

Research Briefing N° 93

Researching Embodiment with Digital Technologies

This research explores multimodal methodological approaches (see explanation below) for examining how mobile, tangible and sensor based technologies can support learning through technology-enhanced experiences that encourage hands-on and physical forms of interaction – often referred to as ‘embodiment’ or ‘embodied’ forms of learning or interaction.



[Click here](#) to watch a video presentation of a study which examines students’ experiences of time and place using mobile technologies (iPads) to study historical settings.

Key words: mobile technologies; tangible technologies; sensor technologies; research methods; multimodality; embodiment

Key findings

The findings and outputs are of interest to educators, designers, policy makers, practitioners, academics, researchers and others who want to better understand how to research interactive digital technologies and how they shape communication, interaction and learning.

A multimodal approach to research emphasises examination of how we use different modes (ways) to communicate and ‘make meaning’ through interaction with the world. Specifically this means undertaking a detailed analysis of the role of body position, gaze, manipulation and speech in shaping interaction with physical and digital artefacts. Analysis using this approach shows how students’ use of their bodies can support learning with different interactive technologies:

- With a ‘tangible tabletop’ (where students use ‘tangibles’ – objects with digital information ‘embodied’ in their physical structure e.g. size, shape, texture, and related to other digital representations/information – to explore the properties of light in a school science activity): the way students positioned themselves around the table affected the nature of their learning interaction; the use of two modes of communication: visual and touch, were essential in supporting many of the

scientific ideas they were exploring and in helping their understanding. Also where they stood or the ways in which they moved around the table influenced how they interacted with the tangibles to work together and communicate their ideas to one another.

- With an iPad: preschool children's types of touch differed qualitatively (in terms of quality) and quantitatively (in terms of quantity) when finger painting with an iPad or on paper. For example, the iPad supports a wider range of touch types, more continuous touch-based interaction, engagement for a longer duration, and more variation through the linking of different types of touch into more complex sequences; but the quantities and range of fingers used was less than with physical paint, and several sensory features of touch are lost e.g. the tactile, textural experience of paint.
- With mobile technology 'in the field': enhancing physical space with digital images or sound through iPads supported students' interpretation of events that took place in the same location but at different times in history.

This Research Briefing relates to IOE Research Briefings 62, 91 and 92: '**Designing 'tangibles' for learning: an empirical investigation**', '**Multimodal Methodologies for Researching Digital Data and Environments (MODE)**' and '**Video Technologies in the Operating Theatre**' respectively.

What we did

The project is funded by the [National Centre for Research Methods](#), which forms part of the Economic and Social Research Council (ESRC), and focuses on improving the standard of research methods in the social sciences across the UK (October 2011-2014). The research is based at the **IOE's London Knowledge Lab**, a collaboration between the Institute of Education and Birkbeck.

Mobile technologies (such as iPads, smartphones, wireless connections, GPS etc.) are profoundly changing interaction and have important implications for education. Researching the design, use and evaluation of learning environments where mobile technologies are used is complex and raises significant methodological challenges; that is, to the principles and procedures used to carry out inquiry/research. To examine methodological approaches we have undertaken a number of studies exploring different types of mobile technologies for different age groups and different learning purposes:

- analysis of the role of hand action and manipulation in 'meaning making' with a tangible tabletop interface (11-12 years);
- comparative study of pre-school children's touch interactions through finger painting with an iPad versus finger painting with physical paper and paints (18-36 months);
- investigation in how mobile technologies (e.g. iPads) can support learning in history by enhancing a familiar real-world environment with digital overlays of events and stories from WWII (World War Two) (11-12 years).

How we did it

Studies were undertaken with 20 students aged 10-11 years using the tangible table to learn about light behaviour, specifically reflection, refraction and absorption, with objects of different colours, shape and texture; 7 children aged 18-36 months finger painting with iPad and with physical paper and paints; and 60 children aged 9-10 years exploring historical events and environment of the local Common during WWII through a series of location-based tasks constructed for the iPad.

Analysis was based on a combination of observation, video and (where relevant) interview data with participants, specifically using a multimodal approach to analysis. The research was primarily qualitative in nature, in order to gather an in-depth understanding of how students physically position and orient

themselves, use manipulation, gaze and gesture, and speech to support their learning. Quantitative data was also taken and analysed from the finger painting activity.

Further information

Project website: <http://mode.ioe.ac.uk/research/researchproject2/>

Glossary on 'embodiment' and related concepts: <https://embodimentglossary.wordpress.com/>

Key readings/publications:

Sakr, M., Jewitt, C. & Price, S. (2014). The semiotic work of hands. *Classroom Discourse* 4 (2) Taylor & Francis

Crescenzi, L., Jewitt, C. & Price, S. (2014). The role of touch in preschool children's play and learning using iPad versus paper interaction. To appear in Special Issue on Touch *The Australian Journal of Language and Literacy*

[Price, S. & Jewitt, C. \(2013\). A multimodal approach to examining 'embodiment' in tangible learning environments. In *Proceedings of 7th International Conference on Tangible, Embedded and Embodied Interaction*, Feb 2013 43-50, ACM NY](#)

Price, S. & Jewitt, C. (2013). Interview approaches to researching embodiment. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI)* ACM NY p. 2907-2910

[Price, S., Roussos, G. Pontual Falcão, T. & Sheridan, J.G. \(2009\). Technology and embodiment: relationships and implications for knowledge, creativity and communication. *Beyond Current Horizons Review*](#)

Contact

Principal Investigator: Dr Sara Price, Department of Culture, Communications and Media, Institute of Education, University of London

Email: s.price@ioe.ac.uk

Phone: +44 (0)20 7763 2175

Other team members: Professor Carey Jewitt and Mona Sakr (Institute of Education)

Researchers are based at the London Knowledge Lab (LKL) – a collaboration between the Institute of Education and Birkbeck