



## **TO THE LEVERHULME TRUST**

- 1. SUMMARY**
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**“THE SIGNIFICANCE OF ICT (INFORMATION &  
COMMUNICATIONS TECHNOLOGY) FOR THE READING,  
WRITING & COMMUNICATION  
SKILLS OF DEAF PEOPLE”**

**Submitted by:**

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# **“The significance of ICT (Information & Communications Technology) for the reading, writing & communication skills of deaf people”**

**(Final report to the Leverhulme Trust by the Deafax Research Unit, Reading, November 2009)**

## **A SUMMARY**

The project aim was to obtain data about the impact of ICT from controlled experiments, interviews and group discussions with deaf children and young adults about their experiences in learning to read, write and communicate, as well as from seminars on these and related issues with teachers of the deaf. Contexts were explored, notably past and current research in the US and elsewhere. The project approach included the use of British Ability Scales (BAS) and the Neale Analysis of Reading Ability (NARA tests) at 9-month intervals as baseline measures of general cognitive ability, reading (decoding) and reading comprehension. Other tests explored the impact of specific technologies and online ‘deaf-friendly’ materials. Staff and local administrators helped in a difficult time with the recruitment of schools to take part in the research. Questionnaires were completed by deaf pupils and teachers. Deaf teacher/researchers took part in some of the processes. Pupils involved in the BAS and NARA tests were divided into three groups ([a] hearing impaired with special IT support programme; [b] hearing impaired without such a programme; [c] no hearing impairment and no special programme). Little or no reading improvement was found across the time scale in groups [b] and [c]. Group [a] significantly improved their reading accuracy. There are some constraints, however, on conclusions drawn from these tests: Group sizes were relatively small, given the difficulties in recruiting participants. By the second round of tests some pupils had left (e.g. to other schools), and groups were not ideally matched for age. Future studies would benefit from using smaller age ranges within groups, and levels of pupils’ hearing difficulty should be estimated and used as controlling variables, since in the groups in this project the pupils’ difficulties ranged from profound to mild hearing impairment.

Tests associated with other IT programmes were the result of pupils being shown particular technologies or taking modules relating to IT and communication, and being tested at different points of time. Those who saw online materials and were tested for the ‘European Computer Driving Licence’ achieved improved marks (but not sufficient to pass the ECDL). In all of these cases the different strategies for exploring relationships between the use of IT and deaf pupils’ literacy and communication skills reflect the difficulty in the recent period of recruiting schools for the deaf or deaf units in mainstream schools for research purposes. The project counterbalanced this difficulty by adopting a multi-pronged approach, bringing together a range of insights into the use of IT hardware and software by deaf pupils and teachers of the deaf, different kinds of tests, and seminars on teaching reading and exploring visual literacy. There are important resulting pointers for development and future research, and Deafax is already planning and taking initiatives, some collaboratively, that will benefit from this project and its outcomes.

## **1. The project**

This project ran from 2<sup>nd</sup> April, 2007 to 2<sup>nd</sup> October, 2009, funded by a grant of £94,791 by the Leverhulme Trust. The project was conducted by:

- Mr. Ken Carter, Director of the Deafax Research Unit (14 hours per week)
- Dr. Rachel Pye, assessor (7<sup>th</sup> July, 2008 to 15<sup>th</sup> July, 2008 - 24 hours)
- Dr. Catherine Foy, assessor (7<sup>th</sup> July, 2008 to 20<sup>th</sup> July, 2008 - 45 hours)
- Mr. Jonathan Haenen, assessor (June/July/October 2009-33 hours)
- Ms. Louise Mann, voluntary research assistant (6<sup>th</sup> October, 2008 to 21<sup>st</sup> October, 2008)

### **A Project Advisory Group consisted of the above and the following:**

- Ms. Helen Lansdown (CEO of Deafax), Chair
- Dr. Vesna Stojanovik, Dept. of Psychology and Clinical Language Sciences, University of Reading, who also supervised the administration of research tasks by the assessors, from the same department.
- Prof. Harold Silver, evaluator, former Professor of Education in the University of London, and Principal of Bulmershe College of Higher Education, Reading
- Mr Graham Hocking, Deafax, (ECDL-European Computer Driving Licence) and Ms. Rubbena Aurangzeb-Tariq (ELTT-Enhanced Learning through Technology) were involved in aspects of the experimental research.
- Ms. Prue Goodwin, Lecturer in Visual Literacy and Communication, at the University of Reading, acted as a consultant to the Seminars on the "Teaching of reading to deaf children".

**The research was conducted at the Deafax Research Unit, based at the University of Reading. The numbers involved were:**

**Schools -7 at which the testing and other activities took place;  
Teachers of the Deaf - 40; Hearing pupils - 14; Deaf/HI pupils - 51**

## 2. Objectives and procedures

The basic aim of the project was to obtain data from controlled experiments as well as from field research comprising interviews, group discussions and focus groups with deaf children and young deaf adults about their experiences in learning to read, write and communicate, and the factors affecting them and the outcomes. The research aimed to consider developments in the use of generally available or specialist technologies, attitudes of children, young people and the relevant adult constituencies to technology-supported learning. A recent-historical context for the research involved conducting a detailed analysis of the landmark work on *The Deaf School Child* (1979) by R. Conrad and the establishment and rolling update and annotation of a bibliography of subsequent historical and contemporary international research and publications.

To accomplish these aims a multi-pronged approach was planned, including: a project involving a baseline phase with the administration of British Ability Scales (BAS) and the Neale Analysis of Reading Ability (NARA) at two 9-month intervals; an 'Enhanced Learning through Technology' (ELTT) programme to ascertain whether specific technologies would make a significant difference to deaf pupils' reading, writing and communication skills; and the use of online 'deaf-friendly' materials to enhance reading, writing and computer skills of deaf/hard of hearing pupils through the European Computer Driving Licence (ECDL) programme. Other activities planned were to include focused seminars for teachers of the deaf relating to children's reading and writing; assessments of different kinds of software; questionnaires to and interviews with teachers of the deaf, hearing PGCE students and deaf pupils.

A problem (one not uncommon in recent school-based research) proved to be the difficulty of recruiting schools that would take part in the research, and though this was solved with support from head teachers, teaching staff and local administrators, the result was a delay in starting the implementation of some aspects of the project and smaller numbers of participants than anticipated.

### **3. Outcomes and conclusions.**

- (i) Two seminars were held with 30 participants on the teaching of reading to deaf pupils. The first, introduced by Prue Goodwin, focused on meaning and visual literacy. The teachers undertook assignments with their deaf pupils and gave presentations on the strengths and weaknesses at the second seminar, focusing on 'making meaning' and conducted by deaf author Joyce Dunbar.
- (ii) Responses to questionnaires were received from 35 deaf pupils aged 8-14, highlighting issues of confidence and attainment in relation to time spent using IT equipment at school, communication with teachers and other adults, and the use of software reviewed in this project. 20 questionnaires were returned from teachers responsible for some 276 pupils with a range of degrees of deafness. Important areas were identified for future ICT planning and provision to improve reading, writing and communication skills.
- (iii) The ELTT programme, administered by a deaf teacher/researcher, addressed tasks undertaken by the group of 8 children aged 6-10, questions asked by them, and encouragement to report their learning outcomes, using technologies such as PowerPoint that were shown to them. The ECDL programme was used with 21 deaf pupils in three schools, taking a module focusing on presentation. The pupils were tested at two points in time, and the test results were analysed by the Deafax Training Manager, who is severely deaf and a qualified British Computer Society marker/invigilator. The pupils who saw online materials used between the two tests achieved improved marks, though these did not reach the ECDL pass mark.
- (iv) The project involving the British Ability Scale (BAS) and the Neale Analysis of Reading Ability II (NARA II) tests as well as ICT based education programme had three groups of participants: a hearing (no impairment) control group consisting of 14 children with an average age of 8 years 1month, a deaf/hearing impaired (HI control group consisting of also 14 children with an average age of 11 years, 2 months matched to the hearing group on verbal, non-verbal and reading abilities; and a HI experimental group consisting of 8 children with an average age of 10

years 1 month who had significantly lower verbal, non-verbal and reading abilities compared to the other two groups. Cognitive measures including non-verbal and verbal standardised tests from the BAS battery were taken from all children at two time points, roughly 9 months of each other. During the interceding months of these periods, the children in the HI experimental group received a series of specially constructed ICT-based education programmes. Neither control group received any alternative or extra education programme. The hypothesis tested in this design was that the children in the experimental group would benefit from a relative improvement in literacy progress in comparison to both control groups. The NARA II test was used to assess reading ability.

Inferential statistics was carried out to investigate relative *improvement* in reading, language and non-verbal abilities in the three groups of participants. The main finding was that the HI group which received ICT intervention significantly improved their reading accuracy from time 1 to time 2. They also improved their reading comprehension and their reading rate, though because of the relatively small sample sizes, this improvement was not statistically significant. Verbal and non-verbal abilities also improved but again the differences between their scores at time 1 and time 2 did not reach statistical significance. This pattern of improvement was also seen in the hearing control group; however this was to be expected given their typical general development. The results suggest that the developmental disadvantage associated with the HI control group is not present (or reduced) in the HI experimental group, which could be attributed to the presence of training courses. The HI control group which did not receive ICT intervention showed hardly any improvement. They improved their non-verbal abilities, although there was a loss over time with regard to their verbal abilities (i.e. these children scored lower on a test of verbal similarities at time 2 than at time 1). Most importantly, this group of children did not improve their reading skills from time 1 to time 2. In fact, not only did this group not improve on any of the components of reading skills assessed, but they seem to have digressed at time 2, in particular with regard to reading comprehension and reading rate.

As this study was an initial exploration of the idea of using ICT training as a means of improving literacy, there are a number of aspects of the design which should caution the interpretation of these results. The first and most obvious is the sample size. Group sizes started relatively small, which is reflective of the difficulty in recruiting this sort of sample. By time 2, many individuals were no longer available for assessment for various reasons (e.g.

illness, moved out of the area, progressed to secondary school). Group attenuation of this sort is typical of longitudinal experiments, but the resulting sample sizes suggest that further research on larger groups should be conducted to repeat and corroborate results. Additionally, the group age matching was not ideal. Due to recruitment difficulties some of the children included in the study were at secondary school level. Future studies would benefit, if practically possible, from using a smaller range of ages within their groups. As a final point, the HI samples were heterogeneous in that the majority of children had some sort of general hearing difficulty, but their difficulties ranged from profound hearing impairment to mild hearing impairment. As a general observation, those children with milder hearing difficulties were generally less cognitively disadvantaged than others. Thus in future studies, an estimation of hearing difficulty and success of electronic augmentation should be collected as background information for the participants, and should be used as a controlling variable in result analysis.

- (v) The results of the different strategies for exploring relationships between the use of IT and deaf pupils' literacy and communication skills indicate some of the difficulty in the recent period of recruiting sufficient numbers of schools for the deaf and deaf units in mainstream schools to achieve the comprehensive data and analysis. This difficulty was counterbalanced by the adoption of the multi-pronged approach that brought together a range of insights into the perceptions and use of IT hardware and software by deaf pupils and teachers of the deaf. There are important pointers for development initiatives and future research.

## **4. Publications, dissemination and further work**

### **Internal publications:**

- The significance of ICT for the reading, writing and communication skills of deaf people: A bibliography. Working paper 1, 2007
- The significance of ICT for the reading, writing and communication skills of deaf people: Deafax and Deafax-related publications 1984-2006. Working paper 2, 2007
- The significance of ICT for the reading, writing and communication skills of deaf people: Introductory paper: The project and its research background. Working paper 3, 2007

- Exploring the teaching of reading to deaf pupils: seminar 1 report, 2007
- Exploring the teaching of reading to deaf pupils: seminar 2 report, 2008
- Review and evaluation of software for deaf pupils, 2008
- A perspective on visual literacy and ICT for deaf pupils: interview (by Louise Mann) with Ken Carter, 2009

### **In the planning stage:**

- British and international journal articles on the project procedures and outcomes.
- A book on the project, its outcomes, background, contexts and pointers for the future. (70,000 words have been written in draft form so far)
- Contributions to conferences, mainly in Britain and US.
- At least one invited seminar for deafness-related professionals in government departments and agencies, professional associations and research bodies.

### **Project-related future work:**

Collaborative research by Deafax, other bodies and the University of Reading, including a follow-up project with autistic spectrum disordered children.

Further development of Deafax's Virtual Learning Academy for deaf and special needs children, taking account of the outcomes of this project.

## **5. Five key words:**

1. Technology
2. Deafness / Deaf
3. Literacy
4. Communication
5. Ability