Experimental research on mathematics teaching of “situated creation and problem-based instruction” in Chinese primary and secondary schools

Abstract  This research tends to make the experimental study on the mathematics teaching model of “situated creation and problem-based instruction” (SCPBI), namely, the teaching process of “creating situations—posing problems—solving problems—applying mathematics”. It is aimed at changing the situation where students generally lack problem-based learning experience and problem awareness. Result shows that this teaching model plays a vital role in arousing students’ interest in mathematics, improving their ability to pose problems and upgrading their mathematics learning ability as well.

Keywords mathematics situations, problem posing, problem solving, mathematics teaching, experimental class, control class

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1 Introduction

In mathematics teaching of primary and secondary schools, teachers usually devise some mathematical problems for students to solve, such as mathematical proof, algebraic computation, numerical inspection etc. Most of them are characterized by their clear statements and definite targets. Obviously, they could have helped students to master mathematical knowledge and skills, however, these problems are far from all mathematical activities. In fact, whether it is a science subject or a mathematics activity, mathematics consists of two aspects: “problem posing” and “problem solving”. Therefore, when the “problem” is regarded as the heart of mathematics, it seems to be not only the “problem-solving” object, but also the mathematical creativity which can be found.

In response, Full-time Compulsory Education Mathematics Curriculum Standard (experimental draft) (MEPRC, 2001) and Senior High School Mathematics Curriculum Standard (Experimental Draft) (MEPRC, 2003) promulgated by the Ministry of Education one after another, specify the curriculum target that students should learn how to pose mathematics problems, understand them and solve them from the mathematical angle.

However, the real mathematics classroom environment shows us the prospect. First, teachers’ classroom questions are in high density and low level, which arouses people’s doubts about this “lack of interactive teaching”. Second, the learning method of getting accustomed to learning to “answer” instead of learning to “pose” is hindering students’ development of problem consciousness and innovation ability. Thereupon, when problem posing has become the important component in mathematics curriculum, and when experimenting, observing, exploring and conjecturing have become the same important mathematics thoughts and methods as logic and abstract, people cast their eyes on the common topic, “Why do our students rarely ask questions?”

Over the past two decades, teaching research into mathematical problem posing has attracted the popular attention of the field of mathematics education at home and abroad (Xia, 2005). The main reason for this lies in the reflection of the current situation on teaching practice of problem solving, and the developing requirement of knowledge and economical society on mathematical initiative talent. The research focuses on how to instruct and encourage students to find out and pose problems with the help of their problem awareness. Consequently, researchers discuss the teaching methods and strategies of “problem posing” from different angles, which offers abundant resources, that is, the transition from curriculum ideas to teaching reality.

However, the research on the “problem posing” in China remains in the beginning phase. In fact, it was not until the promulgation of National Elementary