics teaching reform. The previous studies are not only in-depth but also obtain many achievements. (2) Reviewing the previous studies, we can find that there are some obvious deficiencies. There are still many omissions in the preciseness and scientific nature of the whole research process, such as the reliability and validity of the questionnaire, the selection of research samples. Another deficiency is the countermeasures of school education put forward by predecessors, some of which are too theoretical or not detailed enough, leading to these measures difficult to implement. In terms of research content, there is a lot of attribution and countermeasures are lack of group pertinence, only a few achievements include the countermeasures or attribution of specific groups. (3) There are also some gaps in previous studies. For example, there is a lack of studies on the evaluation mechanism of the implementation of countermeasures; there is a lack of effective and unique countermeasures and suggestions combined with the characteristics of different student groups. Therefore, future research must adopt more scientific research methods, expand the scope of research on mathematics learning difficulties on the premise of ensuring its scientific nature and persuasiveness; it is necessary to explore measures to improve mathematics learning difficulties from a broader and more feasible perspective to make this study more comprehensive and in-depth.

Keywords

Mathematics, Learning, Difficulties, Transformation

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1. Introduction

The Outline of Basic Education Curriculum Reform (Trial Implementation) previously promulgated highlights the two major characteristics of popularization and foundation, and conveys the concept of "one cannot be less"; The new mathematics curriculum standard also clearly points out that everyone should be able to learn mathematics well and learn valuable mathematics [1], emphasizing the wholeness of learning subjects. But looking back at the current front-line mathematics teaching practice, we can find that there are a lot of students with mathematics learning difficulties [2]. If the mathematics learning effect of this group of students is not ideal, it will greatly hinder the development of students themselves, and can not adapt to the upsurge of education reform for the development of every student. Therefore, it is very important and necessary to study how to improve

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students' mathematics learning difficulties. At present, there has been a lot of research achievement on students with mathematics learning difficulties, mainly on the attribution and countermeasures of students with mathematics learning difficulties, but there is little comprehensive research on this topic. Therefore, to find out the current research status of students with mathematics learning difficulties, the existing deficiencies and blank points, this paper intends to conduct a comprehensive summary and summary of previous studies. This study can not only help researchers to clarify the current research ideas and results, but also provide the researchers with ideas and directions for further research through the summary of this study, and promote further research by pointing out the deficiencies and blank points that have not been involved in.

The main research questions of this paper are as follows: (1) what are the main research results about the attribution and improvement measures of students with mathematics learning difficulties? (2) What are the deficiencies and gaps in the current research on the attribution and improvement measures of students with mathematics learning difficulties?

2. Methods

2.1. Data Source

This paper only studies Chinese materials, and all references are from the CNKI database. CNKI is a large-scale full-text database covering and disseminating various forms of literature and materials in China, such as journals, doctoral dissertations, conference minutes, newspapers, patents, yearbooks, and so on. It is the most authoritative literature retrieval tool for national academic journals, which contains all the contents of Chinese journals, including various disciplines. Therefore, based on the integrity of its literature collection and huge academic influence in China, this paper selected this database to ensure the integrity of references and the reliability of the study. The selected documents include journal papers, conference reports and dissertations.

2.2. Data Collection

The author took "mathematics learning difficulties" as the basic keywords, respectively used "causes", "attribution", “reasons”, "countermeasures" and "strategies" as the keywords, and took "subject" as the search items. After four times of literature retrieval, 175 results are found. After reading all the literature, it was found that the first time to study the causes and strategies of students with mathematics learning difficulties was in 2001. Excluding the same retrieval results, the criteria for further determination of data are as follows: (1) Chinese articles published in China; (2) clear attribution and countermeasures of students with mathematics learning difficulties; (3) Only papers published in recent ten years are selected. After screening, 25 papers were selected as data.

2.3. Data Collation

After a preliminary review of the selected literature, it is found that the depth and breadth of the research are limited, so the author used the method of taking notes to sort out the previous research results. In the process of reading the literature, the author summarized the research methods, research problems, research results and conclusions in each paper.

After reading all the articles, it is preliminarily believed that the current attribution research mainly focuses on the students' subjective attribution, objective environment attribution and school curriculum teaching attribution; At present, the research on the strategies of mathematics students' learning difficulties mainly focuses on the measures to guide the students to adjust themselves and the measures for the reform of mathematics teaching.

3. Results

According to the summary and analysis of previous studies, the author holds that the current studies on the attribution of mathematics students' learning difficulties mainly focus on the students' subjective attribution, objective environment attribution and school curriculum teaching attribution; the studies on the countermeasures of mathematics students' learning difficulties mainly focus on the measures to guide the students to adjust themselves and the measures for the reform of mathematics teaching.

3.1. Research Status of Attribution of Students with Mathematics Learning Difficulties

3.1.1. Students' Subjective Attribution

The subjective cause of students' difficulties in learning mathematics comes from the students themselves, which can be roughly divided into non-intelligence and intelligence factors.

For the attribution of non-intelligence factors of students, Che and others made psychological attribution on the learning difficulties of deaf-mute children and believed that they were mainly affected by three emotions: external dependence, passive learning, and psychological inferiority [3]. Li and others take high school girls as the research objects, pointing out that they lack independent learning consciousness, learning interest and strong dependence on non-intelligence factors [4]. Zhou analyzed the causes of rural primary school students' mathematics learning difficulties and thought that the main reason for the difficulties was the interest and

improper learning attitude of left-behind children [5]. Tian used literature method and interview method to study minority college students and thought that students' interest, initiative and self-efficacy were too low [6]. Through a questionnaire survey, Wu studied the reasons for the students with learning difficulties in learning probability theory and found that students lack good learning habits, unclear learning purposes, and lack of will [7]. Su studied the learning difficulties of rural high school freshmen, and found that some students had low interest in learning and low enthusiasm for learning [8]. Mao pointed out that the basic reason of vocational students' mathematics learning difficulties is their low self-efficacy [9]. Zhong studied the reasons for the increase in the proportion of junior high school mathematics underachievers. He believed that students' lack of self-confidence, lack of interest and weak will to learn are the important reasons for learning difficulties [10]. Gao thinks that the high school students have great psychological pressure because they pay too much attention to mathematics [11]. Chen studied the phenomenon of learning difficulties of high school girls, and found that the physiological changes of girls were greater than that of boys, dispersing part of students' energy; girls' learning enthusiasm was not high enough, and inferiority complex was also one of the reasons [12].

As for the attribution of students' intelligence factors, Tian thought that students lacked reasonable thinking mode and scientific learning methods, which led to learning difficulties [6]. Wu used the method of the questionnaire survey and found that students' basic knowledge of mathematics, symbolic expression ability, mathematical problem transformation ability, and problem analysis ability are poor [7]. Su thinks that the foundation of rural freshmen in thinking ability and learning methods is too weak, which leads to learning difficulties [8]. Mao thinks that the direct cause of learning difficulties is the poor mathematical foundation of vocational students, and the important reason is the lack of learning ability [9]. Zhong thinks that junior high school mathematics underachievers have defects in learning methods and skills, which leads to the increase of the proportion of backward students [10]. Wang thinks that because of the weak grasp of basic knowledge and methods, senior high school sports students have slow reaction, calculation errors and learning difficulties [13]. Bai and others analyzed the reasons for the difficulties in learning advanced mathematics of independent college students, and pointed out that one of the reasons was the students' thinking and cognitive impairment [14]. Gao discusses the causes of junior high school students' difficulty in abstract thinking. He thinks that students' meta-cognitive ability is insufficient, they can not actively control their thinking process, and it is difficult to achieve a balance in the process of assimilation and adaptation interaction [15].

3.1.2. Objective Environment Attribution

Zhou thinks that the poor economic conditions in rural areas lead to relatively backward teaching equipment and cultural concepts, which has a certain negative impact on students with learning difficulties [5]. Xu and others put forward that there are negative factors causing students' learning difficulties in the family environment, such as the degree of family attention, parents' cultural level and so on [16]. Wu analyzed the reasons for the students' difficulties in learning mathematics. He thought that the common effect of nature, geography, and history not only caused the situation of lax study style and low ability but also led to the students' difficulties in adapting because of the students' different language habits, life culture, and their national cultures [17]. Mao thinks that the current vocational schools adopt a unified teaching management mode, which is convenient, but ignores the learning enthusiasm of the students, and the unified assessment method also destroys the students' self-confidence and self-esteem [9]. Li thinks that the backward teaching equipment in rural high schools and parents' insufficient attention to students' learning are the important external reasons for students' learning difficulties [18].

3.1.3. Attribution of School Curriculum Teaching

Qiu thinks that the reason why freshmen in senior high schools are prone to learning difficulties is inseparable from the characteristics of mathematics textbooks which are "difficult, large capacity and high starting point". Besides, due to the various teaching contents, teachers' teaching methods are too rough, and students' absorption effect is not ideal [2]. Shan and others believe that the sudden improvement in the abstractness, rigor and logicality of the content of mathematics textbooks, the great transformation of mathematical research objects from number to form and then to the combination of number and shape, and the changes of teaching methods and contents in different research periods all cause students to have too much pressure on learning mathematics so that they can not quickly adapt to the rapidly increasing difficulty of mathematical knowledge learning [19, 20]. Xu explores the causes of the students with learning difficulties in vocational schools and thinks that the main reasons are the burnout psychology of some teachers and the imperfect education system [16]. Zhang takes the students with learning difficulties in independent colleges as the research object, and probes into the causes of difficulties in learning higher mathematics. In terms of teachers, she believes that teachers blindly inculcate the contents of teaching materials, and simply use books as the carrier, lacking the application connection between knowledge and

real life, and the feedback is not timely. Most of the class hours are new teaching, and lack of practice and summary lessons [21]. Su investigated the causes of learning difficulties in higher mathematics, Pan explored secondary vocational students, both studies pointed out that teachers can't teach well and the tradition of teaching strategies is one of the important reasons for learning difficulties [22] [20]. Li studied the higher mathematics learning of liberal arts students and found that the contradiction between content and class hours caused students learning difficulties [23].

3.2. Research Status of Countermeasures for Students with Mathematics Learning Difficulties

3.2.1. Measures to Guide Students to Adjust Themselves

The countermeasures to guide students to adjust themselves can be roughly divided into two aspects: non-intelligence factors and intelligence factors.

For the improvement measures of non-intelligence factors, Qiu believes that we should pay attention to the implementation of emotional education for students, correct their learning attitude and enhance their confidence in learning [2]. Mao believes that teachers and students should strengthen communication to create a relaxed and happy learning atmosphere for students [9]. Zhong thinks that the relationship between teachers and students should be improved, teachers should let students experience the generation process of knowledge, create a learning competition environment, play the role of interesting mathematics and show their artistic charm to improve students' interest in learning [10]. Liu believes that teachers should attach importance to communication with students, help students solve problems, and establish self-confidence in learning mathematics [24]. Wang thinks that it is necessary to stop the rambling state of high school sports specialty students and help them establish a correct learning concept [13].

For the measures of intelligence factors, Su thinks that teachers should strengthen the guidance inside and outside the class to help students find the correct learning methods [8]. Zhong believes that teachers should teach students how to learn, help students summarize learning methods and establish correct learning concepts [10]. Chen believes that teachers should pay attention to training students' thinking, so that students can learn to listen to lessons, summarize in time, and be good at transformation [12]. Bai and others believe that teachers should help students guide their thinking and learning methods, and pay attention to letting students participate in the whole process of knowledge generation [14]. Zhang believed that students should be urged to self-regulation and reflection, help students summarize and sort out mathematical knowledge, and promote their autonomous and active learning [21]. Li thought that we should improve the liberal arts students' self-study ability of higher mathematics to promote their learning [23].

3.2.2. Countermeasures for Mathematics Teaching Reform

Zhang proposed that teachers should make full use of modern teaching software and means in teaching, and formulate a complete teaching plan and outline, and focus on the teaching of basic courses [21]. Wu believes that for ethnic students, we should pay attention to the teaching of ideological methods, inspire and induce students, train their mathematical skills, and improve their thinking ability [17]. Tian proposed that we should attach importance to the intuitive teaching [6]. Shan and others put forward that for the phenomenon of learning difficulties in college mathematics, teachers should improve teaching methods and complete the knowledge connection between the university and middle school; We should pay attention to the explanation of abstract concepts, infiltrate the idea of mathematical modeling, encourage students to think deeply and improve their mathematical ability in all aspects [19]. Li pointed out that in teaching, teachers should optimize and integrate teaching contents, enrich homework forms, and improve teaching methods and means; It is also suggested that the evaluation model of mathematics learning should be reformed [23]. Su put forward the countermeasures for higher mathematics. He thought that teachers should strengthen their professional quality and teaching skills, pay special attention to the seamless connection between middle school mathematics and university mathematics, and improve the learning evaluation system [20]. Pan thinks that the learning atmosphere also affects mathematics learning. Therefore, teachers should strengthen the construction of study style and class atmosphere to create a learning atmosphere of learning happily [22]. Tian thinks that teachers should combine the students' reality and the content of teaching materials, and combine the two to teach students at different levels [6]. Wang put forward some suggestions on how to make full use of the advantages of music inclined students to learn mathematics better, such as explore and adopt teaching methods in line with the characteristics of a music major, and teachers should often reflect on teaching [25].

Besides, there are very few studies that mentioned the objective environment to change the measures. For example, Zhou proposed that the government should increase investment in rural education, improve teaching facilities, promote the construction of home school cooperation, and strengthen the ties among parents, teachers and schools [5].

4. Discussion

The attribution research of the students with mathematical difficulties shows that it mainly includes three aspects: Students' attribution, objective environment attribution, and school curriculum teaching attribution. The reasons for students mainly involve two aspects: non-intelligence factors and intelligence factors. Non-intelligence factors mainly involve students' interest and motivation, learning will, independent consciousness, dependence and inferiority complex. Almost all studies agree that learning interest and motivation are important factors causing learning difficulties. Besides, students' weak will to learn, and some psychological problems also cause this phenomenon. In the aspect of intelligence, it mainly includes the students' improper learning methods, learning plans and good habits lack, and problems in the way of thinking, knowledge construction and representation. In the past, the predecessors consider several aspects, such as regional differences, economic conditions, and family background. For the attribution of school curriculum teaching, the predecessors mainly considered the teaching concept and professional skills of teachers, the content of teaching materials, and so on.

From the summary of the studies on the countermeasures of the students with mathematical difficulties, we can see that it mainly involved the students and the reform of mathematics teaching. Similar to the attribution, the former studies on the countermeasures for students can be roughly divided into two aspects: adjustment of non-intelligence factors and adjustment of intellectual factors. In terms of non-intelligence factors, most of the previous studies advocated to enhance students' interest in learning, motivation and will; From the perspective of intelligence factors, previous studies mostly put forward suggestions from the aspects of learning plans, learning methods and learning ability (such as thinking ability and self-study ability). Given mathematics teaching reform, the past studies mainly discussed from the renewal of teachers' educational concept, the enhancement of teaching professional skills, the diversification of teaching methods and means, and the friendly relationship between teachers and students. Besides, there are also a few studies that put forward strategies for external factors such as family and government.

As for the research methods, when sorting out the literature notes, it is found that in addition to the theoretical speculative research method, there are also many empirical research methods such as questionnaire surveys and interview to explore the attribution and countermeasures of the students with mathematical difficulties. As for the selection of research objects, previous studies have involved primary and secondary school students, deaf-mute students, minority students, vocational school students, art students, college students, and other groups. From the summary of the previous research content and the analysis of the research process, we can see that the predecessors have a certain depth in the research content and method, and the research results are constantly emerging.

But even so, there are still some deficiencies in previous studies. In the research process, although many studies use empirical research methods for data analysis to ensure the persuasiveness of the research, there are still many omissions in its rigor and science nature, such as the reliability and validity of the questionnaire, the selection of research samples and so on. For example, in the countermeasures of school education put forward by predecessors, many studies have not put forward specific and operable teaching methods, so such achievements are of little significance and are difficult to realize in teaching practice. In terms of research content, it can be seen from the above that the previous studies have involved the phenomenon of mathematics learning difficulties of various groups. However, after reading the studies carefully, it can be found that many attribution and countermeasures are almost the same for different groups, and only a few achievements contain countermeasures or attribution with the particularity of the research group.

Besides, there are some blank points in the previous research. For example, based on the above countermeasures, there are no clear judgment and evaluation criteria for the effectiveness or the degree of effectiveness after the improvement education of students with learning difficulties. And there is a lack of effective and unique countermeasures and suggestions combined with the characteristics of different student groups.

5. Conclusions

Through reviewing, sorting, and analyzing the previous studies on the attribution and countermeasures of students with mathematics learning difficulties, this paper came to the following conclusions:

In recent years, the studies on the attribution of students with mathematics learning difficulties are mainly divided into three aspects: Students' attribution, objective environment attribution, and school curriculum teaching attribution; The studies on the improvement measures of mathematics learning difficulties are mainly divided into two aspects: guiding students to adjust themselves and aiming at mathematics teaching reform. The previous studies were not only in-depth but also obtained many achievements.

Reviewing the previous studies, there are obvious deficiencies. There are still many omissions in the preciseness and science nature of the whole research process, such as the reliability and validity of the questionnaire, the selection of research samples, and so on. And some of the measures put forward by

predecessors about the reform of mathematics curriculum are too theoretical or not detailed enough, which makes it difficult to implement these measures. In the research content, there is a lot of attribution and countermeasures which lack group pertinence, only a few achievements include the countermeasures or attribution of specific groups.

There are also some gaps in previous studies. For example, there is a lack of evaluation mechanism research on the effectiveness of the implementation of countermeasures and the lack of effective specific countermeasures combined with the characteristics of different student groups.

In the future, therefore, it is necessary to expand the scope of scientific research, adopt more scientific research methods and standardize the research process from science nature and persuasiveness perspective based on previous studies; It is necessary to explore the strategies and suggestions to improve mathematics learning difficulties from a broader and more feasible perspective to make future studies more comprehensive, systematic and in-depth.

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