

# USING THE INTERNET TO ENHANCE INDEPENDENT LEARNING.

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### ABSTRACT:

The Internet has provided a facility to support flexible delivery for teaching and learning. This has encouraged the development of student-focussed independent learning. This paper reviews two case studies that explore new approaches to teaching and learning that do not rely on a teacher-focussed or teacher-centred style, but rather utilise the Internet as a means of communicating between, and with, students.

The first case study involves the use of the Internet to enhance the field experience obtained by geospatial science students in their undergraduate studies. Learning through “Action Learning and Action Research” this study uses a Virtual Field Trip (VFT) to prepare second year students for a week-long field excursion to a popular national park in western Victoria, Australia. Initial findings are that whilst students found the VFT useful and would prepare them for fieldwork, they would not like to see it replace actual fieldwork.

The second case study was part of an international collaborative learning project developed by The Online Center for Global Geography Education under the auspices of the Association of American Geographers. RMIT undergraduate students participated in on-line learning with a group of undergraduate students from Utrecht University in the Netherlands. Whilst research has shown that collaborative learning allows students to attain a higher level of cognitive thinking and interest, this remains unclear with regards to on-line collaborative learning. The module evaluated by the students dealt with population geography. The module consisted of four lessons, each with a series of pages of textual and graphical material and a series of questions and activities. Students were divided into 16 groups of six students, three from RMIT and three from Utrecht. Overall student feedback was positive, but a number of students experienced difficulty in organising themselves and getting work completed on time. Questionnaires were issued to students prior to and after the module had been completed. Evaluation is still underway.

## 1. INTRODUCTION

Action learning and action research has been defined by Kimber (1999) as learning that results from active experience. Rather than students passively learning via the traditional “teacher-focussed” lecturing approach, action learning and action research actively engage students in building, testing and refining mental models (Michael and Modell, 2003).

The School of Mathematical and Geospatial Sciences runs three spatial science programs in geomatics, surveying and multimedia cartography. Practice-based geospatial science professions like surveying and cartography are reliant upon the application of knowledge in practice. It is therefore imperative that theory is integrated into practice through action learning (Chien *et al.*, 2002).

RMIT has moved towards a student-focussed learning environment where students are able to access learning materials outside the traditional lecture theatre. This has been facilitated through the implementation of the distributed learning system (DLS) at a university-wide level. Based on the Blackboard software, the DLS provides the facility for academic teaching staff to monitor student progress, upload courseware including assignments, on-line tutorials and other supporting documentation. This facility has also enabled the two case studies discussed in this paper to be implemented and tested for their effectiveness in imparting knowledge to

undergraduate geospatial science students. The aim of this paper is to present two case studies that demonstrate the application of the Internet to facilitate independent learning.

## 2. CASE STUDY 1: VIRTUAL FIELD TRIP

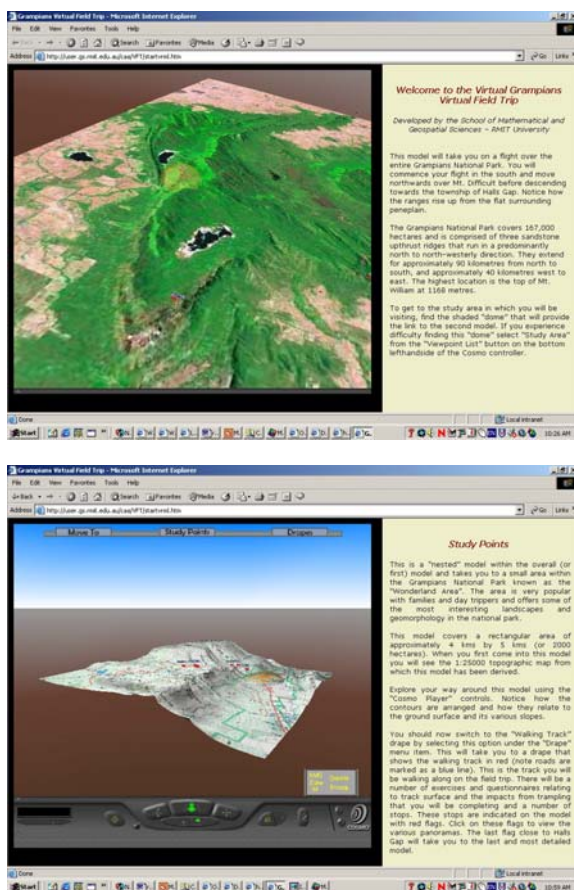
Virtual field trips vary in what is presented and the quality and approach of what is presented (Qiu and Hubble, 2002). These include VFTs that use a series of maps, text and photographs that read like a diary of activities on a field trip, for example the five day tour of the Grand Canyon developed by Bob Ribokas (2002), through to the Virtual Field Course hosted by the Geography Department at the University of Leicester ([www.geog.le.ac.uk/vfc/index.html](http://www.geog.le.ac.uk/vfc/index.html)). The Virtual Field Course is comprised of a number of exercises, including one based on a geo-referenced database, focussing on computer-based support for fieldwork. Likewise, the Department of Spatial Sciences at Curtin University of Technology in Western Australia, has developed the “Virtual Online Learning” ([www.cage.curtin.edu.au/volearning/](http://www.cage.curtin.edu.au/volearning/)) that can be used to facilitate geographic concept learning using a number of spatial activities ranging from survey principles to thematic classification.

As part of the second year, students are required to participate in a field camp of four days. Surveying students undertake a number of surveying exercises, whilst Cartography and some Geomatics students (not pursuing a major in surveying) are required to undertake a series of “mapping” activities. This

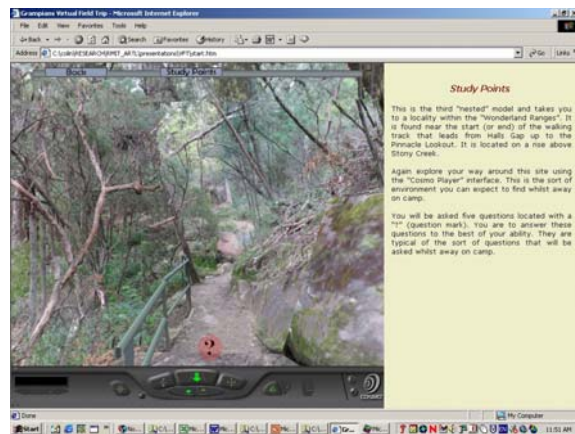
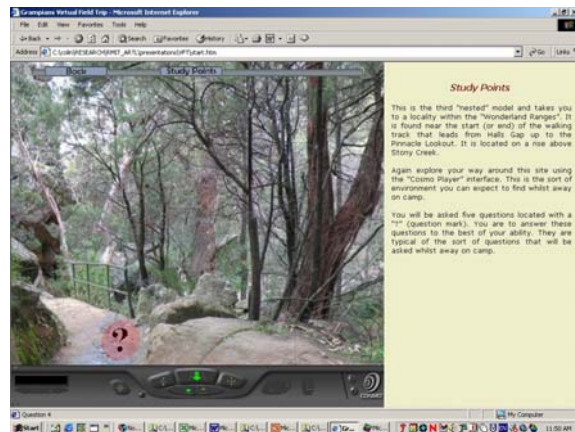
second group of students undertake fieldwork assessing hiker impact along walking trails in the Grampians National Park in western Victoria, Australia.

Previous research by Counihan (2005) has demonstrated that enhanced appreciation for a locality can be gained with increased prior knowledge about that locality. Given the limited time students are away, it is imperative that their learning experience is maximised during the field camp. It was decided to embark on the development of the virtual field trip to not replace, but rather augment, fieldwork to be encountered by students whilst away. Development of a series of nested virtual environment (VE) models is discussed extensively in Arrowsmith *et al.* (in press). The model is available at <http://user.gs.rmit.edu.au/caa/VFT/start.htm>.

Figures 1 to 4 show examples of the three scales of models used in the VFT.



Figures 1 and 2: *The large and medium scale shows the virtual field trip locality in context.*



Figures 3 and 4: *Site specific models give the students an appreciation for the type of environment through which they will be traversing. Question bubbles enable interactive feedback to students.*

An initial evaluation of the VFT using a questionnaire administered to 17 participants revealed the following general observations:

- all students like field trips and camps;
- all students generally got good marks for geography related courses;
- all students are able to work well with computers;
- all students believe that field excursions are a valuable learning resource; and
- disagree that VFTs should replace fieldwork.

Specific observations relating to the VFT included:

- the majority of participants found it useful and would prepare them adequately for fieldwork;
- about half the participants experienced difficulty navigating their way around the VFT and became disoriented;
- most participants could anticipate that a range of biophysical factors would result in variable impacts; and
- all, with the exception of one participant, would feel more comfortable about going on a field trip to the Grampians. This participant also expressed some

concern regarding gaining understanding of the variability of impact along walking tracks.

The key benefits identified from this initial development include:

- the ability to portray information at a variety of scales;
- the ability for students to gain a three dimensional visualisation of the environment into which they would be visiting; and,
- the ability for students to work at their own pace.

Whilst the ultimate objective with fieldwork is for students to be exposed to the real environment about which they have been learning in the classroom, the VFT enables each student to explore the region independently and at their own pace. They can independently evaluate information relating to the environment given in the VFT and reflect using the formative assessment provided as part of the VFT. This will prepare them for what will eventually become a group activity. Given that fieldwork is essentially a group activity focussing on action learning, where students are asked to work in groups of two or three, extension into group work can be achieved on-line using the VFT through threaded discussion groups using the facilities provided within the RMIT DLS and Blackboard. Debate, peer opinion and collective report writing, with input from the fieldwork co-ordinator can all be achieved on-line.

### **3. CASE STUDY 2: EVALUATION OF A MODULE DEVELOPED FOR INTERNATIONAL COLLABORATIVE GEOGRAPHY EDUCATION**

In mid 2004 an expression of interest was made by the Association for American Geographers (AAG) for interested academic staff to participate in an international collaborative project for the teaching and learning of geography. The project titled "The Online Center for Global Geography Education" is part of the IGU Commission on Geographical Education, and the project leaders have stated its primary objective as being to "...internationalize the undergraduate geography curriculum" (The Online Center for Geography Education, 2005). . Using the Internet it is anticipated that the learning and appreciation of geography can be enhanced by using the Internet to link students in different countries for collaborative learning and discussions about contemporary global issues (*ibid* 2005). We responded to that request on the basis that we believed our students would benefit from the opportunity to interact with peers from overseas, and that the students were already familiar with the distributed learning environment (using Blackboard) on which the project was based. We were selected to participate in the evaluation of one of a series of developed modules. A meeting of collaborators was held at a workshop at the International Geographical Congress held in Glasgow in 2004. The module we elected to evaluate dealt with topics relating to global population. The content of this module fitted well with a course taught in second semester (July to October) called "Changing Global Environments". This course deals with environmental change focussing on the Quaternary period. As part of this course we investigate climate change and its evidence, Pleistocene extinctions, human migration and civilization, culminating in human population growth and its environmental implications. As part of the course we investigate population and its dynamics including the geographic variability in growth. Students enrolled in the course are from a range of backgrounds, primarily from applied sciences. The majority would be "geospatial science students"

(Geomatics, Surveying and Cartography) who do this as an elective course. The course is offered as an elective and therefore attracts students mainly from 2<sup>nd</sup> to 4<sup>th</sup> year where opportunities to enrol in electives are greater.

Initially, the AAG assigned students into 16 groups of 6 students. Three students from RMIT were paired with three students from Utrecht University. Because of the makeup of these groups, members were more than likely unknown to each other even from within RMIT where the course is offered over two geographically separated campuses. Students were then asked to introduce themselves via a student page where they could post information about themselves and put up a photograph.

The "Population" module was comprised of four separate tutorials and within each tutorial there were three to four pages of written background material that contained embedded tasks and discussion questions. Students were requested to post comments, answers or general discussion and opinions to the threaded discussion board. Because the module formed only one aspect of what we study there was little opportunity to spend much time on the details of population growth. Therefore students mainly worked and communicated independently of teaching staff with the on-line material. However students were required to participate in all the on-line discussions and were required to submit answers to questions. Part of the assessment for this course was evidence of active participation in the on-line discussions. Both due to time constraints and by design, teaching staff maintained a "hands off" approach. On-line threaded discussions were monitored from time-to-time and all group discussions were reviewed nearer the completion of the course for assessment.

Most students participated quite effectively. I don't believe all students participated equally and sometimes responses from overseas (and locally) were slow.

Out of a 12-week semester, the module accounted for approximately 2 of these. Most students spent longer than the allocated time in participating in the module work and this made up a more significant proportion of their practical work.

#### **3.1 Attitudinal evaluation**

To evaluate the effectiveness of teaching and learning in each of the modules and in particular the effectiveness of doing this internationally, two questionnaires were administered before and after the module. The first of these dealt with attitudes of students to working in groups, and in particular international groups, and learning "on-line". The second questionnaire dealt with academic content, or knowledge, contained within the module. These questionnaires were designed by AAG project staff and administered locally. Surveys to determine changes in knowledge and attitude using pre and post-test surveys are widely used, for example Madle *et al.* (2003) who used a similar procedure to evaluate the changes in knowledge and attitudes of digital library users in the British National Electronic Library for Communicable Diseases.

The attitudinal questionnaire consisted of 22 independent questions where students were asked to respond by ticking a box, on a Likert Scale, from strongly agree to strongly disagree to a series of statements. Responses were sought prior to participation in the learning module and the same questions were given after participation. There were 45 responses

obtained in the pre-test and 40 responses obtained in the post-test. Of these 25% of the students were female. 70% of respondents were aged between 18 and 23, 20% aged from 24 to 29 and the balance, that is 10% of students (or 4) were over 30 years old. All students indicated they used email occasionally or frequently. 75% of participants had travelled overseas.

Responses to each of the statements were recorded by students ticking a box and for each of these a mean weight was calculated. For responses of "Strongly agree" a "1" was recorded, 2 for "Agree", 3 for "Neutral/No opinion", 4 for "Disagree" and 5 for "Strongly disagree". The appendix shows for each question, the number of responses given, the weighted mean and variance, and the difference in the weighted mean for the pre and post-tests. To determine whether an attitudinal change was statistically significant a paired T-test was undertaken at the 0.025 level of significance (critical value of  $t = 2.02$ ).

### 3.2 Observations from responses

If we first consider the weighted mean responses, it can be seen that question 13, 11, 17 and 2 all recorded strong agreement. Question 13 "The internet is a valuable tool for learning" indicates the positive attitude RMIT students have towards learning "on-line". At RMIT we have emphasised the need for on-line access to material in order to embrace the university's policy of "flexible learning" and "flexible delivery". Staff and students make frequent use of the distributed learning environment offered by RMIT and students see it as just another piece of equipment to aide their learning. Question 11 and 17 "Learning about global problems interests me" and "Understanding international perspectives is essential to solving world problems" had strong positive responses. Again this is not surprising given the nature of the course content and that students were selecting this course as an elective. Strong disagreement was felt in responses to questions 1 and 7. Question 1 "Geography is not a subject I enjoy studying" makes perfect sense. If the student didn't like studying geography then they would not have elected to do this course. Question 7 "The study of geography is not useful for understanding major world problems" demonstrates that students feel that geography will assist them to understand global problems.

In terms of attitudinal differences, between the pre and post surveys, from the appendix it can be seen that statistically significant changes in attitude from the pre to post surveys were found in responses to questions 6, 8, 9 and 22. Attitudes are "...general and enduring positive or negative feeling[s] about some person, object, or issue" (Worchel *et al.* 1991: page 175). Therefore any change in attitude from participating in a 12-week course requires further investigation. Whilst knowledge can be altered relatively easily, by definition, changes in attitudes are more difficult to attain.

Movement of attitudes in a "positive" direction (that is a move towards stronger agreement) were found for questions 6, 8 and 22. Question 6 asks students to respond to "Learning about other cultures is why I like geography". This change in attitude is likely to have arisen because of the students' increased exposure to working with people from another country. Actual contact with peers from an overseas university has allowed students to interact and appreciate views held by international students. Question 8 "I understand the causes of global problems such as over-population" is more a knowledge-based

question and that students are now feeling more confident with the knowledge they have acquired through the course. Consequently they now feel they have a better understanding of global problems. Question 22 "Collaborating with students from overseas is fun" may indicate an initial reticence to participate in the activity, not knowing exactly what was going to be required. After completing the set tasks participants have now possibly realised that collaboration is not such an onerous task, and one that resulted in a level of satisfaction and appreciation working with peers from overseas.

Movement of attitudes in a negative direction (that is a move towards a stronger disagreement with a statement) was found in only one instance, question 9, "I do not believe global problems such as overpopulation can be solved". This reinforces the change in attitudes to the statement in question 8 in that there is a slight shift in positive attitude that problems associated with overpopulation can be addressed. Knowing that peers from another country might have similar thoughts to our own students, may increase their level of optimism to that issue.

By contrast the least change (and statistically insignificant) was seen in responses to questions 16, 17 and 19. Question 16 "I dislike working in teams on class assignments" scored a mean of 3.59, indicating a low level of disagreement with the statement. This is somewhat of a surprise given the hearsay problems associated with students working in teams. However the response is also encouraging and shows a concerted effort by teaching staff to move towards collaborative learning and group assignment work, and the more positive attitude of students to this. However in terms of altering their attitudes to working in teams, this project had very little, if any, influence. Little change in response to question 19 "I like communicating by email" also demonstrates this project had little impact on student attitudes. With a response rate averaging 2, indicates a general acceptance that email is part of our daily lives and is an accepted form of communication. Question 17 "Understanding international perspectives is essential to solving world problems" could be considered to be a widely accepted attitude (receiving strong agreement responses) and therefore this project merely served to reinforce this.

### 3.3 Other issues noted

There was some difficulty in getting students to collaborate concurrently – often there were delays in getting responses from students both locally and internationally and this frustrated some of our "better" students. Posting something to the discussion board and getting no response (at least for one to two weeks) made it difficult to maintain focus. I do believe (hearsay) that the students enjoyed the opportunity to interact with students from another country and it was a valuable experience.

I also believe the experience was extremely valuable and would like to explore new opportunities to further our collaboration with other universities internationally. For a subject such as geography where the focus is on global environments and human interaction with those environments, it is essential to examine international perceptions and values. For our students to hear opinions and exchange ideas and knowledge with students from another university allows our students to put into context the work we study in the classroom or lecture theatre. It shows them that the problems we face as an individual country are not that different from other countries and we all face similar challenges.

#### 4. CONCLUSIONS

This paper has reviewed two case studies used to identify the problems and benefits in supporting student-centred, teacher-independent learning using the Internet. The first case study made use of a virtual field trip to enhance the field experience of undergraduate geospatial science students. It did this through the use of a series of nested virtual environment models. Evaluation showed that the models were of limited use in conveying concepts that would be implemented in the field. These virtual environment models enable the complexity of reality to be simplified so that the important environmental aspects that are the focus of the fieldwork can be highlighted. Students were able to explore their virtual environment without the restriction of time and spatial scale. They were observed working independently of teaching staff, and at their own pace, often revisiting sites to gain a further understanding of important biophysical environmental relationships. These attributes of independent working were seen in case study two. This second case study also showed that certain attitudes can be altered and that collaboration with international students is enjoyable.

Common findings from both case studies are that students are able to work independently not only as individuals but also in groups. They are able to work independently of teaching staff provided clear objectives, guidelines and tasks are made explicit. They are willing and able to use the Internet along with a range of Internet-dependent tools as a mechanism for working through learning material. Case study two demonstrated that attitudes to cultural differences may be altered in collaboration with international students. Finally as case study two showed, students enjoy collaboration with international students.

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**APPENDIX**

	Pre-test								Post-test													
	SA	MA	N	MD	SD	No of Responses	Mean	Var	SA	MA	N	MD	SD	No of Responses	Mean	Var	Diff in mean		Calc t	Table T (at 0.025)	Significant	
Q	1	2	3	4	5				1	2	3	4	5				(d)	(d sq)				
1	1	3	3	24	14	45	<b>4.04</b>	0.84	0	3	4	18	16	41	<b>4.15</b>	0.76	0.10	0.01	0.53	2.02	N	
2	18	19	7	1	0	45	<b>1.80</b>	0.60	18	20	3	0	0	41	<b>1.63</b>	0.38	-0.17	0.03	-1.10	2.02	N	
3	0	4	11	18	12	45	<b>3.84</b>	0.84	1	2	9	17	12	41	<b>3.90</b>	0.92	0.06	0.00	0.29	2.02	N	
4	2	13	7	14	10	46	<b>3.37</b>	1.49	2	7	4	18	11	42	<b>3.69</b>	1.36	0.32	0.10	1.26	2.02	N	
5	7	27	7	4	0	45	<b>2.18</b>	0.64	9	25	6	2	0	42	<b>2.02</b>	0.55	-0.15	0.02	-0.93	2.02	N	
6	5	19	9	9	2	44	<b>2.64</b>	1.14	5	25	6	4	0	40	<b>2.23</b>	0.62	-0.41	0.17	-2.02	2.02	Y	
7	0	2	11	17	15	45	<b>4.00</b>	0.76	3	4	3	17	14	41	<b>3.85</b>	1.44	-0.15	0.02	-0.64	2.02	N	
8	7	26	7	5	0	45	<b>2.22</b>	0.71	12	26	3	0	0	41	<b>1.78</b>	0.32	-0.44	0.20	-2.89	2.02	Y	
9	1	12	12	17	3	45	<b>3.20</b>	0.96	0	8	5	22	6	41	<b>3.63</b>	0.91	0.43	0.19	2.08	2.02	Y	
10	5	14	7	14	5	45	<b>3.00</b>	1.51	5	15	7	9	5	41	<b>2.85</b>	1.54	-0.15	0.02	-0.55	2.02	N	
11	17	23	5	1	0	46	<b>1.78</b>	0.52	13	21	6	1	0	41	<b>1.88</b>	0.55	0.10	0.01	0.61	2.02	N	
12	0	4	10	21	10	45	<b>3.82</b>	0.77	2	1	7	19	12	41	<b>3.93</b>	0.99	0.10	0.01	0.51	2.02	N	
13	31	14	0	0	0	45	<b>1.31</b>	0.21	21	19	1	0	0	41	<b>1.51</b>	0.30	0.20	0.04	1.83	2.02	N	
14	0	5	7	15	18	45	<b>4.02</b>	1.00	0	9	4	21	7	41	<b>3.63</b>	1.01	-0.39	0.15	-1.79	2.02	N	
15	13	16	15	1	0	45	<b>2.09</b>	0.70	10	21	8	1	0	40	<b>2.00</b>	0.55	-0.09	0.01	-0.52	2.02	N	
16	2	7	8	17	10	44	<b>3.59</b>	1.29	3	4	8	19	7	41	<b>3.56</b>	1.22	-0.03	0.00	-0.12	2.02	N	
17	21	21	3	0	0	45	<b>1.60</b>	0.37	18	20	3	0	0	41	<b>1.63</b>	0.38	0.03	0.00	0.26	2.02	N	
18	1	17	19	5	4	46	<b>2.87</b>	0.90	3	15	16	6	1	41	<b>2.68</b>	0.80	-0.19	0.03	-0.94	2.02	N	
19	15	20	6	3	1	45	<b>2.00</b>	0.93	11	20	9	0	1	41	<b>2.02</b>	0.71	0.02	0.00	0.13	2.02	N	
20	4	3	3	18	17	45	<b>3.91</b>	1.50	4	7	2	14	14	41	<b>3.66</b>	1.83	-0.25	0.06	-0.90	2.02	N	
21	9	23	7	6	0	45	<b>2.22</b>	0.84	7	22	6	1	4	40	<b>2.33</b>	1.22	0.10	0.01	0.46	2.02	N	
22	3	13	24	3	2	45	<b>2.73</b>	0.73	9	18	11	1	1	40	<b>2.18</b>	0.79	-0.56	0.31	-2.94	2.02	Y	
																	-1.49	1.41				