APPLICATION OF THE AUTHENTIC-UG USING AUGMENTED REALITY TO SUPPORT GEOMETRY LEARNING IN AUTHENTIC LEARNING DESIGN

BY:

RIO NURTANTYANA

STUDENT ID : 17720251022

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Application of the Authentic-UG using Augmented Reality to Support Geometry Learning in Authentic Learning Design

研 究 生： Rio Nurtantyana

指導教授：黃武元 博士 和 Suprapto, Ph.D

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Master Thesis

Application of the Authentic-UG using Augmented Reality to Support Geometry Learning in Authentic Learning Design

Master student: Rio Nurtantyana

Advisors:

Prof. Wu-Yuin Hwang

Suprapto, Ph.D

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Student Number: 107524606
Thesis Title: Application of the Authentic-UG using Augmented Reality to Support Geometry Learning in Authentic Learning Design
Supervisor: Prof. Wu-Yuin Hwang
Faculty, Department, School: Graduate Institute of Network Learning Technology (NLT) ☐ PH. D ☑ Master
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Advisor _____

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國立中央大學碩士班研究生

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中文摘要

在 Android 平臺上開發使用擴增實境技術的 Authentic-UG，使用可以高精度測量線條和測量角度的 ARCore SDK，可以為學生在真實情境的學習設計中學習幾何學提供優勢。Authentic-UG 利用 xAPI 技術詳細記錄每個學生的學習活動，系統還實現了註記功能，方便學生在搜索幾何物件後可以解釋答案。Authentic-UG 具有彈性，可以使用 RESTFUL API 連接到 Dashboard-UG 系統，因此教師可以在進行實境活動時查看每個學生的紀錄。

在本研究中，我們開發了 Authentic-UG 來促進學生的實境式學習，並從角度和線的概念上探討了小學四年級學生學習幾何的學習行為與學習成績之間的關係。本研究的參與者共有 50 名學生，分為實驗組及對照組，實驗組有 25 名學生使用 Authentic-UG，對照組有 25 名學生，為期十週，兩組之間具有相同的先備知識。

在學習過程中使用 Authentic-UG 後的統計結果表明，實驗組具有更好的學習成績，特別是在幾何對象的估計能力方面，而實際操作的結果也通過教師評估和同儕評估進行檢查。因此，最具影響力的學習活動是結合角度和線及鷹架概念來幫助估算組合題型的能力，可以有效地提中同儕評估的品質。有一種現象是，在角度的概念中，比起關注線的準確性，學生們更注重的是角度的準確性。學生覺得使用 Authentic-UG 是一種更快樂的學習體驗，因為在真實的環境中，學生有對於搜索幾何物件和測量主動探索的動機也更健康。

關鍵詞 : Authentic-UG, 實境式學習, 幾何學習, 擴增實境

Abstract

Development of Authentic-UG adopting augmented reality technology on the Android platform with ARCore SDK that can measure lines and measure angles with high accuracy is an advantage that can be used for learning geometry to students in authentic learning design. Authentic-UG can detailed record each student's learning activities with the xAPI technology, the system also implemented with annotation features to facilitate student for explaining the answers after searching for geometry objects. Authentic-UG has a flexible system with the use of the RESTFUL API protocol that can be connected to the Dashboard-UG system, so that teachers can see each student's process when doing authentic activities.

In this study, we developed the Authentic-UG to facilitate student in authentic learning and we investigate the relationship between learning behavior and learning assessment with learning achievement in fourth-grade elementary school students to learn geometry in the concept of angle and the concept of line. The participants of this study with 50 students, divided two groups that 25 students in the experimental group using Authentic-UG and 25 students in the control group for 10 weeks with the same initial prior knowledge between groups.

The statistical results after using Authentic-UG in the learning process indicate that the experimental group has a better learning achievement, especially in the skill of estimation ability on geometry objects. The results of authentic work also checking by teacher assessment and peer assessment using scaffolding. Therefore, the most influential learning activities to help estimation ability in the combine topic which combines the angle concept & line concept and also the scaffolding can work well to help peer assessment quality. There is a phenomenon that students only focus on the concept of angle which is shown by the level on the accuracy of angle is more influent than the level of accuracy of the line. Student feel that using Authentic-UG is more happy learning experience because student feel motivated also healthy to active explore to searching geometry object and make measurement in the authentic environment.

Keywords: *Authentic-UG, authentic learning, geometry learning, augmented reality.*

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Explanation of Symbols

Symbol	Description
α	Cronbach's alpha to show the internal consistency of items in group
p	Probability value for show the statistical significance
r	Correlation coefficient value that show the strength and direction linear relationship among variables.
R-Squared or R^2 or r^2	Coefficient of determination to show the predictable variable in in dependent variable from independent variable