

The world has gone digital. Our work, education, entertainment, even our ability to communicate with each other, are increasingly reliant on digital technologies. Yet millions are excluded from this revolution, unable to understand or access the devices the rest of us take for granted. In digitally-divided Britain, for example, nearly a fifth of the population cannot get online.

To be without digital technology is to be marginalised. It is a serious deprivation that jeopardises people's ability to learn and to earn, to stay healthy and to stay in touch. Helping the digitally excluded to become included is a key theme of the Technology Enhanced Learning (TEL) Research Programme.

In the context of education, three groups of learners are particularly likely to be excluded: those with special educational needs, those who are disengaged, and those who are hard to reach. Within these broad categories, other smaller groups have been identified. These are people who have been ignored and yet are considered potentially able to benefit from innovative uses of technologies. They include Travellers, very young children and children in care.



Digital inclusion research aims to identify, develop and evaluate tools, methods and practices which:

- overcome barriers to inclusion;
- help individual learners fulfil their potential;
- provide opportunities for equitable learning experiences and outcomes.

Digital inclusion research strives to be transformative and to meet three challenges:

Challenge 1: Transformation of technologies

How can we design and develop new technologies to help excluded learners?

Challenge 2: Transformation of learning

How can technologies be used to transform the learning experiences and outcomes of excluded learners?

Challenge 3: Transformation of teaching

How can technologies be used to transform inclusive teaching practices?



Seale, J. (2009) Digital Inclusion: A Research Briefing by Technology Enhanced Learning Phase of the Teaching and Learning Research Programme Available from: www.tel.ac.uk

CHALLENGE 1: Transformation of technologies

Some learners, particularly those with physical and learning disabilities, struggle to take advantage of everyday technologies such as the internet and multimedia. Researchers therefore need to develop new technologies or find ways of using and adapting existing technologies to produce systems that are accessible, easy to use and powerful.

The **Surfing Symbols** project focuses on enabling people with profound learning disabilities to surf the internet using hand-held flash cards to control their computers. Equipped with a computer, a webcam, a program that recognises symbols, and cards on which the symbols have been printed, disabled users are able to both upload and play YouTube videos and play QuickTime videos. The technology takes advantage of as many free or cheap applications as possible.

The development of Surfing Symbols was underpinned by an inclusive approach to research. Computer scientists and speech therapists worked with people with learning disabilities and their support workers in order to understand their expectations of everyday technologies. They also considered how technologies could be used to enhance day-to-day living, for example, by helping them communicate their needs at meetings.



Widgets for Inclusive Distributed Environments are designed to make it easier for disabled students to learn online. Through developing widgets (apps or gadgets) that work on the web or on mobile devices, the project aims to increase the flexibility and functionality of the virtual learning environments set up by education organisations. Examples include a widget that can utilise StickyKeys to help learners with motor difficulties complete online forms, a widget for boosting screen contrast or activating voice recognition, and a symbols-based calendar.

Computer scientists from the Accessibility Research Centre, learning technologists from JISCTechDis, and tutors and students with learning disabilities from Portland College worked together on the project. The team is now running a series of workshops with lecturers, tutors, learning technologists and disability co-ordinators to enable them to produce learning designs that can be developed into bespoke widgets.



Surfing Symbols

<http://thebigtree.org/symbol-surfing>

Reference: Bunning, K., Heath, B. & Minnion, A. (2009) Communication and Empowerment: A place for rich and multiple media? *Journal of Applied Research in Intellectual Disabilities*, 22,4,370-379

Widgets for Inclusive Distributed Environments

<http://arc.tees.ac.uk/wide/>

Reference: Pearson, E. J., Gkatzidou, V. & Green, S. J. (2010) 'From a personal learning environment to an adaptable personal learning environment: Meeting the needs and preferences of disabled learners', in *Proceedings of the 10th IEEE international conference on advanced learning technologies*, Sousse, Tunisia, July 5-7, 2010. California: IEEE, pp.333-335.



CHALLENGE 2: Transformation of learning

Using technology can be frustrating. Some learners find it fails to satisfy their needs or offers them inappropriate, meaningless experiences. The challenge for researchers is to exploit the potential of technology to protect learners from the risk of underachievement. One TEL research project, Echoes, is meeting this challenge by transforming how we acquire vital communication and social skills. Aimed at children, including those on the autistic spectrum, Echoes uses a young agent called Andy to respond to learners' actions.

Echoes

For children using **Echoes** is like playing a computer game. It's an unusual game, however, because it adapts to their individual needs and develops their social understanding and communication in innovative ways.

Children explore a 'magic garden', home of child-like agent Andy. Andy plays with them, gives them instructions and responds to them in a way that helps develop 'joint attention'. This crucial social skill, lacking in children on the autistic spectrum, uses eye contact or gesture to share experiences. Andy encourages children to follow his gaze through playful activities

with exciting objects. The activities approximate the 'real world', but they remove some of its unpredictability and threat. Andy lets children repeat actions in order to practise them and to try out new actions, engendering an awareness of alternatives and consequences. He communicates with children through simple language and through gestures

such as pointing, as well as gaze and body language.

Echoes has developed technology-enhanced learning that combines interactive multi-touch screens, gaze tracking, and intelligent agent-based context-sensitive interfaces to create a novel multi-modal environment.

Echoes

Website: <http://echoes2.org/>

Reference: Guldberg, K., Porayska-Pomsta, K., Good, J. and Keay-Bright, W. (2010) ECHOES II: the creation of a technology-enhanced learning environment for typically developing children and children on the autism spectrum, *Journal of Assistive Technologies*, 4 (1), 49-53



CHALLENGE 3: Transformation of teaching



For some disadvantaged or disengaged students, learning is painful and full of failures. Spaces for self-exploration and development are closed down rather than opened up. Researchers need to harness the creative, motivating aspects of technology to win the trust and fire the imagination of both teachers and students. Achieving this has the

potential to transform their relationship and enhance learning. Inter-Life, another TEL research project, is focusing on such transformations, using technology as a medium for developing a student-centred approach.

Inter-Life

The online Inter-Life project encourages young people to be creative, empowers them to deal with education, and helps them cope with transitions such as the move from school to university. The Inter-life team has developed private islands within the online virtual worlds of Second Life and OpenSim. The islands provide safe spaces for young people to engage in creative activities that build confidence, resilience and self

esteem. They also help them become better at problem solving, teamwork and conflict resolution. Teachers inhabit these virtual worlds alongside learners, but they don't control them.

Drawing on expertise in the development of student-centred research communities, Inter-Life ensures that teachers help students to co-construct knowledge around issues of personal relevance and importance. An Inter-Life island community gives students a sense of control and ownership. Supported by their teachers, they construct the buildings, decide the rules, design the art and organise the activities. Central to community life are the meetings. These are an opportunity to talk about important issues and take place in a space on the island designed by the young people. Conversations might revolve around how the island is run and looked after, or they might

A MINI-CASE STUDY: technology plus sensitive teacher assistance = inclusion

The belief that virtual worlds have the potential to give young people a space to be imaginative and fulfil their potential is perfectly illustrated by one of the participants in the Inter-Life project. Frank (not his real name) is a looked-after 17-year-old. He spent three months working with others on the island, an experience which has inspired him to enrol on an IT course and to go to university in 2012. Currently only 7 per cent of teenagers in care go on to higher education compared to 40 per cent of 18-year-olds nationally. Frank, who spent 11 years in care, believes teenagers are often happier talking through an avatar. He says: 'Inter-Life island is a good place for young people to gain confidence and help them deal with issues they might have in children's homes or in foster care. The listening is better.'



be about aspects of exclusion and social injustice, such as bullying, that the young people are experiencing in their non-island lives.

Participating in these activities in a virtual world is helping young people deal with 'real-world' transitions such as changing schools or homes.

Inter-Life

Website: <http://www.inter-life.org/blog/>

Reference: Lally, V., Sclater, M., Pomerantz, M. (in press) Inter-Life as a Virtual Research Community: transforming spaces, changing lives. Journal of Computer Assisted Learning (Special Issue)

Further resources

From the Technology Enhanced Learning Research Programme

All available from
www.tel.ac.uk



Seale, J. (2009) *Digital Inclusion: A Research Briefing by Technology Enhanced Learning Phase of the Teaching and Learning Research Programme*



Technology Enhanced Learning Research Programme (2010) Digital Inclusion flyer.



Library of digital inclusion related literature and research

Recent research publications

Carr, D. (2010) Constructing Disability in Online Worlds; Conceptualising Disability in Online Research *London Review of Education*, 8, 1, 51-61

Eynon, R. & Helsper, E.J. (2011) Adults Learning Online: Digital Choice and/or Digital Exclusion? *New Media & Society* 13, 4 534-551

Lewthwaite, S. (2011) Disability 2.0: A study of student experiences of disability and social networks in higher education. PhD Thesis. University of Nottingham

McPake, J., Plowman, L. and Stephen, C. (in press) Digitally divided? An ecological investigation of young children learning to use ICT. *Early Childhood Development and Care*

Power, C., Petrie, H., Sakharov, V. & Swallow, D. (2010) Virtual Learning Environments: Another barrier to blended e-learning. *Lecture Notes in Computer Science*, 6179-519-526

Seale, J., Draffan, E.A. & Wald, M. (2010) Digital agility and digital decision-making: Conceptualising digital inclusion in the context of disabled learners in higher education, *Studies in Higher Education*, 35, 4, 445-461

Wallace, S., Parsons, S., Westbury, A., White, K., White, K. & Bailey, A. (2010) Sense of Presence and Atypical Social Judgments in Immersive Virtual Reality: responses of adolescents with Autistic Spectrum Disorders. *Autism*, 14(3), 199-213

Reports and commentaries

Abbott, C. (2007) E-inclusion: learning difficulties and digital technologies. Bristol: FutureLab. http://www.futurelab.org.uk/resources/documents/lit_reviews/Learning_Difficulties_Review2.pdf

Becta (2008) Meeting their potential: the role of education and technology in overcoming disadvantage and disaffection in young people http://webarchive.nationalarchives.gov.uk/20101102103654/research.becta.org.uk/index.php?section=rh&catcode=_re_rp_02&rid=14771

Dutton, W.H., Helsper, E.J. and Gerber, M.M. (2009) Oxford Internet Survey 2009 Report: The Internet in Britain. Oxford Internet Institute, University of Oxford

Helsper, E.J. (2008) Digital Inclusion: An Analysis of Social Disadvantage and the Information Society (Department for Communities and Local Government) <http://www.oii.ox.ac.uk/microsites/oxis/publications.cfm>

Padfield, P. (2006) Learning at a distance supported by ICT for gypsies and Travellers: Young people's views. Edinburgh. STEP. <http://www.scottishtravellered.net/research/LADICT.pdf>

Selwyn, N., and K. & Facer. (2007) Beyond the Digital Divide: Rethinking digital inclusion for the 21st Century. Bristol: FutureLab http://www.futurelab.org.uk/resources/documents/opening_education/Digital_Divide.pdf

Walker, L. & Logan, A. (2009) Using digital technologies to promote inclusive practices in education. Bristol: FutureLab http://www.futurelab.org.uk/resources/documents/handbooks/digital_inclusion_handbook.pdf

Key inclusion policy documents

Department for Business, Innovation and Skills (2009) Digital Britain: Final Report. <http://www.official-documents.gov.uk/document/cm76/7650/7650.pdf>

Digital Inclusion Team. (2007) The Digital Inclusion Landscape in England: Delivering Social Impact Through Information and Communications Technology. <http://www.epractice.eu/files/media/media1881.pdf>

Digital Inclusion Team (2010) A Benefits Framework for Social Inclusion Initiatives: <http://www.esd.org.uk/esdtoolkit/Communities/DigitalInclusion/Tools/Benefits%20Final%20Report%20-%20June%202010.pdf>

European Commission (2010) Digital Agenda for Europe http://ec.europa.eu/information_society/activities/einclusion/index_en.htm

Sources for inclusion-related technology applications

EmpTech: Independent database of a wide range of available assistive technologies (software and hardware): <http://www.emptech.info/>

Projects, services and initiatives

Ace Centre, support and training on the use of communication aids for people with complex physical and communication difficulties: <http://www.ace-centre.org.uk/>

Digital Activist Inclusion Network: <http://www.dainproject.org.uk/index.php>

ESD4You Digital Inclusion Check-List: http://www.esd.org.uk/esd4you/What_is_esd/What_is_esd-toolkit/Digital_Inclusion_Checklist.aspx

Infocow, connects young people with useful stuff to help them make informed decisions and take control of their lives: <http://www.infocow.org.uk/>

The South Yorkshire e-Inclusion Projects: <http://repository.alt.ac.uk/444/1/syelp-einclusion.pdf>

The E-Learning and Mobility Project for Traveller children: <http://www.natt.org.uk/elamp-initiatives>

EU4All Accessible Lifelong Learning for Higher Education: <http://www.eu4all-project.eu/>

JISCTechDis: Advisory Service on technology and inclusion in education: <http://www.jisctechdis.ac.uk/>

Silwood CyberCentre: <http://www.intomedia.org.uk/silwood/ENTER.HTM>

WiseKids: Promoting innovative, positive and safe internet use <http://www.wisekids.org.uk/>

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.

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