

科技部人文社會科學研究中心
補助科技部跨領域研究計畫之前置規劃案結案報告

神經科學與人文科學之新整合：
經驗學習之認知負荷與腦波變化

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中文摘要

認知負荷理論在教育心理學上已經廣泛使用了幾十年，而非教育領域也開始應用此概念，重新檢視各領域的心理模型處理歷程，作為教學上調整教學內容的依據。而腦電波技術自從認知神經科學領域發展以來，在市面上已經開始出現大量價錢較可負擔、技術也較穩定的商用軟硬體，而國內外的學術單位也競相發展價錢更親民、使用更簡便、訊號更穩定的軟硬體。也因為這些軟硬體的研發成功，使得腦電波的應用可以更快發展，可推動到其他非認知神經科學的研究領域，建立起跨領域的研究橋梁。本研究因此期望可以整合來自認知心理學(認知神經科學)、管理學、語言學等專長的研究者，利用腦波儀器所提供的腦波數據指標，配合傳統行為研究方式如問卷、訪談，以及資料探勘等技術，多管齊下，藉由廣告行銷、英中翻譯、機器人輔助等主題，探討不同族群例如消費者、雙語使用者、以及失智症患者，各自在面對研究者所提供的認知任務時，所面臨認知負荷的類型可由那些生理、行為指標測得，而這些數據又可對於改善行銷、翻譯、機器人輔助等主題的傳播、教學、與使用上，可提供那些未來應對的建議，作為行政主管機關與學校研擬相關政策或因應策略之參考。本規劃案藉此次機會建立跨校跨領域的研究團隊，完成未來整合型研究計畫的規劃，擬定方向與執行細節，未來一年內可向科技部提出跨領域的整合型研究計畫。

關鍵詞：認知負荷理論、腦波、跨領域

Abstract

Cognitive load theory has been widely used in the field of educational psychology for decades. Non-educational fields have also begun to apply this concept to re-examine the mental model of processing in various fields as a basis for modification of teaching contents. Since the development of cognitive neuroscience in the field of cognitive neuroscience, there have been a large number of commercial software and hardware products that are more affordable and more stable in the market, and academic institutions at home and abroad are competing to develop more affordable and user-friendly software and hardware with more stable signals. Because of the successful development of these software and hardware, the application of brainwaves can be developed more rapidly, which can be promoted to other non-cognitive neuroscience research fields and establish a cross-domain research bridge. The study therefore hopes to bridge up researchers from domains of cognitive psychology (cognitive neuroscience), management, and linguistics by using indexes provided by brainwave instruments in conjunction with traditional behavioral research methods such as questionnaires, interviews, and data mining. Through advertising, English-Chinese translation, robot assistance, this collaborative project explores processing in different groups of participants such as consumers, bilingual users, and patients with Alzheimer disease. The study discusses the different types of cognitive loads measured by physiological and behavioral indexes, and these data can be used to provide recommendations for future studies, as a reference for the relevant authorities or schools to develop policies or response strategies. This project has established a cross-disciplinary research team through this opportunity to complete the planning of future integrated research projects and formulate specific directions and implementation details. A cross-disciplinary integrated research project is expected to be proposed to the Ministry of Science and Technology within a year.

Keywords: Cognitive load theory, brainwave, cross-discipline