

Designing the Future of CSL Teacher Education: 5C Competencies through Augmented Reality and PBL

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Abstract

With the rapid advancement of technology, pre-service CSL language teacher training has gone beyond traditional theory and practice, emphasizing the cultivation of digital literacy, creativity, and intercultural competence. Augmented Reality (AR), as an emerging digital teaching tool, provides immersive and interactive learning experiences and is considered a promising medium to enhance motivation and creativity. This study involved 28 pre-service learners enrolled in a Mandarin teacher-training program, who participated in an AR-integrated project-based learning (PBL) course designed to foster the development of the 5C competencies: Creativity, Critical Thinking, Self-Regulation, Collaboration, and Cross-cultural Communication.

The course followed a four-stage process of design–implementation–sharing–reflection. Students created AR-based teaching projects, showcased them via digital platforms, engaged in peer reviews, and completed both pre-/post-tests of the 5C scale and a self-evaluation survey. Data included quantitative measures (5C pre- and post-tests, end-of-course self-evaluations) and qualitative evidence (AR projects, Padlet peer interaction records, and reflective reports), analyzed through both descriptive statistics and thematic coding.

Findings indicate positive gains in Creativity, Critical Thinking, and Self-Regulation. Self-evaluations further showed moderate-to-high confidence in AR tool proficiency ($M = 3.81$, $SD = 1.14$) and creative design ($M = 3.89$, $SD = 0.89$), though time management remained relatively weak ($M = 3.70$, $SD = 0.87$). Qualitative feedback echoed these trends: while AR enhanced interactivity and creativity, students reported challenges in technical operations and time pressure.

This study highlights the potential of integrating AR and PBL into Mandarin teacher training, demonstrating improvements in digital literacy and innovative teaching competencies, while underscoring the need for better project management support.

Keywords: Augmented Reality, Project-Based Learning, CSL Teacher Education, 5C Competencies, Self-Regulated Learning

華語師資培育的未來設計：以擴增實境與專題導向學習培養 5C 能力

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摘要

隨著科技快速發展，職前華語師資培訓已不僅限於理論與教學實務的傳統架構，更需同時培養數位素養、創意思維與跨文化能力。擴增實境（Augmented Reality, AR）作為新興數位教學工具，能提供沉浸式與互動性的學習經驗，具備激發學習動機與提升創造力的潛力。本研究以修習華語學分學程的學習者（共 28 名有效樣本）為對象，設計並實施一門融合 AR 與專題導向學習（Project-Based Learning, PBL）的課程，探討其對學習者專業發展與 5C 能力（創造力、批判思考、自我調節、合作協作與跨文化溝通）的影響。

課程設計採「設計—實作—分享—反思」的流程，學生以 AR 平台建置華語教學專題，並於數位平台公開展示與互評，撰寫課程心得並完成 5C 前後測與期末自我評量。研究資料包含量化數據（5C 能力量表前後測、期末自我評量問卷）與質性資料（教學專案成果、平台互動紀錄與反思心得），並以量化與質性並行的方式進行分析。

研究結果顯示，學習者在 5C 能力的「創造力」、「批判思考」與「自我調節」構面呈現正向提升趨勢。期末自我評量亦指出，學生普遍認為自己在 AR 工具使用與創意設計能力上已達中高水準（ $M = 3.81, SD = 1.14$ ； $M = 3.89, SD = 0.89$ ），顯示課程有助於數位素養與創新設計的培養。然而，在時間管理與任務規劃方面的平均數相對較低（ $M = 3.70, SD = 0.87$ ），反映專題導向學習雖能激發創意與合作，但在進度掌控與分工協作上仍是挑戰。質性資料呼應這些結果，學生在心得中普遍肯定 AR 增強互動與創意的價值，但也提及操作門檻與時間壓力。

本研究突顯 AR 與 PBL 融合於華語師資培訓的應用潛力，不僅能提升學習者的數位工具熟練度與創新設計力，亦能促進批判思考與自我調節能力。同時，本研究建議未來相關課程設計需加強專題管理與技術層面的輔助，以確保學習成效與研究普及性。

關鍵字：擴增實境、專題導向學習、華語師資教育、5C 能力、自我調節學習