

5. Access to Computers in Schools: Are Tablet PCs the Way Forward?

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Abstract. In the past, schools have provided students with access to computers in ‘labs’ of desktop computers and/or trolleys of notebooks for classroom use. Both these options have limitations when attempting to integrate computers into classroom learning activities. Now, developments in hardware present opportunities to reassess computer use in schools. In this paper, selected features of tablet PCs, ‘pen and ink’ methods of input data, and ways of using familiar and new software products are outlined. The opportunities presented by these developments in hardware and software to empower learning and teaching are discussed. The paper presents tablet PCs as an innovative and important new development which should be considered when decisions about hardware purchases are being made in schools.

Keywords: tablet PC, digital ink, alternative input devices, curriculum integration, computer access in schools

1. Introduction

Providing students with access to computers has been difficult in many schools. The decisions taken in the past have been influenced by the type of computers available (desktop or notebook) and issues to do with physical space (where the computers could be located), networking/cabling (how, and at what cost) and security (theft). In the days when desktop machines were the only option, computers were often set up in ‘labs’ (often called MMLC, or ‘multimedia learning centre’ in Hong Kong schools) and students were timetabled to use these scarce resources for a limited time each week. This is the ‘student to computer’ option. In many cases the physical location of these ‘labs’ in relation to the classrooms where other learning activities were undertaken presented compelling reasons to *avoid* using computers in teaching/learning activities (Becta, 2004a; Reynolds, *et al.*, 2003). For instance, the ‘travel time’ needed to move a large group of students from classroom to computer ‘lab’ and back again, especially when this involved - in the case of Hong Kong schools - moving up and down several floors without lifts, meant a considerable loss of teaching/learning time. In many cases the design of the ‘labs’ also presented problems. With computers arranged in rows so that they could all be located in one room, student learning activities based on collaborative work were difficult to organise and teachers found it difficult to move along the rows to supervise and assist students. Evaluations of ICT in

Hong Kong schools since the release of the *Five Year Strategy* in 1998 (Education and Manpower Bureau, 1998) have pointed to the importance of distributing resources so that computers are readily available to support students' learning activities (Centre for Information Technology in School and Teacher Education, 2001; Hong Kong Polytechnic University Project Team, 2005).

More recently, when notebook/laptop computers became an affordable option, some schools attempted to make these available for classroom activities using the 'computer to student' option. This enabled computers to be more readily integrated into classroom learning activities but unanticipated problems - such as moving heavy trolleys of notebooks around the school, and asking students to use the notebooks in confined classroom settings - were often powerful disincentives for teachers to use computers in classroom learning activities.

Recent developments suggest that new options are available to deal with the problems associated with past approaches to student access to computers. The first is wireless networking, which enables suitably equipped computers to be used anywhere in a school, free from the constraints imposed by physical connection to network points. This development is outside the focus of this paper, except to note that the capacity to use a wireless network greatly facilitates classroom use of computers, like accessing the Web or software on the school's intranet. The second development - which is the focus of this paper - concerns the hardware which students are expected to use in classrooms. In this regard, the advent of tablet PCs and, in particular the 'digital ink' technology which these fully functional computers utilise creates new opportunities to critically examine the ways in which student access to computers can be provided.

Tablet PCs provide access to computers in two ways. Firstly, in terms of putting a robust, portable, easily stored and fully functional computer in the hands of students for use anywhere (classrooms or excursions) computers are needed. Secondly, digital ink provides access to computers by eliminating problems with keyboard entry, especially for younger students. Moreover, while digital ink is now available on versions of commonly used software products, the difficulties involved in using it on desktop and notebook monitors/screens makes this feature unviable in classrooms (except in cases where teachers use a computer for presentations to the whole class).

In this paper, selected features of tablet PCs are identified. The ways in which tablet PCs could facilitate the integration of computers into classroom learning activities are discussed. The conclusion presented is that tablet PCs warrant serious consideration as an option for schools when decisions about hardware purchases are being made.

2. Features of tablet PCs

There are now many brands of tablet PCs (see Appendix) which are available in two designs - 'convertible' (in which the tablet, like the screen on a notebook computer, detaches from the keyboard) and 'slate' or standalone type (Becta, 2004b). The features described in this paper are based on the NEC tablet PC, a 'slate' design with an A4 size screen (see Appendix A). It is a fully functional Windows XP computer and runs familiar Microsoft Office applications such as *Word*, *PowerPoint* and *Excel*, as well as other software developed specifically for the tablet PC (noted later in this paper).

The NEC tablet PC is a light weight (when compared with many notebooks) computer, which can be easily stored in students' desks when not in use, or carried in back packs together with books and folders between school and home. The A4 size screen is sufficiently large to enable an overview of documents, spreadsheets or presentations to be obtained without scrolling up and down the page or frame. Screen resolution is very good, although classroom trials revealed that 'glare' on the screen under fluorescence lighting can be distracting. Battery life (about 100 minutes) is acceptable (but could be improved). As an accessible, easy to store computer for classroom use, the tablet PC overcomes the difficulties experienced in the past with taking students to computers ('labs') and bringing computers to students (carts of notebooks). It provides a ubiquitous computing option for classroom learning activities.

However, access in terms of portability is not the only feature which warrants serious consideration in schools. Tablet PCs utilize new 'pen and ink' technologies so that words or numbers written on the screen using the stylus, in the same way as comments are written on paper, are converted to text with familiar products like Microsoft *Word* or *Excel*, or appear as hand written notes - which can later be converted to text - in new software products like Windows *Journal*. For instance, when using Microsoft *PowerPoint* or Windows *Journal*, hand drawn diagrams can be made to represent particular cases, instead of users being limited to the standard 'auto shapes' included in these software products. Hence, data which record the users' personal needs are entered on the tablet PC in the same way as hand written notes have traditionally been recorded on paper, to be converted later to text, edited and printed.

Being able to record and edit data in this way is a significant new development in the use of computers in schools. For the first time, a method of input is available which does not rely on a keyboard (which has proved particularly difficult for young pupils to use) or a mouse, both input methods which can be difficult to use in classroom settings. Input

methods match the motor skills of young users, and the traditional ways of recording text and numbers using pencil and paper methods. Some ways in which tablet PCs might be used in learning activities are outlined in the following examples.

3. Examples of learning activities using tablet PCs

3.1 Data entry via hand written comments

One of the innovatory features of tablet PCs is the ability to record hand written notes using a stylus in a similar way to writing notes on paper.

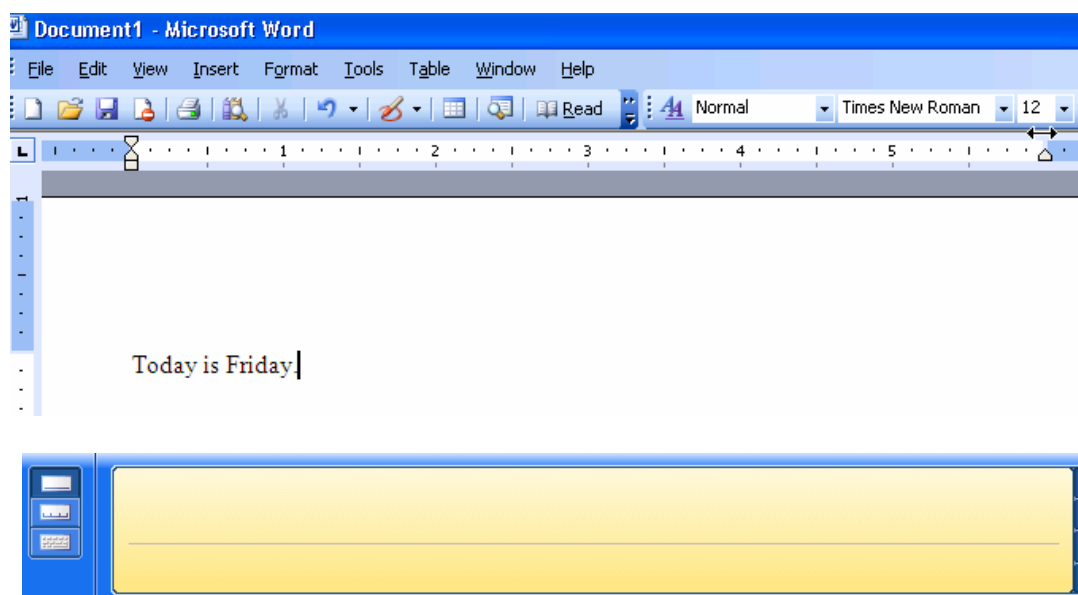


Figure 1: Converting hand written notes to text using Microsoft *Word* on a tablet PC

Notes written on the graphic pad are converted to text in Microsoft *Word* (Figure 1). These can be edited using the stylus and on-screen keyboard.

3.2 Note taking including diagrams

In this example (Figure 2), notes and diagrams have been made (using Windows *Journal*) while the Economics teacher is explaining concepts.

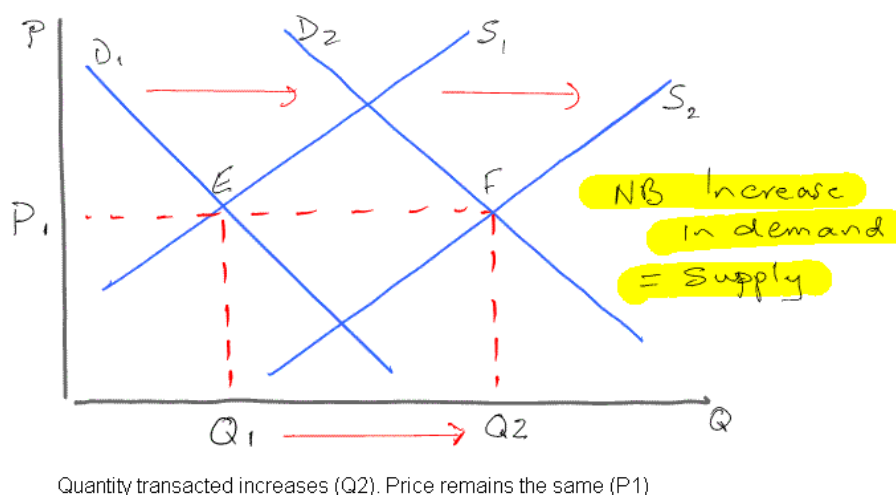


Figure 2: Hand written notes and diagrams using Windows *Journal* on a tablet PC

Another approach would be to ask students to download the chart on the wireless network and highlight main points emphasized in the teacher's explanation.

3.3 Using digital images

Digital photos provide valuable opportunities to record observations on excursions but using these in curriculum related activities has not always been easy.

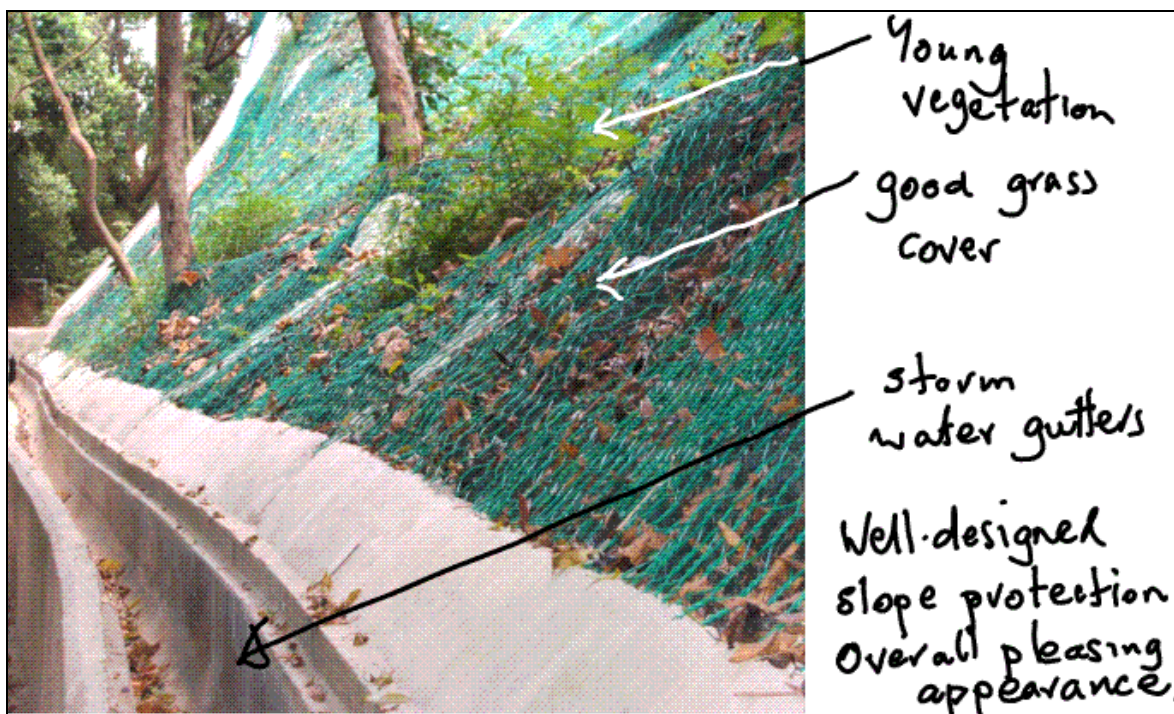


Figure 3: Annotated digital images recorded on a Geography excursion

On a tablet PC, digital images can be readily annotated (Figure 3) using Windows *Journal* or in Microsoft *Word* or *PowerPoint*.

3.4 Using diagrams (electronic worksheets)

Electronic worksheets (Figure 4) can be prepared using drawing tools and auto shapes, or scanned from existing worksheets and completed by students using hand written notes.

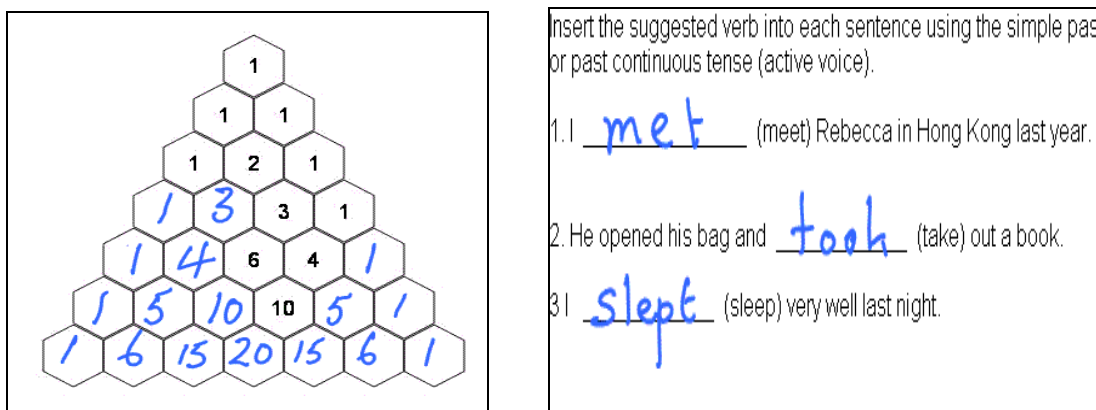


Figure 4: Electronic worksheets (*Windows Journal*)

4. Concluding comments

In this paper, some features of tablet PCs have been illustrated using examples based on typical learning activities. These examples show that the way a tablet PCs is used - by inputting handwritten notes (which can be converted to text files) or annotating digital images and diagrams - closely matches traditional forms of note-taking and recording in classroom activities. As digital files, they can then be used by students in written reports, class presentations, online discussions and Webpage publishing. As portable devices which can be readily stored in students' desks and back packs, tablet PCs increase the likelihood that past problems with access to computers may be overcome. There are now many examples of 'innovators' and 'early adopters' (Rogers, 2003) recognizing the benefits of tablet PCs in curriculum activities in schools (Appendix B). Given these benefits, more widespread adoption of tablet PCs in schools is likely in the next few years. Tablet PCs are an innovative new development in computing and warrant serious consideration when decisions about hardware purchases are being made in schools.

Appendix A

A guide on using tablet PCs is available at

<http://www.microsoft.com/education/EdGuideTabletPC.aspx>

Microsoft Tablet PC Product Information can be accessed at

<http://www.microsoft.com/windowsxp/tabletpc/evaluation/default.msp>). Information on the NEC tablet PC can be found at <http://www.nec-asia.com/minisites/t400/>.

Appendix B

Tablets in Education

<http://www.toshibadirect.com/td/b2c/ebtext.to?page=tabletpcfam&ccid=1291021&seg=PSE&sel=1>

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