Geography Map Knowledge Acquisition by Solving a Jigsaw Map Compared to Self-Study: Investigating Game Based Learning

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ABSTRACT

Efficacy of games as learning medium is of interest to researchers and the gaming industry. A critical metric for learning is knowledge retention and very few studies have conducted in-depth comparisons of: a) game versus no-game learning, b) collaborative versus individual learning. Towards this, the study reported in this article will present the findings from an experiment using Asia and world maps, cut into pieces as in a jigsaw puzzle. The participants were primary school children who were randomly assigned to the puzzle and no-puzzle group. To understand the role of collaborative interactions in learning, each group was further divided into two subgroups. Each subgroup either solved the puzzle or studied the full map (no-puzzle) individually or collaboratively. Three post-tests were conducted over a period of 10 days. The mean scores and Mann Whitney test shows: a) In the no-puzzle condition, no difference in the average scores of the individual and collaborative groups for both maps was observed, b) In the puzzle condition, the collaborative group score was slightly more than that of the individual group for Asia map, while the difference was significant for the continent map, and c) Puzzle and no-puzzle individual group scores were comparative for Asia map but the continent map groups showed a major difference. The findings are mixed with collaborative puzzle solving showing higher retention while puzzle solving does not show significant effect on learning and retention.

KEYWORDS
Children, Collaborative, Learning, Puzzle-Game, Retention Memory

INTRODUCTION

The fundamental goal of learning is knowledge acquisition and that of teaching is to convey the knowledge. In a traditional classroom, the teacher uses a plethora of tools to convey the different categories of knowledge – reasoning, facts and narratives, phonology and constructs in language and spatial skills to name a few. The first step towards achieving the teaching goal is to motivate and engage the children. Role-playing, games, discussions are some of the creative means the teacher applies to sustain focus in the class. Industry and educators have collaborated to design games to address some of the requirements. For example, the 1903 board game of monopoly (called “Landlord’s game”) by Elizabeth Magie was conceived to teach the concept of single-tax theory and over the years modified to

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teach many concepts in finance, social lessons, trade and negotiations. The National Park Service put
together its own version of Monopoly game (Smith, 2008). Adaptations of Monopoly for educational
purposes include Mnemolpoly, a game for psychology courses (Schoen, 1996) and Sociopoly a game
similar to monopoly game (Jessup, 2001), designed to teach social inequality.

Thus, since long game industry and educators are trying to revolutionize education system so
that learning can be made practical conditions and fun at the same time. Mayer (2016) discusses
the role of computer games in education and according to him, “Game effectiveness is improved by
using conversational language, spoken format, prompts to explain, explanatory feedback, and pregame
activities.” He groups the on-going research in understanding the effectiveness of games in learning
as (a) value addition - the features that makes learning better (b) cognitive consequences - focusing on
improving the cognitive skills and (c) media comparison studies – which conducts experiments and
analysis to understand whether games are better than conventional media for academic learning (Mayer,
2011b, 2014). Stressing the importance of post-assessments to evaluate student implicit learning,
Rowe et al., (2017) tested with three science puzzles. Halloran et al., (2013) show the importance
of simulation game in learning (the Society for Advancement of Games and Simulations in Education
and Training) (SAGSET) defines simulation game as, “A simulation game combines the features of a game
(competition, cooperation, rules, participants, and roles) with those of a simulation (incorporation
of a critical feature of reality)” (Ruohomaki, 1995, p.14)). They made use of realistic adaption of a
monopoly game to help students learn lodging industry and property development knowledge and the
results showed that such simulation games could be used as an interactive learning tool for students.

One of the earliest educational games are jigsaw puzzles of map skills, mathematics, colour
matching, crosswords to name a few. The crossword puzzle has been traditionally acknowledged
as critical for language skills. Teachers have also introduced jigsaw puzzles to enhance interactions
and team-work in school children. Studies on the efficacy of puzzles have reported an increase in a
range of spatial skills like mental rotation, spatial perception and spatial visualization using standard
jigsaw puzzles (Verdine et al., 2008) in persons with Prader-willi syndrome. For example, puzzles of
geography maps are provided to children in middle-school to facilitate their map reading skills and
familiarise them with the facts – like names of cities, oceans, continents etc. While spatial skills are
measured as a function of the number of pieces in the puzzle and the time taken to match the patterns
and complete the puzzle, knowledge acquisition is tested by the ability to memorize and recall the
names of the objects (example: countries, continents, oceans etc., for a geographic map) and their
spatial location in the game space.

With motivation and attention enhancement as catalysts for learning, industry and educators are
designing and introducing interesting learning environments by using new interactive technologies
for students to solve the problem in a more effective manner (Garris, Ahlers, & Driskall, 2002).
Acceptance of the new teaching methods by teachers are key to its effectiveness in classrooms or as
states that, “Kids are almost certainly learning more positive, useful things for their future from their
video games than they learn in school…” A growing array of multimedia technologies of software,
hardware and the modes for human-computer/system interaction are currently being explored for
new integrated games for teaching both academic subjects and professional skills, a genre called
serious games or educational games. Serious games are interactive games (Prensky, 2001; Vogel et
al., 2006), having some set rules and constraints (Garris et al., 2002), directed towards a clear goal
(Malone, 1981). They are goal driven experiences fundamental to education. Though serious games
can be physical board games (monopoly, crosswords, jigsaw puzzles) the video game format has the
ability to create immersive virtual environments and provide instantaneous feedback, thus captured
the attention of educators to create new learning environments for students to observe, experience, and
interact individually or collectively. A recent study by Bourgonjon et al., (2013) looked at perceptions
and beliefs in decision-making processes of teachers to introduce new learning methods. They found
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