Does technology enhance learning?

SOME FINDINGS FROM THE UK’S TECHNOLOGY ENHANCED LEARNING (TEL) RESEARCH PROGRAMME.
Technology Enhanced LEARNING

The Technology Enhanced Learning (TEL) Research programme is:

- a £12m programme funded by the UK ESRC and EPSRC;
- designing and evaluating systems to advance our understanding of learning and teaching in a technological context;
- supporting eight large multidisciplinary projects;
- based at London Knowledge Lab, Institute of Education, London;
- working to achieve impact for emerging research results and mapping progress on key themes.

Get real, get virtual

Does technology enhance learning? It’s not unreasonable to ask this question, but unfortunately, it’s the wrong question. A better question is: how can we design technology that enhances learning, and how can we measure that enhancement?

Digital technologies have yet to make the impact on education that is taken for granted in commercial and industrial worlds, or in academic fields such as the sciences, humanities and social sciences.

For young people, technology is part of the fabric of their lives, so its limited and largely unimaginative use in schools, colleges and universities widens the gap between their formal and informal learning. TEL aims to design technologies that close the gap, solving real problems of teaching and learning. This leaflet highlights some of TEL’s key themes and emerging findings.

Professor Richard Noss, TEL Director, London Knowledge Lab
Society is changing. Many aspects of life – communication, finance, shopping and information-sharing – are moving into the digital world. The digital literacy strand aims to understand what skills are needed to function in the digital world and how these can best be taught and learnt.

Anyone denied access to these new digital worlds for whatever reason is being denied a human right. TEL’s digital inclusion strand aims to understand the process of exclusion and develop strategies for reducing it.

**Inter-Life project**

‘We’re working with some youngsters who are quite reflective about the virtual Inter-Life Island we created. They are aware of the impact it has had on their own aspirations.

‘One of the youngsters we have worked with now wants to study computer science at university. He’d never talked about career aspirations or university, never used that vocabulary before.

‘There is an interaction between the way they are developing real world skills and the stuff they are doing on Inter-Life.

‘Inter-Life is collaborating with various local authorities to bring about a difference to some of the most deprived young people in the UK.’

Professor Vic Lally
Inter-Life project, University of Glasgow

Technology Enhanced INCLUSION
TEL research is interdisciplinary. It brings together researchers representing both social and computer sciences, enabling an integrated understanding of how to develop hardware, software and pedagogy for best learning outcomes.

This interdisciplinarity creates opportunities as well as challenges, and we offer support to researchers in the TEL field, building a UK research community for the future.

The programme also addresses the fast-moving and wide-ranging ethics issues in TEL, with the safety of everyone involved in the research the key concern.

TEL’s Technology Enhanced Research (TER) strand looks at ways of optimising and disseminating research methods being developed in the programme. Examples include new ways of gathering and analysing data or cataloguing and sharing publications.

The TEL Racing Car

‘Forty or so years ago, Formula 1 cars would be checked only at pit stops and lap times measured by handheld stopwatches and clip boards. Today’s Formula 1 cars (and drivers) are instrumented with sensors that measure all aspects of engine, car and driver performance. Data is wirelessly streamed in real time to pit engineers and recorded for later analysis.

‘The Technology Enhanced Research strand aims to encourage projects to “technology-enhance” their research and evaluations just as they “technology-enhance” teaching and learning.’

Professor Richard Cox
TEL TER strand leader,
University of Edinburgh
Technology has the potential to increase teachers’ and learners’ productivity. It can, for example, help design software that reduces teachers’ and learners’ time and effort, and helps them to learn from each other.

A bag of plastic teeth for dental students costs £15,000. The hapTEL project’s award-winning virtual dental workstation replaces the need for these expensive replicas. Its sophisticated touch sensitive system allows students to try, try and try again, perfecting their skills on virtual teeth. Not surprisingly, hapTEL has attracted considerable commercial interest.

‘The fact that you could just keep having goes over and over again was a really big thing for me this year.’

King’s College dental student

The SynergyNet project is developing pedagogy, software and hardware for a classroom environment of multi-touch screen desks which could be a reality in schools in the coming decades.

‘The system can aid more efficient sharing of class resources and support learners in developing quicker understanding of task demands (an approx 25% time saving compared with paper-based tasks). It can also capture assessment data on students’ work, summarise it for teachers and allow them to fine-tune levels of difficulty to give students more engaging work.’

Professor Steve Higgins
University of Durham

The Learning Designer project allows teachers and lecturers to design and share their teaching based on templates of good practice, increasing the overall expertise and resources available.

‘Architects have the most wonderful digital design tools. Teachers have got nothing to allow them to play with the design of their teaching. We wanted to create power tools for teachers.’

Professor Diana Laurillard
Institute of Education, London
Technology Enhanced INTELLIGENCE

Artificial intelligence is the next big step on the digital journey, with systems increasingly able to predict the needs of users and offer them personalised choices. TEL projects incorporate AI elements and the AI strand looks across the piece, mapping TEL’s place in the overall field. As time goes on, AI is likely to play a larger and larger part in learning.

The Ensemble project helps teachers and learners in HE use semantic web technology to gather and analyse information for case studies in settings from biology to dance to maritime science. Ensemble’s flexible and accessible tools allow users to harness the semantic web to navigate complex, controversial and rapidly developing fields of study where textbooks quickly become out of date.

‘We have been helping teachers and students to explore and experiment with a range of new technologies in order to draw on all the resources that are available via the web, particularly to address complex and challenging topics, and to prepare them for independent learning beyond university.’

Dr Kaska Porayska-Pomsta
Institute of Education, London

The Echoes project is developing a virtual reality environment to investigate social skills development in children, particularly those with autism.

‘Some children displayed behaviours that, their carers say, they normally find difficult. These behaviours included sustained focus of attention, anticipation, and knowingly searching for interaction cues from the virtual character. We are very excited about these initial trials which highlight the potential of using technology such as the Echoes environment with children, whereby social contexts can be paced and enriched according to each child’s individual needs.’

Professor Patrick Carmichael
Liverpool John Moores University
Science, Technology, Engineering and Mathematics (STEM) research and development is a UK government priority. Qualifications in STEM subjects lift students’ life chances, and contribute to the national economy. The key contribution of TEL research is to make STEM learning relevant to students, so that they can build things for themselves, exploiting familiar digital devices and harnessing the power of dynamic representations.

The Personal Inquiry project has developed the nQuire toolkit that allows teachers and students to design and run science inquiries at school, at home, or outdoors on mobile devices (Download at www.nquire.org.uk).

nQuire results in positive learning outcomes, significantly greater than those of a control class, and enhances children’s enjoyment of and engagement with science lessons.

One student gleefully recounted a story of measuring the decomposition of rotting cheese in his garage while another simply stated that when using the nQuire tools in science ‘the teacher got better’.

The MiGen project’s technology allows children to get past the frequent stumbling block of understanding ‘generalisation’ in algebra and unlock the world of mathematics. In the MiGen software world, pupils build patterns with coloured tiles. The system uses colour and animation to encourage them to move from specific patterns to formulating general rules. (Download at www.tlrp.org/tel/migen)

‘It’s better than just sitting down with a textbook, you can actually see what’s happening so you don’t have to visualise it all in your head.’

Secondary student piloting MiGen software
Visit the website for more information on findings featured in this booklet plus many more resources including briefings, papers, videos and software downloads.

Technology Enhanced Learning (TEL)  
London Knowledge Lab, IOE London  
23 Emerald Street,  
London, WC1N 3QS  
**twitter:** @TLRPTEL  
**email:** tlrptel@gmail.com  
**phone:** +44 (0)20 7911 5577