INTRODUCTION

Computer imaging is seen as another area in which art students can extend their creativity by harnessing modern technology to produce exciting new products. However, what happens when holistic, creative learners need to acquire sequential, analytic skill before they can work in this medium in a creative way? What happens when the logical computer buff sees this as a further chance to learn more about computers? How do these diverse thinkers cope with the requirements of computer imaging that needs the logical applications of the analytical thinker as well as the creative awareness of the artist? This study looks at responses from students who cover this range of learning styles, to such a course conducted by a secondary school Art and Technology Centre. Further work throughout the year will look to redress the difficulties some students have experienced when trying to function in an unfamiliar learning style.

THE SETTING

The Art and Technology Centre has been operating since 1989 and now contains: Amiga computers, video cameras, a postscript printer, a colour printer and an audio digitiser. This range of hardware is supported by a large range of software from painting and drawing programs, desktop publishing and video presentation programs.

The Centre functions as an interactive facility and, although situated with other art rooms, it does remain separate and secure. The equipment it contains has the capacity to generate artwork, extend art practice and problem solve in an endless combination of possibilities. Images can be developed on an Amiga by using it as a drawing, painting or animating tool and artwork is often extended by working (through design processes). The final products can be printed in colour or black and white, as a transparency, colour print or slide, on videotape or saved to disk. These facilities are used by art students of all year levels from 8–12, art work students in Years 11 and 12 and students taking the TAFE course in Computer Imaging and Desktop Publishing. Other interested students, outside organisations and local businesses also access the Centre. It is in enormous demand and generates a great amount of interest and enthusiasm in the users. Consequently, it is a continuing concern to stimulate creative practice and maintain a cutting edge approach to technology.

THE PROGRAM

Small groups of students who access the facility for a limited time of one and a half hours each week to take the TAFE modules in Computer Imaging and Desktop Publishing written by Peter Wharton, lecturer in Graphic Design at the Queensland College of Art, Griffith University. It was the teacher's decision to offer the course to all students who need not necessarily be undertaking a program of study in art or artwork. To broaden all students' opportunities in visual art and design there has been no attempt to cull or deliberately select students for this course. The only encouragement has been to canvass for a balance of girls and boys on an equity of access basis.

This open access created a set of circumstances and problems that had to be addressed. How these were addressed provided much of the material for this article and much provocative discussion for the writers.

In keeping with the aims of the Centre, the program was designed to provide opportunities in art education for all students, to extend the use of the facility and to foster creative practice. It was also hoped to encourage mathematics/science students who are often afraid, disdainful or sceptical of the visual.

The course is organised to cover and satisfy the requirements of TAFE but also nurture and expand the creative visions of 18 individuals to a greater or lesser degree. Task sheets have been written to clarify the content of the syllabus, to sequence development of skills and knowledge, to force the issue to work in a problem solving manner and finally resolve a task by producing an image, animation or video. This sample (figure 1) is one of the early task sheets.

Julie Peachey
HEAD OF DEPARTMENT, ART
CORINDA STATE HIGH SCHOOL

Dorothy Muller
RESOURCE TEACHER
CORINDA STATE HIGH SCHOOL

The authors of this article in forming this research and writing collegiate have come to their appreciation and enthusiasm for computers as whole brain learning tools from two differing perspectives—one as an art teacher who initially approached the medium as a new and exciting tool, the other with a passion for helping all children learn. TAFE programs enhance opportunities for our students at upper high school levels and the task sheets included in this article make the content of the syllabus accessible for students in the classroom. The research into learning styles in a graphic computer environment with a select group of TAFE students illustrates the flexibility of the computer as a tool for encouraging whole brain learning.
TASKSHEET 2: INTRODUCTION TO COMPUTER IMAGING

Hardware: Amiga computer with minimum of 1 megabyte of memory
Software: DeluxePaint IV
Content: Customising brushes
- creating a brush
- selecting complex shapes
- removing objects from the background
- saving the load brushes
- handle
- perspective

Task: Create an imaginative image which demonstrates your knowledge and understanding of customised brushes using the software program DeluxePaint IV.

Procedure: Demonstration of processes by teacher. Experimentation using support material and/or manual. Production of your image during this session or with subsequent lunchtime sessions.

Support Materials:

CREATING A BRUSH
Select a custom brush tool using left mouse button. Background colour will be transparent and you duplicate the selected section. By picking up a custom brush with right mouse button you remove the selected section leaving the background colour. Create an irregular shaped brush by double clicking on the brush selector. Complete the shape by pressing the space bar. Using the Autotransparency option allows you to change the transparency colours in your brush. The same colour clicked on when creating a polygon brush will also be transparent if autotransparency is turned on.

REMOVING OBJECTS FROM THE BACKGROUND
Refer to the above points in creating a brush but do not check your active background colour as your customised brush treats it as transparent.

SAVING AND LOADING BRUSHES
Brushes can be treated just like pictures. They even have their own menu. Brushes can be loaded and saved just as pictures can. Brushes when loaded come equipped with their own palettes. If the current picture has a palette different to the brush palette, the palette can be changed by:
Change Colour > Use Brush Palette (Picture Menu).
If you want to use newly loaded brush with current palette use
Change Colour > Remap (Brush Menu)

OTHER ITEMS IN BRUSH MENU
Allow you to resize, reshape and recolour brushes in various way

HANDLE
Is an option used with more advanced persons with this program. It allows you to specify whether your arrow cursor sits at the centre (Default Setting) or at one of the corners of the brush (used with Perspective in the Effects Menu). Accessing the corner of the customised brush from the Handle Submenu moves the cursor to lower right hand corner of the brush. Further accessing moves the cursor from corner to corner.

PERSPECTIVE
Perspective accessed through the Effects Menu lets you rotate a brush through any of three axes of 3D space to define a plane of operation.

FAST FB
This option can be selected from the Presets menu and redraws all parts of a brush with single pencil lines instead of showing the full custom brush until drawing is finished.

CHANGING PAGES
A useful item when manipulating brushes. This enables you to swap from page to page.
Spare > Swap (Picture Menu) or J key.
You can have different background colours on each page. Palette follows from one page to another.

The Study
Research over decades has indicated that the two hemispheres of the brain tend to specialise in different functions, process information in different ways and handle different problems. In most individuals the left hemisphere specialises in logic, words, facts, step-by-step thinking, symbols, organisation, and time. The right hemisphere specialises in intuition, pictures, emotions, synthesising, creativity and is time free. Both sides of the brain are used but one side is usually more dominant and this is often used, even if inappropriate to the task. Developing the less dominant side would allow an individual to use the most effective mode of processing for a task, he or she would be using the whole brain.

The school has been involved in addressing this problem and in promoting whole-brain learning, based on Herrmann’s (1989) whole-brain model of thinking, learning and acting. He attributes different processing styles to each hemisphere; the right hemisphere is intuitive and holistic, and the left hemisphere is analytical and sequential. However, in this model each hemisphere has within it two levels of thinking, the cerebral mode that is rational, conceptual and reflective, and the limbic mode that is more emotional and doing. This results in a four section model of whole-brain functioning (figure 2).

All staff were inserviced in the main features of the theory and some applications suitable for the classroom. Some staff looked in more depth at strategies that would assist those students who were predominantly either logical or intuitive learners. The students who elected to do TAFE Computer Imaging Course were from all subject areas in the school and many of them take a highly scientific and mathematical course of study with a greater likelihood of being logical, sequential thinkers. There is little cohesion in the group except for an interest in image making on computers. The logical thinker prefers limited choices and singular outcomes and staff examined strategies that could expand the ability of those students to tackle problems in a more creative, divergent manner. They are a diverse lot in behaviour, knowledge, skills, thinking styles, abilities and sensibilities.

This study investigated the learning and thinking styles of these students. Its concerns were: whether the right-brained, holistic thinkers are...
hampered by the sequential, structured use of the technology and are thus less able to be creative; whether the left-brained logical thinkers were able to move from using the technology for its own sake to using it creatively; and, whether any cultural or gender differences discriminated against full participation in the course. To this end research has involved observation of the students' approach to the course and of their facility in using the technology to achieve a creative outcome. They have been tested using a modified version of Herrmann's Thinking Styles Dichotomy Exercise which graphs brain dominance patterns.

A cross-section of three students favouring the right-brain mode, three the left and three comfortably working in both modes was selected for further study. This group was closely observed, interviewed and their subject selection and performance noted.

OUR OBSERVATIONS

Those students with a preference for upper-right-thinking processes coped well with the technology and have found the work fun. They do not seem constrained by the tasks set, or necessarily feel obliged to do them and they are happy with the organisation of the class environment. School subjects they are studying include Artwork (a school subject) and Mathematics in Society amongst a range of others but do not include the traditional 'maths-science' subjects.

The student from the 'lower-right' group has a 'maths-science' background and high task commitment. Here the experimental nature of the upper-right mode students was missing and this student experienced difficulty creating the image that was initially visualised. The frustration felt in not achieving at the usual high level was evident in her reporting the class environment only moderately satisfying.
Where the preferred mode of thinking was fairly evenly balanced between right and left hemispheres, students were comfortable with the technology and the processes. They were quite happy with most aspects of the class environment but the concern with inability to ‘think of anything to draw’ started to appear. Such processes as digitising images which they could then rework and extend helped these students. The school subjects they had selected to study tended to contain unusual combinations such as Home Economics and Mathematics.

In the group with a left mode of thinking the students exhibited characteristics of both the upper and lower quadrants. Here, however, there was a marked difference between the males and female. The males were interested in the technology and felt that they were already familiar with it. However, they found the lack of a set goal difficult initially because they could not visualise images that they would like to produce. The female was able to use the technology to develop creative images and enjoyed extending imported images.

**DISCUSSION**

A key observation of this study was that none of these groups of students has found the technology daunting. The barriers they have experienced have not been the technology, they have been the creative demands of the course. The right-brained students did not require excessive assistance to use the technology, however, they actively sought teacher support when they were in need of it. With each new aspect of the technology to which they were introduced they took what they wanted to know at the time and applied it to solve their own problems. They came with their own ideas which they wanted to try and did not look to others to provide the inspiration for their work. The upper-right mode students liked creating, inventing and manipulating the equipment rather than being especially concerned with finishing a task. They were openly enthusiastic whereas the other right-brained student displayed a much quieter approach.

The work that these students have produced to date demonstrates the Centre's capacity to extend learning and promote creative practice. The creativity unleashed by this medium is overwhelmingly apparent in these examples of one right-brained student's work on the same theme, one from the first session (figure 3) and the other three months later (figure 4).

The students who experienced most frustration with the course were male left-brained thinkers. They required more direction, more specific instructions and needed fixed outcomes without which they felt most uncomfortable. While the other groups had ideas with which they wanted to experiment these students maintained that they did not have internalised ideas of their own to try. This was because they did not visualise, they had no pictures in their heads.

This frustration became more explicit on examining the student interviews and profiling. Subsequently, strategies were set up to encourage these students to make the breakthrough in

---

**Figure 4**

**Figure 5**
creativity. They were encouraged to move out of their preferred mode of thinking and work to accept the legitimacy of risk taking. These images (figures 5-7) illustrate the huge strides these students made once they were prepared to step out of the known, they show a development in creativity.

What has become apparent is that, as the course progresses, images created by all of the students have become more complex and the approaches taken to create them have become similar. All of the students have gained significant knowledge of design problem solving, no matter what their preferred mode of learning.

The frustrations still continue but a feeling of enthusiasm permeates the Centre as the students work quietly and collegially on their recent tasks.

CONCLUSION

The course has addressed teaching and learning practices that we are trying to encourage so that our students will be prepared for the life-long learning that faces them. Some of these practices include:

- designing
- problem solving and critical thinking skills
- self-paced and autonomous learning
- peer tutoring
- creative practice
- enterprise
- the need in everyone to find avenues of self expression
- looking at, evaluating and responding to our world
- familiarity with technology.

The research has been catalytic in bringing added flexibility to the program to cater for the diverse needs of the group. Assessment can now take place once each task is completed or at an appropriate time elected by individual students, or at the end of the course, with the student selecting the method of presentation. Negotiation and collaboration are important aspects of the student/teacher interactions and students' awareness of this perhaps unfamiliar aspect of the learning environment has been made more explicit. It is rarely a teacher-dominated environment and, although a very busy one, it is a quiet place where students and teachers enjoy sharing and exchanging information and ideas.

The teacher, in the role of facilitator, looks for the key to every individual's creativity, to unleash new ways of looking at our world and responding to it. For some this may be as easy as turning within and exploring the ideas in their minds. For those and for others it may come from their visual world in a number of ways:

- looking at it
- drawing it
- talking about it
- from books
- from video and film
- from other artists
- from music
- from the technology itself.

Visiting artists and tutors have a most significant role to play in unlocking creativity in this program.

The task sheets fulfil an organisational need for the teacher to cover TAFE requirements and for those many left-brain dominated students.
REFERENCES

Education Department of South Australia 1986, *Databases in the Classroom*, Satchel, Angle Park Computing Centre.

Hancock, J. 1989, 'Learning with Databases' in *Journal of Reading*, vol. 5, no. 1, pp. 9-12.


SOFTWARE
Dataworks, Footyworks
KnoWare, *The Bushrangers' Database*
KnoWare, *The Explorers' Database*
KnoWare, *The Explorers Journals*

NSW Education Department, 'First Fleet' in *Resource Materials for the First Fleet Convict Database*.

Sunburst Communications, *The Endangered Species Database*
Sunburst Communications, *Solar System Database*

continued from page 26

who enjoy carefully sequenced and finite ways of learning. The in-built flexibility of the program allows other students to explore their own ideas laterally and use the task sheets as a spring board for their own creativity, demonstrating the power of this media to be a wonderful tool for whole-brain learning. The left-brain assimilation of the technical and sequential processes is a necessary part of the creative process leaving the right brain free to fly with ideas once there is technical automaticity.

Howard Gardner (1983) proposes what we see as 'intelligence' in mathematics is seen in the artist as a 'gift or talent', one of our other forms of intelligence. He maintains that we are truly complex beings made up of multiple intelligences and those of the arts are some of these intelligences. In that case there is a talent in all of us and it is the role of the teacher to find a road that each student can journey down to explore and mobilise his or her creativity.

Image generating computers and their associated technology are a truly open-ended tool for every student's journey to creativity and whole-brain learning.

BIBLIOGRAPHY


continued from page 31

computer and non-computer games can then be designed to meet teacher and student expectations and requirements. According to Myers (1984), the best computer game designers are the best artists, those who examine broadly whatever is learned from games played in their natural environment and apply the same general qualities to computer games. Similarly the same general qualities should apply for non–computer games. These qualities should include how to feel or empathise, how to understand, and not in the strictest sense, how to know.

REFERENCES


