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**Learning technology in adult  
English, maths and ESOL/ELT  
provision: an evidence review  
Appendices**

NOVEMBER 2014

**RESEARCH**

This evidence review was carried out by the National Research and Development Centre for Adult Literacy and Numeracy (NRDC) at the Institute of Education, London, in partnership with SQW Ltd and the National Foundation for Educational Research (NFER).

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## A2 Summary of primary research sources (n=20)

Source	Research Question(s)				
Arslanyilma, A. & Pedersen, S. (2013)	1. Do non-native speakers with access to subtitled videos produce more negotiation of meaning than non-native speakers without access to subtitled videos in an online Task-Based Language Learning (TBLL) environment?				
	Technology	Learning Subject	Quantitative Methods	Qualitative methods	Population
	United States	Subtitled videos in an online Task-Based Language Learning (TBLL) environment	Second language acquisition	Quasi-experimental design (in that it was an empirical study, but groups were randomly assigned, not individual students) compared 2 groups learning online, one of which had access to videos (experimental) and one which didn't (control)	
<b>Description</b>					
<p>Ten pairs of non-native speakers of English, working collaboratively, completed communication tasks using a bespoke online TBLL environment and a chat tool in WebCT-Vista. Five pairs were provided with subtitled videos before completing the tasks; five were not. The videos showed a short dialogue between native speakers doing a task similar (not the same) to that the learners had to do – learners could watch as many times as they liked before the activity. The purpose was to make learners familiar with the vocabulary and sentence structures that would be useful to them, without taking away from the cognitive complexity of what they had to do themselves.</p> <p>The study focused on “negotiation of meaning”, that is, the process whereby students come to understand each other – which they have to do to complete the tasks. The understanding is that increased negotiation of meaning results in improvements in input comprehension; in turn, there is considerable evidence for a causal relationship between comprehensible input and second language acquisition.</p>					

	<p>The students in the pairs communicated using a chat tool, which created transcripts that were analysed. The amount of negotiation of meaning was calculated via the negotiation of meaning sequences model. The dependent variable is the ratio of negotiated turns to total number of turns.</p>				
	<p><b>Finding(s)</b>                  Non native speakers who were familiarised with the tasks through subtitled videos engaged in more negotiation of meaning than those who were not.                  Students with subtitled videos in an online TBLL environment produce about three times more negotiation of meaning sequences, about two times more turns, and about three times more negotiated turns than do students without subtitled videos.</p>				
<p><b>Source</b></p>	<p><b>Research Question(s)</b></p>				
<p><b>Barden (2011)</b>                  England</p>	<p>1. What are the “affordances” of an online social network for dyslexic sixth-form students? That is, what are the relationships between the intervention and the characteristics of the learner/learning group that enable particular kinds of learning?</p> <ul style="list-style-type: none"> <li>• What does the project reveal about the students’ motivation to learn through literacy?</li> <li>• What does it reveal about their sense of identity?</li> <li>• What pedagogical principles does their use of the social network evoke?</li> </ul>				
	<p><b>Technology</b></p>	<p><b>Learning Subject</b></p>	<p><b>Quantitative Methods</b></p>	<p><b>Qualitative methods</b></p>	<p><b>Population</b></p>
	<p>Facebook</p>	<p>Literacy</p>		<p>Three qualitative methods: (1) case studies, (2) action research and (3) classroom ethnography</p>	<p>5 dyslexic 6<sup>th</sup> form students aged between 16-18.                  Convenience sample</p>
	<p><b>Description</b>                  Doctoral research by a teacher-researcher on the use of Facebook as an educational resource by dyslexic students, designed in part to add to evidence on the potential of digital media to engage and motivate dyslexic students. A small scale study, it also focused on students who were relatively high achieving educationally (the subjects were A level students) thus the sample cannot be considered representative of dyslexic population, and there are limits to which the results can be generalised to</p>				

	other settings.			
	<b>Findings</b>			
	<ol style="list-style-type: none"> <li>1. Facebook offers an arena for learning that is active (collaboration with teachers and peers rather than transmission) and critical (informed discussion and evaluation)</li> <li>2. Digital media, including Facebook, have the potential to level the playing field and make education more equitable.</li> <li>3. Students were motivated to engage with texts by the opportunity Facebook provided for self-directed learning through literacy (reading and writing).</li> <li>4. The use of social media had positive consequences on the participants' self-esteem and learning identity</li> </ol>			
<b>Source</b>	<b>Research Question(s)</b>			
<b>Berger (2005)</b> United States	<ol style="list-style-type: none"> <li>1. What do adult literacy and basic education (ALBE) instructors state are the consequences of adopting the Internet into the adult literacy classroom?</li> <li>2. How do instructors classify observed consequences of adopting the Internet according to Rogers' (2003) three dimensions of desirability, predictability, and directness?</li> </ol>			
	<b>Technology</b>	<b>Learning Subject</b>	<b>Quantitative Methods</b>	<b>Qualitative methods</b>
	Internet in the classroom	Adult literacy and basic skills	Telephone interviews to rate consequences	Telephone interviews to uncover consequences
				Convenience sample. 20 ALBE instructors (including those teaching GED, ABE, and ESL) in six states. 5 male; 15 female; 19 White, 1 African-American mostly aged 45-55 9 rural, 11 urban

					programmes
					Study limited by the fact that it was not representative (limited geography, purposive sampling) and that it did not collect views from students.
<b>Description</b>					
<p>The purpose of this study was to understand adult literacy providers' perceptions of the consequences of adopting the Internet into their classrooms. Instructors were asked to describe changes in their (1) students; (b) classroom environments; (c) themselves as teachers. They then rated each consequence as desirable or undesirable, anticipated or unanticipated, and direct or indirect.</p> <p>The study was limited by the fact that it was not representative (limited geography, purposive sampling) and that it did not collect views from students.</p>					
<b>Findings</b>					
<p>1. Instructors perceived three broad areas of impact: <b>students were more empowered</b> (taking control of their learning, improved skills, increased engagement); there was more collaborative learning (students working together and sharing information); change in instructor role from lecturer to facilitator, but (negatively) also more need to police student's work.</p> <p>2. 60 consequences identified: 40% anticipated and 60% unanticipated. The most popular profile of consequences (38.3%) was one that was desirable, unanticipated, and as a direct result of adopting the Internet; followed by (25%) those that were desirable, anticipated and directly related to adopting the internet. In other words, although <b>the consequences were overwhelmingly positive many of them were not anticipated.</b></p>					
<b>Source</b>		<b>Research Question(s)</b>			
<b>Blake (2009)</b>		1. Can fluency be improved though the medium of a text-based Internet chat environment?			
United States		<b>Technology</b>	<b>Learning Subject</b>	<b>Quantitative Methods</b>	<b>Qualitative methods</b>
		Text-based	ESL	Pre and post	
					34 ESL learners

	Internet chat		tests in <b>oral fluency</b> Exit survey of learners		26 female, 8 male
<b>Description</b>					
<p>This study examined the impact of synchronous computer-mediated communication on the second language acquisition process by comparing the test scores of ESL learners taking 6 week course (12 sessions)</p> <p>Learners were randomly assigned to 3 different environments – text-based Internet chat (course entirely online, n=10); traditional face-to-face (n=14); control environment (online activities but no interaction with students, n=10). The same instructor taught all three groups with the same curriculum. Participants in the Internet Chat group met together with the instructor in a WebCT Vista chat room and communicated with each other in real time via typed messages.</p> <p>Pre and post test in oral fluency were analysed using software that converts sound files into a spectrogram and allows the researcher to transcribe and analyse small segments of recorded speech. Five temporal measures of fluency were applied to both the pre- and post-test samples of speech.</p> <p>The purpose of the questionnaire was to gain insight into how each of the learning environments was perceived by the participants who engaged in the environment.</p>					
<b>Findings</b>					
<ol style="list-style-type: none"> <li>1. The gain scores of participants in the text-based Internet chat environment were significantly higher on the “phonation time ratio” and “mean length of run” measures than the gain scores of participants in the face-to-face and control environments.</li> <li>2. Gain scores on the three other measures (speaking rate; articulation rate; average length of pauses) were not significant.</li> </ol>					
<b>Source</b>					
<b>Chen et al (2011)</b> United States	<b>Research Question(s)</b> <ol style="list-style-type: none"> <li>1. Do scorers award different scores to handwritten responses than to typed versions of the same response?</li> <li>2. Do adults perform differently on paper- versus computer-based functional writing tasks, in terms of quality (as measured by scores) and quantity (as measured by length)?</li> <li>3. Does the influence of test administration mode on writing quality vary by demographic variables?</li> </ol>				



4. Does the effect of test administration mode on writing quality relate to the word processing experience of individual adults?				
Technology	Learning Subject	Quantitative Methods	Qualitative methods	Population
Computer-based assessment of writing	Literacy	Statistical analysis of scores on computer and paper versions of a functional writing assessment		Subset of the 1607 adults (16+) – voluntary participants in the 2008 National Assessment of Adult Literacy (NAAL). Final total sample was 935
<b>Description</b>				
<p>This study was undertaken partly due to concerns that individuals with low literacy skills were likely also to have limited computer experience that would place them at a disadvantage in computer based assessments of writing; also that scorers might exhibit a bias to one mode.</p> <p>Three writing assessments were administered in paper and computer modes to adults. Analysis compared (1) scores for adults' original handwritten responses to scores for their transcribed word-processed versions; (2) differences in performance between adults who received paper versus computer versions of the same task; (3) whether the differences between administration modes were moderated by demographic variables or by computer experience.</p>				
<b>Findings</b>				
<ol style="list-style-type: none"> <li>1. There were no statistically or practically significant scoring differences between handwritten and transcribed computer responses to the three writing tasks.</li> <li>2. Adults performed better overall and on most aspects of the writing tasks when writing on paper than on computer.</li> <li>3. The effects of administration mode varied by employment status for one task, by race/ethnicity, age and word-processor experience for another task, and remained the same for all subgroups for the third task, suggesting that computer mode of administration may disadvantage some groups.</li> </ol>				
<b>Source</b>		<b>Research Question(s)</b>		
<b>Engstrom (2005)</b>		The purpose of the study was to explore how to build reading proficiency in a diverse group of		

<p>United States</p>	<p>students while engaging them in academically challenging work that makes the structure of language more transparent.</p>				
	<p><b>Technology</b></p>	<p><b>Learning Subject</b></p>	<p><b>Quantitative Methods</b></p>	<p><b>Qualitative methods</b></p>	<p><b>Population</b></p>
	<p>Assistive technologies</p>	<p>Literacy</p>	<p>Pre and post tests in reading</p>	<p>Interviews to track confidence</p>	<p>8 college students (young adults) with low literacy skills, related to learning disabilities and difficulties</p>
	<p><b>Description</b></p>				
	<p>This study explored how assistive technology could be used to build reading proficiency in a diverse group of students while engaging them in academically challenging work that makes the structure of language more transparent. The students took coordinated courses in reading and in writing and also received additional study support sessions. Three forms of computer assisted technology were used: the Kurzweil 3000 text-to-speech software program, a word processing programme, and Inspiration software for mapping or outlining key elements of the text.</p>				
	<p><b>Findings</b></p>				
	<p>Findings in this study are reported as two case studies of students. The author concludes from her data that the positive outcomes for these students suggest the importance of combining reading and writing strategy instruction with assistive technology support and word-level instruction in a way that scaffolds the students' total written language development.</p>				
<p><b>Source</b></p>	<p><b>Research Question(s)</b></p>				
<p><b>Griffin (2008)</b> United States</p>	<p>1. Do the mathematics achievement scores of learners on a developmental maths course increase when cooperative learning and computer-assisted instruction (CAI) are utilized? 2. Does the cooperative use of computers change student attitudes to mathematics and to working in cooperative learning groups?</p>				
	<p><b>Technology</b></p>	<p><b>Learning Subject</b></p>	<p><b>Quantitative Methods</b></p>	<p><b>Qualitative methods</b></p>	<p><b>Population</b></p>
	<p>Computer Assisted</p>	<p>Basic mathematics</p>	<p>Pre and post testing in mathematics</p>		<p>51 students, with limited arithmetic</p>

	Instruction (CAI)		Survey tracking changes in student confidence and attitudes, taken both before and after the treatment		skills 84.1% of the sample were aged 18-25 Convenience sample										
<b>Description</b>															
All students in this doctoral research study worked with CAI – the study compared two groups of students who worked alone with CAI (the control group, n=24) with two groups of students working collaboratively (the experimental group, n=27), in a treatment lasting 10 weeks. The study was therefore focused not on the intervention (both groups received the same instruction) as much as the implementation of this intervention															
<b>Findings</b>															
<ol style="list-style-type: none"> <li>1. There was a significant difference on mathematic achievement scores where the cooperative learning group outperformed the participants working alone using computer assisted instruction.</li> <li>2. There was no change in the participants' attitude toward mathematics or students' perceptions of teacher attitudes.</li> <li>3. There was however, a significant difference on the post-survey scores for Students' Attitude Toward Cooperative Learning, with those in the treatment group experiencing a significantly positive increase.</li> </ol>															
<b>Source</b>															
<b>Research Question(s)</b>															
<b>Koehler et al (2011)</b> <ol style="list-style-type: none"> <li>1. What is the impact of the intervention on students' ability to use present and past simple passive voice in affirmative sentences for describing the USA?</li> <li>2. Does the design of the program facilitate the grammar concept knowledge transfer to contexts other than geography and history of the country?</li> <li>3. How do students use the programme?</li> <li>4. What is the relationship between students' learning outcomes and their computer skills, between their learning outcomes and prior knowledge?</li> </ol>															
<table border="1"> <thead> <tr> <th data-bbox="492 1292 739 1372">Technology</th> <th data-bbox="739 1292 974 1372">Learning Subject</th> <th data-bbox="974 1292 1321 1372">Quantitative Methods</th> <th data-bbox="1321 1292 1601 1372">Qualitative methods</th> <th data-bbox="1601 1292 1937 1372">Population</th> </tr> </thead> <tbody> <tr> <td data-bbox="492 1372 739 1420">Web-based</td> <td data-bbox="739 1372 974 1420">ESL</td> <td data-bbox="974 1372 1321 1420">Pre-post test scores</td> <td data-bbox="1321 1372 1601 1420">Feedback on</td> <td data-bbox="1601 1372 1937 1420">14 adult ESL learners</td> </tr> </tbody> </table>						Technology	Learning Subject	Quantitative Methods	Qualitative methods	Population	Web-based	ESL	Pre-post test scores	Feedback on	14 adult ESL learners
Technology	Learning Subject	Quantitative Methods	Qualitative methods	Population											
Web-based	ESL	Pre-post test scores	Feedback on	14 adult ESL learners											

	multimedia instruction			student perceptions	aged 22-60, working in English at intermediate/advanced levels  Convenience sampling
<b>Description</b>					
This study describes and evaluates a low cost multimedia instructional programme intervention – it was small in scale, involving linked studies of 14 participants in two educational settings, with data gathered in two sessions (lasting a total of 2-3 hours). A non-experimental, descriptive approach was used. The first study (n=10) used pre and post testing to evaluate the programme; the second study (n=4) aimed to find out how the programme addressed the individual learning needs of students.					
<b>Findings</b>					
<ol style="list-style-type: none"> <li>1. Students' ability to use the passive voice increased; those with the lowest scores at pre-test gained the most from the programme</li> <li>2. Student's ability to use present and past simple passive voice in other contexts increased; again those with the lowest scores at pre-test gained the most.</li> <li>3. The most highly ranked features were feedback, images, the highlighted words that can be clicked to hear and see their definition (word annotations), and extra practice.</li> <li>4. No relationship between computer skills (demographics survey) and performance on the tests was found.</li> </ol>					
<b>Source</b>		<b>Research Question(s)</b>			
Lewandowski (2010) England		<ol style="list-style-type: none"> <li>1. To what extent does the use of a simple device (digital recorder) enhance learners' learning experience?</li> <li>2. To what extent does it lead to improved language performance</li> <li>3. To what extent are beginner learners of English (E1/E2) capable of scaffolding each other and is this effective?</li> </ol>			

	Technology	Learning Subject	Quantitative Methods	Qualitative methods	Population
	Digital voice recorders	ESOL		Qualitative comparison of recordings at two time points Analysis of learner reflections and questionnaire data	Unemployed ESOL learners at E1 (n=11) and E2 (n=10) 6 men and 15 women, from a wider range of national and linguistic backgrounds  Age range 20-79, with a mean of 37
<b>Description</b>					
<p>This piece of action research followed adult ESOL learners on a 12 week long course, who received 5 hours (2 classes) of tuition per week. Digital voice recorders were used to allow learners to record their performance on various tasks. They were then asked to listen to their performance reflect on it and give peer feedback where appropriate. Learners were then asked to record themselves performing the same task again. The recordings were subsequently compared qualitatively to see if there was an improvement between recording one and recording two and whether or not learners took on board comments and suggestions made at the reflection/feedback stage.</p>					
<b>Findings</b>					
<ol style="list-style-type: none"> <li>1. Data analysis showed that using digital voice recorders is less effective at the lower level, i.e. E1. E2 learners, however, responded very well to this intervention. E1 learners were able to use the recorders but had insufficient language skills to self/peer correct, thus the level of English language skills affected the learner's ability to engage effectively in this type of reflective activity.</li> <li>2. E2 learners liked the fact the technology allowed them to correct their grammatical mistakes</li> </ol>					
<b>Source</b>					
<b>Research Question(s)</b>					
<b>Li &amp; Edmonds (2005)</b> Canada	<ol style="list-style-type: none"> <li>1. Do adult learners with learning disabilities improve their level of achievement in mathematics studies by engaging with computer-assisted instruction (CAI)?</li> <li>2. What benefits and advantages emerged when using CAI with at-risk learners?</li> </ol>				

3. What limitations and challenges were identified when using CAI with at-risk learners?				
Technology	Learning Subject	Quantitative Methods	Qualitative methods	Population
Computer Assisted Instruction	Mathematics	pre-post tests entry/exit surveys	learner survey data (open questions) teacher observations, lesson plans	“At risk learners” – those with some kind of learning barrier – on Adult Basic Education program
<b>Description</b>				
<p>This study compared three classrooms of at-risk adult learners studying basic mathematics, two treatment classes (n=22 and n=10 [exit survey only]) and one control (no CAI) class (n=16).</p> <p>The course had a blended learning approach, with an online component in the form of a website. Treatment groups had approximately 15 hours time in the computer lab over the semester and were also able to access the website at home (averaging 5 hours each in the semester). Students in the treatment group had a basic working knowledge and moderate comfort level with computers.</p>				
<b>Findings</b>				
<ol style="list-style-type: none"> <li>1. There were some academic benefits to these learners of using CAI: the treatment group scored significantly higher than the control group in three of the six units (whole numbers, fractions, and decimals). Other tests showed that learners in the treatment group were learning just as well as those in the control group – therefore there were no negative academic impacts of using CAI.</li> <li>2. The survey revealed that most students enjoyed working on computers in the lab, though their use at home remained the same as in the beginning of the class.</li> <li>3. All students thought the CAI component helped with their knowledge, and appreciated the guidance and clarity given by the teacher.</li> <li>4. Though the responses were positive, results showed that approximately half the students were still unsure of CAI as an instructional tool.</li> <li>5. The most effective strategies found were the building of knowledge through increased practice and learning with online and computer-based lessons. In addition, with the ease of designing scaffolded learning in digital environments and with the presence of continual teacher support, learners overcome learning difficulties, and become more satisfied with their learning.</li> </ol>				

Source	Research Question(s)				
<p><b>Maguire et al (2006)</b> England</p>	<p>The evaluation tested the Portland Partnership’s software-based learning programs and VLE with a wide range of students with communication difficulties caused by severe cognitive and physical disabilities. The supporting objectives of the evaluation were to</p> <ul style="list-style-type: none"> <li>• evaluate the effectiveness of each program or VLE element by making observations of its use by students and recording tutor comments;</li> <li>• draw out specific recommendations for improving the programs; and</li> <li>• identify general guidelines for designing learning programs and VLEs for students with cognitive and physical disabilities.</li> </ul>				
	Technology	Learning Subject	Quantitative Methods	Qualitative methods	Population
	Virtual Learning Environment	Essential skills		Observations Feedback from students and tutors	27 students with disabilities and special needs at pre-entry (18) and entry levels (9)  20 male; 7 female; all but 1 aged 18-24
	Description				
	<p>This report evaluates a computer-based VLE which was developed to support learners with severe learning and communication disabilities, and tested at four colleges in England.</p>				
	Findings				
	<p>Most findings in this evaluation report relate to specific software features. More generally, the evaluation reported positive impacts to students of using the VLE.</p>				
Source	Research Question(s)				
<p><b>McCulley (2012)</b> United States</p>	<ol style="list-style-type: none"> <li>1. Does text-to-speech adaptive educational technology improve low-literate incarcerated adults’ reading competency scores?</li> <li>2. Does adaptive educational technology improve low-literate incarcerated adults’ reading competency scores differently by (a) age, (b) gender, (c) ethnicity, (d) ELL status, or (e) initial literacy level?</li> <li>3. How do low-literate incarcerated adults and teacher/adult mentors explain their level of satisfaction (like or dislike) with the adaptive educational technology?</li> </ol>				

	Technology	Learning Subject	Quantitative Methods	Qualitative methods	Population
	Adaptive technology (text-to-speech software)	Literacy	Pre and post test using computerised reading assessment Survey data	Instructor interviews	24 adult literacy learners in prison 14female, 10 male, median age of 34 10 white, 14 BME 4 ELL Convenience sample
<b>Description</b>					
This study assessed the effect of adaptive technology on incarcerated low-literate adult populations, determining the effectiveness of text-to-speech computer software technology (Kurzweil 3000) with incarcerated adult learners seeking to improve literacy competencies. No control group was included in the pre-experimental research design and no comparison group was available. Data were collected over a period of five months, with a median 167.5 minutes using intervention					
<b>Findings</b>					
<ol style="list-style-type: none"> <li>1. There was a significant positive difference between pretest and posttest Comprehensive Adult Student Assessment System (CASAS) literacy scores.</li> <li>2. None of the other variables (age, gender, minority status, ELL status, level of competency on the CASAS literacy pretest, or time committed to the innovation) provided statistically significant results.</li> <li>3. The majority of students and teacher/mentors experienced satisfaction with the technology usage.</li> </ol>					
<b>Source</b>	<b>Research Question(s)</b>				
<b>Mellar et al. (2007)</b> England	<ol style="list-style-type: none"> <li>1. How can teaching, learning and assessing literacy, numeracy and ESOL be improved?</li> <li>2. What factors contribute to successful learning?</li> <li>3. What is the motivational impact of ICT on learners?</li> <li>4. How does ICT impact on the wider learning context?</li> <li>5. What is effective support for the development of tutors in the use of ICT in Skills for Life?</li> </ol>				
	<b>Technology</b>	<b>Learning</b>	<b>Quantitative</b>	<b>Qualitative</b>	<b>Population</b>



	Subject	Methods	methods	
Seven ICT interventions: (see below)	Literacy, ESOL and ICT skills	Pre and post tests	51 classroom and 123 learner observations	150 students in the evaluation phases 80 students at pre and post testing
<b>Description</b>				
<p>This project was one of a suite of five Effective Practice studies carried out by NRDC/IOE. Research took place in two phases; in the first researchers worked with a group of nine tutors as practitioner researchers in devising uses of ICT to support learning in their classroom contexts. In the second phase of research, seven scenarios of ICT use were evaluated.</p> <p>Learners were tested pre and post course (40 hours of teaching) on their ICT skills, ICT confidence, ESOL listening skills and/or reading skills. Classes and individual students were observed.</p> <p>The seven interventions were:</p> <ol style="list-style-type: none"> <li>1. <b>WebQuests</b>: inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the internet</li> <li>2. <b>E-portfolios</b>: web-based technology that allows users to design websites in which they can store and display their work, thus creating electronic books or portfolios</li> <li>3. <b>Tablets</b>, incorporating the use of a pen and handwriting recognition.</li> <li>4. <b>M-learning</b>, using handheld computers with mobile phone functionality and built-in cameras</li> <li>5. <b>Digital video</b>, to create films</li> <li>6. <b>Mindmaps</b> (diagrams used to visually organise information), using a mindmapping program called Inspirations</li> <li>7. <b>Basic ICT class</b> (with embedded literacy), which used computers as a hook to attract people into learning</li> </ol>				
<b>Findings</b>				
<ol style="list-style-type: none"> <li>1. Learners improved in almost all cases in both literacy/ESOL skills and ICT skills and confidence.</li> <li>2. Mobile technologies (tablets, personal digital assistants [PDAs], mobile phones) were found to be particularly motivating, and enabled greater flexibility in teaching.</li> <li>3. No correlation was found between changes in ICT-skills and ICT-confidence scores and changes in reading and listening scores. This suggests that the two areas of skills are being learnt independently, that is the acquisition of one is not affecting the acquisition of the other.</li> <li>4. There was a negative correlation for gains in ESOL scores for men (older learners made least</li> </ol>				

	<p>progress). There were positive correlations for gains in ICT skills and confidence (older learners made most progress).</p> <ol style="list-style-type: none"> <li>5. Initial ICT-confidence scores correlated with learners' persistence. Those with lower scores were likely to attend less frequently, and were more likely to eventually drop out.</li> <li>6. Use of the internet, PowerPoint and word processing positively correlated with gains in ICT skills.</li> <li>7. When collaborative work was forced by the need to share technology it was not as successful as when tutors developed tasks that required peer interaction.</li> <li>8. The most effective teaching strategy was extending, where the tutor built on or added to material previously introduced, or added to a comment by a learner.</li> </ol>				
<b>Source</b>	<b>Research Question(s)</b>				
<p><b>Pleasance (2010)</b>  England</p>	<ol style="list-style-type: none"> <li>1. Is Moodle being used effectively to support ESOL learners?</li> <li>2. How do teachers and learners view Moodle as a teaching and learning tool?</li> <li>3. How will these views influence the future development of Moodle in terms of content, pedagogy and syllabus design?</li> </ol>				
	<b>Technology</b>	<b>Learning Subject</b>	<b>Quantitative Methods</b>	<b>Qualitative methods</b>	<b>Population</b>
	Moodle	ESOL		<p>Learner questionnaires</p> <p>Teacher questionnaires</p>	<p>11 adult ESOL learners</p> <p>5 male, 6 female</p> <p>Median average age of 30</p> <p>5 teachers, 3 of whom had an IT qualification</p>
	<b>Description</b>				
	<p>This paper reports the findings of a small-scale study into the effectiveness of the VLE system Moodle as a teaching and learning tool on an ESOL course. The study was designed to gather information using questionnaires regarding Moodle and its benefits to ESOL learners within a specific context. The paper concludes by proposing some recommendations for the future development of Moodle on ESOL courses with particular consideration given to pedagogy and</p>				

	syllabus design.				
	<b>Findings</b>				
	<ol style="list-style-type: none"> <li>1. Moodle is viewed as a useful learning tool and that it benefits learning.</li> <li>2. Teachers felt the online forum function was particularly beneficial as a teaching and learning tool, with learners developing their language skills and lexical knowledge through its facility for communication</li> <li>3. The forums increased learner motivation and engagement and provided opportunities for real communicative tasks, such as online discussions, social networking with other learners or communicating with the teacher about coursework.</li> <li>4. This study emphasised that the teacher is a key variable in Moodle's successful implementation and that teachers have as much to learn about being online teachers as learners do about being online learners.</li> </ol>				
<b>Source</b>	<b>Research Question(s)</b>				
<b>Silver-Pacuilla (2006)</b>	1. Does increased engagement with assistive technology increase literacy skills?				
United States	<b>Technology</b>	<b>Learning Subject</b>	<b>Quantitative Methods</b>	<b>Qualitative methods</b>	<b>Population</b>
	Assistive technology – text-to-speech and speech recognition software	Literacy		Observations Reflective dialogue with learners	18 adult students with learning disabilities, 10 of whom completed all assessments  Age range 19-62 (average 35) 8 women, 2 men 9 English speakers 5 white, 3 Hispanic, 2 African American
	<b>Description</b>				
	This project investigated whether an increased engagement with the multisensory presentation of print through text-to-speech and speech-recognition software could improve participants' literacy skills. The primary assistive technologies (AT) used were text-to-speech software (Kurzweil 3000),				

	<p>Microsoft Word, Dragon Naturally Speaking (a voice recognition program) and the Internet; participants used the AT from between 10 to 48 hours (average 16 hours) over the course of the project.</p>				
	<p><b>Findings</b></p>				
	<ol style="list-style-type: none"> <li>1. Students and their peers indicated that they perceived the small-group coaching with AT as an enriched and empowering environment.</li> <li>2. When provided with appropriate support for literacy development, the students bridged the gap themselves between secondary and postsecondary educational environments and expectations. Small-group tutoring with assistive technology for students with learning disabilities can be enabling and empowering and can begin to bridge the multiple gaps in instructional practice and service.</li> </ol>				
<p><b>Source</b></p>	<p><b>Research Question(s)</b></p>				
<p><b>Synder et al (2005)</b> Australia</p>	<ol style="list-style-type: none"> <li>1. What is the relationship between literacy practices and the use of ICT in adult literacy education?</li> <li>2. What are the new literacies required for effective and critical use of ICT in adult literacy education?</li> <li>3. What changes to pedagogical practices are associated with the use of ICT in adult literacy programs?</li> <li>4. What are the professional development needs of educators when ICT are used for teaching and learning in adult literacy programs?</li> </ol>				
	<p><b>Technology</b></p>	<p><b>Learning Subject</b></p>	<p><b>Quantitative Methods</b></p>	<p><b>Qualitative methods</b></p>	<p><b>Population</b></p>
	<p>ICT in general</p>	<p>Literacy</p>		<p>Case studies Semi-structured interviews Diary analysis</p>	<p>Adult literacy programs</p>
	<p><b>Description</b></p>				
	<p>This study was designed to add to understanding about adult learners' digital communication practices and the implications for adult literacy programs. It aimed to describe and analyse the</p>				

	<p>technology-mediated literacy practices of the participants at each site, at one point in time. A case study methodology was used, in five sites selected to represent a range of adult literacy programs across three states: two large public Registered Training Organisations, an adult literacy program embedded in an occupational health and safety course, an Indigenous Learning Centre, and a large regional adult and community education provider. Data were collected over a three month period, from teacher and learner interviews and diaries. Age was examined as a factor, with 40 selected as the dividing line between older and younger learners.</p> <p>Two outputs from this project are referenced here – the National Project Report and the support document, which contains an extended literature review and more detailed descriptions of the case-study sites.</p>				
	<p><b>Findings</b></p>				
	<ol style="list-style-type: none"> <li>1. The link between contemporary literacy practices and the use of information and communication technologies was inextricable. The younger learner group reported low levels of usage compared with the Australian population. Accommodating the differences between learners in the degree and range of their experiences of technologies represents a major challenge for adult literacy educators.</li> <li>2. There is a need to include information and communication technology ‘life skills’ in adult literacy education. The cultural dimension of techno-literacy, through which users make meaning in specific contexts of use, is perhaps even more important. There was little evidence of attention to the promotion of critical awareness.</li> <li>3. Teaching for the new literacies requires more sophisticated technical expertise and technical support than has ever been the case in adult literacy education, requiring educators with strong operational skills, and with access to quality, reliable equipment and to technical support.</li> <li>4. Unless opportunities are created to promote these changes to practice, then the likely outcome is that old approaches will linger and the integration of information and communication technologies into adult literacy education will be stalled.</li> </ol>				
<p><b>Source</b></p>	<p><b>Research Question(s)</b></p>				
<p><b>Thomas (2009)</b> United States</p>	<ol style="list-style-type: none"> <li>1. What is the quality of experience with the programs and the perceptions of achievements and goals attained from involvement with the program?</li> </ol>				
	<p><b>Technology</b></p>	<p><b>Learning Subject</b></p>	<p><b>Quantitative Methods</b></p>	<p><b>Qualitative methods</b></p>	<p><b>Population</b></p>
	<p>ICT delivered in the classroom and</p>	<p>Adult literacy, numeracy and</p>	<p>Telephone survey (exit)</p>		<p>165 female welfare recipients, 70 (42.4%) of whom completed</p>

	by distance learning.	ICT			the survey
<b>Description</b>					
<p>This source describes the Project TECH model - to address barriers to job retention and career advancement that stemmed from a lack of basic literacy and computer skills - and reports on what happens when participants who are low-income workers are given a computer, basic training software, Internet access, and training.</p> <p>Participants received weekly mandatory training in classrooms and open lab sessions and were also given a PC (with broadband internet access) to use at home for a six-month period. The program of instruction included weekly face to face instruction that was designed to encourage participants to stay motivated, to remain connected to the instructor and the learning process, and to address questions or problems they might have encountered during the week with learners also able to learn in their own homes at times and at a pace that suited them. The learning took place in two phases – a pre program where the learning happened in a classroom over about 6 weeks, with 36 hours training completed (basic computer skills and basic skills); and the distance learning phase – with weekly meetings throughout (lasting 3 hours).</p> <p>Although the telephone survey was designed to collect detailed data on (a) employment and history; (b) job retention; (c) job advancement; (d) educational attainment; (e) welfare independence; (f) overall quality of experience with the programs, PLATO software, and the instructors assignments; and (g) perceptions of achievements made/ goals attained as a direct result of program participation, this source reports only on the overall quality of experience with the programs and the perceptions of achievements and goals attained from involvement with the program, partly because the quantitative self-report data were inconsistent and incomplete.</p>					
<b>Findings</b>					
<p>1. Participants indicated that having computers in their home really increased their autonomy and interest in learning and it helped them overcome their fear of computers. The self-paced program provided the needed flexibility for various participants' disparate schedules. The program also assists participants in becoming more informed consumers.</p>					
<b>Source</b>		<b>Research Question(s)</b>			
<b>Tozcu &amp; Cody (2004)</b>		1. Do the students in an intensive English program who use Tutorial CALL to learn highly frequent vocabulary learn a significantly larger number of words than those in a control group?			

United States	<ol style="list-style-type: none"> <li>2. Do the students who use Tutorial CALL to learn highly frequent vocabulary decrease their reaction time for frequent word recognition as compared to the control group?</li> <li>3. Do the students who use Tutorial CALL to learn highly frequent vocabulary exhibit significantly better reading comprehension than a control group?</li> </ol>			
Technology	Learning Subject	Quantitative Methods	Qualitative methods	Population
Computer assisted language learning (CALL)	ESL	<p>pre and post tests in vocabulary, reading comprehension and reaction time</p> <p>learner survey</p>		<p>56 intermediate level English learners, 28 assigned to a treatment group and 28 to a control group</p> <p>From a range of backgrounds, majority (n=43) were from South East Asian backgrounds.</p>
Description				
<p>Participants in this study were English language learners on two intensive programmes. The treatment consisted of learning the highly frequent words in English on the computer. The study experienced relatively high rates of attrition and it is possible that those who remained on the programme were those who liked using the computer programme.</p>				
Findings				
<ol style="list-style-type: none"> <li>1. Students in the treatment group showed significantly greater gains in vocabulary knowledge than the ones in the control group.</li> <li>2. The treatment also had a significant positive effect on reading comprehension. The analysis shows that when students learn the highly frequent words in English on the computer, a significant improvement in reading comprehension results, and these gains were significantly greater than those experienced by the control group.</li> <li>3. The treatment had a positive effect on the rate of speed for frequent word recognition. In the study both the control and treatment groups showed increases in their rate of speed for frequent</li> </ol>				

	<p>word recognition. However, the students in the treatment group showed significantly greater gains than the ones in the control group.</p> <p>4. Gender, Age, Native Language, and Institution were not significant variables in analysis on vocabulary and reading comprehension. However, students whose native language was a Romance language improved their reaction times more than the Asian speakers.</p>				
<b>Source</b>	<b>Research Question(s)</b>				
<b>Webb (2006)</b>	1. What are the experiences of adult speakers of other languages learning English through ICT?’				
England	<b>Technology</b>	<b>Learning Subject</b>	<b>Quantitative Methods</b>	<b>Qualitative methods</b>	<b>Population</b>
	CAI – the English Language Learning and Instruction System	ESOL		Semi-structured interviews observations document analysis learner surveys	46 diverse adults learning ESOL through computers in seven learndirect ICT centres in England.
	<b>Description</b>				
	<p>Pilot evaluation of an ICT-based CD-ROM learning package called English Language Learning and Instruction System (ELLIS) for adults learning ESOL at a sample of learndirect centres in England. The study compared the effects of different settings and types of tutoring on the learners’ experiences and perceptions of the value of the CDROM for learning English.</p> <p>Open access ICT rooms supported by generic tutoring were compared with settings where ESOL trained tutors provided more structured support by blending more traditional learning and teaching with the technology. Both settings were compared with learners using the software with no tutor support.</p>				
	<b>Findings</b>				
	<p>1. Learners in all settings commented positively on their experience of learning English through ICT.</p> <p>2. Previous IT experiences contributed to successful learning</p> <p>3. Different learning settings and tutor attitude made a difference to the learners’ use of these media, with the greatest use of the software being found in the open access centres that favoured independent learning, rather than the community centres, where the software was more of an adjunct to traditional classroom teaching.</p>				



	4. ICT-based learning seemed to offer a learning 'space' for effective language practice, which appeared largely absent in other ESOL learning contexts. Most learners from the open access learning centres, who described experiencing feelings of marginality in traditional classrooms and in everyday encounters with the host community, felt more able to practise their language skills in these ICT-based contexts. Computer-assisted language learning (CALL) can offer a space for marginalised language learners to practise and negotiate language meanings, and through this it further sustains their interest in learning by this method.				
<b>Source</b>	<b>Research Question(s)</b>				
<b>Yeh &amp; Nason (2008)</b>	Not stated				
Australia	<b>Technology</b>	<b>Learning Subject</b>	<b>Quantitative Methods</b>	<b>Qualitative methods</b>	<b>Population</b>
	Computer assisted learning	Maths (ratio and fractions)		Observations	Prisoners
	<b>Description</b>				
	This report describes a research study undertaken with a cohort of inmates enrolled in the education program at a male correctional centre in eastern Australia. Building on the interests of inmates with low numeracy skills in mixing paints, researchers developed an ICT resource that could be used for learning ratio and fractions. This short paper evaluates use of the tool within a semiotic framework.				
	<b>Findings</b>				
	The semiotic framework is essential for the design of ICT tools for learning mathematics. ICT tools that are informed by the semiotic framework will seek out to utilise any possible meaning-making resources across typological, topological and social-actional resources. This will also lead to more creative and innovative design of ICT tools.				

## B1 Additional detail on search strategies

This Annex describes the overall parameters used for searching for the literature, and the specific strategies adopted by the study team to search for and retrieve key documents for selection and review.

### Step 1: Conducting bibliographical searches

The first stage, the bibliographic searches, was carried out by the National Foundation for Educational Research (NFER) Centre for Information and Reviews. A search strategy was devised, in collaboration with NRDC and SQW, to identify literature on the potential value of technology-rich approaches to adult English, maths and ESOL/ELT learning, and their possible application to certain target populations. This involved the NFER's information specialists matching database keywords to all the research questions and agreeing the search strategy with the review team at NRDC and SQW, as well as the experts. The keywords comprised sets that were devised to cover concepts for each facet of the review: adult language, literacy and numeracy, technology, learner cohorts, learning/learner outcomes, effectiveness and efficiency, and the characteristics of the populations that BIS wished the review to examine.

The precise search terms used with each of the databases (in terms of keywords used) are specified in detail in Annex A2.

In addition, a set of terms was devised to define those populations that were outside the scope of the review. This population set was used to establish one set of exclusion criteria and was incorporated into all of the searches.

Adolescents, Children, Early adolescents, Early childhood education, Elementary school students, Elementary schools, First schools, High schools, Infants, Infant school education, Infant school pupils, Infant schools, Intermediate grades, Junior high schools, Junior schools, Junior secondary schools, Kindergarten, Kindergarten children, Middle school education, Middle school pupils, Middle schools, Nursery school education, Nursery schools, Preschool children, Preschool education, Primary school pupils, Primary schools, Primary secondary education, Secondary education, Secondary school pupils, Secondary schools, Sixth form colleges, Sixth form education, Sixth form schools, Universal primary education

The search used four types of search source to ensure thorough coverage of the evidence base:

- a range of bibliographic databases
- websites of key organisations and institutions
- reference harvesting of key documents
- publication lists of subject experts

A trial search was carried out on the British Education Index using a set of terms for adult language, literacy and numeracy, combined with a technology set. Combining these results with learning/learner outcomes and effectiveness/ efficiency sets led to very few hits that were relevant to the literature review. It was therefore decided not to combine these sets at the searching stage, and to screen on these terms at a later stage in the review

The bibliographic databases and organisations' websites that were included are listed in Tables B-1 and B-2. These websites were searched on main keywords and/or the publications/research/policy sections of each website we browsed, as appropriate.

**Table B-1: The databases included in the search strategy**

Database	Description	Search details
Applied Social Sciences Index and Abstracts (ASSIA)	This is an index of over 600 international English language social science journals, which provides unique coverage of educational and developmental aspects of children.	searched via CSA 6/03/14
Australian Education Index (AEI)	AEI is Australia's largest source of education information covering reports, books, journal articles, online resources, conference papers and book chapters.	searched via Dialog Datastar 03/03/14
British Education Index (BEI)	BEI provides information on research, policy and practice in education and training in the UK. Sources include over 300 journals, mostly published in the UK, plus other material including reports, series and conference papers.	searched via Dialog Datastar 20/02/14
The Cochrane Library	The Cochrane Library is a collection of six databases that contain different types of high-quality, independent evidence to inform healthcare decision-making.	searched 11/03/14
Dissertation Abstracts	The most comprehensive collection of dissertations and theses	searched via Proquest 13/03/14
Education Resources Information Center (ERIC)	ERIC is sponsored by the United States Department of Education and is the largest education database in the world. Coverage includes research documents, journal articles, technical reports, program descriptions and evaluations and curricula material.	searched via Dialog Datastar 24/02/14
Emerald	Emerald is a long established publisher with over 200 titles in the fields of management, information science and engineering.	searched via Emerald 13/03/14

Greynet	The Grey Literature Network Service, including the OpenGrey repository, containing over 700,000 bibliographical references to grey literature produced in Europe.	searched 11/03/14
Idox Information Service	The IDOX Information Service covers all aspects of local government. Key areas of focus include public sector management, economic development, planning, housing, social services, regeneration, education, and environmental services.	searched 11/03/14
IoE Digital Education Resource Archive	The IOE UK Digital Education Repository Archive (DERA) is a digital archive of documents published electronically by government and other relevant bodies in the areas of education, training, children and families.	searched 11/03/14
Open Grey	OpenGrey is a multidisciplinary European database, covering science, technology, biomedical science, economics, social science and humanities	searched 11/03/14
PsycInfo	PsycINFO contains references to the psychological literature including articles from over 1,300 journals in psychology and related fields, chapters and books, dissertations and technical reports..	searched via Ovid SP 20/02/14
Social Policy and Practice	Social Policy and Practice is a bibliographic database with abstracts covering evidence-based social policy, public health, social services, and mental and community health. Content is from the UK with some material from the USA and Europe. Searches were carried out across the descriptors, heading word, title and abstract fields, to enable retrieval of terms both as keywords and free text.	searched via Ovid SP 5/03/14
Social Science Citation Index	Social Sciences Citation Index (SSCI) is an interdisciplinary citation index covering approximately 2,474 of the world's leading journals of social sciences, across more than 50 disciplines	searched via Thomson Reuters Web of Science 11/03/14
Social Science Research Network (SSRN)	Social Science Research Network (SSRN) is devoted to the rapid worldwide dissemination of social science research and is composed of a number of specialised research networks in each of the social sciences.	searched via SSRN 13/04/14

Source: NFER

**Table B-2: The web resources included in the search strategy**

Organisation	URL
Campaign for Learning	<a href="http://www.campaign-for-learning.org.uk">http://www.campaign-for-learning.org.uk</a>
Centre for Literacy	<a href="http://www.centreforliteracy.qc.ca">http://www.centreforliteracy.qc.ca</a>
Confederation of British Industry	<a href="http://www.cbi.org.uk">http://www.cbi.org.uk</a>
gov.uk	<a href="https://www.gov.uk">https://www.gov.uk</a>
Educational Endowment Foundation	<a href="http://educationendowmentfoundation.org.uk">http://educationendowmentfoundation.org.uk</a>
European Association for the Education of Adults	<a href="http://www.eaea.org/">http://www.eaea.org/</a>
Futurelab at NFER	<a href="http://www.futurelab.org.uk">http://www.futurelab.org.uk</a>
Institute for Learning	<a href="http://www.ifl.ac.uk">http://www.ifl.ac.uk</a>
National Center for the Study of Adult Learning and Literacy	<a href="http://www.ncsall.net">http://www.ncsall.net</a>
National Institute of Adult Continuing Education	<a href="http://www.niace.org.uk">http://www.niace.org.uk</a>
National Literacy Trust	<a href="http://www.literacytrust.org.uk">www.literacytrust.org.uk</a>
National Research and Development Centre for Adult Literacy and Numeracy	<a href="http://www.nrdc.org.uk">http://www.nrdc.org.uk</a>
Organisation for Economic Cooperation and Development	<a href="http://www.oecd.org">http://www.oecd.org</a>
Technology Enhanced Learning Research Programme	<a href="http://tel.ioe.ac.uk">http://tel.ioe.ac.uk</a>
Towards Maturity	<a href="http://www.towardsmaturity.org">http://www.towardsmaturity.org</a>
UK Commission for Employment and Skills	<a href="http://www.ukces.org.uk">http://www.ukces.org.uk</a>
UNESCO	<a href="http://en.unesco.org">http://en.unesco.org</a>
World Bank	<a href="http://www.worldbank.org">http://www.worldbank.org</a>

Source: NFER

**Step 2: Retrieving documents and initial screening**

Details of the numbers of records retrieved by and selected from each database search are indicated in Table B-3 below.

**Table B-3: Items found and selected from the bibliographic database searches**

Database	Items found	Items selected for consideration	Items identified as high priority for this review
Applied Social Sciences Index and Abstracts (ASSIA)	3	1	0
Australian Education Index (AEI)	480	457	-
British Education Index (BEI)	540	434	5
The Cochrane Library	0	-	-
Dissertation Abstracts	246	23	1
Education Resources Information Center - (ERIC)	1921	1821	11
Emerald	0	-	-
Grey Net	0	-	-
Idox Information Service	0	-	-
IoE Digital Education Resource Archive	4	*	*
Open Grey	4	*	*
PsycInfo	869	818	3
Social Policy and Practice	3	3	1
Social Science Research Network (SSRN)	4	*	1
Social Science Citation Index (SSCI)	1500	1429	2
Total	6919	6155	24

Source: NFER

A further 33 documents were found as a result of searches of web sources: three of these were identified as high priority for the review, bringing the total number of sources for inclusion to 27.

### Step 3: Applying exclusion criteria

We applied exclusion criteria to the 5,607 documents to arrive at a shortlist of documents for final full review. These criteria were derived specifically to ensure that the selected documents explicitly addressed the study research questions, and were methodologically

sound. The criteria were used initially on abstracts of articles and then on full documents (where we could gain access to these).

We excluded those documents that did not discuss or mention the study methodology. We believed that this aspect was crucial in judging the robustness of the study and informing judgements about the effectiveness, or otherwise, of the intervention or practice in question.

In considering the study purpose in selecting articles for final full review, we also screened out documents that did not focus on the main research questions for the study and did not cover the relevant study themes, including the key outcomes of interest.

Table B-4 presents the variables that were considered for selecting articles from the long list, and other factors that were taken into consideration when categorising the literature.

**Table B-4: Descriptors and exclusion criteria**

Descriptors	Exclusion Criteria
<ul style="list-style-type: none"> <li>• Country of origin</li> <li>• Outcome of study</li> <li>• Research type</li> <li>• Source of evidence</li> <li>• Delivery setting</li> <li>• Learning technology used</li> <li>• Population</li> <li>• Adult Sub group</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-2002</li> <li>• No methodology statement</li> <li>• No direct relevance to the key research questions</li> <li>• No reference to a learning technology</li> <li>• Population set:               <ul style="list-style-type: none"> <li>○ Higher education</li> <li>○ Universities</li> <li>○ Professional Education (CPD)</li> <li>○ Teacher Training</li> <li>○ Pedagogy</li> <li>○ Children 0-15</li> <li>○ English as a foreign language (unless relevant to basic skills learning and ESOL/ELT in the UK)</li> </ul> </li> </ul>

Source: SQW

## Step 4: Reviewing

A total of 25 documents were taken to full review. Each of these was coded for relevance to the study's research questions (first order concepts) using Eppi-reviewer. These findings were then grouped according to characteristics, for example, according to learning subject or population of interest. In the final stage of analysis, messages relevant to the study's research questions and hypotheses were drawn out.

## B2 Search Strategy Keywords

### Applied Social Sciences Index and Abstracts (ASSIA)

- #1 Adult literacy (ft)
- #2 Adult numeracy (ft)
- #3 Adult literacy and numeracy (ft)
- #4 ALLN (ft)
- #5 Dyslexia
- #6 Dyscalculia
- #7 English as a second language
- #8 Community based learning (ft)
- #9 English language teaching
- #10 English language training (ft)
- #11 ESOL (ft)
- #12 Literacy
- #13 Reading
- #14 Literacy skills
- #15 Literacy education (ft)
- #16 Literacy program\* (ft)
- #17 Mathematics
- #18 Mathematics skills (ft)
- #19 Mathematics education (ft)
- #20 Numeracy
- #21 Numeracy skills (ft)
- #22 Reading skills (ft)
- #23 Skills for life (ft)
- #24 Workplace based literacy (ft)
- #25 Workplace based numeracy (ft)
- #26 Workplace based skills (ft)
- #27 #1 or #2 or ...or #26
- #28 Blended learning (ft)
- #29 Interactive computer assisted learning
- #30 Computer assisted instruction
- #31 Computer uses in education (ft)
- #32 Computers
- #33 Digital learning (ft)
- #34 Digital literacy (ft)
- #35 Digital technolog\* (ft)
- #36 Distance learning



- #37 E learning (ft)
- #38 Educational technology (ft)
- #39 Game based learning (ft)
- #40 ICT (ft)
- #41 Information and communications technology (ft)
- #42 Information technology
- #43 Innovative technolog\* (ft)
- #44 Interactive learning (ft)
- #45 Interactive technolog\* (ft)
- #46 Internet
- #47 Internet based training (ft)
- #48 Learning technolog\* (ft)
- #49 Massive open online courses (ft)
- #50 M learning (ft)
- #51 Mobile learning
- #52 Massive open online courses (ft)
- #53 MOOCs
- #54 New media (ft)
- #55 New technolog\* (ft)
- #56 Online learning (ft)
- #57 Social media for learning (ft)
- #58 Technology enhanced learning (ft)
- #59 Technological literacy (ft)
- #60 Technology rich (ft)
- #61 VLE (ft)
- #62 Virtual classroom (ft)
- #63 Virtual college\* (ft)
- #64 Virtual learning environment\* (ft)
- #65 Virtual school\* (ft)
- #66 Virtual worlds for learning (ft)
- #67 Web 2.0 (ft)
- #68 Web based learning (ft)
- #69 #28 or #29 or ...or #68
- #70 #27 and #69

### **Australian Education Index (AEI)**

- #1 Adult literacy
- #2 Adult numeracy (ft)
- #3 Adult literacy and numeracy (ft)

- #4 ALLN (ft)
- #5 Community based learning (ft)
- #6 Dyslexia
- #7 Dyscalculia (ft)
- #8 English as a second language
- #9 Community based learning (ft)
- #10 ELT (ft)
- #11 English language teaching (ft)
- #12 English language training (ft)
- #13 ESOL (ft)
- #14 English as a second language (ft)
- #15 English for speakers of other languages (ft)
- #16 Essential skills (ft)
- #17 Foundation skills (ft)
- #18 Functional English (ft)
- #19 Functional literacy
- #20 Functional numeracy (ft)
- #21 Functional math\* (ft)
- #22 Functional reading
- #23 Literacy
- #24 Literacy skills (ft)
- #25 Literacy education
- #26 Literacy program\* (ft)
- #27 Mathematics skills
- #28 Mathematics education
- #29 Numeracy
- #30 Numeracy skills (ft)
- #31 Reading skills
- #32 Skills for life (ft)
- #33 Workplace based literacy (ft)
- #34 Workplace based numeracy (ft)
- #35 Workplace based skills (ft)
- #36 #1 or #2 or...#35
- #37 Adaptive learning games (ft)
- #38 Apps for learning (ft)
- #39 Apps for functional skills (ft)
- #40 Apps for adult numeracy (ft)
- #41 Apps for adult literacy (ft)
- #42 Blended learning

- #43 CAI (ft)
- #44 Computer assisted instruction (ft)
- #45 Computer assisted learning (ft)
- #46 Computer assisted teaching
- #47 ICT in education
- #48 Computers
- #49 Digital education
- #50 Digital literacy (ft)
- #51 Digital technolog\* (ft)
- #52 Distance learning
- #53 E learning
- #54 Educational technology
- #55 Game based learning (ft)
- #56 ICT (ft)
- #57 Information and communications technology
- #58 Information technology (ft)
- #59 Innovative technolog\* (ft)
- #60 Interactive learning (ft)
- #61 Interactive technolog\* (ft)
- #62 Internet
- #63 Internet based training (ft)
- #64 Learning technolog\* (ft)
- #65 Massive open online courses (ft)
- #66 M learning (ft)
- #67 Mobile learning (ft)
- #68 Massive open online courses (ft)
- #69 MOOCs (ft)
- #70 New media (ft)
- #71 New technolog\* (ft)
- #72 Online learning
- #73 Online education
- #74 Online learning platform\* (ft)
- #75 Simulations for learning (ft)
- #76 Social media for learning (ft)
- #77 Technology enhanced learning (ft)
- #78 Technology literacy
- #79 Technology rich (ft)
- #80 VLE (ft)
- #81 Virtual classrooms

- #82 Virtual college\* (ft)
- #83 Virtual learning environment~ (ft)
- #84 Virtual school\* (ft)
- #85 Virtual worlds for learning (ft)
- #86 Web 2.0 technology (ft)
- #87 Web based learning (ft)
- #88 #37 or #38 or...#85
- #89 #36 and #88

### **British Education Index (BEI)**

- #1 Adult literacy
- #2 Adult numeracy (ft)
- #3 Adult literacy and numeracy (ft)
- #4 ALLN (ft)
- #5 Community based learning (ft)
- #6 Dyslexia
- #7 Dyscalculia
- #8 English as a second language
- #9 Community based learning (ft)
- #10 ELT (ft)
- #11 English language teaching (ft)
- #12 English language training (ft)
- #13 ESOL (ft)
- #14 English as a second language (ft)
- #15 English for speakers of other languages (ft)
- #16 Essential skills (ft)
- #17 Foundation skills (ft)
- #18 Functional English (ft)
- #19 Functional literacy
- #20 Functional numeracy (ft)
- #21 Functional math\* (ft)
- #22 Functional reading
- #23 Literacy
- #24 Literacy skills (ft)
- #25 Literacy education
- #26 Literacy program\* (ft)
- #27 Mathematics skills
- #28 Mathematics education

- #29 Numeracy
- #30 Numeracy skills (ft)
- #31 Reading skills
- #32 Skills for life (ft)
- #33 Workplace based literacy (ft)
- #34 Workplace based numeracy (ft)
- #35 Workplace based skills (ft)
- #36 #1 or #2 or...#35
- #37 Adaptive learning games (ft)
- #38 Apps for learning (ft)
- #39 Apps for functional skills (ft)
- #40 Apps for adult numeracy (ft)
- #41 Apps for adult literacy (ft)
- #42 Blended learning
- #43 CAI (ft)
- #44 Computer assisted instruction (ft)
- #45 Computer assisted learning
- #46 Computer assisted teaching (ft)
- #47 Computer uses in education
- #48 Computers
- #49 Digital learning (ft)
- #50 Digital literacy (ft)
- #51 Digital technolog\* (ft)
- #52 Distance learning
- #53 E learning (ft)
- #54 Educational technology
- #55 Game based learning (ft)
- #56 ICT (ft)
- #57 Information and communications technology (ft)
- #58 Information technology
- #59 Innovative technolog\* (ft)
- #60 Interactive learning (ft)
- #61 Interactive technolog\* (ft)
- #62 Internet
- #63 Internet based training (ft)
- #64 Learning technolog\* (ft)
- #65 Massive open online courses (ft)
- #66 M learning (ft)
- #67 Mobile learning (ft)

- #68 Massive open online courses (ft)
- #69 MOOCs (ft)
- #70 New media (ft)
- #71 New technolog\* (ft)
- #72 Online learning (ft)
- #73 Online learning platform\* (ft)
- #74 Simulations for learning (ft)
- #75 Social media for learning (ft)
- #76 Technology enhanced learning (ft)
- #77 Technology literacy
- #78 Technology rich (ft)
- #79 VLE (ft)
- #80 Virtual college\* (ft)
- #81 Virtual learning environment
- #82 Virtual school\* (ft)
- #83 Virtual worlds for learning (ft)
- #84 Web 2.0 technology (ft)
- #85 Web based learning (ft)
- #86 #37 or #38 or...#85
- #87 #36 and #86

### **The Cochrane Library**

- #1 Adult literacy
- #2 Adult numeracy
- #3 Adult literacy and numeracy
- #4 ALLN
- #5 Dyscalculia
- #6 Dyslexia
- #7 English language teaching
- #8 English language training
- #9 ELT
- #10 English as a second language
- #11 ESOL
- #12 Literacy
- #13 Numeracy
- #14 Reading

## Dissertation Abstracts

- #1 Adult literacy
- #2 Adult numeracy
- #3 Adult literacy and numeracy
- #4 ALLN
- #5 English (Second Language)
- #6 ELT (English Language Teaching/Training)
- #7 ESOL
- #8 English as a Second Language
- #9 English for Speakers of Other Languages
- #10 Literacy
- #11 Literacy skills
- #12 Literacy education
- #13 Literacy programmes/programs
- #14 Mathematics/math/maths skills
- #15 Mathematics/math/maths education
- #16 Numeracy
- #17 Numeracy skills
- #18 Reading skills
- #19 #1 or #2 or...#18
- #20 Blended learning
- #21 CAI
- #22 Computer assisted instruction
- #23 Computer assisted learning
- #24 Computer assisted teaching
- #25 Computer uses in education
- #26 Computers
- #27 Digital learning
- #28 Digital literacy
- #29 Digital technologies
- #30 Distance learning
- #31 E learning/e-learning
- #32 Educational technology
- #33 Information and communications technology
- #34 ICT
- #35 Information technology
- #36 Innovative technologies
- #37 Interactive learning

- #38 Internet
- #39 Internet based training (IBT)
- #40 Learning technology
- #41 Massive Open Online Courses
- #42 M learning
- #43 M-learning
- #44 Mobile learning
- #45 MOOCs
- #46 New media
- #47 New technologies
- #48 Online Learning
- #49 Online learning platforms
- #50 Technology literacy
- #51 Technology rich
- #52 VLE
- #53 Virtual Learning Environments
- #54 Virtual schools/colleges
- #55 Web based learning (WEB)
- #56 #20 or #21 or...#55
- #57 #19 and #56

### **Education Resources Information Center (ERIC )**

- #1 Adult literacy
- #2 Adult numeracy (ft)
- #3 Adult literacy and numeracy (ft)
- #4 ALLN (ft)
- #5 Community based learning (ft)
- #6 Dyslexia
- #7 Dyscalculia (ft)
- #8 English as a second language
- #9 Community based learning (ft)
- #10 ELT (ft)
- #11 English language teaching (ft)
- #12 English language training (ft)
- #13 ESOL (ft)
- #14 English as a second language (ft)
- #15 English for speakers of other languages (ft)
- #16 Essential skills (ft)



- #17 Foundation skills (ft)
- #18 Functional English (ft)
- #19 Functional literacy
- #20 Functional numeracy (ft)
- #21 Functional math\* (ft)
- #22 Functional reading
- #23 Literacy
- #24 Literacy skills (ft)
- #25 Literacy education
- #26 Literacy program\* (ft)
- #27 Mathematics skills
- #28 Mathematics education
- #29 Numeracy
- #30 Numeracy skills (ft)
- #31 Reading skills
- #32 Skills for life (ft)
- #33 Workplace based literacy (ft)
- #34 Workplace based numeracy (ft)
- #35 Workplace based skills (ft)
- #36 #1 or #2 or...#35
- #37 Adaptive learning games (ft)
- #38 Apps for learning (ft)
- #39 Apps for functional skills (ft)
- #40 Apps for adult numeracy (ft)
- #41 Apps for adult literacy (ft)
- #42 Blended learning
- #43 CAI (ft)
- #44 Computer assisted instruction (ft)
- #45 Computer assisted learning (ft)
- #46 Computer assisted teaching (ft)
- #47 ICT in education
- #48 Computers
- #49 Digital education
- #50 Digital literacy (ft)
- #51 Digital technolog\* (ft)
- #52 Distance learning
- #53 Electronic learning
- #54 Educational technology
- #55 Game based learning (ft)

- #56 ICT (ft)
- #57 Information and communications technology
- #58 Information technology (ft)
- #59 Innovative technolog\* (ft)
- #60 Interactive learning (ft)
- #61 Interactive technolog\* (ft)
- #62 Internet
- #63 Internet based training (ft)
- #64 Learning technolog\* (ft)
- #65 Massive open online courses (ft)
- #66 M learning (ft)
- #67 Mobile learning (ft)
- #68 Massive open online courses (ft)
- #69 MOOCs (ft)
- #70 New media (ft)
- #71 New technolog\* (ft)
- #72 Online learning
- #73 Online education
- #74 Online learning platform\* (ft)
- #75 Simulations for learning (ft)
- #76 Social media for learning (ft)
- #77 Technology enhanced learning (ft)
- #78 Technology literacy
- #79 Technology rich (ft)
- #80 VLE (ft)
- #81 Virtual classrooms
- #82 Virtual college\* (ft)
- #83 Virtual learning environment~ (ft)
- #84 Virtual school\* (ft)
- #85 Virtual worlds for learning (ft)
- #86 Web 2.0 technology (ft)
- #87 Web based learning (ft)
- #88 #37 or #38 or...#85
- #89 #36 and #88

## **Emerald**

- #1 Adult literacy
- #2 Adult numeracy

- #3 Adult literacy and numeracy
- #4 ALLN
- #5 Dyscalculia
- #6 Dyslexia
- #7 English language teaching
- #8 English language training
- #9 ELT
- #10 English as a second language
- #11 ESOL
- #12 Literacy
- #13 Numeracy
- #14 Reading

### **Idox Information Service**

- #1 Adult literacy
- #2 Adult numeracy
- #3 Adult literacy and numeracy
- #4 ALLN
- #5 ESOL
- #6 English for Speakers of Other Languages
- #7 Skills for Life

### **IoE Digital Education Resource Archive**

- #1 Adult literacy
- #2 Adult numeracy (ft)
- #3 Adult literacy and numeracy (ft)
- #4 ALLN (ft)
- #5 Dyscalculia
- #6 Dyslexia
- #7 English second language
- #8 English language teaching (ft)
- #9 English language training (ft)
- #10 ESOL (ft)
- #11 Literacy
- #12 Literacy program\* (ft)
- #13 Literacy education (ft)
- #14 Mathematics education (ft)
- #15 Mathematics skills (ft)

- #16 Numeracy
- #17 Numeracy skills (ft)
- #18 Skills for life (ft)
- #19 Workplace based literacy (ft)
- #20 Workplace based numeracy (ft)
- #21 Workplace based skills (ft)
- #22 #1 or #2 or ...#21
- #23 Computers
- #24 Blended learning (ft)
- #25 CAI
- #26 Computer assisted instruction (ft)
- #27 Computer assisted learning (ft)
- #28 Computer assisted teaching (ft)
- #29 Digital learning (ft)
- #30 Digital literacy (ft)
- #31 Digital technolog\* (ft)
- #32 Distance learning
- #33 E learning
- #34 Educational technology
- #35 Game based learning (ft)
- #36 Information and communications technology (ft)
- #37 Innovative technolog\* (ft)
- #38 ICT
- #39 Information technology
- #40 Interactive learning
- #41 Interactive technolog\* (ft)
- #42 Internet
- #43 Internet based training (ft)
- #44 Learning technolog\* (ft)
- #45 Massive open online courses (ft)
- #46 M learning (ft)
- #47 Mobile learning
- #48 MOOCs (ft)
- #49 New media (ft)
- #50 New technolog\* (ft)
- #51 Online learning (ft)
- #52 Online learning platform\* (ft)
- #53 Social media for learning (ft)
- #54 Technology enhanced learning (ft)

- #55 Technological literacy (ft)
- #56 Technology rich (ft)
- #57 VLE\* (ft)
- #58 Virtual learning environment\* (ft)
- #59 Virtual college\* (ft)
- #60 Virtual school\* (ft)
- #61 Web based learning (ft)
- #62 #23 or #24 or ...#61
- #63 #22 and #62

## PsycInfo

- #1 Acalculia
- #2 Adult literacy (ft)
- #3 Adult numeracy (ft)
- #4 Adult literacy and numeracy (ft)
- #5 ALLN (ft)
- #6 Community based learning (ft)
- #7 Dyslexia
- #8 English as second language
- #9 English language teaching (ft)
- #10 English language training (ft)
- #11 ESOL (ft)
- #12 Essential skills (ft)
- #13 Foundation skills (ft)
- #14 Functional English (ft)
- #15 Functional literacy (ft)
- #16 Functional mathematics (ft)
- #17 Functional numeracy (ft)
- #18 Functional reading (ft)
- #19 Literacy
- #20 Literacy education (ft)
- #21 Literacy programs
- #22 Literacy skills (ft)
- #23 Mathematics education
- #24 Mathematics skills (ft)
- #25 Numeracy (ft)
- #26 Numeracy skills (ft)
- #27 Reading skills

- #28 Skills for Life (ft)
- #29 Workplace based literacy (ft)
- #30 Workplace based numeracy (ft)
- #31 Workplace based skills (ft)
- #32 #1 or #2 or...#31
- #33 Adaptive learning games (ft)
- #34 Apps for adult literacy (ft)
- #35 Apps for adult numeracy (ft)
- #36 Apps for functional skills (ft)
- #37 Apps for learning (ft)
- #38 Blended learning (ft)
- #39 Computer aided instruction
- #40 Computer applications
- #41 Computer assisted learning (ft)
- #42 Computer assisted teaching (ft)
- #43 Computer usage
- #44 Computer uses in education (ft)
- #45 Computers
- #46 Digital learning (ft)
- #47 Digital literacy (ft)
- #48 Digital technologies (ft)
- #49 Distance education
- #50 E learning (ft)
- #51 Educational technology (ft)
- #52 Game based learning (ft)
- #53 ICT (ft)
- #54 Information and communications technology (ft)
- #55 Information technology
- #56 Innovative technologies (ft)
- #57 Interactive technology (ft)
- #58 Internet
- #59 Internet based training (ft)
- #60 Learning technology (ft)
- #61 Massive open online courses (ft)
- #62 M learning (ft)
- #63 Mobile devices
- #64 MOOCs (ft)
- #65 New media (ft)
- #66 New technologies (ft)

- #67 Online learning (ft)
- #68 Online learning platforms (ft)
- #69 Simulations for learning (ft)
- #70 Social media for learning (ft)
- #71 Technology enhanced learning (ft)
- #72 Technology literacy (ft)
- #73 Technology rich (ft)
- #74 Virtual classrooms
- #75 Virtual learning environments (ft)
- #76 Virtual colleges (ft)
- #77 Virtual schools (ft)
- #78 VLEs (ft)
- #79 Virtual worlds for learning (ft)
- #80 Web 2 (ft)
- #81 Web based learning (ft)
- #82 #33 or #34 or...#81
- #83 #32 and #82

## **Social Policy and Practice**

- #1 Adult literacy
- #2 Adult numeracy (ft)
- #3 Adult literacy and numeracy (ft)
- #4 ALLN (ft)
- #5 Dyscalculia
- #6 Dyslexia
- #7 English second language
- #8 English language teaching (ft)
- #9 English language training (ft)
- #10 ESOL (ft)
- #11 Literacy
- #12 Literacy program\* (ft)
- #13 Literacy education (ft)
- #14 Mathematics education (ft)
- #15 Mathematics skills (ft)
- #16 Numeracy
- #17 Numeracy skills (ft)
- #18 Skills for life (ft)
- #19 Workplace based literacy (ft)

- #20 Workplace based numeracy (ft)
- #21 Workplace based skills (ft)
- #22 #1 or #2 or ...#21
- #23 Computers
- #24 Blended learning (ft)
- #25 CAI
- #26 Computer assisted instruction (ft)
- #27 Computer assisted learning (ft)
- #28 Computer assisted teaching (ft)
- #29 Digital learning (ft)
- #30 Digital literacy (ft)
- #31 Digital technolog\* (ft)
- #32 Distance learning
- #33 E learning
- #34 Educational technology
- #35 Game based learning (ft)
- #36 Information and communications technology (ft)
- #37 Innovative technolog\* (ft)
- #38 ICT
- #39 Information technology
- #40 Interactive learning
- #41 Interactive technolog\* (ft)
- #42 Internet
- #43 Internet based training (ft)
- #44 Learning technolog\* (ft)
- #45 Massive open online courses (ft)
- #46 M learning (ft)
- #47 Mobile learning
- #48 MOOCs (ft)
- #49 New media (ft)
- #50 New technolog\* (ft)
- #51 Online learning (ft)
- #52 Online learning platform\* (ft)
- #53 Social media for learning (ft)
- #54 Technology enhanced learning (ft)
- #55 Technological literacy (ft)
- #56 Technology rich (ft)
- #57 VLE\* (ft)
- #58 Virtual learning environment\* (ft)



- #59 Virtual college\* (ft)
- #60 Virtual school\* (ft)
- #61 Web based learning (ft)
- #62 #23 or #24 or ...#61
- #63 #22 and #62

## Social Science Citation Index

- #1 Adult literacy
- #2 Adult numeracy
- #3 Adult literacy and numeracy
- #4 ALLN
- #5 English (Second Language)
- #6 ELT (English Language Teaching/Training)
- #7 ESOL
- #8 English as a Second Language
- #9 English for Speakers of Other Languages
- #10 Literacy
- #11 Literacy skills
- #12 Literacy education
- #13 Literacy programmes/programs
- #14 Mathematics/math/maths skills
- #15 Mathematics/math/maths education
- #16 Numeracy
- #17 Numeracy skills
- #18 Reading skills
- #19 #1 or #2 or...#18
- #20 Blended learning
- #21 CAI
- #22 Computer assisted instruction
- #23 Computer assisted learning
- #24 Computer assisted teaching
- #25 Computer uses in education
- #26 Computers
- #27 Digital learning
- #28 Digital literacy
- #29 Digital technologies
- #30 Distance learning
- #31 E learning/e-learning

- #32 Educational technology
- #33 Information and communications technology
- #34 ICT
- #35 Information technology
- #36 Innovative technologies
- #37 Interactive learning
- #38 Internet
- #39 Internet based training (IBT)
- #40 Learning technology
- #41 Massive Open Online Courses
- #42 M learning
- #43 M-learning
- #44 Mobile learning
- #45 MOOCs
- #46 New media
- #47 New technologies
- #48 Online Learning
- #49 Online learning platforms
- #50 Technology literacy
- #51 Technology rich
- #52 VLE
- #53 Virtual Learning Environments
- #54 Virtual schools/colleges
- #55 Web based learning (WEB)
- #56 #20 or #21 or...#55
- #57 #19 and #56

### **Social Science Research Network**

- #1 Adult literacy
- #2 Adult numeracy (ft)
- #3 Adult literacy and numeracy (ft)
- #4 ALLN (ft)
- #5 Dyscalculia
- #6 Dyslexia
- #7 English second language
- #8 English language teaching (ft)
- #9 English language training (ft)
- #10 ESOL (ft)

- #11 Literacy
- #12 Literacy program\* (ft)
- #13 Literacy education (ft)
- #14 Mathematics education (ft)
- #15 Mathematics skills (ft)
- #16 Numeracy
- #17 Numeracy skills (ft)
- #18 Skills for life (ft)
- #19 Workplace based literacy (ft)
- #20 Workplace based numeracy (ft)
- #21 Workplace based skills (ft)
- #22 #1 or #2 or ...#21
- #23 Computers
- #24 Blended learning (ft)
- #25 CAI
- #26 Computer assisted instruction (ft)
- #27 Computer assisted learning (ft)
- #28 Computer assisted teaching (ft)
- #29 Digital learning (ft)
- #30 Digital literacy (ft)
- #31 Digital technolog\* (ft)
- #32 Distance learning
- #33 E learning
- #34 Educational technology
- #35 Game based learning (ft)
- #36 Information and communications technology (ft)
- #37 Innovative technolog\* (ft)
- #38 ICT
- #39 Information technology
- #40 Interactive learning
- #41 Interactive technolog\* (ft)
- #42 Internet
- #43 Internet based training (ft)
- #44 Learning technolog\* (ft)
- #45 Massive open online courses (ft)
- #46 M learning (ft)
- #47 Mobile learning
- #48 MOOCs (ft)
- #49 New media (ft)

- #50 New technolog\* (ft)
- #51 Online learning (ft)
- #52 Online learning platform\* (ft)
- #53 Social media for learning (ft)
- #54 Technology enhanced learning (ft)
- #55 Technological literacy (ft)
- #56 Technology rich (ft)
- #57 VLE\* (ft)
- #58 Virtual learning environment\* (ft)
- #59 Virtual college\* (ft)
- #60 Virtual school\* (ft)
- #61 Web based learning (ft)
- #62 #23 or #24 or ...#61
- #63 #22 and #62

### B3 Additional detail on German language review search strategies

The German-language literature review searched a number of databases for relevant literature which appeared in the period from 2002 to 2014. The following databases were included:

- FIS Bildung Literaturdatenbank/Fachportal Pädagogik.de ([http://www.fachportal-paedagogik.de/fis\\_bildung/fis\\_form.html](http://www.fachportal-paedagogik.de/fis_bildung/fis_form.html))
- DIE (German Institute for Adult Education) Library ([http://bibliothek.die-bonn.de/webopac/index.asp?DB=w\\_biblio](http://bibliothek.die-bonn.de/webopac/index.asp?DB=w_biblio))
- Library of the FernUniversität Hagen (<https://www.ub.fernuni-hagen.de/>)
- Library of the University of Cologne (<https://www.ub.uni-koeln.de/>)
- Database of the Bundesverband Alphabetisierung und Grundbildung e.V. (<http://www.alphabetisierung.de/service/literaturdatenbank.html>)
- Database of the German Adult Education Association (DVV) (<http://www.grundbildung.de/praxis/literatur/>)
- Database of the Federal Office for Migration and Refugees (<http://www.bamf.de/EN/Infothek/infothek-node.html>)

For the research different keyword settings are used with the following notations:

Alphabetisierung, Blended Learning, Computer, Computerunterstütztes Lernen, Deutsch als Fremdsprache, Deutsch als Zweitsprache, Digitale Technologie, Digitale Medien, E-Learning, Funktionale Analphabeten; Gamebased Learning, Grundbildung, Integrationskurse, Internetunterstütztes Lernen, Lernplattform, Lernportal, Lernsoftware, Literalität, Literacy, M-Learning, Mobile Learning, Mobiles Lernen, Neue Medien; Neue Technologie, Numeracy, Online-Lernen, Social Learning, Web 2.0 Technologie.

## B4 Review of current datasets

Nine data sources and a total of 40 datasets were identified during the scoping stage of the data review. Four of the nine sources provided relevant information on the populations of interest.

### Census 2011

Census statistics help to paint a picture of the whole population of England as it was in March 2011 and provide data down to the lowest level of spatial detail (lower super output areas or LSOA<sup>12</sup>).

Table B-5 presents the data currently available from the Census in relation to the key research question for the study. Data is available on the size of the adult population with basic skills, as well as on the sub-cohort of lone parents.

**Table B-5: Population data collected in the Census, 2011**

Data Available in the public domain
Level of Qualification by age and gender
Level of Qualification by economic activity and age
Level of Qualification by lone parent status and gender
Lone parent status by age and gender
Lone parent status by economic activity

*Note: Age is based on date of birth and so further data cuts would be possible*

Data for the level of qualification is available for a number of different categories. These are people with no qualifications, or at Level 1 or Level 2, those following apprenticeships and those with other qualifications (these include vocational/work-related qualifications and foreign qualifications, where the UK equivalent level is not known). In the Census this information is available broken down by age, gender, economic activity (economically active, unemployed, employed and economically inactive) and lone parent status, in a range of combinations.

### DWP – Job Seekers Allowance Claimants

The Department for Work and Pensions provides claimant count data on a monthly basis, both for Great Britain as a whole and at the regional level. It provides a breakdown by lone parents, gender and age (limited to age groupings or bands). Age is recorded as the chronological age (not date of birth) of the claimant on the day of claiming, but is banded for publication.

<sup>1</sup> In 2011, there were a total of 32,844 LSOAs in England. An LSOA is defined by the size of its population and the number of households it contains. The minimum and maximum population size is 1,000 and 3,000 respectively, while the number of households ranges from 400 to 1,200. The LSOAs are used as the standard unit for reporting small area statistics and boundaries can change when the population or household thresholds are breached.

<sup>2</sup> All known planned releases of the data (with the exception of ongoing specialised datasets e.g. small area populations) have now been published.

## SfA and BIS - Adult FE & Skills, Apprenticeships and Workplace Learning

The Skills Funding Agency (SFA) and the Department for Business, Innovation & Skills (BIS) provide quarterly data for England on learner participation, outcomes and level of highest qualification. The data is currently available in the public domain at the national level (England) for the period from 2008/2009 to 2012/2013. This dataset provides information on adults (aged 19 and over) in government-funded further education (excluding schools and higher education) and for all ages (16 and over) in apprenticeships. The full breakdown of publicly available data, showing the different data cuts, is provided in Table B-6.

**Table B-6: Population data collected in the SfA and BIS learner participation, outcomes and level of highest qualification dataset**

Data Available in the public domain
Participation and achievement of adults 19+ at skills below Level 2 and Level 2
Participation of adults (19-24, 25-49, 50+) by English and Maths, below Level 2 and Level 2
Participation of adults (19+) by gender and English and Maths, below Level 2 and Level 2
Participation of adults (19+) by English and Entry level, Level 1 and Level 2
Participation of adults (19+) by Maths and Entry level, Level 1 and Level 2
Participation of adults (19+) by ESOL and Entry level, Level 1 and Level 2
Achievement of adults (19+) by English and Entry level, Level 1 and Level 2
Achievement of adults (19+) by Maths and Entry level, Level 1 and Level 2
Achievement of adults (19+) by ESOL and Entry level, Level 1 and Level 2
Apprenticeships programme starts by Age (under 16, 17, 18, 19-24, 25-34, 35-44, 45-59, 60+)
Apprenticeships programme starts by Gender
Apprenticeship participation by age (under 19, 19-24, 25-49, 50+) and apprenticeship level
Apprenticeship participation by gender and apprenticeship level
Workplace Learning participation (19+) by level (below Level 2, Level 2)
Workplace Learning achievement (19+) by level (below Level 2, Level 2)

*Note: Age is provided by age at start of programme*

We also note that:

- Participation and achievement adult FE and skills data is available by for all adults aged 19+, but while participation data is further broken down by age, attainment data is not.

- Apprenticeships data is also available by a range of ages (as shown in Table B-6 above); this is more detailed than the participation data but is not broken down by gender.
- Information on Workplace Learning participation is not available by age range or by gender (as indicated in Table B-6 above).

### SfL Survey 2011

The Skills for Life 2011 survey, commissioned by BIS, provides mean estimates of the proportions of adults (16-64) by basic skill level. Statistics are derived from sets of 1,000 independent estimates of the number of adults with each skill level in 2011.

This data provides breakdowns of literacy, numeracy and ICT skills across the five lowest levels of the National Qualifications Framework (from Entry Level 1 and below to Level 2 and above).

### Data Gaps

For three out of four of the datasets reviewed, data is collected but not published on a number of areas that could help identify the population that could benefit from the use of a technology-rich environment. These additional cuts of data include:

- Census 2011: lone parent status by level of qualification, age, gender and economic activity
- DWP Lone Parent JSA Claimant Data: more detailed age information, cross tabulated by gender.
- SfA and BIS - Adult FE & Skills, Apprenticeships and Workplace Learning: more detailed cut of age as well as further information on skills below Level 2, including for English and Maths participation

As the summary Table 5-1 shows, no data is available on the skills level of either the prison population or JSA claimants.



## B5 Data analysis

This section looks at the information that the various data sources and datasets can provide on the key population groups.

### Key Messages:

In 2012/13:

- 1.1 million adults (aged 19 and over) participated in government-funded further education (excluding in schools and higher education) in basic skills English and Maths.
- 868,700 people aged 16+ participated in Apprenticeships. Just over half (55%) were aged between 16 and 24.
- 30,900 learners started workplace learning at below Level 2
- 70% (3.2million) of the lone parents in England aged 16+ had qualifications at Level 2 or below (based on 2011 Census data)
- 89% of the 120,510 JSA lone parent claimants at February 2014 were female and 88% were aged 25-49.

### Census 2011

- A total of 19.1 million adults aged 16-64 in England were qualified to no higher than Level 2 in any subject area. Of these, 3.8 million were aged 16 to 24. The highest proportion of working age adults with no qualifications was aged between 50 and 64.
- A total of 7 million adults aged 16-64 were unemployed or were economically inactive, with skills qualifications at Level 2 or below. Of these, 40% (2.8 million) had no qualifications.
- There were a total 4.5 million **lone parents** (aged 16+) in England and 70% (3.2million) who had qualifications no higher than Level 2. Of these, just over one third (34%, 1.1million) had no qualifications.

### JSA Lone Parent Claimant Counts

- There were 120,510 JSA lone parent claimants at February 2014, a decrease of 38,065 since February 2013.
- The majority (89%) of JSA lone parents were female (107,560) with 12,950 male.
- No data on these claimants' levels of qualification are publicly available.

## SFA and BIS - Adult FE & Skills, Apprenticeships and Workplace Learning

### *Adult FE and Skills*

- A total of 1.1 million adults (aged 19 and over) in 2012/13 participated in government-funded further education (excluding in schools and higher education) in basic skills English and Maths. As shown in Table 1-6, of these:
  - 765,800 participated in English courses, with the highest percentage (45%) participating at Level 1
  - 748,200 participated in Maths courses, with the highest percentage (46%) participating at Level 1
  - 146,200 participated in ESOL, with the highest percentage (84%) participating at Entry Level.

**Table B-7: English and Maths Participation by Level**

Subject	Level	Total
English		765,800
	Of which entry level	120,200
	Of which level 1	340,900
	Of which level 2	327,900
Maths		748,200
	Of which entry level	95,500
	Of which level 1	346,800
	Of which level 2	334,800
ESOL		146,200
	Of which entry level	123,200
	Of which level 1	21,700
	Of which level 2	7,500

Source: SfA and BIS data

### **Apprenticeships**

- A total of 868,700 people aged 16+ participated in Apprenticeships in 2012/13. Just over half (55%) were aged 16-24.

**Table B-8: Apprenticeship Participation by Age and Gender**

	2012/13	% of total
Under 19	181,300	20.9%
19-24	294,500	33.9%
25-49	334,600	38.5%
50+	58,300	6.7%
Female	455,600	52.4%
Male	413,100	47.6%

Source: SfA and BIS data

- There were 510,200 apprenticeship programme starts in the 2012/13 year. Of these, just under one third of the participants (32.4%) were aged 19-24 and 22.5% were under 18 years of age. The age 25 and over population comprised 45% of all apprenticeship starts.

**Table B-9: Apprenticeship Programme Starts by Narrow Age Band and Gender**

	2012/13	% of total
Under 16	230	*
16	25,080	4.9%
17	35,810	7.0%
18	53,430	10.5%
19-24	165,390	32.4%
25-34	101,180	19.8%
35-44	64,790	12.7%
45-59	61,060	12.0%
60+	3,260	0.6%
Not known	-	-
Female	279,000	54.7%
Male	231,210	45.3%

Source: SfA and BIS data

### Workplace Learning

- A total of 148,800 learners started workplace learning in 2012/13. Of these, 21% were qualified below Level 2. The published data presents a break down by English and Maths, but does not provide detail on the level of qualification for these subject areas.

**Table B-10: Workplace Learning Starts by Level**

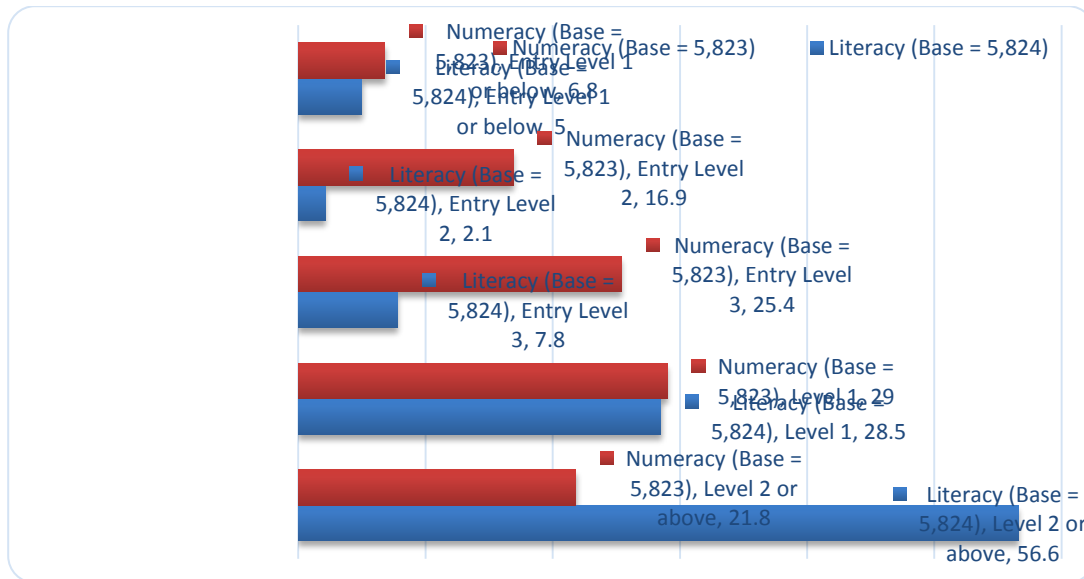
Level	2012/13
Total Starts	148,800
Of which....	
Below Level 2	30,900
Level 2	102,200
Level 3	11,300
Level 4+	2,000
No Level Assigned	2,400
Below Level 2 (excluding English and Maths)	2,900
English and Maths	39,400
Full Level 2	85,200
Full Level 3	6,100

Source: SfA and BIS data

### SfL Survey 2011

Data from the Skills for Life Survey is derived from estimates of a sample (see below for details) of the population. Therefore analysis of this data provides an indication only. Key information indicates:

- Skills for Life data (Figure B-1) shows that the surveyed population had a lower level of numeracy qualifications than literacy qualifications at each of the levels.

**Figure B-11: Skills Levels (%)**


- Similarly, Table B-11 shows that, in the Skills for Life sample, both 16-18 year olds and 19-65 year olds learners had lower levels of qualifications in numeracy than in literacy.

**Table B-12: Literacy and numeracy levels by age (%)**

	Age					
	All		16-18		19-65	
	Literacy %	Numeracy %	Literacy %	Numeracy %	Literacy %	Numeracy %
Entry Level 1 or below	5	7	3	4	5	7
Entry Level 2	2	17	2	24	2	16
Entry Level 3	8	25	10	29	8	25
Level 1	28	29	30	24	28	29
Level 2 or above	57	22	56	19	57	22

Source: Sfl survey 2011

## C1 Evidence review of German-language sources

### **Evidence Review of Learning Technology in adult literacy, numeracy and German as second language provision in Germany**

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## Summary

This literature review of German-language evidence on the uses and values of learning technology in adult basic skills delivery identified a number of findings from research and development projects, including several recent initiatives funded by the Federal Ministry of Education and Research (BMBF). However, as with English-language evidence, there was a dearth of robust evaluations, and the messages below are drawn largely from small-scale research and from qualitative data.

Overall, blended learning emerges as the approach that is most highly recommended for low-skilled adults, as it is perceived to be more successful than pure e-learning in motivating and engaging learners. This assumption is not, however, based on robust and statistically valid studies that compare blended learning with on-line only delivery, and there has been no systematic measurement of learning outcomes. In line with findings from the English-language review, the literature in German reports on social benefits more than on learning and skills gains.

The German-language review identified a number of studies where the use of learning technology was associated with increased learner motivation. Evaluation data (Cramm & Neudorf, 2011) suggested that game-based learning was particularly successful at this, and particularly with younger learners. Also successful were programmes where adult learners were involved in learning content development.

More tentative messages, based on lower quality evidence, emphasised the benefits to low-skilled adults of learning with technology:

- Learning with technology offers more flexibility (local, temporal, social and medial) than traditional delivery.
- Learning technology can be used to teach literacy skills, ICT skills and communication skills simultaneously, and this combination can increase learners' employability.
- As it offers an opportunity to learn anonymously, learning technology can play a vital role in engaging adults embarrassed by their poor basic skills
- E-learning is not associated with the formal learning environment in which many low-skilled adults have had negative experiences
- For low-skilled adults, technology offers opportunities for instant feedback and quick gains, providing motivation and increased frustration tolerance. There is, however, no robust evidence on the impact of learning technology on retention rates.
- E-learning offers a variety of routes into learning which can support the learner by providing choice and provision tailored to individual need.
- E-learning can encourage social inclusion through the development of online learning groups and communities. Moreover, given the need for digital competences in daily life, improved ICT skills also promote social inclusion.

- Integrating technology into learning opens up educational possibilities. Learners can access learning content by different means (e.g. by reading texts, listening to podcasts, watching videos).

Lastly, German-language research stressed strongly that good study skills are integral to the effective implementation of learning technology in adult basic skills delivery. In order to use learning technology well, learners need to be able to guide and control their own learning. These skills can be taught, and in turn learning technology can be harnessed to support and teach the study skills necessary for participation in lifelong learning.

## 1. Introduction

In Germany ICT and new technologies are considered “engines” for social development and are of increasing importance in education. Around the turn of the last century, the first attempts were made in Germany to use learning technology in adult basic education, that is, literacy, numeracy and German as second language provision<sup>3</sup>. ICT competence is increasingly important in everyday life, in working life and for social participation; a lack of ICT skills can lead to marginalisation (the “digital divide”). Digital skills are now seen as linked to literacy and numeracy skills as part of the core of basic skills that are necessary in the modern economy: “using new media requires literacy and problem solving skills” (Tröster, 2005, p. 10). Therefore new technology is gaining importance in the context of adult basic education and ICT competence has become an important educational goal. There is a belief that using technology in learning has the scope to open up new learning approaches and to motivate more adults to take up opportunities to improve their basic skills (Tröster, 2005).

### 1.1 Methodology

This review considered existing evidence in the German language on the value of learning technology to adult literacy, numeracy and German as a second language provision with reference to two research questions from the main English language review:

1. What does the evidence-base now tell us about the value of using different types of learning technology in adult basic skills delivery?
2. How does current engagement with technology vary between different populations of interest? In particular for those who are unemployed compared to the employed, and for young people compared to older age groups?

Literature from 2002 to 2014 was included in the review, drawn from searches of the following databases:

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<sup>3</sup> In Germany, adult numeracy is not a stand alone subject, but is offered as part of adult basic education. There is therefore no evidence base specific to the use of learning technology in adult numeracy. Delivery of German as a second language usually takes place as part of integration programmes for migrants.



- FIS Bildung Literaturdatenbank/Fachportal Pädagogik.de ([http://www.fachportal-paedagogik.de/fis\\_bildung/fis\\_form.html](http://www.fachportal-paedagogik.de/fis_bildung/fis_form.html))
- DIE (German Institute for Adult Education) Library ([http://bibliothek.die-bonn.de/webopac/index.asp?DB=w\\_biblio](http://bibliothek.die-bonn.de/webopac/index.asp?DB=w_biblio))
- Library of the FernUniversität Hagen (<https://www.ub.fernuni-hagen.de/>)
- Library of the University of Cologne (<https://www.ub.uni-koeln.de/>)
- Database of the Bundesverband Alphabetisierung und Grundbildung e.V. (<http://www.alphabetisierung.de/service/literaturdatenbank.html>)
- Database of the German Adult Education Association (DVV) (<http://www.grundbildung.de/praxis/literatur/>)
- Database of the Federal Office for Migration and Refugees (<http://www.bamf.de/EN/Infothek/infothek-node.html>)

Databases were searched using the following German-language terms:

*Alphabetisierung, Blended Learning, Computer, Computerunterstütztes Lernen, Deutsch als Fremdsprache, Deutsch als Zweitsprache, Digitale Technologie, Digitale Medien, E-Learning, Funktionale Analphabeten; Gamebased Learning, Grundbildung, Integrationskurse, Internetunterstütztes Lernen, Lernplattform, Lernportal, Lernsoftware, Literalität, Literacy, M-Learning, Mobile Learning, Mobiles Lernen, Neue Medien; Neue Technologie, Numeracy, Online-Lernen, Social Learning, Web 2.0 Technologie.*

## 1.2 About this review

Section 2 describes the context for the use in Germany of technologies in adult basic education. Sections 3 and 4 answer the first and second research questions respectively. Section 5 summarises the evidence base and its gaps.

## 2. Current practice in using different types of learning technology in Germany

This section describes some recent projects in Germany which have used learning technology with adult basic skills learners. For several of these projects there was little research and evaluation evidence available which could be used to determine their value.

Beginning in 2001, the Federal Ministry of Education and Research (BMBF) funded two projects devoted to the use of new media in adult basic education. The first was the @Ipha project (Innovative Approaches in Basic Education through Media-based Access/ @Ipha – Innovative Ansätze in der Grundbildung durch medienbasierte Zugänge), which ran until the end of 2004 and was a starting point for the use of new technologies in literacy and numeracy education in Germany. The project was coordinated by the German Institute of Adult Education (DIE) and run in cooperation with four continuing education institutions. In this pilot project, teachers and learners developed customised multi-media-learning units – the goals here, in addition to improving outcomes for learners, were to develop a

framework for the use of technology in adult basic skills delivery, to increase the professional skills of teachers and to build a research and practice network<sup>4</sup>.

In the second project, APOLL – Alfa-Portal-Literacy Learning, which ran from October 2002 to September 2005, the German Adult Education Association (DVV - Deutscher Volkshochschul-Verband) and the Federal Association for Literacy and Basic Education e.V. (Bundesverband Alphabetisierung und Grundbildung e.V.) developed a learning portal offering information and materials for teachers and learners. The portal included an e-learning-platform, “I want to learn to write” ([www.ich-will-schreiben-lernen.de](http://www.ich-will-schreiben-lernen.de)) which adults could use to improve their literacy or numeracy on-line<sup>5</sup>. The platform could be used alongside face-to-face-learning lessons, but it could also be accessed by individuals anonymously, outside of formal courses. Texts, exercises and materials were also available as audio files (Kellershohn & Robert, 2006). This e-learning portal has developed since its launch in 2004, and today “I want to learn” ([www.ich-will-lernen.de](http://www.ich-will-lernen.de)) is Germany’s biggest open learning-portal. It provides free learning materials aimed at improving basic skills and offers exercises aimed at increasing employability and enabling users to obtain school leaving certificates. The learning portal is suitable for both beginners and more advanced learners, with materials tailored to individual users and support offered by online tutors. The portal is also used by adult education institutions, which incorporate it into their programmes of blended and online learning (DVV, 2010). Teachers use the portal to create individual exercises for their learners, to track learner progress, and to access guidance and advice (Schön, 2013a).

In 2011 the portal was expanded to include basic financial education “Life and Money” (“Leben und Geld”). In 2013, “I want to learn German” ([www.ich-will-deutsch-lernen.de](http://www.ich-will-deutsch-lernen.de)), a portal aimed at immigrants, was launched, offering learning programmes for individuals and learning materials to be used alongside integration courses. The portal also now contains a social networking service, “AlphaVZ”, where learners can talk and develop their skills in a secure, non-commercial environment. The basic functions are like those in other social networks, but the community platform is simple to manage and provides users with information about online security and the benefits of web 2.0. It is the first media-pedagogical online community in Germany (Rustemeyer, 2010).

Between 2007 and 2010, the BMBF also funded the development and research project, alph@bit, “Game-based Training in Basic Education – Scenario-based Learning for Low-skilled Individuals” (“Game-based Trainings in der Grundbildung – szenarienbasierte Lernangebote für Geringqualifizierte”)<sup>6</sup>. Among the project outputs was the award-winning<sup>7</sup>

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<sup>4</sup> This project was a finalist for the European E-Learning Award (eureleA) 2005 and one of the cooperation-partners, berami, was awarded the European Language Label in 2004 for its learning programme, Topsy-turvy. Reading and Writing in the Kitchen and Canteen (“Durch Kraut und Rüben. Lesen und Schreiben in Küche und Kantine”) (Tröster, 2005; Tröster 2013).

<sup>5</sup> [http://mpa.medienkompetenzportal-nrw.de/mpa-lfm/lfm\\_output/mpa\\_detail.pl?record=premYxsO8kLcTYndVpMONuorzcmIzmdlfo2EQi7vI5ufcbSa1NsU11253805075](http://mpa.medienkompetenzportal-nrw.de/mpa-lfm/lfm_output/mpa_detail.pl?record=premYxsO8kLcTYndVpMONuorzcmIzmdlfo2EQi7vI5ufcbSa1NsU11253805075)

<sup>6</sup> This project (<http://www.projekt-alphabit.de>) was run jointly by the Fraunhofer Institute for Computer Graphics Research IGD, the German Adult Education Association (DVV), the National Association Volkshochschulverband Mecklenburg-Vorpommern e.V (a member of the DVV which represents the interests of adult education centres at the federal level) and the German Institute for Adult Education (DIE).

<sup>7</sup> eureleA 2011; Comenius EduMedia Medaille 2011, SGA Serious Games Award 2011 and LARA Games Award 2010

learning and adventure game “Winterfest”. This game expanded sector understanding of what could be achieved with learning technology and set the benchmark for future learning game. It also highlighted what organisations would require, in terms of staff training, hardware and other resources (Tröster, 2013), when using similar technology with learners.

Based on experiences in the alph@bit project a new simulation program, eVideo 2.0<sup>8</sup>, for sector-oriented adult literacy was developed and evaluated by KES-Verbund bei Arbeit und Leben e.V., Landesarbeitsgemeinschaft Berlin (DGB/VHS). Funded by the BMBF, this targeted initiative was aimed at low-grade employees of freight forwarding companies in Berlin, many of whom have reading and writing difficulties that limit their understanding of warning notices or hazard notes. Moreover, the increased use of innovative technology in the workplace has brought with it an increased risk of accidents where employees are not sufficiently skilled in its use. The requirement for employees to meet a standard of competence in basic skills was met by a tailored learning program grounded in real workplace simulations. The eVideo 2.0 programme includes 22 exercises in four different working areas: all the scenarios are generic and not specific to particular job types. Learners were not involved in the content design but act in the videos, simulating work experiences. eVideo 2.0 is not a literacy or numeracy course; rather it is a learning tool that addresses participants’ underpinning literacy and numeracy skills in the context of specific workplace problems. The initiative started in September 2012 and the first test version was launched in spring 2014 (Lüdke & Schulz, 2014; Ocht & Schulz, 2012).

The project iChance, run by the Federal Association for Literacy and Basic Education e.V. and funded by the BMBF from 2008 to 2014, was part of a larger project, the joint project “Developing Chances” (“Chancen erarbeiten”). This campaign “iChance – better reading, better writing!” was a new attempt to target young adults with low-skills and sought to remove the taboos surrounding poor basic skills by motivating this cohort to engage in learning. The campaign worked with prominent partners (such as football clubs) and used new technology to draw people into learning. The web site [www.ichance.de](http://www.ichance.de) is aimed at young adults seeking information, advice and guidance on literacy and numeracy learning in Germany. It also offers learning materials, learning games and links to further information. The information portal [www.ichance.de](http://www.ichance.de) can also be used in literacy lessons to motivate reading and writing (Bundesverband Alphabetisierung und Grundbildung e.V. 2008, 2011).

Another aspiration of “Developing Chances” was the implementation of new technologies in adult literacy delivery. “Learning Playfully” (“Spielend lernen”) was a initiative to use games consoles as a form of mobile learning in literacy lessons which was tested in six learning centres. It was supported by Nintendo Europe GmbH and Tivola Publishing GmbH (Blume & Kalisch, 2011a, 2011b; Kalisch & Helten, 2011).

Since December 2013 the leo.-App has been available from the Apple App-Store. This application is based on the leo.- Level One Study and lea.-Diagnostic. The leo.-Study provided the first representative data about the reading and writing competences of the German population and in lea.-Diagnostic a diagnostic tool has been developed to measure individual literacy and numeracy competences. The leo.-App allows individuals to

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<sup>8</sup> [www.alphabund.de](http://www.alphabund.de); [http://www.kes-verbund.de/web/evideo2.0\\_branchenorientierte\\_alphabetisierung.html](http://www.kes-verbund.de/web/evideo2.0_branchenorientierte_alphabetisierung.html)

measure their competences; adult education organisations can also use the App to give advice to the learners and to measure learning outcomes and progress (Euringer, 2014).

### **3. What is the value of learning technology in adult basic skills delivery in Germany?**

#### **3.1 New technology in adult literacy and numeracy education**

Hambach and Malo (2008) discussed the pros and cons of using different types of new technology in adult literacy, including computer-based training, web-based training, game-based training, computer-supported cooperative learning, blended learning and web 2.0, basing their findings on small-scale qualitative research undertaken on the @lpha and A POLL projects. Game-based training, where learners apply and improve their knowledge and skills in problem-solving scenarios, was recommended as a means of increasing learner motivation. Although this learning process can be self-regulated, learning with ICT also offered opportunities for collaborative learning, both with fellow learners and with teachers. Hambach and Malo noted that this type of learning makes stringent demands on learners, not only in relation to their skills sets, but also in terms of the need to have access to computer equipment (in learning centres, in the workplace, or at home).

A 2004 study “Learning – lifelong” (“LeiLa – Lernen-ein-Leben-lang”), focused on the role of new technology in facilitating the integration of disadvantaged young people. It was found that although it was possible to support the development of study skills, this was only achieved through using a specific learner-adapted programme. The young people themselves welcomed using digital media, seeing it as bringing benefits to a number of areas in their personal, social and work lives (Hammer, Hildebrandt, Koch; 2004).

##### **3.1.1 Educational software and e-learning**

DIE’s @lpha project launched a debate on the use of educational software in adult basic education. In the project’s development stage, existing software was reviewed in order to establish a set a quality criteria. The aims of using educational software/ e-learning were to improve learners’ internet/computer competences and to facilitate self-regulated learning in between face to face learning.

The LuTA Study 2003, “Socio-demographic characteristics and technological skills of people with poor literacy skills” (run in the context of A POLL), found that 43% of participants wanted to learn with new technologies. The study suggested that one advantage of e-learning is the possibility of anonymity it affords adults stigmatised or discriminated against by their low skills. Learners are also less likely to associate E-learning with their previous, poor experiences of formal education (Fiebig, Lübs, Ragg, 2003).

In Germany the @lpha project generated a series of challenges and recommendations for the use of new technology in adult literacy, and for the development of multi-media learning-modules (see Table 1 below).

#### **Table G1: Challenges and recommendations for using new technology in adult literacy (Tröster, 2005)**

<b>Challenges</b>	<b>Recommendations</b>
	<b>Learning/teaching situation</b>
<i>1. New technology offers alternative learning methods to traditional and familiar methods, because many learners have a positive attitude towards computer-based work.</i>	<i>1. Learners adopt active roles; they can determine the speed at which they learn and monitor and review their own learning. Teachers must be flexible, changing their role to one of advice and support).</i>
<i>2. Use new technology without assuming that technological approaches are inherently superior: engage with pedagogical questions.</i>	<i>2. Using new media can improve communication and cooperation in the learning group.</i>
<i>3. New media are tools for and parts of basic education.</i>	<i>3. Motivation and engagement increase where learners participate in the process. Learners can create their own learning materials and should express their learning needs.</i>
<i>4. Successful implementation of multi-media learning modules is dependent on teacher attitude, on the theory behind the learning and on the quality of learning content.</i>	<i>4. Using new media increases competences in various areas (computer, creativity, problem-solving strategies, reflection of learning/teaching situations, reading, writing)</i>
<i>5. Worthwhile use of new media in literacy delivery requires personal and institutional resources (temporal and financial) as well as technical resources.</i>	<b>Didactics/methods</b>
	<i>5. Learners should gain subject knowledge and ICT skills. This requires mapping of learning content to computer use.</i>
	<i>6. Multimedia learning modules should reflect everyday life and working life to make them relevant to learners.</i>
	<i>7. Scaffolding and bite-size learning support learner autonomy.</i>
	<i>8. Learners modules should correlate with the individual adult's learning needs.</i>
	<i>9. Multimedia learning modules require a special visual appearance, reduction of text and use of audio and video clips. They must be easy to navigate.</i>

In the context of this project different workshops were held and different learning modules were developed and created using authoring software. The participation of the learners was important in making the learning relevant and increasing motivation (Tröster, 2005).

The small case study, "Topsy-turvy. Reading and writing in the kitchen and canteen" (Durch Kraut und Rüben. Lesen und Schreiben in Küche und Kantine), followed female migrants working as kitchen porters whose education had been interrupted and who had low ICT skills. In the course of their research the authors tested and validated (through questionnaires) five recommendations for the use of new technology in adult literacy delivery:

1. For low-skilled and disadvantaged learners, the rapid sense of achievement increased frustration tolerance and motivation.

2. Contributing to the development of the learning materials increases learners' engagement with web-based technology. These materials can be adapted for other groups of learners.
3. Permanent opportunities to modify and to extend the web-based technology should be included, meaning that the technology can be adapted, modified, improved and revised for use with other groups
4. In the context of blended learning, computer-based or web-based technology is highly appropriate for adult literacy delivery because it offers a variety of ways for adults to access learning and it supports learners' autonomy.
5. In adult literacy delivery, computer-based or web-based technology should be used alongside face-to-face learning as direct contact between learners and teachers is very important for learners with few literacy skills.

Most workshop participants were very proud of learning with computers. They wanted to learn further at home and with other learning software. Working with the learning software increased learners' self-confidence (Peikert & Petrides, 2005).

Similar responses from learners were recorded with respect to the "Uniword" ("Uniwort") learning software. Writing on a computer was regarded as less stressful than writing by hand. Learners were highly motivated to master using computer technology and they felt proud to hold the printed result in their hand. Self-regulation and autonomy increased, learners could set their own pace in learning, and benefited from receiving real time feedback and assessment. Because the software offered learners the chance to edit their text several times, learners increased their vocabulary. Dealing playfully with learning software and learning games enables relaxed learning situations, mutual support and community building (Burkert-Flaspöhler, 2004).

### 3.1.2 The DVV learning portal

The DVV learning portal "I want to learn" (see section 2) lets learners access a range of case studies, related to their own daily life and workplace, guided by protagonists of a similar age. This encourages learners to feel the portal is relevant to them and increases motivation. As it is designed as blended learning, the portal can support and add to the face-to-face learning in lessons/courses provided by adult education centres (VHS), but it can also be used to bring adults to learning for the first time (Frieling, 2008). However, the DVV portal only records the registration of learners, and no further information about the number and profile of active learners is collected.

The DVV learning portal is a central element of two programs which enjoyed an extensive rollout and were popular with learners (although no evidence was gathered related to learning outcomes). One was targeted at adults who were unlikely to enrol on courses traditionally offered by adult education centres, including educationally-disadvantaged women and mothers of young children in socially disadvantaged areas<sup>9</sup>. These women

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<sup>9</sup> "EQUALS" – "Increase of efficiency and quality in Literacy through Lifeworld-Research and Development of social-integrative Advice and Learning Delivery" ("Erhöhung von Effizienz und Qualität in der Alphabetisierung durch Lebensweltforschung und Entwicklung sozialintegrativer Beratungs- und Lernangebote")

were invited to attend ICT courses in their children's schools, where they could develop their computer skills as well as their literacy and numeracy skills. They accessed the training through the DVV learning portal. These women reported that working with new technology was fun and that their progress in learning had motivated them to engage in further education and made them feel more socially included (Hock, 2011; Schneider & Schuster, 2011).

The second successful use of the DVV learning portal took the form of a learning café, offered in adult education centres, in vocational preparation schools, and social establishments or businesses in Hamburg<sup>10</sup>. The learning café was an open learning arrangement, where learners can work individually or in groups to improve their literacy, numeracy or ICT skills, supported by one or two tutors familiar with the "I want to learn" portal. The portal creates a learning environment that promotes social inclusion, autonomy and competence, and support the development of self-guided learning and self-efficacy. This learning is free, voluntary, and easily accessed. A small-scale evaluation of this project (Schneider & Schuster, 2011) found:

- no significant increase of learning compared with a group of learners who did not join the learning café; slightly more progress was made by the cafe learners in mathematics than the non-cafe learners, but this was not significant
- positive changes in self-efficacy as evaluated by learners
- motivation did not increase (perhaps because learners were highly motivated to start with) because of the positive motivational starting situation)
- those in the learning café experienced a significantly stronger sense of autonomy and social inclusion.

In a questionnaire, two thirds of the learners said they used the learning portal outside the learning café and 60% of learners wanted to continue to use the learning portal. The learners were very satisfied with the tutors' support and with the atmosphere in the learning group.

Since 2004 nearly 450,000 individuals have been given access keys for the learning portal. To improve the use of the learning portal in the context of blended learning, the DVV commissioned an external evaluation in 2013, run by ZEF, the Centre for Evaluation and Research Advice, based at Alpen-Adria-University Klagenfurt, Austria. ZEF developed and tested eight ways of using the learning portal in six different geographic locations<sup>11</sup>, with the aim of finding out how the portal was best used to support learners and teachers in combination with face-to-face learning during or after the lessons. In the process, data on learners' motivation, progress and attitudes were gathered to evaluate the effectiveness of the portal.

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<sup>10</sup> The institution in Germany is called "Beschäftigungsträger", but there is no proper translation in English.

<sup>11</sup> For example, in Frankfurt, seven learners and their teacher met four times a week for three lessons. The learning portal was part of two lessons per week, to improve the learners' literacy and numeracy. Each week a new learning issue relating to everyday life was chosen, for example "Flat hunting". Within the workshop, learners practiced a combination of individual learning and community learning, (Schön, 2014b).

The evaluation gathered highly positive feedback from learners who enjoyed learning through the portal, and underscored the value of technology in providing learning that could be tailored to the individual needs of a heterogeneous body of learners. The trainers used the learning portal as a big “pool” for exercises, which they can individualise to learners, and trainers also reduced the amount of time they spent in preparing lessons (Schön, 2014b). This evaluation emphasised the strength of learning technology in allowing content to be tailored to the strengths and weaknesses of individual learners, meaning that any heterogeneity in the learner group was less relevant. Learners can get feedback immediately and see their own progress and work at their own pace (Schön, 2014a).

### **3.1.3 Game-based learning**

The learning game “Winterfest” was developed and evaluated as part of the alph@bit project (see section 2). A range of participants were interviewed during and after the development of the game. The evaluation found that although learning games can enable learners to deal with written language and motivate them, engagement was dependent on learner preferences. Some learners, particularly women, did not like the scenario of the medieval fantasy world (Malo & Steffen, 2012). The adventure learning game is mainly targeted at young adults and requires basic knowledge and skills in literacy, numeracy and ICT. For this target group the game offered various learning opportunities and is a good support and addition to traditional lessons. The evaluation found that participation in game-based learning can lead adults to progress to other learning opportunities (Cramm & Neudorf, 2011).

### **3.1.4 Interactive Whiteboards**

Melchert (2011) assessed the use of interactive whiteboards in adult literacy delivery at an adult education centre over the course of three years. This study found that the combination of the “digital pencil” and the keypad enabled a wide range of visual techniques and pedagogical possibilities. Other advantages of the whiteboard include the simplicity of creating exercises for learners, the scope for creating impromptu exercises, the ability to make immediate corrections and changes, and the fact that the teacher can maintain eye contact with learners while using the board. The inclusion of video-clips, audio files, pictures, photos, and websites allows better visualisation and in doing so facilitates learning. Teachers were able to use the interactive whiteboard to demonstrate the use of the software to all learners in the class. Panels can be archived and shown many times.

### **3.1.5 Using new technology in adult literacy delivery outside the adult education centre**

In the adult education centre of Oldenburg, computers have been used regularly in adult literacy delivery for some time, mostly as writing tools and also for using the specially developed learning software, “Offering Vocational Learning and Basic Education” (“Beluga - Berufsbezogenes Lern- und Grundbildungsangebot”). Initially ICT was only used in the literacy courses, but e-learning has been increasingly integrated into the home learning environment. The adult education centre Oldenburg has begun collecting small-scale survey data (34 participants) to obtain more information about the computer and internet access of their learners and their practice of e-learning at home. Only 10% of learners had



no home computer; computers were mainly used as a writing tool and to play computer games. Most of the learners were happy to learn using ICT and made significant progress in their learning, especially in writing. Learners were participating in social networks and other Internet-based activities, which reduced social exclusion. Computerised writing tools meant that text could easily be corrected and online dictionaries quickly and easily accessed.

### 3.2 New Technology in Adult German as Second Language Delivery

Although there is a general drive to encourage the use of e-learning in migrant integration courses, stemming from the belief that using new technology increases learning motivation, the evidence base on the value of using new technology in German as second language delivery is small.

The 2011 national action plan for the use of learning technology in the context of integration cited the potential gains to be made for using new technology in language learning, including the fact that learning is independent of time and place and can be adapted to learners' needs. It was felt that existing learning content could be improved if it were made more relevant to learners' interests. The reasons for limited use of new technology in courses include a shortage of equipment in institutions, and a lack of teachers with the necessary qualifications and training (Bundesministerium des Inneren und Bundesministerium für Migration und Flüchtlinge, 2011). The authors recommend more research in this context, better equipment and increasing the training available for teacher/trainers (Croll, Bernsmann, Bretl, 2011).

The testing phase of the new "I want to learn German" part of the DVV learning portal suggested that:

- Acquisition and expansion of verbal language competences are not held back by slower progress with written language skills
- Learners can learn how to deal with specific problems
- Learners can find suitable materials for their individual learning needs

Most of the learners in the testing phase (94%) used "I want to learn German" regularly over a continuous period of time and reported that they found the portal a useful supplement to the face-to-face learning offered on the integration courses. Most learners wanted to continue using the portal beyond the end of their course. A national roll out of the portal is planned for the end of 2014 (Eichen & Sokolowsky, 2014).

The aim of the study "E-Learning in German as second language-adult literacy" ("E-Learning in der DaZ-Alphabetisierung") run by the University Mainz, was the validation of support for those with extensive literacy and language needs by using new technologies. Technology can be used to link learning content like simultaneous watching and listening, and the possibility of interaction can promote the learning process. E-learning is independent of time and place and offers better opportunities to increase learning autonomy and self-regulated learning. Basic media skills are taught simultaneously. A concept of an additive e-learning module, especially for the learners with very low literacy skills, was developed, to strengthen the learning output. It contained exercises that can be repeated or used as games when learners take a break from learning. Survey data were gathered from both teachers and trainers as a means of evaluating the program. This

found that learners had engaged with the program more than was originally anticipated. The teachers were sceptical about e-learning, arguing that the navigation seemed to be too difficult.

After a short time, 70% of learners were able to use the e-learning program without teacher support. But learners reported that teacher feedback was an important component to their motivation as well as their own success in learning. Most learners wanted like to continue with e-learning. One conclusion of the study was that in order to implement these media successfully in the classroom, teachers had to embrace the technology more fully (Grein, 2012).

Computer-assisted Language Learning (CaLL) has been established in language learning research in the last few years, but limited research was found in this area. There are various learning materials available for learning German as a second language but not all of these are professional produced or pedagogically sound. Learners therefore need the skills to be able to select appropriate materials from the internet, and they need to have the necessary study skills to use them well. Face to face contact with a teacher can be instrumental in being confident enough to use online materials effectively as part of learning (Brünner, 2008).

Mobile devices are increasingly important in language learning because of the amount of daily communication that happens through these. Participants of the DaZ [German as second language] Literacy Courses cannot be taught without mobile devices. It is necessary to make use of the learners' ICT competences and to include/use these in their language learning and literacy. When offering learning using mobile devices it is important to consider the financial implications, for institutions and for learners (for example, the costs of sending text messages). Ideally mobile devices would be provided, but where this is not possible, a "bring-your-own-device" approach is recommended.

#### **4. How does current engagement with technology vary between different populations of interest?**

Very little research evidence from Germany looked specifically at the use of technology by different cohorts of adult basic skills learners. The evidence that does exist is a by-product of other, more general, studies and is largely qualitative in nature.

For example, data gathered from teacher interviews in the context of alph@bit and "Winterfest" indicated that most young learners were highly motivated to use adventure learning games. Young learners were familiar with using computers and most were able to transfer the skills they acquired through using the game to real life. One learner reported that using the adventure learning game was enjoyable, improved his confidence, helped establish a good relationship with his teacher and fellow learners; in other words, it was an important step on a journey to successful learning (Cramm & Neudorf, 2010).

Although it is often assumed that younger people are more interested in using new technology than older people and that their ICT skills are stronger, evidence from the "Learning Playfully" ("Spielend lernen") project challenges this. Even elderly women used the mobile learning delivery with enthusiasm and without reticence. (Kalisch & Helten, 2011).

## 5. Evidence base and its gaps

In 2010 Grell and Grotlüschen reported on the gap in research on e-learning and literacy or e-learning and special target groups, like adults with poor basic skills. Research in this area focuses on graduates and executives rather than on low-skilled learners (Grell & Grotlüschen, 2010). According to the studies “Education as Bridge for Disadvantaged Learners” (“Bildung als Brücke für Benachteiligte”, Grotlüschen, Brauchle, 2004) and “Resistant Learning in the Web” (“Widerständiges Lernen im Web”, Grotlüschen, 2003) disadvantaged learners experienced difficulties with e-learning, not in dealing with the technology, but in having the skills to learn independently and to reflect on and apply their learning (Grotlüschen, 2006).

In the context of e-learning in German as a second language and in adult literacy, there was an absence of evidence on the additional value of using new technology in and the increased individual training success. This requires larger studies and a more valid research designs than have been used to date; the reasons for the lack of research may be funding-related, but such research may also not have been prioritised or considered sufficiently relevant.

Very few studies focused on learners themselves and data on learners’ backgrounds, motivations and interests are mainly gathered from teachers. Learners’ needs are considered from the stance of the provider institution/organisation, the teacher, or society in general. Further research could consider:

- What are the needs of learners with low literacy, language and maths skills?
- What benefits from technology do adult basic skills learners report?
- Does the use of technology in adult basic skills delivery improve learning outcomes?
- Can new technology improve the learning experience?
- What study skills do learners need to use new technology effectively and how can these skills be developed.
- How effective is the use of learning technology in adult basic education compared to adult education without learning technology?
- How cost-effective are specific technologies (e.g. mobile learning)?

Digital competences are becoming more and more important in adults’ lives, to improve social participation and to support employability, and should form part of adult literacy education. Existing approaches to the integration of new technologies in adult education should be rigorously evaluated in order to understand the extent to which they can open new and appropriate learning opportunities in adult literacy delivery (Grell & Grotlüschen, 2010).

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