

## Linking teaching and research using Do-It-Yourself (DIY) Interactive Multimedia Assignments (IMM)

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### Abstract

*This article describes a case study in which students of structural geology are empowered to learn by actively engaging not only with cutting-edge research, but also with the researchers who published it. Working in groups, the students re-engineer the knowledge and information in a journal publication and use it to develop an authored interactive multimedia research assignment. Part of the study involves engaging in a dialogue (by email) with the research author(s). The exercise has been used over many years and has helped to build up a significant database of digital assignments. It is hoped that other GEES practitioners might like to consider using a similar multi-media exercise in enhancing the teaching-research link.*

### Introduction

The following case study describes a practice where students are inculcated in the principles of geoscientific research through the "knowledge" re-engineering of a topical research journal article. The underlying philosophy upon which the study is based follows from that of Laurillard (1993) who described learning based upon scientific research (and publication) as a meaningful dialogue with the world conducted by the learner using acquisition, discussion and discovery and through the use of experience, interrogation and experimentation. The study was initiated in 1996 as a means of improving student learning using multimedia assignments and was based upon similar concepts described by Sawyer (1995) and Farrow (1993). The learning method has been running continually on an annual basis since that time.

### Aims of the Do It Yourself (DIY) Interactive Multimedia (IMM) Assignment

The case study outlined here fits into the category of linking research and teaching by the use of assignments, which involve elements of research processes, (i.e.) analysis and re-engineering of research articles. Overall, the aims of the study are to empower the learners, to allow them to be more creatively and actively engaged with the scientific research and information and ultimately to provide a more equitable balance between teacher-driven and learner-driven education. At the University of Adelaide, third year undergraduate students are encouraged to communicate with journal publication authors whilst developing IMM modules based on their cutting edge research articles. The DIYIMM project has been used in a final year undergraduate structural geology course continually since 1996. In that year a simple student research assignment essay, comprising 25% of the marks for the course, was replaced by the DIYIMM exercise. The exercise was also changed to a group learning exercise, with groups of 2 or 3 students working jointly and collaboratively on development of the multimedia assignment and on an accompanying seminar.

As the research assignment was a major component of the course, the students were provided with details of its aims, intended learning outcomes and components in the introductory period of the course (i.e.) first or second week. The IMM assignment exercise was introduced in conjunction with a change to a more problem-based and flexible delivery of the course overall, with all course materials delivered on the www (which at that stage had only been available for about 2 years). Lectures were replaced with mini "lectorials" and topic

reviews, practical classes were replaced with short problem-based exercises, and fieldwork was supplemented with digital and video media. This was part of a larger development of innovative flexible course delivery as is described in James et al (1995), Clark and James (1993), James (1994), James and Clark (1991, 1993, 1996) and James et al (1997), and is summarised along with a detailed account of the early DIYIMM project in James et al (1996). Students were advised that the aims of the learning exercise were not only to instill in them an understanding of the features and concepts of structural geology, but that they were also being asked to undertake this as active and experiential learners in a self-paced, flexible, and collaborative learning environment. A comprehensive evaluation of the overall study was carried out and published by James et al (op cit).

### Process and Procedures

Detailed instructions are provided to the student class at the beginning of the semester. There then follows an intervening 6-7 week period when the exercise is carried out and it is usually presented as a joint seminar during the last contact period of the course. Students are given an introductory and explanatory contact lesson describing the aims, objectives, tools and methods, together with a short hands-on practical class on how to use the available multimedia authoring system (e.g. Hyperstudio, Powerpoint, Hypercard etc) and how to access the array of digital resources which might be needed to carry out the assignment.

Working in pairs (or groups of 3 maximum) the students are asked to prepare a major interactive multimedia assignment from a specialist reading topic provided. Each pair or group is allowed to choose a topic to read about from one journal article from a recent issue of the *Journal of Structural Geology*. They are then asked to research using other recent papers on this topic. They are expected to use the references from their selected article as well as textbooks, the library, the Georef database and the Worldwide Web to find at least another five references to read on the topic.

The students are asked to carry out this research and then prepare and present the assignment in electronic format using one of a number of possible multimedia software authoring tools. Hardware requirements to be able to carry out the exercise include a well-equipped computer laboratory/suite plus access to various tools for scanning images, digitising video, storing and retrieving electronic image/software databases, network access and site licences for the various authoring and digital text and imaging manipulation. The preferred software recommended was initially the Hyperstudio software package by Roger Wagner or Hypercard on an Apple Mac platform. These were utilised initially because of their low (site licence) cost, their ease of use and their interactivity. Subsequently, many of the tools available in these authoring packages have been included in Powerpoint or other web-page authoring software, which have become the preferred options for many students. There is no limit placed on the number of cards or linked stacks (Hyperstudio terminology) or slides or files (Powerpoint terminology) or Hyperlinked web pages (WWW terminology), which may be contained in their multimedia assignments. However, they are made aware of the memory limitations of the computers, file transfer limits, and the limited assessment value of the project (see below).

Students are asked to be careful in the construction of the IMM module and to include as a minimum a title screen, introduction to the aims of the research, a range of text (subheadings/subdivisions are recommended), annotated graphics/digital photographs, perhaps some sound, a summary and a correctly referenced bibliographic screen. They are asked not to feel restricted by these conditions, and they are encouraged to consider incorporating visual and graphic design ideas, flair and innovation. They are told to search for information on the worldwide web about the research topic, but are reminded of the inherent dangers in accessing improperly authorised or published scientific material. Finally, the students are asked to email one or more

authors of one of the papers that they read and to ask a question about the topic, and then to report this together with any correspondence from the author(s) in their assignment. This dialogue is an important key to the research/teaching link as the students have to devise an appropriately and intellectually stimulating and enquiring question to the author(s). Receiving a reply (which does not always happen), is most exciting to the students and is a critical point in the realisation that the author is a real person and is carrying out their research usually in a similar institution (University). Authors generally reply positively to the questions (it at least shows that someone is reading and interested in their own research), and occasionally a general dialogue occurs.

The students ultimately present a summary of their specialist IMM research assignments as a seminar during one of the last practical sessions of the structure classes, as they hand in the assignment. This now happens digitally via an electronic drop box in the Blackboard VLE (virtual learning environment) software. The group has ten minutes to present the seminar, which is not sufficient time to completely cover the topic or to go into great detail. Rather they choose one aspect of interest or one view or theory to present. They give the seminar to the whole class and are expected to present it in as professional a manner as possible using computer projection facilities. Along with the publication of the assignments on the website, this allows access of all of the students' work to each other and externally, which is certainly an improvement on the former essay style of assignment where feedback was only possible between staff and individual students.

### Outcomes and Assessment

The exercise clearly provides a close link between the teaching of structural geology and the most current research being carried out in the discipline. Students not only have to read and understand one international journal article (which is now available on line before even the hard copy journal arrives in the library), but they must also search through the bibliography of that article for a number of relevant papers. They must interrogate and summarise not only the text, but also become familiar with the figures, diagrams, plates, tables and these days often simulations and animations which may be available on the author's website. Assessment criteria match these aims of the course, and the students are given feedback and summative scores based on their ability to synthesise data and interpretations, relevance of content, visual impact, simplicity of navigation etc.

The exercise has now been running continuously for eight years. Each year, the class of between 20-30 students produce 10-15 assignments (modules). This has left a legacy of numerous IMM modules providing interesting summaries of much of the last eight years of cutting edge research in structural geology. Immediately following the course in the first two years, individual interviews and student evaluation surveys were carried out to assess the value of this exercise. Most students indicated their support for the IMM assignment exercise and many commented that they "enjoyed" using, what was then, novel software. Some students were concerned with the amount of time the exercise took relative to the assessment value, while others criticised the balance between learning the technology and software versus the learning of "structural" concepts. However, overall the value of improving computer literacy was seen as an advantage, for example in terms of its importance to their future professional careers. Other negative aspects of the exercise included hardware and software difficulties (access, crashes, digital presentation etc), although in later years, these concerns have been largely overcome by improvements in the computer technology. These outcomes are all discussed fully in James et al (1996).

### Conclusion

In conclusion, it appears that the exercise has been a successful trial and modification of a typical undergraduate research project. In this case, however, the students are no longer considered simply as

"consumers" of learning and information, but are now also recognised and rewarded as producers. This exercise in the creative use of learning technology is allowing them to be much more active and therefore effective in their learning. It has proved a useful and powerful way to link cutting edge research in structural geology with student learning and teaching.

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