

# Enhancing Students' Spatial Ability by Implementing a Digital Game

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**Abstract:** This study utilizes a digital game to improve individual's spatial abilities. An action game is designed and developed to achieve the purpose of the study. The game uses the 3D Studio Max 9.0 to build 3-D models: Photoshop CS2 for drawing characters and scenes textures, and Virtools Dev 4.0 for developing the game. In the game world, tasks are designed to increase spatial ability with rotating question, visual discrimination and visual memory with space, rotate, reverse, inference and displacement. This study provides a model of various entities for learners' contact, depict size, shape, aspect and position.

**Keywords:** Digital game, game-based learning, spatial ability

## Introduction

People explore the world through visions. In their daily life, people need the ability to identify objects or positions in painting and way finding. They also make decisions by judging the information from the outside world with figures or images no matter in driving transport or designing one. Spatial ability is becoming an important capability for children and adults. According to current research, the development of spatial ability has positive correlation with individual's visual thinking experience. The richer of the individual's visual thinking experience, the stronger the spatial inference ability he has (McKim, 1980). As we can see from various examples from the real world that architects, sculptors, and artists, all have outstanding spatial ability (Gardner, 1983). Research results also indicated that people's spatial ability has positive correlation with their mathematical ability. In addition, this capability could be improved through training and learning. Therefore, this study intends to utilize a digital game to improve individual's spatial abilities based on the literature review and the new development of technology.

## 1. Literature Review

Studies showed that past experience affected individual's spatial ability. Planning and strategy design improved individual's spatial ability (Cohen, 1985; Holley & Danserean, 1984; Zavotka, 1985). Researchers also proposed that three-dimensional and two-dimensional computer simulation graphics is effective in improving learners' thinking and spatial abilities (McCormack, 1988). Recent research showed that digital game could be applied as a teaching tool in classrooms (Rosas et al., 2003). Feng (2007) believes that spatial attentional capacity and a higher-level spatial function may be improved

simultaneously by appropriate training. In addition, digital games may create a new learning culture that corresponds better with students' habits and interests (Prensky, 2001).

## 2. Design

The digital game designed for this study used 3D Studio Max 9.0 to build 3-D models, Photoshop CS2 to draw characters and scenes textures, and Virtools Dev 4.0 as development tools for the game. The game style is fantasy. Hollow Earth claims is the story background of this game. See below for sample screenshots.



Figure 1



Figure 2

Digital games can improve students' learning achievements in algebra, motivation to learn, curiosity, attention, and concentration while they carry out effective learning strategies through the games. Playing digital game could be one of the solutions in improving students' spatial abilities when the game is designed and implemented appropriately. After all, spatial ability has a strong influence on a person's daily life. This study proposes that the player's spatial ability can be improved while a digital game is specially designated spatial ability tasks and stages.

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