

Kinect computer game for developing number concepts: personalising technology for improved learning

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To discuss this case study, please contact us via email customersupport@camdenlearning.org.uk



Key Points

- Research into the role of embodiment in learning
- Kinect app to help learners to develop number concepts such as estimation

Purpose

What were your reasons for doing this development work?

To extend the range of ways we have to enable our children to grasp concepts of number, such as estimating number. Brian Butterworth (Professor, UCL with a specialism in dyscalculia) researches into how embodiment helps learning. We are working with him on using Kinect to develop estimation concepts in number.

The project was funded through CPEE, Camden Partnership for Educational Excellence.

Who were the identified target learners?

Our target learners are children with learning difficulties in mathematics aged 8 to 13 in 4 classes at Swiss Cottage School. We aim to have Kinect in every class in the long term.

The number of target learners is increasing: a research project in Camden schools is in development. Swiss Cottage School and the CLC are recruiting primary schools to take part in a term-long project with KS1 learners.

What were your success criteria?

That the target learners would learn the concept of estimating and be able to apply it in other situations.

What did you do? (What success criteria did you use?)

The team includes class teachers and me, a programmer based in the school (I have other roles too). Brian Butterworth, Emeritus Professor at University College London with a specialism in dyscalculia is also involved in an advisory capacity.

Initially we used a lesson study approach to establish our understanding of the way the children thought about estimation of number and to analyse what experiences

they might need to develop this particular concept. This involved close observation of the learners by class teacher and a maths specialist teacher with discussion afterwards to draw out our analysis. This early research helped to get a baseline for the project. I worked closely with the teachers to develop the Kinect app.

Lesson study methodology used collaborative discussion to consider in depth the different means children used to learn and what challenges the game would pose. The team considered what the individual learner's approaches to the task would be, what would constitute overload, and what would scaffold learning. We found processes needed to be simplified so as not to be too multilayered. We developed a great deal of shared understanding through this lesson study approach.

Fifteen Kinects have been funded through the project. The Kinect program enables the child to respond by moving their whole body; the movement is detected and shown on screen as a marker moving along a number line. When the child moves to the right, the marker moves to a higher number. The learner raises their right hand when they (and the marker on screen) are in their desired position. This can be used as a response to a range of concepts, such as estimating number, addition, and so on. Pairs of learners can work competitively or cooperatively.

We worked with the children on a weekly basis throughout the year, trying the estimation game, observing the learners' responses, analysing what was needed, and adapting it by the following session to try again. The program is progressive – it gets more challenging for the player as they succeed. We aim to make the program more intelligent so it can detect focuses for improvement and offer more opportunities for the learner to practise that particular concept. There have been many iterations. One refinement was a teacher's delete button so the last attempt is removed from the data if a distraction occurs.

We are now expanding its use to other areas. One current development is with art, drawing people using movement of hands.

What specific teaching resources did you use?

- Kinect – a motion-sensor device developed by Microsoft for Xbox consoles and Windows pcs which enables users to interact with the computer through movement. We use Kinect version 1 with Windows 7 (v2 released soon uses Windows 8).

www.microsoft.com/en-us/kinectforwindows/

- The resource of an in-house programmer. We have a site where schools in the project can download our Kinect apps:

<https://swisscottageapps.co.uk/Kinect/kinect.html>

Outcomes and Impact

What has been the impact on pupil learning and teaching?

The class teachers are keen to develop ways of using Kinect, eg one teacher wanted Kinect to help learners stand up and move around first thing in the morning,

so used the estimating app to encourage them to be physically active.

Teachers suggest modifications to the app: for example, when a teacher wished to move with a child to support their grasp of how to play, I was able to program the app to ignore people over a certain height so only the child showed up on screen.

Developing bespoke apps to fit individual learners' needs is a great advantage in a special school, especially as they can be developed on a very short time scale, observed in use and further adapted very quickly.

Wider than just the estimation app is the impact of the research approach: Lesson study has become embedded across the school, strengthening the structure of team collaborative dialogue around observing learners, and leading to insights into pedagogy which is shared across the school. The lesson study research also gave us confidence in determining what we wanted from the estimation game, and the realisation that the real issue is personalising technology for learning, rather than selecting existing technology to try out.

Most exciting is the opportunity that comes from having developed a Code Library as a result of programming – this is the key to schools developing personalised technology provision. Access to a code library means bespoke responses to individual learning needs can be developed. Our teachers can say 'I'd like the technology to be able to this, for a learner with these specific needs' and the programmer can use his library of code to generate what the teachers need. (see <https://swisscottageapps.co.uk/> for an idea of the developing resource for teachers.)

The research project into estimation is still going on so there is no data yet. But during the early lesson study research when we were developing the program with three learners, the impact on engagement was immediately evident: they engaged really well and this has been sustained throughout. The learners are broadening their experience of learning through embodiment, and enjoying the learning process. The Kinect program enables them to learn cooperatively and with bodily expression – not so easily done on a keyboard or touch-screen.

In the initial lesson study research phase, two out of the three learners improved their concepts and skills in estimation. One learner had difficulty estimating three groups of numbers (eg estimating 3 groups of 2, though could estimate one group of 6) but this definitely improved with using Kinect.

Evidence of impact on pupil learning and teaching/leadership

Brian Butterworth is collecting data (including control data). The program itself logs data on result and speed of response.