Visual impairment and ITC: are we magnifying the problem?

N.J.Musgrove[1]
R.P.Homfray[1],
S.Evans[2],
A.S.Sales[2],
R.Hughes[3],.
N.Cooper[4],

[1] School of Applied Sciences (SAS), University of Wolverhampton
[2] Royal National College for the Blind (RNC), Hereford.
[3] School of Legal Studies, University of Wolverhampton
[4] I.T Services, University of Wolverhampton

Background

The University of Wolverhampton is attracting an increasing constituency of students with additional needs, both through normal recruiting and through Widening Participation and similar initiatives. As a consequence the School of Applied Science has some experience (Musgrove *et al,* 2001, 2002) in the use of adaptive technology with students with a range of additional needs but little with those who needs are primarily in terms visual impairment.

Whilst the use of screen magnification software is now well established for visually impaired students (Neuman, 2002: RNIB, 2003), this project focuses on earlier work in SAS (*ibid*) in examining the use of our 'twin-monitor' approach, both as a teaching tool and as an enabling technology for students with visual impairments.

The innovation

The Royal National College for the Blind (RCN) is the country's leading institution for students with visual impairment and has considerable experience in the needs of visually impaired learners, particularly in the field of ITC (Evans & Sutherland, 2001). The project team worked closely with staff from the college in the testing and evaluating this innovation.

A standard RNC student computer was modified by replacing the graphics card with a Matrox 550 dual output card and by attaching a second (CRT) monitor. Following a period of familiarisation by staff and experimentation with different settings, customising keystroke operations, monitor positions etc., an optimal 'generic setup' was established; this offered the simplest operation and maximum flexibility for use in teaching and also as an enabling mechanism for individual students.

The 'secondary' monitor was placed on the left with the keyboard in front. The 'primary' monitor was located on the left with the mouse in front. This allows the user to magnify the secondary screen whilst leaving the primary screen at its normal setting. The principal functions of the card were assigned individual keystroke combinations:

Ctrl + 0 activates the secondary monitor
Ctrl + 1 toggle between the PixelTOUCH ® magnifications (x1, x2, x4)
Ctrl + 2 activates the DualHead Zoom feature
Ctrl + 3 cancels the DualHead Zoom feature
Ctrl + 4 toggle image smoothing on / off

Learner cohort

The participating students were selected from a cohort of students who were partially sighted but whose needs or personal preference did not require the use of screen reader software. Students were given an individual introduction to the system but in instances where there was pre-existing familiarity with standard PCs, induction periods of less than 30 minutes were not uncommon.

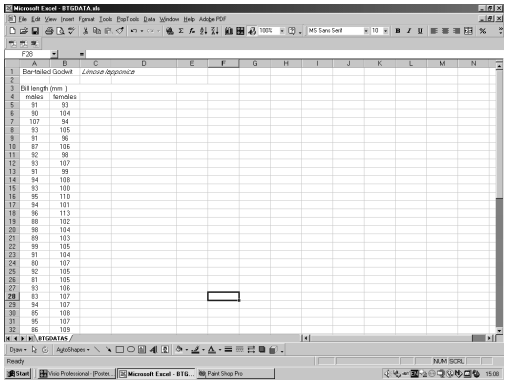
Use of the system fell within two basic areas.

a) dual use where the learner was undertaking software training, typically Microsoft WORD and Excel®, and where the instructor was demonstrating or supervising various processes or operations.

b) personal use by the student using Word/Excel etc. to complete work or assignments.

Outcomes, Benefits and Drawbacks

The principal advantage of using the system in DualHead mode is in one to one teaching where it allows the instructor to see the entire screen whilst the learner can view a selected area on the second screen at an appropriate magnification. The instructor is seeing the overall picture and can, if required, tell the learner how to move to other areas of their screen which may be outside the selected area and therefore not immediately visible.



	A	B	C	D
1	Bar-tailed Godwit		*Limosa lapponica*	
2				
3	Bill length (mm)			
4	males	females		
5	91	93		
6	90	104		
7	107	94		
8	93	105		
9	91	96		
10	87	106		
11	92	98		
12	93	107		

Figure 1:
Example of DualHead use with Excel spreadsheet with the left hand monitor set as the primary or search screen and the right hand monitor displaying the selected area to fill the screen

The DualHead mode can also be employed by the learner in normal use. Here, the primary screen has a maximum usable viewing area, and is used as a 'search' screen where particular areas of interest can be selected (using the mouse cursor to draw a rectangle enclosing the area). The selected are then displayed in full screen mode on the secondary monitor.

Learners who were happy with lower levels of magnification, up to x4, used the PixelTOUCH option with its ability to cycle through the three setting (x1, x2, x4) with a single keystroke combination.

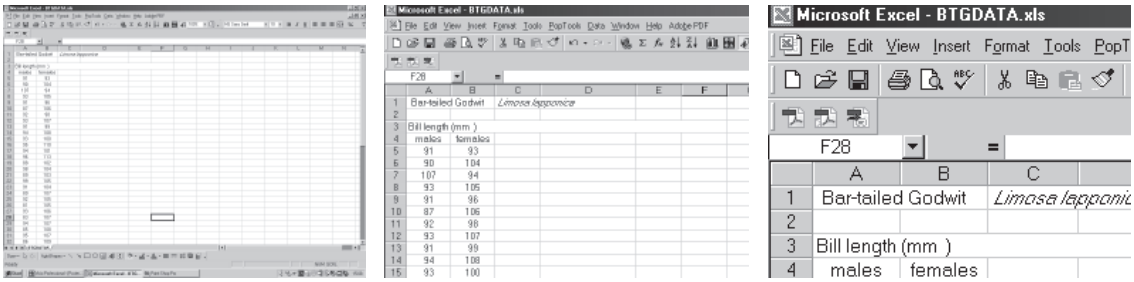


Figure 2:
Example of PixelTOUCH showing the three levels of magnification.

An advantage over other screen magnification software is that the focus does not jump around when menus etc. are opened.

The system does suffer from some minor drawbacks when used on the standard RNC set-up. The RNC clone carries various alternative screen reader software packages which produce latency problems, i.e. a slowing in the screen refresh rate which gives the impression that words have not been typed. This can be irritating.

This problem was solved initially by the expedient removal of the offending software packages; which, given that our approach may be viewed as an alternative, was not considered too draconian a measure. However work needs to be done to see if this problem can be resolved without the need for removal of software, possibly through the use of a graphics card with more on board memory and a faster processor.

Perversely, learners for whom the DualHead Zoom facility was most appropriate encountered problems through not being able to see the cross hairs cursor used to delineate selected areas.

Perhaps the major irritation was the screen not scrolling across automatically when text was input – the student needed to use the mouse to change the focus of the screen.

Evaluation

The success of the trial was assessed by a convincing albeit not traditionally rigorous method. One student withdrew due to a deterioration in vision which necessitated the use of high levels of magnification and the simultaneous use of a screen reader which our system was not able to provide. With this exception, all of the students who took part in the trial are still using the system in their everyday ITC activities. One student was impressed enough to purchase a similar graphics card to have access to the PixelTOUCH facility on his single screen home PC. Given there was only one system available, its advantages must outweigh the inconvenience of the competition for its use

Future Developments

RNC have commissioned a further two systems for their ITC suites and will continue to collaborate with the University in developing this approach and in promulgating its use.

Acknowledging the low cost of these graphics cards (particularly when compared with the market leaders in screen magnification software) and their platform independence there is potential for use in low cost enabling solutions for economically disadvantaged students or in developing countries.

Acknowledgements

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