

A CELLULAR AUTOMATON – BASED GAME TO ENHANCE HIGH SCHOOL STUDENTS’ LOGICAL THINKING

APINYA DHATSUWAN 5438260 ILSE/D

Ph.D. (SCIENCE AND TECHNOLOGY EDUCATION)

**THESIS ADVISORY COMMITTEE: MONAMORN PRECHARATTANA, Ph.D.,
WANNAPONG TRIAMPO, Ph.D., KHAJORNSAK BUARAPHAN, Ph.D.,
ARTORN NOKKAEW, Ph.D.**

ABSTRACT

This study developed and implemented the cellular automaton-based learning unit as an instructional tool to enhance grade 10 students’ logical thinking. The study emphasized cellular automata (CA) procedure that has the potential to provide logical thinking practices. The developed game, Blockyland is based on the CA concept. It asked the students to evaluate the provided information and all the available options before making a decision. The game has interactive feedback towards individual’s performance.

The participants of the study are tenth graders in a Thai secondary school. The results of a preliminary study indicate the feasibility of CA as a game-based learning tool. The participants were satisfied learning with the game and wanted to learn with a CA-based game in the digital version. A pilot study revealed the effectiveness of the learning unit in enhancing participants’ logical thinking. The participants also had positive satisfaction towards the developed game.

The implementation study examined the effectiveness of the learning unit. The participants’ logical thinking was significantly enhanced after the implementation of the learning unit. Moreover, the participants’ CA logical test scores were significantly higher after the implementation. The enhancement of the CA logical test score was found no relationship to prior logical thinking. In addition, there was no relationship between participants’ GPA and their logical thinking or their CA logical test score. Hence, the learning unit provides logical thinking practice through the CA concept and is suitable for participants regardless of their prior logical thinking or GPA.

**KEY WORDS: CELLULAR AUTOMATA/ CA-BASED GAME LEARNING
UNIT/ GAME-BASED LEARNING/ LOGICAL THINKING**

136 pages