教育科學研究期刊　第五十四卷第四期
2009 年，54（4），139-170

探究學生串聯電路認知特徵演化歷程之跨年級研究

林靜雯
臺北市立教育大學自然科學系
助理教授

邱美虹
國立臺灣師範大學科學教育研究所
教授

摘要

跨年級研究有助於課程設計的縱向連續發展，但卻極爲耗時費力。因此，林靜雯等人（林靜雯，2006；Lin & Chiu, 2006）建立支序分類之概念演化取向，藉電腦軟體預測學生串聯電路心智模式的演化路徑，希望能克服早期跨年級研究的缺點。本研究特別設計跨年級的調查，以電學診斷式測驗檢測三年級、五年級、七年級及九年級學生共 440 名，藉此獲得學生各認知特徵與狀態於各年段的分布比例以檢驗林靜雯等人的預測。研究結果顯示，林靜雯等人的預測與實徵結果大致相符，且藉由其預測與跨年級調查結果的整合，本研究清楚表徵學生於串聯電路心智模式上認知特徵演化的全貌，並解釋了學生串聯電路概念演化與課程發展之間的可能關係，初步證實了支序分類學之概念演化取向之可行性。

關鍵字：支序分類之概念演化取向、串聯電路、跨年級研究、認知特徵

通訊作者：林靜雯，E-mail: jwlin@tmue.edu.tw
收稿日期：2009/02/10；修正日期：2009/11/30；接受日期：2009/12/07。

Journal of Research in Education Sciences
2009, 54(4), 139-170

An Across-grade Study to Investigate the Evolutionary Processes of Students' Cognitive Characters in Series Connection

Jing-Wen Lin
Department of National Science,
Taipei Municipal University of Education
Assistant Professor

Mei-Hung Chiu
Graduate Institute of Science Education,
National Taiwan Normal University
Professor

Abstract

An across-grade study is helpful for the developing of vertical curriculum design, but it requires considerable time and manpower. Therefore, Lin and her colleague (Lin, 2006; Lin & Chiu, 2006) develop a cladistics approach in conceptual evolution to predict pupils' mental model evolutionary pathways in series connection with the assistance of the software. They hope to overcome the limitations of the across-grade studies in the early days by this approach. Accordingly, this study conducts an across-grade survey and adopts a set of diagnostic test items to 440 students from Grade 3 to Grade 9 to obtain the across graders percentages of students' cognitive characters and statuses for evaluating Lin and her colleague's prediction. The research results show that Lin's prediction almost fits the empirical data of the across-grade tests. In addition, they clearly represent a global picture of the evolutionary process of pupils' cognitive characters of mental models in series connection and explain the possible relationship between pupils' conceptual evolution in series connection and curriculum sequence by comparing Lin's prediction and the investigation results of the across-grade tests in this study. In sum, the research results verified the feasibility of applying cladistics approach in conceptual evolution to science education tentatively.

Keywords: cladistics approach in conceptual evolution, series connection, across-grade study, cognitive character

Corresponding Author: Jing-Wen Lin, E-mail: jwlin@tmue.edu.tw