

國科會計畫

計畫編號: NSC99-2511-S018-016

研究期間: 9908-10007

國中生數學素養的評量與提升數學素養的教學活動設計
Assessing Junior High School Students' Mathematical Proficiency and
Developing the Teaching Activities Design for Promoting Students'
Mathematical Proficiency

秦爾聰

中文摘要

本研究的目的是在於依據 Kilpatrick 等人所提出的「數學素養的五股能力」為架構 (NRC, 2001)，並參考 PISA 國際評比中有關數學素養的評量架構，發展出評量學生數學素養的有效方式，並且據此設計出國中階段各單元以發展學生數學素養為導向的教學活動(含形成性評量)與數學素養的評量試題。研究設計第一年會先針對個案教師進行為期一學年的課室觀察，並應用 NVivo 8 的質性資料分析軟體(依據紮根理論所設計的一套軟體)來分析其學生所展現的數學素養，以試圖歸納整理出「數學素養的五股能力」所可以量測的具體模式，同時亦對老師的教學進行分析，作為教學活動設計的參考；接者以一年三個月的時間，以筆者先前所發展之臆測為中心的數學探究學習套件為基礎，針對「數學素養的五股能力」的架構作重新的教學活動設計，並融入形成性評量與設計每一單元後之評量試題，透過發展研究法中的思考實驗與教學實驗來進行教學活動設計的效化；最後九個月的工作則是彙整各單元教學活動設計中的學習評量試題，整理設計成每年級各階段的評量試卷，並檢驗內容效度、專家效度，與透過對學生的施測來檢驗庫李信度、折半信度、重測信度與效標關聯效度來進行效化，以發展成為可量測國中生數學素養的有效工具。

關鍵字：數學素養；評量；教學活動設計

Abstract

This three-year research project is aimed at developing an effective approach for assessing junior high school students' mathematical proficiency, by basing on Kilpatrick's theory of "The five strands of mathematical proficiency" and PISA international assessment framework of mathematical literacy. By means of the developed approach, instructional activities (with formative assessment) for fostering students' mathematical proficiency and test items for examining students' mathematical literacy of each topic in the curriculum are to be designed. The research design is as follows: In the first year, by means of observing a case teacher's classroom teaching for a whole year, all the collected qualitative data are to be analysed by using NVivo 8 (a qualitative data analysis software based on the framework of "Grounded Theory") for investigating the students' mathematical proficiency, in order to generalise an assessment model for examining students' five strands of mathematical proficiency. Besides, the teacher's teaching is also analysed for the reference of further teaching activity design. In the following one year and three months, based on the work of my former research, the teaching activities of all the topics in the curriculum are to be designed, which are validated through "thought experiments" and "teaching experiments". In the last nine months, all the test items from each teaching activity will be collected to form exam papers for different periods of the three years junior high school curriculum. All the exam papers will be validated through examining the content validity, expert validity, Kuder-Richardson reliability, split-half reliability, test-retest reliability, in order to develop a valid instrument for assessing junior high school students' mathematical proficiency.