Learning gains from using games consoles in primary classrooms: a randomized controlled study

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Abstract

It is known that computer games are motivating for children, but there is limited direct evidence of their effects on classroom learning. Following a successful small-scale case study conducted by the authors, the aim of this randomized controlled trial was to further investigate the effects of a commercial off-the-shelf computer game on children’s mental computation skills and on aspects of their self-perceptions. A pre-post design was employed, with 634 primary-school (elementary school) children (10-11 years old) from 32 schools across Scotland. Schools were randomly assigned to experimental or control conditions. In the experimental schools, children used a games console for 20 minutes each day, running a ‘brain training’ game. The controls continued with their normal routine. The treatment period was nine weeks. Significant pre-post gains were found in both groups over the treatment period for both accuracy and speed of calculations. However, the gains in the games console group were up to twice those of the controls. There were no significant changes in two measures of self-concept for either group, although there was a small but statistically significant gain in attitude to school amongst the experimental group. When scores were analysed by ability, different patterns of scores were apparent. Qualitative data pointed to a range of benefits from the games-console experience. There are many implications which arise from the findings, some of which will be explored at the presentation.

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Keywords: Games-based learning; primary school; elementary school; learning gains; ICT; games consoles.

1. Background

There is a growing acceptance of the value of ICT in primary schools, with a range of applications now embedded in mainstream practice. In recent years initiatives have included the use of laptops, interactive white boards, hand-held computers and the internet. Additionally, there has long been an interest in the use of games-based applications in the classroom, with a growing interest in the potential of commercial off-the-shelf computer games (COTS) for learning in schools. The arguments for such games are framed in terms of knowledge gains, skill

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development, motivational aspects and cultural relevance issues (see, for example, Prensky, 2001; Kirriemuir & McFarlane, 2002; Sandford, Ulicsak, Facer & Rudd, 2006). However, as yet, the evidence of their educational value is neither extensive nor robust (Condie & Munro, 2007). In fact, in the current educational literature, much that has been written about the benefits of games and games-based learning appears to focus on the beliefs and attitudes of teachers, pupils and parents (eg McFarlane, Sparrowhawk & Heald, 2002; Facer, 2003; Sandford et al., 2006). There is a notable absence of studies that report output measures in terms of attainment.

2. Current study

This randomised controlled trial (RCT) followed on from a small-scale case study (Miller & Robertson, in press) which found statistically significant improvements in computation (accuracy and speed of processing) and self-perceptions when children used a COTS programme on a games console (Dr. Kawashima’s brain training) over a ten-week treatment period.

The design of the current trial involved identifying schools which were in the lowest quartile in terms of socio-economic status (as measured by entitlement to free school meals) in each of the participating Regional Education Authorities. Once the pool of schools had been identified in each authority, they were randomly assigned to the experimental or control group. Each school in the experimental group was given a set of Nintendo DS lite games consoles for a primary 6 class.

2.1. Participants

- 32 schools
- 4 education authorities
- Complete data set for 634 P6 children

2.2. Method

- Randomised controlled trial (stratified random sample)
- There were 2 conditions:
  - Experimental group, who used the Nintendo half an hour a day, 5 days a week playing Dr. Kawashima’s Brain Training
  - A control group, where the teachers were asked not to change their normal routine
- A training session was provided for the teachers who were in the Nintendo group
- The treatment period was 9 weeks
- Data collected: pre and post measures of computation (accuracy and speed), various self-measures, (eg mathematics self-concept). In addition, other data were collected: eg children’s previous performance against national standards (5-14 levels); computer use at home.

3. Findings

3.1. quantitative data

3.1.1.1. Accuracy (number correct)
- Statistically significant gains in both groups.
- But the mean gain in the experimental group was approximately 50% greater than that of the control group. This difference was statistically significant.

3.1.2. Speed of processing (time taken to complete number test)
- Statistically significant improvement in both groups.
• However, the mean improvement in the experimental group was more than twice that of the control group. This difference was highly statistically significant.

3.1.3. Self-concept
• No significant change in either maths self-concept or academic self-concept in either group.

3.1.4. Attitude to school
• Slight – but statistically significant – improvement in attitude towards school in the experimental group, but not in controls

3.1.5. Analysis by previously recorded mathematical ability (please note: general trends – more detailed analysis to follow)
• In terms of accuracy, the less able children tended to improve more than the more able children.
• In terms of speed, the middle ability children tended to improve more than the children at the top and bottom of the ability range

3.1.6. Gender:
• There were no significant gender differences.

3.2. qualitative data

In addition to the quantitative data collected, we also noted comments from teachers and children after the treatment period was over. Further qualitative data will be reported in due course, but some interesting findings included:
• improvements noticed in children’s academic work: tables, basic computation, writing
• truanting and lateness had dramatically improved in some classes (the Nintendos were used at the start of the school day)
• children keen to take responsibility for the management aspects (collection, distribution, charging etc)
• improvements in interpersonal relationships (children taking a supportive interest in the performance of peers)
• children believed that they were ‘smarter’ as a result of using the game

4. Conclusion

There are many implications here: for the use of COTS in classrooms, for the raising attainment agenda, for teaching and learning styles, for further investigation of the domains of learning, for the management of electronic resources once purchased, for teachers’ belief systems, and a range of other issues. These will be developed in more detail in full journal papers.

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