3rd International Conference on Innovation in Teaching and Education

July 18 - 20, 2025 London, United Kingdom

Flipped Classroom Pedagogy, Engagement, and Academic Performance: Validating Multidimensional Learning Processes through Integrated Survey and Behavioral Evidence

Wang Yuanyuan[1], Xie Nina[2], Liu Yujun[3], Jin Haiting[4]

[1]Hong Kong Metropolitan University, Hong Kong
[2,3,4]Lingnan University, Hong Kong

Abstract

While flipped-class courses are designed to enhance student engagement, most classroom analytics still rely on simplistic right–wrong scoring or end-of-semester surveys. To address this limitation, we developed and validated a 26-item Engagement & Experience Questionnaire (EEQ) grounded in multidimensional engagement theory (behavioral, emotional, cognitive) and self-determination perspectives. Additionally, we collected eye-tracking (ET) data to examine real-time cognitive processing during multiple-choice (MC) quizzes. EEQ items were theorised to load on three correlated factors—behavioural strategy, emotional value and cognitive investment. Meanwhile, two representative heat maps of eye movement (high- vs low-engagement tertiles) illustrate gaze patterns on Bloom–Remember and Bloom–Analyse items. Confirmatory factor analysis supported the three-factor EEQ model. Internal consistencies were strong. Cognitive-engagement scores correlated with closed-book final-exam marks. A 2 (ItemType: low vs high Bloom) × 3 (EEQ cognitive engagement tertile) mixed ANOVA on fixation time showed a main effect of engagement but no interaction, suggesting consistently deeper processing by highly engaged students across item types. The EEQ offers a brief, psychometrically sound tool for flipped-class designers, while the preliminary ET visualisations demonstrate how behavioural traces can enrich engagement research. Future work will integrate item-level gaze metrics with score modelling to support adaptive feedback in AI-enhanced learning environments.

Keywords: Cognitive Engagement; Eye-Tracking; Flipped Classroom; Multiple-Choice Assessment; Student Engagement Measurement