Computer technology in the Geography classroom

Quality teaching and learning

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Computer technology is influencing every area of our lives. Funding from the Federal Government and the need to connect with and engage Generation Y students in learning puts pressure on teachers to find valid and effective ways of using computers in the classroom. This article shares one Geography teacher's experiences of using computer technology to enhance quality teaching.

> *Although technology is not a substitute for quality teaching, it can enhance quality teaching*

Introduction

Using computers as a teaching tool can be exhilarating one moment and utterly depressing the next. The capacity of technology to bring learning alive for students and make learning significant is immense, yet the demands which such learning places on teachers' computing knowledge and skills can be daunting, and the technical glitches frustrating. One thing, however, is certain, although technology is not a substitute for quality teaching, it can enhance quality teaching.

Hattie (2009, p. 36) asserts that "teachers need to be actively engaged in, and passionate about teaching and learning", a view which is supported by the New South Wales Department of Education and Training (NSWDET, 2003). Quality teaching also requires diversity.

> Highly effective teachers don't just teach in one way—they have a repertoire of instructional techniques, teaching behaviours, and essential skills on which to draw, depending on the needs of their students, the nature of the subject, and the complexity of the learning outcomes. (McEwan, 2002, p. 81)

The use of technology, particularly computers, dramatically increases the range of techniques available to support quality teaching. The integration of computers into the learning environment must link computers to learning and the sociocultural environment (Lim, 2002).

The New South Wales Quality Teaching Model is widely accepted as providing a sound framework for quality teaching. The goals of this model are to:

- promote high levels of *intellectual quality* to produce deep understanding of important, substantive concepts, skills and ideas;
- establish a high *quality learning environment* to create classrooms where students and teachers work productively in an environment clearly focused on learning; and
- generate *significance* by connecting students with the intellectual demands of their work to help make learning meaningful and important to them.

(McLeod & Reynolds, 2007, p. 46)

While all three domains of the Quality Teaching Model are essential for quality learning, and all three goals may be enhanced by the use of computers, this article focuses on the dimension of *intellectual quality* as it relates to computers in the classroom. *Intellectual quality* refers to teaching that focuses on a small number of key concepts and the relationship between these concepts in order to promote deep knowledge and understanding. Six elements make up the *intellectual quality* domain. A description of these elements is found in Figure 1.

When using computer technology in the classroom, it is important to move past Type I applications that focus on the acquisition of facts, and even beyond word processing activities and internet research to reach a more instructional approach. This is not to say that word processing and research are not valid uses for computers. These uses alone cannot justify the financial investment schools make in computer technology (Maddux, Johnson & Willis, 1992), and do not necessarily satisfy the elements of quality teaching. Therefore, it is important to develop strategies that use computer technology whilst addressing key elements of the *intellectual quality* domain.

This article presents six strategies that utilise

computers in the classroom. These strategies have proved effective in engaging students in learning, and promoting *intellectual quality*. Although the examples given are in the field of Geography, they can be adapted to other subject areas.

Geography is defined in New South Wales by the Board of Studies as being "an investigation of the world which provides accurate description and interpretation of the varied character of the earth and its people" (Board of Studies, 1999, p. 5). As such, it develops knowledge and understandings about how people interact with their environments, and includes a strong skills component, which encourages students to investigate and communicate geographically. The strategies described in this article are presented with a sample activity in which each has been trialled; however, each has been widely applied to other topics and stages of the curriculum.

Figure 1: The elements of intellectual quality as given in the NSW Quality Teaching Model (Adapted from McLeod & Reynolds, 2007)

INTELLECTUAL QUALITY	
Deep knowledge	The knowledge being addressed focuses on a small number of key concepts and the relationships that exist between the concepts.
Deep understanding	The students demonstrate a profound and meaningful understanding of key concepts and the relationships that exist between the concepts.
Problematic knowledge	Students are encouraged to seek alternative solutions and question existing ones.
Higher-order thinking	Students engage in thinking that requires them to organise, apply, analyse, synthesise and evaluate knowledge and information.
Metalanguage	Teachers and students use the specialised terminology that relates to the lesson content and discipline.
Substantive communication	Students are engaged in meaningful conversations about the concepts and ideas presented in classes.

1. Online readings and discussion forums

Encouraging senior students to read a wide range of current literature from a variety of perspectives on mandatory topics is always a challenge. Utilising the school intranet, selected readings may be placed in specific subject folders for students to complete for homework.

Sample activity: Yr 12, reading on world cities

Task: A reading about the future of world cities has been placed on the school intranet for you to download, read and discuss. You may comment or react to content in the article, ask follow-up questions, pose hypotheses or seek clarification of meaning by posting on the discussion forum. Alternatively, you may respond to a post made by a classmate.

Benefits

- Students became more interested in completing the homework readings and posing questions / comments for classmates.
- Students were engaged in their favourite pastime—talking to friends—but with one significant difference, they were engaged in *substantive communication* about a given topic. In addition, they were using the appropriate *metalanguage* and generating written ideas about the topic as well as engaging in *problematic thinking*. What is more, this was taking place outside of class hours.
- The use of the intranet has significantly improved both the completion rate of readings and the interaction between students on selected topics.
- Readings cannot be lost or left at school.
- The teacher's awareness of the comprehension levels of individual students is enhanced, allowing for differentiation.

Suggestions

- Be familiar with the reading, its relevance to the syllabus and possible avenues of discussion that may be prompted by the reading.
- Check the discussion pages regularly to ensure students keep to the topic, and to engage in the discussions taking place.
- Vary the length, difficulty and source of the readings in order to maintain interest.
- Observe copyright regulations.

> ***"Students were engaged in their favourite pastime—talking to friends—but with one significant difference"***

2. Podcasting

A podcast is an audio or video file that is usually made available for others to download.

Sample activity: Yr 7, world heritage sites

Task: Use *iMovie* to make a video podcast of a world heritage site with which you feel a connection. The podcast must include the specified details and meet the given production criteria.

Benefits

- Allowing choice of site gave students a sense of control over their learning.
- In-depth investigation of one site allowed them to build *deep knowledge* and *understanding* around the single concept of what constitutes a world heritage site.
- The podcast encouraged students to use appropriate *metalanguage*.

- The end product was presented to an audience but avoided the anxiety that class presentations sometimes engender.

Suggestions
- Be familiar with the software, in this case iMovie.
- Set specific criteria and parameters for students to operate within.
- Allow for a range of technology skill levels.
- Set completion dates for each step / stage of the process.
- Compile a list of useful and credible websites for student to explore.

3. Video diaries

Sample activity: Yr 12, biophysical interactions, ecosystems at risk, people and economic activity

Task: At the end of each day's activities during the field trip to Hook Island, you will work with a partner to record a video diary entry. When planning your video, you may make notes of your observations and data collection, for example tourist tallies, underwater quadrats or species identification. Ensure that you use technical language appropriate to the day's activities. A copy of your diary entries will later be given to everyone in the class.

> ***Video diaries allowed students to process their learning and articulate it to an audience***

Benefits
- Video diaries allowed students to process their learning and articulate it to an audience.
- The task required *problem solving* and encouraged *substantive communication* on a small number of concepts, which promotes *deep knowledge* and *understanding*.
- Students needed to be familiar with the *meta-language* relating to their field study activities and use appropriate *metalanguage* in their video diary.
- Planning the content of each diary entry helped students consolidate the learning that took place.
- Students enjoyed sharing their diaries and watching classmates' dairies. This allowed students to listen to the material several times over, from a variety of perspectives (*problematic knowledge*).
- The teacher could quickly assess the students' understanding and note any areas that needed clarification or further explanation.
- This activity allowed students to be creative in their presentations with everything from David Attenborough style documentaries to 'talking coconut' diaries being submitted.
- Using a computer to edit the videos onsite further enhanced the learning that took place.

Suggestions
- Set strict time limits and stay nearby so students remain on task.
- Always set explicit quality criteria so students are aware of your expectations.
- The teacher may wish to view the video diaries to ensure they have titles and that days or dates are clearly identified, this also allows for teacher censorship.
- Careful naming of files helps prevent accidental erasure.

4. Virtual fieldwork

Students at all levels can benefit from participation in virtual field studies. Although virtual field studies can never replace the benefits of genuine field experiences, they introduce the tools that geographers use when engaged in fieldwork.

A series of virtual field studies are available from Jacaranda (Interactive World Atlas, 2007) and are suitable for all stages of Geography. Sample virtual field studies in this series include the Murray-Darling, Mexico City, Ningaloo Reef, Antarctica, Banda Aceh, Kakadu, Melbourne Docklands, New Orleans, Nouakchott and the Three Gorges Dam.

Benefits
- Students had an opportunity to 'visit' a wider variety of locations than would otherwise be possible.
- Designed to foster *problematic thinking* and *higher order thinking* skills, the activities lead students to *deep knowledge* and *understanding* of one geographic location.
- Students were engaged with a variety of interrelated stimuli such as graphs, audio interviews, photographs, maps and flow charts.
- There were opportunities for students to respond and consolidate learning.
- The multimedia nature of virtual field studies caters for a variety of learning styles, and effectively teaches the processes, methodologies and *metalanguage* involved in fieldwork.

Suggestions
- Teachers must complete the field study for themselves prior to the class.
- Setting the scene and building the context of the study is important before commencing the activities.
- Before starting, decide what method of assessment will be used and whether it will be assessment of learning or assessment for learning.

5. Online video tutorials for skill development

The Geography syllabus requires students to apply "mathematical ideas and techniques to analyse geographical data" (Board of Studies, 1999, p. 10). One aspect teachers struggle with is finding sufficient class time for consolidation of skills. During homework activities, students may forget steps, apply a formula incorrectly or fail to understand

what the question is asking. This problem may be counteracted by creating short video tutorials of the teacher demonstrating specific skills and posting them on the school intranet.

Benefits

- Research supports modelling as a powerful teaching tool (Bandura, 1997; Horner, Bhattacharyya & O'Connor, 2008; Schunk, 2004), and students were able to watch the modelled process as often as necessary.
- Each tutorial focused on one skill and included both the skill and a problematic application of the skill. This helped the students develop *deep understanding* and encouraged *problematic knowledge*.
- Students were exposed to *metalanguage*.
- The tutorials provide a non-threatening and non-assessed opportunity for skills acquisition outside the classroom. Students who were reluctant to complete a practice skill page were more likely to watch a video clip.
- Students could replay the tutorial while practising skills or preparing for assessments.

Suggestions

- Upload the tutorials when the skills are introduced in class.
- Remind the students to use the tutorials for revision before assessments.
- Place downloadable skill worksheets on the intranet along with each tutorial.
- 3–5 minutes is around the optimum length for a tutorial.
- The intranet enables the teacher to monitor who has been watching each tutorial and how long they watched it (some may need reminding that 13 seconds is hardly long enough to be beneficial).
- To vary presentations, use a puppet or get the students to record their own tutorial.

6. Data collection and analysis

Sample activity: Yr 7, global change

Task: Each student needs to bring a bag of clothing items they would normally wear on the weekend.

Class period 1: Check the label of each item to determine where it was made. Using your laptop, enter this information in *Pages* (a software package). As you enter information, a pie graph will be generated and updated with each additional entry. After 1 minute, you will rotate to another student's selection of clothes and enter the relevant data, and so on.

Class period 2: Analyse the data you have collected. Create a report that includes the pie graph, a definition of globalisation, an explanation of the results, a statement of how this study affects you, and a portrait photo of yourself as the reporter.

Benefits

- Students found the activity engaging, fun and relevant because they used items of their own.
- Students could observe their data being processed immediately on the pie graph.
- Although conducted individually, students quickly began to engage in *substantive communication* as trends began to emerge. Students did not predict all the results correctly, thus the element of surprise kept them interested in the task.
- *Higher order thinking* was required when students had to analyse their findings and write their report.
- *Metalanguage* was encouraged in the report writing.

> ***Students quickly began to engage in substantive communication as trends began to emerge***

Helpful pointers

- Encourage all students to have their items ready on the data collection day.
- Leave the clothing in small piles and move the students from one pile to the next.
- Explore the different graphing options available and choose the one best suited to the purpose (pie, bar, column).
- Use questioning to promote higher order thinking, for example, origin of brand names versus origin of manufacturing.
- The photograph identification is fun and fast (if your computers have the necessary tools) but not essential.

Conclusion

These activities demonstrate that the intellectual quality domain of the New South Wales Quality Teaching Model can be enhanced by the use of computer technology when addressing syllabus requirements for Geography. In addition to the specific strategies listed in this article, students in



[Photography: Tiani Page]

> *Computer technology will only be as effective as the teacher using it*

Geography classes have designed and created multimedia presentations, collected and interpreted a variety of electronic information, and learnt to refine search techniques using the internet, all of which are syllabus suggestions for integrating ICT into the Geography classroom.

Computers are an essential commodity in the personal lives of most high school students. In order to maintain educational relevance for Gen Y and the even more technology-wise Gen Z students, teachers need to embrace computers as a teaching tool, as well as become smarter and more effective in using them to enhance quality learning. It is important to remember that computer technology will only be as effective as the teacher using it. When teachers create ICT pedagogies that meet the criteria of the New South Wales Quality Teaching Model, everyone wins—students are able to work with familiar technology and enjoy their learning; teachers see students engage and learn about the world in which they live. In addition, society benefits from young people who are equipped with both learning and ICT skills for use in the real world. TEACH

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