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高中學生進行開放式探究活動之個案研究－問題的形成與解決
A Case Study of High School Students Doing Open-ended Inquiry Activity: Problem Framing and Solving

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中文摘要

近年來，鼓勵學生進行探究活動已成為科學教育界普遍關注的議題。探究導向的教學，是 以學生的探究活動為中心，經由問題解決的過程，一方面讓學生體會科學探究的經驗，學習到科學的過程 與技能，另一方面，探究的主題可以打破學門的藩籬，學生探究自己有興趣的問題，在真實的科學活動中 建構、理解科學知識。本研究選擇 1998-1999 學年度參與開放式科學探究活動的三組學生（共九位），以 質性研究法探討學生在開放式探究活動中如何形成問題？如何解決問題？問題的解決有何特質？研究發現 ，學生提出的問題，多來自學生的學習與生活經驗，研究問題會隨著研究情境的發展而更加精鍊，問題解決 的歷程具有「權宜」與「索引」的特質。學生在探究現場遭遇到突發的、特定的問題，所運用的推理過程 是通過具體操作而達到抽象的層級；解決問題的方式與實際行動的採行則與探究現場的情境相關，而不是 在去脈絡的情境下，運用現成既定的公式（algorithms）進行思考。學生並且學習到如何形成問題、設計 實驗、執行探究、解釋數據；學生所從事的科學活動、所經驗的情境，可能與科學家真正的科學工作有些 差距，然而卻是亟富啟發意義的探究經驗，是抽離情境下的科學教學所難以比擬的。

關鍵字：高級中學; 問題解決; 探究

Abstract

The purpose of this study was to investigate the features of problem framing and solving in an inquiry-oriented laboratory environment. With the research based on the data from three investigative groups, it was found that students' problems i n the laboratory were related to their everyday life experience. Then, these problems could be elaborated according to the evolution of the inquiry-oriented environment at a later time. In addition, students' problem solving in open-ended inquiry environm ent was distinctly different from doing word problems in a traditional science classroom setting. Finally, problems might be solved from concrete operation to abstract level. Students who coped with the constantly arising problems invoked situated creativ e ways to make their experiments work, rather than search for a prescribed algorithm to solve the problems. Based on the results of this research, it was suggested that high school students learn science concepts, process, and skills efficiently from auth entic science activities. In order to help students experience the uncertainties, ambiguities, and the social nature of scientific work, science should be learned in contexts constituted in part by ill-defined problems.

Key words：Inquiry; Problem solving; Senior high school