



Why is the Tablet PC the Most Powerful Tool for Teaching and Learning?

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- A Tablet PC affords the teacher and learner the best of all worlds in one device. No one can dispute the benefits of a pen and paper for education, allowing students to express their thoughts using a fluid mode of input. The idea of thinking through a challenging problem with a flashing cursor on a Word document is not only unnatural, but largely unproductive. It can also lead to a shallow level of analysis due to the difficulty with which ideas can be linked or changed fluently. Thinking with a computer can often be rigid as you are working within the confines of a formal structure such as a word processor where presentation becomes the focus instead of fluency of thought. Contrary to this, deep thinking is often not sequential in nature and the annotations, linking arrows, and the crossing out of mistakes are a valuable part of the thinking process. The ability to use a pen/stylus for this is essential. If given a challenging task involving deep thinking (which hopefully students are given every day at school), would you rather try to think through or solve that problem with a left justified cursor on a word processor, or pen and paper?
- Once a Tablet PC is being used successfully, the ability to then store, share, backup and print your handwritten notes is a huge advantage. There would be many cases where students have lost their 'writing book' before the examinations leaving them with nothing but their textbook and vague memories of what they wrote down. All notes, annotations, diagrams, and in mathematics, drill and practise examples of equations are gone. The ability to think fluently and also have the benefits of those being electronic files which can be collaborated on is a huge advantage of a Tablet PC in education.
- Many schools using Tablet PC's in their schools have indicated that the device increases their pedagogical capacity by allowing, for example, Art to become a part of every classroom without the traditional logistical constraints. Although a Tablet PC will never, (and should never) replace what happens in an Art classroom, at secondary level when students and teachers do not have a base classroom, the use of Art in subject areas such as Geography, History or English is often lost or at best limited. Teachers are now able to have students use Art as an interim step in creative writing where students are able to first draw what they imagine, then learn the explicit skills of descriptive language used to describe what they have drawn. For visual learners, this interim step has been reported to improve student writing as they have an additional step between the ideas they have in their imagination and expressing those ideas directly into written language, a task they previously found very difficult.

- Tablet PCs can allow teachers to complete their marking online which is seamless in terms of not having to use paper in this process. Any document sent to a teacher can be directly annotated on and sent back to the student as part of the assessment or drafting process. Should students want to handwrite their first draft, this is possible on a Tablet PC using Microsoft OneNote or even in a Word document addressing the argument that students won't be able to handwrite by the time they reach their end of year examinations.
- One of the main criticisms of notebook / laptop programs in schools for 20 years has been that students still need to be able to handwrite their exams at the end of their formal secondary education. Although there is research indicating that even notebook technology used effectively can allow students to write more successfully than with pen and paper, the issue of practising the skill of handwriting still has some relevance. With a Tablet PC, students are still able to handwrite in the traditional way but are also able to back up their work or share it with peers or teachers. When a Tablet is used most effectively, the handwritten notes can include not only written notes but also drawings, typing, images and even recorded audio and video.
- One of the most powerful ways that teachers can improve their students' results is by improving the quality of feedback that they provide for their students once work is submitted. A Tablet PC and free screen capturing software allows teachers to record a video of them marking an essay (for example) with their stylus, and more importantly speak to the student while marking and record that into the video also. This means that teachers are able to verbally explain the intricacies of why a student has made a mistake rather than attempting to distil this complex feedback in to a few words in the side margin. The depth of information that students can receive back from their teachers is far greater than having only minimal written feedback. Although this strategy may not be used for *all* pieces of work, or even for *all* students in a class, the ability to provide rich feedback for students is something that every teacher should strive to provide. Teachers experienced in using this form of feedback are also having their students peer assess in this manner which is a great learning experience for both the author and reviewer of a piece of work.
- Microsoft OneNote is a piece of software that is most useful when used with a Tablet PC. It allows students to learn by having all of their notes in any format (typed, hand written, image based, audio or video) in the one place for their learning. OneNote uses the metaphor of a book to organise information allowing this to be set up as relevant for the school or individual student. When teaching in a traditional non-Tablet notebook or laptop environment, students report finding it difficult conceptually to track all of their learning. The reason is that students in one subject over the course of a week may learn using PDF's Word documents, Excel spread sheets, PowerPoint presentations and websites and have to be able to understand how all of those files fit into the context of understanding a topic or concept in their learning. OneNote allows all of these documents to remain in their original form and are embedded directly onto the electronic 'pieces of paper' that a student is using to write notes, draw diagrams or type information. This means that files with valuable information regarding a concept are viewed 'in the context' of the topic or concept or class

notes rather than being a set of separate files in a folder.

- The use of modelling software can be very powerful in helping students to understand certain concepts. For example, in Physics, students with a Tablet PC can use software such as Microsoft Physics Illustrator to allow them to apply the laws of Physics to hand drawn objects and pictures. This allows students to quickly and naturally turn drawings into moving objects which they can change the properties of objects to see the impact of these changes. Similar software exists for the learning of Chemistry and also Mathematics where natural hand written inputs can be interactive and aid the learning process.
- Research indicates that students at University level prefer their lecturers to provide them with PowerPoint slides in advance of the lecture. This allows the student to watch the presentation as the lecturer is giving it at the front of the theatre. Unfortunately, this also often leads to a passive style of engagement in the information being presented. To foster deeper thinking about the topics being discussed, the notion of 'note-making' (as opposed to note-taking) is being employed where students have a Tablet PC enabling them to summarise content and add diagrams and notes in a fluent fashion to the PowerPoints supplied by the lecturer. The same thing applies at the Secondary level where teachers can move one step beyond 'chalk and talk' and engage students in adding meaning to the partially complete notes provided by the teacher. The Tablet PC allows these additions to be in the form of diagrams, drawing and fluent notes, rather than just typed input.
- Students can also use a 'pen and paper' on a Tablet PC to demonstrate their understanding of complex concepts by recording a screen capture (video) of their explanation. Teachers will tell you that the level of understanding that you develop to effectively *teach* information is far deeper than if you are merely asked to *learn* it. Explaining how to complete a certain type of mathematical equation or interpret a graph while recording audio and video of pen based annotations they make, is a powerful way that students can use their Tablet PC for learning. Teachers can then collect the video files of student explanations and use this information as formative assessment to guide the next steps for their classes, or even share the best ones to help other students with their understanding. Teachers often indicate that although students tell them that they understand a concept, when asked to fluently explain what they 'understand', they are unable to easily express it. Even on examinations at the end of Year 12, students need to be able to express, in written form, their understanding of the concepts.....what better way to prepare the students than to require them to demonstrate their understanding through *teaching* the concepts themselves. Our aim as educators is to ensure not only that we have *taught* information, but that it is *learned* by the students, and asking them to demonstrate their understanding through recorded explanations is a powerful learning activity.
- Another advantage of a Tablet PC is the ability to seamlessly use collaborative software which allows students to interact with classmates in real time using natural pen based inputs. One such software application is DyKnow. This software avoids paper travelling around the school from student to teacher and back again and allows for greater collaboration to occur in classes. Teachers can survey their students in real time and then

use the results to share back onto student Tablets so that a further question about the results could be asked. Students can be required to then annotate the graph of results collected a matter of minutes earlier and explain *why* they think these results may have occurred. What this allows for is a seamless, easy way for information to be shared and collaborated on as part of the learning process without the need to paper inefficiently roaming around the classroom. Although this program will work on a non-Tablet PC, the benefits are most pronounced when students are able to write on their screen with a pen/stylus. Using this software in Mathematics even allows a teacher to automatically collect student work and then replay the writing as if a student were sitting there writing it live. Maths teachers can see the thinking being used by a student to solve an equation and will even see the mistakes a student has erased, allowing them to assess more accurately the understanding of a student. Any piece of written work by a student can be easily shared with all students in the class so that they can learn from a fellow student's approach to solving a maths problem. They in turn can reply the original piece of work to understand the steps in solving the equation.

- "Research has shown there is no more powerful way to communicate the idea that's in my head into your head, than by talking and drawing a simple picture about it at exactly the same time". Dan Roam (Author of 'The Back of a Napkin')

Learning does not just involve one way of using information, or of engaging with technology. Powerful learning requires the use of numbers, videos, audio, typing, drawing, writing, sketching, painting, touching... the list goes on. Until the Tablet PC with digitized stylus was introduced to schools, teachers have been seriously restricted in the tasks and challenges they could work with students on, because they had to conform to a set of keys and a mouse / mousepad to interact with the machine. The pedagogical potential of a Tablet PC with a digital pen and multi-touch screen is far greater than mobile, slate or laptop combined. Although it has the best of each of the other form factors, the pen exponentially multiplies the potential of what teachers and students can achieve.

