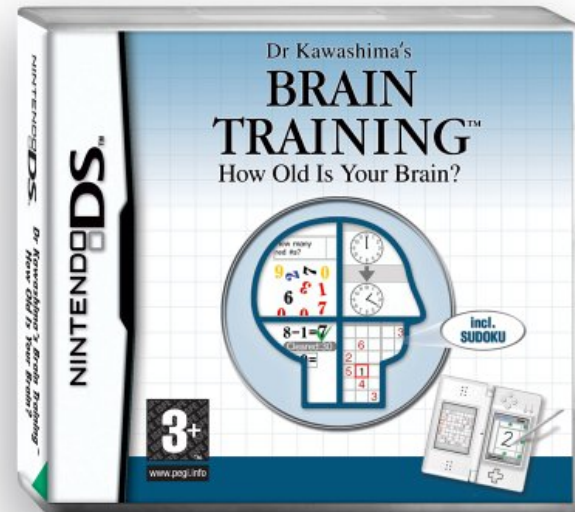# Does a handheld gaming device make an effective assistive technology tool?



**Higher Education Assistive Technology (HEAT) project**

**B**|**U** Bournemouth University

TechDis

# Introduction

- The perceived benefits of playing games to improve educational potential have long been discussed

- In October 2006, a study by the Federation of American Scientists claimed games could teach skills including:

  - Strategic thinking
  - Interpretive analysis
  - Problem solving
  - Forming and executing plans
  - Adapting to rapid change

- Potential educational uses for handheld gaming devices are becoming increasingly apparent with the possibilities of access to mobile devices containing software for educational improvement encompassing many different disciplines.

# Dr. Kawashima and Nintendo

- Dr. Kawashima is a leading figure in Japan concerning Brain Imaging Research.

- "We should consciously challenge our brain to do different things for about 5 - 10 minutes every day at least"

- The Nintendo DS Lite handheld gaming system combines dual screen viewing with interaction provided by a combination of the innovative touch screen and a stylus – alongside traditional controls.

- European release of Brain Training (June 2006) marketed as part of Nintendo's Touch! Generations campaign

- Game has now sold well over 700,000 copies, the majority to over twenty-fives.
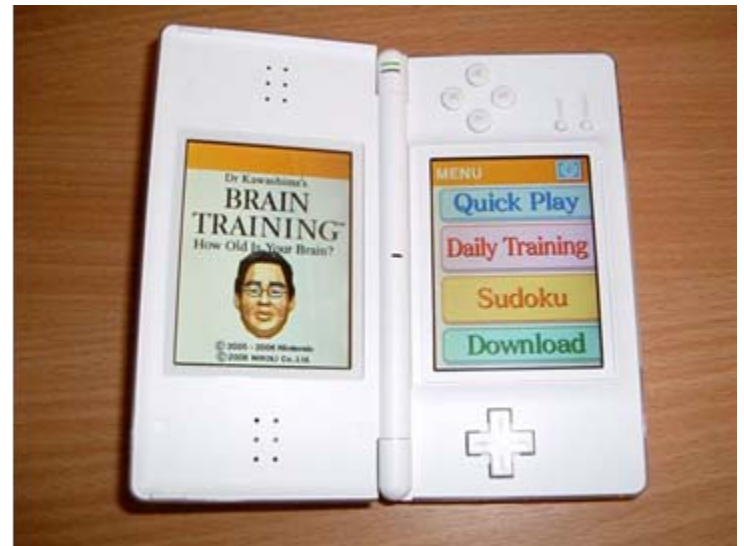
# Brain Training Package

- Brain Training challenges players to spend 10 to 15 minutes each session performing arithmetic, word memory and concentration tasks using the touch screen to write, draw or select options.

- The exercises are presented in a game-like environment providing self-directed challenge. Goal is for users to reduce their brain age to an ideal age of twenty.

- Brain Age Training Check - Calculations x20, Stroop Test, Word Memory, Speed Counting, Connect Maze, Number Cruncher

- The calculation is a best-fit approximation from the data collected from 120 subjects by Dr Kawashima and his team (20 in their twenties, 20 in their thirties, continuing up to 20 in their seventies).

# Types Of Training

- **Calculations x 20 & x 100 -** mental arithmetic puzzles.

- **Reading Aloud** - asks the user to either read aloud text passages (most effective) or silently to themselves.

- **Low To High** - involves numbers appearing in boxes for an instant. The same empty boxes then appear and are selected in order of the lowest to the highest number.

- **Syllable Count** - asks the user to count the number of syllables featured in a sentence.

- **Head Count** - people enter and leave a house. The user keeps track of how many remain with the final number written on screen.

- Date and time dependent - **Memory Quiz** produces random questions which users are asked to remember for future sessions or occasionally the user is asked to **Draw Pictures** of objects, persons, or animals.

- If at least one type of training is performed, users are awarded with a stamp on their calendar for that day.

# Let's Do Some Brain Training

4 + 4 = 8

1 + 5 = 6

4 x 1 = 4

12 – 7 = 5

7 x 4 = 28

4 + 7 = 11

10 – 3 = 7

2 x 5 = 10

3 x 8 = 24

6 x 8 = 48

# Project Goals and Participants

- Investigating the use of the Nintendo DS Lite and Brain Training package as a tool to assist IHCS students requiring help with numeracy during the autumn term of 2006.

- Perceived benefits for student learning:

  - Automatic recording of results and the ability to measure performance over a period of time.
  - Up to 4 separate student result sets can be recorded on one copy of Brain Training providing incentive to compete/compare performance.
  - Privacy removes some of the stigma attached to students having difficulty with numeracy and feeling reluctant to approach someone.
  - Fun and engaging way to learn - simple and accessible to use and interact with.
  - Available to use 24-7.

# Measurement - Overall Objectives

- Medical personnel need to have the ability to quickly calculate measures on drugs rounds and in other areas of their role. Students entering health and social care with poor numeracy skill levels have previously been flagged as a concern by both HSC academics and also in research (Gillham and Chu, 1995).

- In total, 54 individual sessions were completed during the project.

- After an induction session lasting one hour, participants were able to choose to do as many sessions as they required for the duration of the project.

- Each session could consist of as many or as few of the different training types as desired.

- Due to scheduling difficulties all sessions were held at a central location on the University campus.

- At the end of the project, all participants were asked to complete a questionnaire concerning their use of the Nintendo DS Lite and Brain Training.

# Measurement – Training (1)

**Most Popular**

- **High To Low:** Although several found trying to remember the sequence in the low to high task challenging it was one of the most popular types of training. The main challenge is that the numbers disappear off screen very quickly and usually before you can memorise them.

- **Head Count:** This challenges on multiple levels as users need to process the initial number of people in the house immediately and then calculate additions and subtractions quickly and sometimes in tandem. One participant commented "counting the people going in and out of the house was a real challenge". Another thought it their least favourite task as it proved most difficult, but also "my favourite because it offers the biggest challenge."

- **Maths x 100:** One participant initially struggled with the longer maths challenge but eventually grew to like it as they felt it challenged their weakness and rewarded them when they saw an improvement.

# Measurement – Training (2)

**Least popular**

- **Syllable Count**: particularly disliked by everyone.

- **Draw Pictures:** possibly disliked because of the difficulty of using the stylus and touch screen to draw – a less recognisable adult task than some of the others.

- **Reading Aloud**: Only one participant enjoyed this training method. Others found it challenging because it made them feel self conscious. One found "reading out loud embarrassing" but felt that they might not feel so awkward in their own environment, whilst another felt uncomfortable speaking directly into the DS.

# Measurement – DS Positives

When describing what they enjoyed about using the DS:

- Design - small and light, easily portable, compact in design and a clearly visible touch screen.

- Sociability - participating in a group together helped to forge friendships.

- Usability - very easy to use for novices.

- Fun to use - felt more like a game than a learning method.

- Wow Factor - the fact that the DS Lite was perceived as 'hip' allowed some students to discuss what they were doing with their children.

# Measurement – BT Package Positives

- Usability - easy to use with clear instructions and colourful.

- Measurement - challenge of trying to improve on previous scores and ability to discuss results with others positively received.

- Complexity - tasks set deemed suitably challenging but not overly so.

- Enjoyable - amusing and entertaining to use with smiles and laughter occasionally manifesting themselves during sessions.

- Flexible – the ability to take as little or as much time as could be fitted in to one session appealed.

- Variety - the different games and tasks on offer each time users returned to Brain Training was highlighted.

- Timing - the exercise lengths were relatively short enabling students to concentrate fully on the task

- Encouraging - occasional motivations from the cartoon host which appeared on screen were appreciated.

# Measurement - Negatives

- The effectiveness of the voice recognition
  used in tests varied depending upon the individual.

- The effectiveness of the handwriting recognition varied according
  to styles of writing

- Although up to sixteen participants could take part in the project, they
  did not have the full flexibility to take the package with them anywhere
  they went. As one copy of the software held four different records if kit
  was taken off-campus and another student wanted to use it they would
  have to wait until it was brought back.

- A large percentage of the students were involved in long periods of
  placement during the project which caused scheduling difficulties.

# Measurement - Attitudes

- All students agreed that the mobile learning experience was fun (80% strongly agreed and 20% agreed)

- All students would recommend this method of study to others (70% strongly agreed and 30% agreed)

- All students felt comfortable using the DS because they knew how to use it (70% strongly agreed and 30% agreed)

- All students felt that using the Brain Training package engaged and motivated them (70% strongly agreed and 30% agreed)

- Most importantly, all valued the experience of using the device (80% strongly agreed and 20% agreed)

# Measurement - Final Thoughts

- "It has helped me to gain confidence in my numeracy"

- "I really enjoyed taking part in the pilot, and hope that in the future I will have access to a DS and would use it and the brain training on a regular basis because I felt it really helped me"

- "I have really enjoyed taking part in the trial of this package. I would and have recommended this particular software to my friends and family"

- "Thank you for this experience. I hope that the university is able to purchase more of this great learning tool. Let me know if you get a discount anywhere so I can get one too!"

# Conclusion

- Proof of concept of delivering assistance to students wanting to improve their numeracy skills.

- Offers an immersive, enjoyable learning environment and experience.

- Positively received by all students - including those with additional learning needs - in building confidence, providing encouragement and making a difference to numeracy skill levels.

- Deployment quick and easy requiring little support once an induction session has been completed and has suffered no technical problems.

- Evans (2006) identified some specific features of mobile devices which could add benefits to the learning experience:

  - Privacy / Support for learning styles / Immersive / User control (assuming enough devices and packages)

# Way Forward

- Nintendo DS Lite and Brain Training package offer a relatively low cost solution to help improve numeracy skills with medical students.

- It seems a beneficial solution for all students – including those with alternative learning needs - and provides a suitable way of including, motivating and assisting them.

- Easy to transfer into any subject area where students use and need to improve numeracy skills. For example, Touch Generations! English training package and offer it as a study support aid to international students requiring language tuition.

- Sociability aspect of groups engaging with software together rather than individually.

- Additional items requested in second bid were Big Brain Academy and Opera Browser.

- Limitations – student numbers and environment.

# HEAT 2 : Autumn 2007

- Interested participants emailing through reasons for wishing to participate in pilot. Entries received by **23rd September 2007.**

- First and Second best entries supplied with Nintendo DS plus Brain Training, Big Brain Academy and Opera Internet packages for use during the Autumn term.

- Third and Fourth best supplied with Nintendo DS plus Brain Training and Opera Internet packages.

- Winners providing a short written status report in Mid November.

- Report detailing the work undertaken on HEAT Stage 2 is due to be completed by the end of **November 2007**.

# Does a handheld gaming device make an effective assistive technology tool?

**Contact Details**

Andy Pulman, Web Team Leader,
The School of Health & Social Care (HSC),
Bournemouth University

apulman@bournemouth.ac.uk

andyp.edublogs.org/category/heat-project/