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A Preliminary Study on the Enlightenment of Mathematical Philosophy to Mathematics Educators

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Abstract: The debate on the objectivity and subjectivity of mathematics is a debate in the philosophy of mathematics.The origin of philosophy of mathematics can be traced back to the Pythagorean school in ancient Greece,and philosophy of mathematics continues to this day with its unique charm.Through the discussion of the objectivity and subjectivity of mathematics,this paper better applies the philosophy of mathematics-to-mathematics education and lays a solid theoretical foundation for its own mathematics teaching in the future.

Keywords: Philosophy of mathematics;Objectivity;Subjectivity;Mathematical culture

1. Debate on subjectivity and objectivity in philosophy of mathematics

Is mathematics education a subject biased towards subjectivity or objectivity?Different factions in the philosophy of mathematics express their own views on the answer to this question.The three most representative factions to answer this question are absolutism,constructivism,and radical constructivism.Absolutism holds that mathematics is a kind of absolute reality(objective truth),which exists independent of human cognition.Constructivism holds that mathematics has both subjectivity and objectivity.Radical constructivism has a similar but not the same point of view,they believe that knowledge depends on the purely subjective construction of individuals,it is a tool for individuals to organize the empirical world,not to discover Noumenon.Radical constructivism opposes regarding mathematics as a firm objective science and advocates the constructiveness of mathematics.[1]In short,radical constructivism and absolutism tend to be more extreme than constructivism,while constructivism follows the principle of"choice",which not only recognizes the objectivity of mathematics,but also does not deny its subjective color to a certain extent.These three doctrines provide three perspectives for the study of the subjectivity and objectivity of mathematics,so that we can look at mathematics from a multi-dimensional perspective,thus having their own impact on mathematics education.[2]

I personally think that constructivism is of more practical significance to the cognition of the essence of mathematics,because for mathematics,it not only includes pure theoretical mathematical knowledge,but also includes a kind of inherited activity-mathematics education.Relatively speaking,a series of mathematical formulas such as theorems and formulas are derived from predecessors through practical activities,so they are more objective;but mathematical culture,as a kind of spiritual food in the current society,plays an inestimable role in the all-round development of human beings.as a bridge between scientific education and humanistic education,it always gives people ideological enlightenment and adds some subjective color to mathematics.

2. Objectivity in Mathematics

After passing Brinkhoff and Feng.After Neumann's research and analysis,the theory of modern generation mathematics and its related branches have been continuously developed.The introduction of group theory,ring theory and various abstract concepts makes people question the objectivity of mathematics.Is the mathematical object objective?Is mathematics an objective existence or a product of human thinking?[3]

Although the famous mathematician Hilbert said:"in every branch of mathematics,the first and oldest problems must originate from experience and are raised by the external real world."He revealed the subjectivity of mathematics from the point of view of the origin of mathematics.However,we can not only examine the problem on the one hand,mathematics,language,and science are all human activities,and a series of mathematics-related knowledge such as mathematical concepts and mathematical theorems can't be obtained by human thinking.but through the practice of generation after generation of mathematicians,the mathematical theory obtained through practice provides a tool for the transformation of society,and practice is a subjective view of the objective activity. It is a social activity in which people actively transform and explore all objective materials in the real world.Therefore,the rapid development of mathematics depends on people's practical activities.

Based on the objectivity of mathematics,I think that mathematics education in the future should pay more attention to cultivating students'concept of practice and spirit of exploration,to make students understand that the essence of mathematics still comes from practice and in turn serves practice.Educationist Dewey once expressed his views on the nature of education.[4]He believed that the

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essence of education can be divided into three levels:education is growth,education is life,and education is transformation.He believes that the process of education is the process of continuous reorganization,transformation and transformation of personal experience,and students must acquire experience through personal activities.Dewey thus put forward the principle of"learning by doing".

What is more important in mathematics education is to cultivate students'spirit of self-thinking and self-inquiry,while teachers should play the role of a guide.In the traditional teaching mode,teaching activities are mainly carried out with teachers as the center,and students play the role of receivers.This kind of instillation education obviously can't meet the requirements of higher and newer quality of talents today.Therefore,in mathematics teaching,we might as well try"Quincy Education method",that is,"Education should make schools and teachers adapt to students,not students adapt to teachers"teaching method.However,this is not a complete establishment of a"student-centered"education and teaching method,but only allows teachers to think more from the students'point of view in curriculum design,so that students can participate more in the classroom,not only let students accept knowledge,but also actively explore knowledge and develop various abilities with the help and guidance of teachers.

3. Subjectivity in Mathematics

People use different mathematical knowledge in practice,so mathematics may be more objective from the dimension of application. But as Professor Qinan Huang pointed out:"in the modern sense,mathematical culture,as a basic cultural form,belongs to the category of scientific culture.[5]From a systematic point of view,mathematical culture can be expressed as a mathematical scientific system as the core."with the relevant cultural fields radiated by the ideological,spiritual,knowledge,method,and technical theory of mathematics as an organic part,it is a dynamic system with strong spiritual and material functions.[6]Today's mathematics contains such a numerous mathematical culture,so the objective mathematics is integrated with some subjective elements.

From a historical perspective,mathematics plays different roles in different historical periods.The emergence of a series of mathematical civilizations,such as ancient Egyptian pyramid culture and ancient Babylonian cuneiform,have made today's mathematical culture more colorful.From the perspective of artistic dimension,"number"and"beauty"have been inseparable since ancient times,the encounter between the Mona Lisa portrait and the golden ratio,the zigzag coastline and mathematical classification,the fusion of music and Fourier analysis,the collision between the number of petals and Fibonacci mathematics shows the unique charm of mathematics itself.Therefore,mathematics itself can be said to be a creative art,which gives people the enjoyment of beauty.

As a kind of spiritual food,mathematical culture can purify people's state of mind and make people feel that mathematics is not a series of meaningless numbers and formulas.The rapid development of modern science and technology is inseparable from mathematical tools,so modern mathematics education often pays too much attention to the cultivation of students'mathematics knowledge,thus neglecting the development of human spirit.this phenomenon often makes students have the tendency of utilitarianism,which is not conducive to the development and progress of society and human civilization.

4. Realize the unity of subjective and objective

Dialectical materialism holds that people's cognitive task is to obtain the specific historical unity between the subjective and the objective,and the same should be true of mathematics.Mathematics originates from human practice,so mathematical science is objective.However,as an important part of mathematics,mathematical culture exists in different periods of society with its unique charm,enriching people's spiritual world,and its rigorous quality and style also represent a basic virtue of human beings.

At present,with the rapid development of science and technology,mathematical tools play an important role.As a teacher,we should train students to dare to try,be willing to make mistakes,dare to practice and be willing to study.Guide students to apply what they have learned to practice and encourage students to"learn by doing and doing in learning".

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