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Summary

Research evidence about how ICT can support inclusion includes the following key benefits:

- enables greater autonomy for learners
- unlocks hidden potential for those with communication difficulties
- promotes practice that reaches beyond the school into homes and the community.

Teachers can maximise the impact of ICT in inclusive classrooms by:

- understanding the potential of ICT to support learners with special needs
- training classroom assistants in how software or devices can be used
- tailoring and adapting tasks to suit individual students' abilities and skills.

What the research says about ICT supporting special educational needs (SEN) and inclusion

This briefing is based on an analysis of available research about how information and communications technology (ICT) can support inclusive practice in schools. It summarises the key findings and suggests resources for further reading.

How can ICT support inclusion?

'Inclusion' as used in this briefing means the efforts made to include students with a range of physical, sensory, communication or cognitive disabilities in both learning and wider social opportunities. ICT can be vital for these students.

According to the Audit Commission, one in five children in England and Wales has special educational needs (SEN). This includes students with serious physical or learning difficulties but also many students whose reading, writing and numeracy skills develop slowly. Special needs include conditions such as dyslexia, physical disabilities, speech and language disorders, visual impairment, hearing loss, difficulties in communication, and emotional and behavioural difficulties. (Gifted and talented children have individual learning needs but this area is not covered in this briefing.)

Technology can help these children overcome many of their communication difficulties, so they can be included in lessons, and access a wider curriculum. For example, access devices can help learners with physical difficulties to use a computer, and enable them to access the same curriculum as their peers. Software designed to meet a student's particular needs can also help to motivate him or her. For some students technology may be the only way to ensure they can make their thoughts and needs known. For them, access to appropriate ICT-based solutions provides perhaps the only chance of participating in society and realising their full potential.

This briefing covers research into:

- communication aids
- software and web accessibility
- teacher training and support
- connected learning communities.

To judge how inclusion can be supported using technology, it is necessary to examine the available research evidence.

Key research evidence about using ICT to support SEN and inclusion

On the basis of Becta's analysis, using ICT in schools to support inclusion can enable learners to communicate, participate in lessons and learn more effectively. Key evidence is outlined below (there are references for further reading supplied alongside some of the findings).

General benefits

- Enables greater learner autonomy
- Unlocks hidden potential for those with communication difficulties
- Enables students to demonstrate achievement in ways which might not be possible with traditional methods
- Enables tasks to be tailored to suit individual skills and abilities.

Benefits for students

- Computers can improve independent access for students to education (Moore and Taylor, 2000; Waddell, 2000)
- Students with special educational needs are able to accomplish tasks working at their own pace (ACE Centre Advisory Trust, 1999)
- Visually impaired students using the internet can access information alongside their sighted peers (Waddell, 2000)
- Students with profound and multiple learning difficulties can communicate more easily (Detheridge, 1997)
- Students using voice communication aids gain confidence and social credibility at school and in their communities (Worth, 2001)
- Increased ICT confidence amongst students motivates them to use the internet at home for schoolwork and leisure interests (Waddell, 2000).

Benefits for teachers and non-teaching staff

- Reduces isolation for teachers working in special educational needs by enabling them to communicate electronically with colleagues (Abbott and Cribb, 2001; Lewis and Ogilvie, 2002)
- Supports reflection on professional practice via online communication (Perceval-Price, 2002)
- Improved skills for staff and a greater understanding of access technology used by students (Waddell, 2000)
- Enhances professional development and the effectiveness of the use of ICT with students through collaboration with peers (Detheridge, 1997; Lewis and Ogilvie, 2002)
- Materials already in electronic form (for example, from the internet) are more easily adapted into accessible resources such as large print or Braille (Waddell, 2000).

Benefits for parents and carers

- Use of voice communication aids encourages parents and carers to have higher expectations of children's sociability and potential level of participation (Worth, 2001).

Factors for effective use

- Access to professional development is essential for teachers and learning support assistants to improve their ICT skills and confidence, and develop a greater understanding of appropriate access technology for students (Waddell, 2000)
- Help needs to be available for parents and carers to gain access to equipment and training, so they can support students in making better use of technology (Detheridge, 1997; Lancioni *et al.*, 2001)
- Better understanding of the characteristics of interaction between children using augmentative and alternative communication (AAC) aids and their conversational partners is necessary to ensure turn taking in conversations and opportunities to respond (Clarke and Kirton, 2003; Worth, 2001)
- In the longer term, teachers need to work with hardware and software developers to ensure that the needs of the SEN community are considered.

About Becta's 'What the Research Says...' series

This series of briefing papers is designed in particular for teachers, ICT co-ordinators and school leaders, in order to provide an initial idea of the available research evidence for the use of Information and Communications Technology (ICT) in schools and colleges. We welcome feedback and suggestions for further titles in the series (contact details can be found at the end of this briefing).

ICT supporting inclusive practice

Sean, a 15-year-old pupil living in the south of England, finds a computer with a separate wireless screen to be a vital part of his education.

He has been profoundly deaf from birth and has acquired his understanding of English through Cued Speech, a sound-based visual communication system which uses eight handshapes in four different positions in conjunction with the natural mouth movements of speech to make all the sounds of spoken language look different. Sean is a high achiever and already has a grade C for an AS maths module.

His local authority provided support in the form of an audio typist who sat at his side and typed what was said in class. Sean read this off a screen. However, this system caused problems. Unlike other children, Sean could not choose where he sat in class and his typist had to sit next to him too. Other children found the noise of the keyboard to be distracting and as Sean had to sit very close to the machine, he found that the noise was amplified by his own hearing aid.

The remote wireless screen means that although he still has to have a hearing audio typist in the classroom, he does not have to sit next to him or her. He can be part of any group

and join in the social interaction between his peers, as well as seeing the class discussion on screen and being able to concentrate more easily.

The Deaf Children's Communications Aid Project (DDCAP – see <http://www.dccap.org.uk> for more information) is actively looking for a similar solution for other students.

This case study arises from the Communication Aids Project – further CAP case studies are available at <http://cap.becta.org.uk>. You can find out more about Cued Speech at <http://www.cuedspeech.co.uk>.

Explanation of findings

Most of the academic literature agrees that access to ICT can be a powerful tool in supporting educational inclusion. This section explores in greater depth some key aspects of ICT and inclusive education.

Assistive technologies

Assistive Technology (AT) is the software and technology which helps people with disabilities and special needs to overcome the additional challenges they face in communication and learning. For example, switch-operated software, onscreen keyboards and mouse alternatives are all types of assistive technologies.

A number of studies have shown that technology can enable students to overcome barriers to learning and develop positive relationships with peers and teachers. Carers reported that they had higher expectations of students' sociability and level of participation since the introduction of communication aids. Yet evaluation into the use of assistive technology is limited and often lacks detailed and comprehensive criteria for assessing the effectiveness of the devices (Clarke and Kirton, 2003; Worth, 2001).

Research studies indicate fairly positive outcomes from people with profound multiple learning difficulties using micro-switches and speech output systems. However, more advice, support and training for teachers and carers is needed to help students make effective use of the technology (Detheridge, 1997; Lancioni *et al.*, 2001).

Speech-recognition software is of most value to those students who cannot produce handwritten work of sufficient quality or quantity. These systems can have a positive effect on reading and spelling with students showing significant improvement in word recognition, reading comprehension and spelling. However, not all students have expressed positive feelings about using the systems and have often reported the task of correcting speech recognition errors to be tedious and frustrating. In particular, some primary-age students have been unable to use such systems because the software has failed to recognise their high-pitched voices or unclear speech (DfEE/Becta, 2000; Higgins and Raskind, 2000).

Software and web accessibility

Good software design can benefit all students, and special needs students in particular. However, only a small percentage of curriculum materials are currently available in alternative formats accessible to those with special needs. Some students with special needs may need to use assistive technology in order to access the Internet. Yet even when this technology is available, access may still be problematic because the content is often not itself accessible - for example, when websites have not been designed with screen readers in mind. Inclusive design standards and guidelines as recommended by the W3C Web Accessibility Initiative (see <http://www.w3.org/WAI/>) can help to ensure universal access.

Teacher training and support

Evidence from a number of disabled young people, their families and schools shows that access to and interfacing with, assistive technology needs continual training and development (ACE Centre Advisory Trust, 1999). However, teachers cite lack of time, insufficient knowledge of the pedagogical uses of technology, and a lack of information on existing software as three major barriers to integrating technology. Teachers and support staff need ongoing training in order to make informed decisions regarding the technological needs of all students, including those with special needs. In special schools, training funded by the New Opportunities Fund has had a consistently strong and positive effect on pupils' learning in relation to the use of software which prints symbols alongside text to develop pupils' literacy skills. (Loiselle *et al.*, 2001; Ofsted, 2002)

Teachers' effective use of ICT with students is greatly enhanced through collaboration with peers. This is most effective when time is set aside for discussion and reflection away from the distractions of the classroom. Such discussions help teachers to become more observant of their students' forms of communication, and to interpret their responses so that teachers can devise targets and action plans for development. Online discussion forums can provide the means for this professional collaboration where it might otherwise be difficult or impossible. Moreover, encouraging participation from other health and non-educational professionals will continue to develop greater inclusion within schools (Detheridge, 1997; European Agency for Development in Special Educational Needs, 2003; Lewis and Ogilvie, 2002).

Connected learning communities

Leaders of special schools, where the effective use of ICT is well established, can develop new ways of working to support inclusion. Sharing best practice and the special skills of these schools can benefit colleagues in mainstream education, so reducing the divide between mainstream and special. This is already well developed in some areas. Such networks provide support in developing online information, professional development courses and contact for pupils and staff, in partnership with other schools and institutions. (Abbott and Cribb, 2001; Burnett, 2003)

About the research literature

Given the vital role that ICT can play in helping children with special needs to communicate and be involved in learning, it is disappointing that there is relatively little research published in academic journals regarding the use of ICT to support inclusive practice. Other sources of information include reports from charities and policy organisations with expertise in the area of special needs.

There is a growing number of small-scale case studies showing the difference that ICT can make to individuals both at school and at home. Many of these case studies are powerful evidence of the potential that technology has in making a profound difference for students. Such studies may also provide teachers with examples of the use of different types of ICT in varying circumstances, some of which may be applicable to their own students. Hence even though these case studies may be small-scale, they can be of significant value.

Most of the research evaluating speech-recognition systems has concentrated on the reliability and robustness of the systems for general use. Much less evaluation has been undertaken on the ways in which speech-recognition systems can be used and customised to meet the particular needs of individuals.

Becta is preparing a report on how ICT is supporting pupils with special needs within the literacy hour, and evaluating how voice communication aids can be used by people with disabilities to operate computer games. It is also managing a project to show how students with disabilities and learning difficulties are using tablet PCs.

Key areas for further research

- Research is needed into the increased ICT skills required by teaching staff to exploit the technology's educational potential
- Research and findings need to be more widely disseminated on good pedagogical approaches using ICT to support inclusion in special needs education
- More structured and rigorous research is needed into the use and impact of symbols.

Key questions for schools

- Is the curriculum inclusive by ensuring equality of access and opportunity for all pupils, including and through the use of ICT?
- How do your teachers keep up-to-date with the range of hardware and software to support their pupils?
- How can special schools share effective practice using ICT with colleagues in mainstream schools?

DfES/Becta initiatives on inclusion and SEN

The Communication Aids Project (CAP) <http://cap.becta.org.uk> helps pupils who have communication difficulties by providing assistive technology to help them access the curriculum and interact with others, as well as support their transition to post-school provision. Teachers and other adults can access information, advice and guidance through the Inclusion website <http://inclusion.ngfl.gov.uk> and take part in free online discussion groups covering most areas of special needs and inclusive education.

Bibliography and further reading

The research referred to in this briefing represents a selection from the developing field of ICT research related to how ICT supports inclusion, and should not be regarded as a definitive list of the 'most important' research in this area.

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Becta's ICT Research Network

If you're interested in research on the use of ICT in education, you can join Becta's ICT Research Network.

The ICT Research Network seeks to encourage the exchange of information in order to inform the national agenda and professional practice.

Membership is free and is open to:

- teachers
- ICT co-ordinators
- ICT advisers
- school managers
- researchers
- policy makers
- research sponsors
- industry.

The Network provides an opportunity to:

- exchange information on current research
- develop partnerships
- discuss priorities for further investigation
- focus research on issues of importance to practitioners and policy-makers.

They can do this via:

- an email discussion list
- publications
- conferences and events.

More information on Becta's ICT Research Network can be found at: <http://www.becta.org.uk/research/ictrn/>

Alternatively, send an email to:

ictrn@becta.org.uk or write to:

Michael Harris, ICT Research Network, Becta, Millburn Hill Road, Science Park, Coventry CV4 7JJ.

www.becta.org.uk/research

About Becta

Becta is the Government's lead agency for information and communications technology (ICT) in education and supports UK Government, national organisations, schools and colleges in the use and development of ICT in education to raise standards, widen access, improve skills and encourage effective management.

About the ICT in Schools Programme

The ICT in Schools Programme is the Government's key initiative to stimulate and support the use of information and communications technology (ICT) to improve standards and to encourage new ways of teaching and learning. The enormous potential of ICT means that for the first time it is becoming possible for each child to be educated in a way and at a pace which suits them, recognising that each is different, with different abilities, interests and needs. The challenge over the next four years will be to successfully embed ICT in every facet of teaching and learning where it can have a direct impact on raising standards of attainment. A vision for the future of ICT in schools can be found in the paper *Fulfilling the Potential – Transforming Teaching and Learning through ICT in Schools*, available on the DfES ICT in Schools website <http://www.dfes.gov.uk/ictinschools/publications/>

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