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Recreating ecosystems in Micro Worlds

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RECREATING ECOSYSTEMS IN MICRO WORLDS

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Introduction

In this paper we explore the incorporation of information and communication technologies into a Year 8 Science unit concerning Ecology. Our students explore concepts concerning the structure and function of ecosystems including abiotic and biotic characteristics and the interaction between these characteristics. In this unit the students have been required to use MS Excel, Inspiration and Micro Worlds to organise their data and represent the knowledge and understanding they have gained about these concepts. The unit description can be found at http://www.woodleigh.vic.edu.au//IDATER/MW/Ecology_Unit.pdf (the page references in the unit description refer to the students' text, Science Quest 2 {Lofts and Evergreen, 2000}).

Setting

The Woodleigh Schoolⁱⁱⁱ senior campus is set in bush land with a creek and wetland ecosystem and Manna Gum and Tea-tree woodland ecosystem. The students in this class (25 students) have 4 x 80 minute sessions of Science each week. Prior to commencing the field work we had spent a session in class exploring the main concepts of this unit: biotic factors, abiotic factors, relationships within biotic factors and between abiotic and biotic factors, and energy flow through the ecosystem. We were then able to spend four full sessions in our field location. The first session we simply explored the parameters of the field site and learnt how to complete quadrats along transects using the Braun-Blanquet method to record species diversity, abundance and distribution. We then spent the next three periods collecting the data from the field.

Having collected the data we used various computer programs to organise, analyse and represent the data. The first step was to use MS Excel to record the data collected about each species by quadrat linked to a map locating each quadrat. The students had little difficulty using MS Excel as they had used it in mathematics, however, they did need the style of spreadsheet explained as they had not used MS Excel in this way before.

	A	B	C	D	E	F	G	H	I	J	K	L
1		Quadrats										
2	Species Name	James 1	James 2	Dan 1	Dan 2	Dan 3	Dan 4	Dan 5	Catie 1	Catie 2		
3	<i>Acacia longifolia</i> Sallow Wattle						2	1				
4	<i>Acacia mearnsi</i> Late Black Wattle											
5	<i>Acacia melanoxylon</i> Blackwood											
6	<i>Acacia paradoxa</i> Hedge Wattle											
7	<i>Agapanthus</i>							1				
8	<i>Allocasuarina littoralis</i> She oak											
9	<i>Banksia marginata</i> Silver Banksia	#	#									
10	Blackberries									1		
11	<i>Bursaria spinosa</i> Native Box											
12	<i>Callistemon salignus</i> Willow Bottlebrush	#	#									
13	Cape Weed			1		1						
14	<i>Casuarina stricta</i> Coast She Oak											
15	<i>Correa alba</i> White Correa							1				
16	Dead trees							2				
17	<i>Dianella tasmaniensis</i> Flax lily	#	#									
18	<i>Eristemon</i> sp. Wax flower											
19	<i>Eucalyptus ovata</i> Swamp Gum								#			
20	<i>Eucalyptus pauciflora</i> Snow Gum	#	#									
21	<i>Eucalyptus</i> sp.							2	1	1		
22	<i>Eucalyptus viminalis</i> Manna Gum	#		2		4	4	3		1		
23	<i>Gahnia radula</i> Sword sedge							1				
24	<i>Leptospermum laevigatum</i> Coast Tea Tree							1				
25	<i>Leptospermum phylloides</i> Burgan											
26	<i>Lomandra longifolia</i> Spiny Headed Mat-rush		2 #	1								
27	<i>Melaleuca ericifolia</i> Swamp Paperbark		3 #				1		#			
28	<i>Amyema pendula</i> Drooping mistletoe											
29	<i>Pinus radiata</i> Pine tree											
30	<i>Pittosporum undulatum</i> Sweet Pittosporum							1				
31	<i>Poa continentalis</i> Tussock Grass		1 #									
32	<i>Prostanthera</i> sp. Mint bush							1	2			
33	<i>Pteridium esculentum</i> Bracken	#		3				5	5		5	

Figure 1. Excel spreadsheet developed from students collected data

Then the students were asked to list the biotic and abiotic data and highlight the links between them in a concept map using the program Inspiration. The students had little concern using this program as we had used it regularly to organise concepts in previous units, however, they were used to a situation in which the concept plan was used to organise what is known, rather than what was still needed to be known. They were asked to highlight what information they did have and what questions they still needed to have answered. The students were then instructed to seek answers from their peers. A number of examples can be found on the website <http://www.woodleigh.vic.edu.au/IDATER/MW/index.html>.

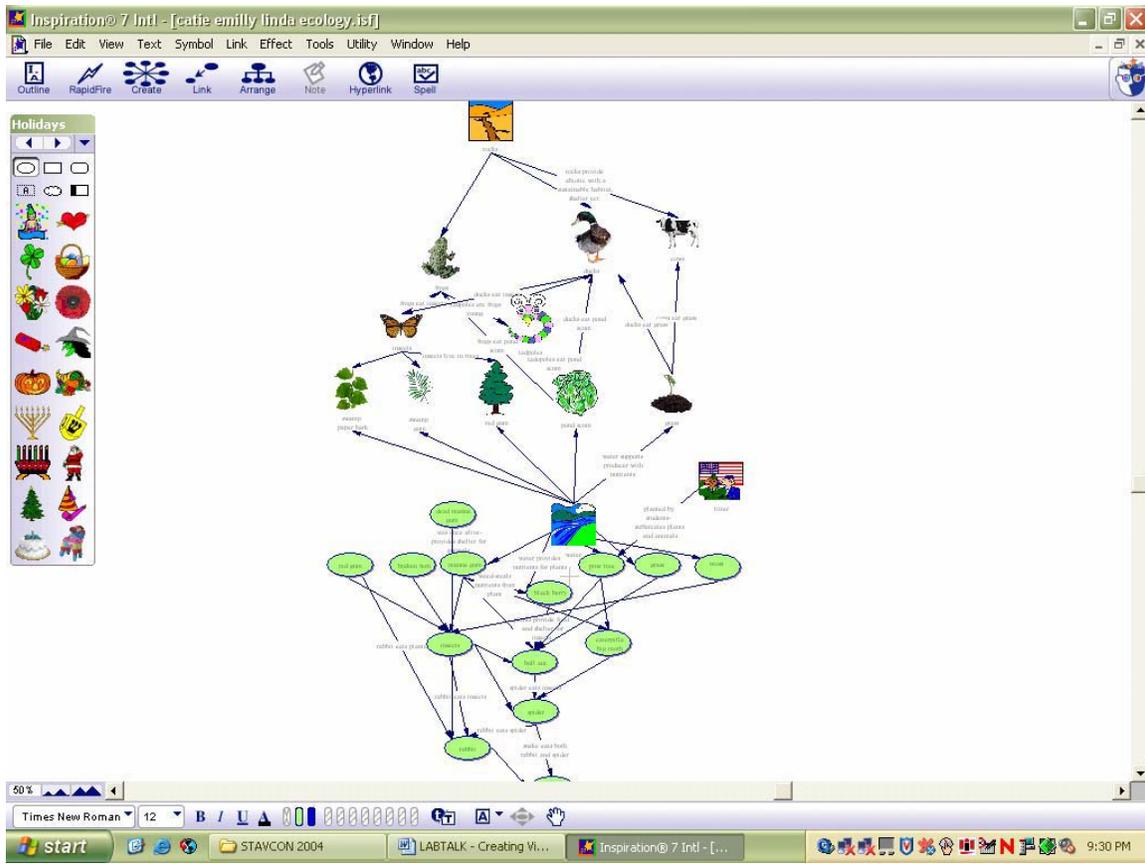


Figure 2. Catie, Emily, and Linda's Concept Plan

Following this we explored the concepts of food chains, food webs and relationships between plants and animals in a single class.

Representing Student Learning

The students now had the information they needed to reconstruct the Woodleigh environment and represent what they had learnt using Micro Worlds. None of the students had previous experience of this program and Gary had little more than they, having used it the previous term with his Year 7s (Chapple and Simpson, 2004) and in preparing this unit. We had a clear vision of what we wanted the students to achieve using Micro Worlds. That was a visual representation of the environment which displayed the knowledge and understanding they had gained. However, Gary did not know how to do it – just that it could be done. The students, likewise, understood what we were asking, but they could not imagine what it may look like, or how to do it either. Fortunately we had the support of Mark who, as a Science teacher, understood what we wanted to recreate and, as an IT consultant familiar with Micro Worlds, knew how to achieve it.

We gave the students 3 x 80 minute sessions to complete the task and Gary openly confessed to his students his personal challenges with this task. We also showed them some examples of things that can be done with Micro Worlds – some simple examples produced by Mark and some simpler examples that Gary had produced: <http://www.woodleigh.vic.edu.au/IDATER/MW/index.html>. The students were

encouraged to explore the software and try different things out. We were able to use a computer room for our first class, but then had use of the school notebooks for the other two classes; these come as 8 notebooks in a trolley with a whole lot of management issues with which to deal (see Chapple and Simpson, 2004).

The students became engaged with the visual aspects of Micro Worlds and many quickly came to grips with the programming required of the more complex features.

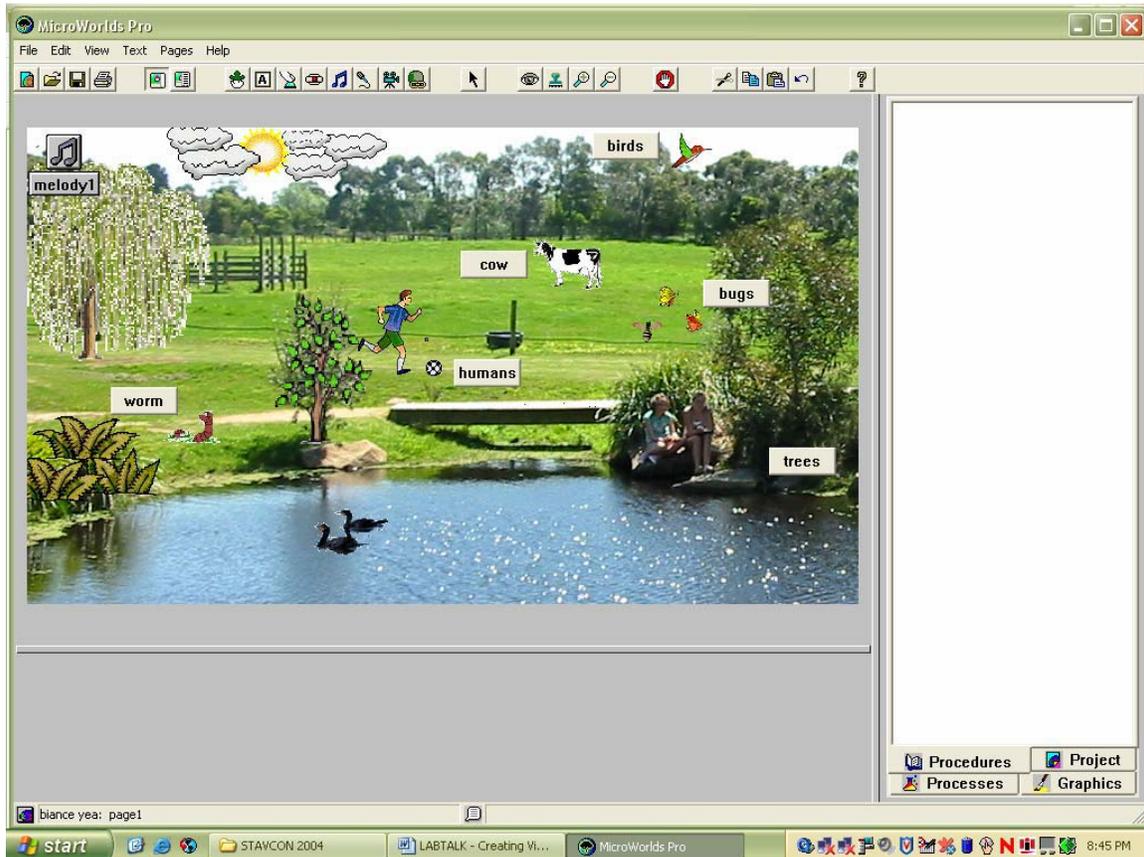


Figure 3. Bianca's Virtual Ecosystem

Some student examples may be found at this link:

<http://www.woodleigh.vic.edu.au/IDATER/MW/index.html>

Reflection

We gained a great deal from this exercise. It was edifying to see students engaged with the software as they struggled to master it and then use it to represent their knowledge and understanding of ecological concepts. Many of the students were able to quickly master the skills required and pushed Gary beyond his comfort zone with Micro Worlds and Adobe Photoshop (the students used digital photos of the environment within their projects to illustrate points and these needed to be cropped and resized). The students appreciated the presence of Mark, who was able to answer their questions and show them better ways to do things.

It became obvious that the students needed a very clear understanding of what they

were trying to create. Fortunately, some of the computer savvy students quickly came to grips with Micro Worlds and we were able to share their early attempts via the data projector. These students were also very willing to act as mentors. However, before using something like this again we will endeavour to produce the same work that we want of my students, so that we can show them how and what we have done – essentially to act as an example. (Lesson learnt for Gary – improve his computer skills, asap.)

The students responded wonderfully to this activity and many were able to clearly identify the important parameters of ecological study that we had wished them to gain and represent it in a digital environment. That they were able to do this in a rich visual environment and a rich digital environment was an added bonus – for them and us. They were clearly engaged by the field work activity and gained skill and knowledge by using MS Excel to organise the data and Inspiration to analyse that data. They were also clearly engaged by Micro Worlds and enjoyed using it to create and animate virtual environments. The students acted autonomously for much of the time supporting each other and referring to the teachers for advice on how to do (computer) questions and what does (concept) mean questions.

Other students were able to explain the concepts but were challenged by the need to represent this in Micro Worlds. They still gained experience in a new software program and gained confidence with using computers and in their own ability as they worked hard to achieve some sort of visually rich product.

We believe that this was a highly successful incorporation of information and communication technologies in a meaningful manner. Stoll et al. (2003. p62) listed ten features of successful teaching and learning that enhanced student engagement.

Enhancing student motivation

- *Use cooperative learning rather than competitive learning*
- *Stimulate cognitive conflict*
- *Encourage moderate risk taking*
- *Praise good work*
- *Make academic tasks interesting*
- *Provide feedback that is connected to learning and effort*
- *Identify many intelligences and showing that they are not fixed but incremental*
- *Encourage self-images as learners*
- *Increase student self-efficacy*
- *Encourage volition*

We believe that this classroom innovation has achieved the majority of these criteria. The students were praised for their excellent work and their excellent efforts, the task was rich and interesting (and demanding) and the students worked in a cooperative atmosphere helping each other to take intellectual risks. Students were encouraged to take many risks in a highly supported and supportive environment in which they were able to work as active learners and perceive themselves as such.

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Mark Chapple is currently an onsite educational technology specialist working at the Woodleigh School. Mark also maintains an independent consultancy practice, working with teachers and schools as they strive to improve student outcomes using learning technologies. In previous positions within the IT industry, Mark worked closely with schools and teachers to assist them integrate technology within classrooms. Over the past ten years he has presented nationally at conferences and held workshops on issues such as planning for technology, developing collaborative learning environments and using technology within the classroom.

iii Woodleigh School is a coeducational independent school with a junior campus (3 year-old kindergarten to Year 6) and a separate senior campus (Year 7 to Year 12) situated on the Mornington Peninsula, 50 kilometres south of Melbourne, Australia.