CS 6650 Midterm

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Abstract

This paper presents two different, related studies on the effectiveness of three different types of play configurations between genders. In study one, an equal number of boys and girls were selected and asked to solve puzzle problems in a piece of software call *The Incredible Machine* (TIM). Groups of two were assigned to either play in parallel on two different computers, play integrated on one computer, or play solo. Children were grouped either as Female/Female, Male/Male, or Female/Male.

Study two, which was a basic repetition of the first study, involved a larger sample size weighted heavily female. Also, in this study the effectiveness of the Female/Male grouping was dropped. Both studies showed that integrated female groups solved the most puzzles and that male groups worked the best in parallel. Neither male or females did well in solo play.

Identification of Gender Issue Not Addressed

There was no attempt by Inkpen et. al. To control for difference in spatial puzzle solving development between the two groups. The basic concept of *The Incredible Machine* is to solve puzzles in a Rube Goldberg fashion which requires a high degree of spatial processing to achieve success ("The Incredible Machine," 2010). Because of difference between toys meant for boys and girls, it's entirely plausible that girls would have less real-world experience with the sorts of spatial processing embodied by the software, hence requiring more time and help to solve the same problem.

A study of the differences in communication between the different gender and play types should be considered. From the Inkpen et. aalstudy we can only assume and guess at what sort of information sharing went on in the different play types between the different genders and how that information sharing influenced the success of the group. The differences in play styles could be explained by the different communication strategies that are adopted by different groups of sexes.

A comparison of effectiveness of different sexes between a computer software version and a physical version of the same puzzle should be attempted. There was no attempt in this study to see if either gender was having difficulty with the solving the same problem in a virtual space over a physical space or even if the space in which the problem is solved has an influence on the success of the group as a whole.

Extension Study Proposal

We consider extending the “playing together beats playing apart” study of Inkpen by studying if different types of reasoning and communication exist between the gender and play groups which would explain their experimental findings. For this study we have created a new piece of software called Lego Augmented Play Participation Laboratory (LARRY). This new piece of software creates a series of Rube Goldberg problems mimicking *The Incredible Machine* used by Inkpen, but using parts from the Lego™ catalog. We created problems that are solvable by the same means using both physical and virtual pieces the same way.

We will invite 300 participants, with an 210/90 female/male target balance to solve puzzles using either the physical pieces or using the LARRY software. Participants will be drawn from a group of 9 to 13 year old students. Like Inkpen they will either play solo or in parallel or integrated groups. We will divide both groups up into equal play type groups (3 groups of 70 for females and 3 groups of 30 for males) and equally divide each sub-group up into a virtual and a physical grouping.

To facilitate analysis of the effects of prior education and experience on this study we will try to generate a much detail on the participants spatial reasoning and memory skills as possible within the study time constraints. Using standard tests we will evaluate their skills for later analysis along with the study results. Also, using questionnaires and interviews we will, as much as possible, try to generate a detailed background of toys and other activities that may provide extra learning opportunities in these two skills.

The testing protocol will involve small groups of participants playing in their prescribed manner independently of all other participant groups. They will be isolated in a cubical with one or two computers or the physical puzzles depending on the type of play. All of their play will be recorded for further analysis. For participants using LARRY they will be given a five minute "tutorial" on the capabilities of the software, and during the testing procedure they are provided a physical manual. This "tutorial" period will also exist for physical puzzles, showing the basic types of pieces that they can use to solve problems.

All participant groups will have a half-hour of solving time to complete as many puzzles as possible. For physical puzzles the time required to transfer between puzzles will not be counted against them. After the half-hour of puzzle solving they will be let into a relaxed area for the battery of spatial reasoning and memory tests, which will be taken individually. Also at this time interviews and a questionnaire will be completed. The groups of participants will be small enough that the entire process should take more then an hour for LARRY groups and an hour-and-a-half for physical puzzle groups.

Introduction

Group learning and cooperation is being an important topic for study, in particular how it relates to improving the success of gender groups at solving educational challenges. As shown by Inkpen et. al, there are differences between the two genders when it comes to cooperative play in solving puzzles. They showed that females have more success when teamed together in an integrated team, while males had the most success when they could achieve independently, while still having somebody to cooperate with.

We plan on extending their study to identify other factors that may influence this results, specifically if there is a difference between the genders when it comes between solving virtual and physical puzzles, differences in skills caused by educational background, and if there are differences in communication patterns and skills between different play group types.

For this study we introduce a new piece of puzzle game software called Lego Augmented Play Participation Laboratory (LARRY). LARRY is designed to mimic the action of Lego and Technix blocks and allows for mostly free-form combination to solve puzzles much in the manner of *The Incredible Machine* (TIM). Unlike TIM we choose to present LARRY as a pseudo-3D world instead of a strictly 2D world to enhance the realism of the puzzles.

In this study we will use three different types of play setups:

Solo Play:	one child played alone at one machine (or physical puzzle station)
Parallel Play:	two children played side-by-side at two machines (or two physical puzzle stations)
Integrated Play:	two children played together at a single machine (or physical puzzle station)

Like the second Inkpen study we will limit our pairs to only Female/Female or Male/Male. Also, we are more focused on how the participants solve the puzzles and not how many puzzles they solve.

References

Inkpen, K., Booth, K.S., Klawe, M., & Upitis, R. (1995). Playing together beats playing apart, especially for girls. *The First International Conference on Computer Support for Collaborative Learning*, p. 117-181.

The Incredible Machine. (2010). *Wikipedia*. Retrieved (2010, March 30) from http://en.wikipedia.org/wiki/The_Incredible_Machine