Technology into a Science Subject

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This research will look at the use of spatial thinking in science as a mediating tool through the use of handheld Global Positioning System (GPS) devices and Geographic Information Systems (GIS), as a means of improving students' conceptual learning with practical, project based, inquiry learning. This tool uses maps as a representation of the natural environment and will allow students to analyse collected data that includes spatially based locations. Thus the role of GIS as a representational tool in mediating learning will be examined.

A case study approach will be employed using Cultural-Historical Activity Theory (CHAT) to examine the introduction of specific technologies into a science subject. The research will also look at the students' use of these tools to find specific spatial patterns and how their understanding of these patterns aids in their learning. This will help to identify the specific affordances that this spatial thinking approach provides that would not otherwise be available to the students.

This research process is now post colloquium and the classroom activities will be conducted in semester 1, 2011.

The use of Technology in Science Teaching

There are a number of tools that are used as aids to science education and this research looks at the use of a specific case, the tools that are made available through the spatial sciences involving the collection of location-based data and the representation of this data using Geographic Information Systems (GIS) software. It will examine both the data collection tools of handheld Global Positioning System (GPS) units and the data analysis tools provided by GIS software and the spatial thinking skills related to the significance of location as a component in science education. The use of spatial thinking in science education

construction and manipulation of representations in teaching secondary science with the intention of showing that different ways of presenting information and interpreting it can improve students' cognitive approaches (Carolan et al 2008, Cox 1999, Prain 2008). The role of representations in science and specifically through the use of GIS will be examined in more detail in the literature review.

The research will examine a number of aspects of GIS as a step in the better understanding of and improved approaches to the teaching of science. The foci to be considered include:

- The nature of spatial thinking and its use in education;

- The role of representational approaches in learning science;

- The uses of technology including software to collect and analyse data; and

- The engagement of students in extended inquiry based activities.

The main theme directing this research is "What can students gain through the use of spatial thinking in their science education?" and thus "How can a student's science learning be supported through the use of a GPS device and GIS software?" This research is based on the belief that the use of an extended inquiry based project incorporating electronic data collection tools, fieldwork and software will help to increase students' engagement in science and level of understanding of the science concepts studied. The science that is taught in classrooms is generally a subset or simplified version of the 'real world' science and thus the environmental science to be examined here will use the levels of science that are reasonably accessible to students and the teacher.

A number of aspects of science education relate to this focus and these will be examined in the literature review. These include:

- The use of tools and simulations in science education and their benefit to students;

- The use of representations in science education;

- The use of GIS in Education and the benefits it provides; and

- The introduction of new teaching approaches.

These aspects will be explored through environmental science classes where students will undertake an inquiry activity involving the environment of a local park. Environmental science offers a number of opportunities for students to collect and analyse sets of data that will include a location field.

This research will explore the use of the specific data collection and analysis tools as an aid to the teaching of science. The general aim is to show whether and how this improves students' engagement, the effects it has on their learning and to identify approaches that will

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