TEACHING FOR ACTION IN THE ENVIRONMENT: SOME RESEARCH OUTCOMES

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ABSTRACT

This paper presents some preliminary research outcomes of a series of five case studies in New Zealand schools that examined teaching and learning approaches to promote students' action competence in environmental education (EE). The project created research partnerships between experienced researchers (mentors), Regional Environmental Education Coordinators and teachers.

Previous research had indicated an under-emphasis of education *for* the environment in school-based EE, suggesting a lack of student action-taking as part of their EE study. The development of action competence in EE is seen as an important component of a student's education for a sustainable future.

The project paired a classroom teacher with a Coordinator to conduct research around the delivery of an EE unit in the teacher's classroom. Each teacher chose their own pedagogies to enhance action-taking. Data collection using classroom observation, interviews and analysis of student work enabled teachers, coordinators and their mentors to look for development of components of action competence during the EE unit.

The project is illuminating some effective pedagogies for teaching EE. Themes such as the use of empowering pedagogies leading to enhanced student engagement and confidence and the changing roles of teacher and student are emerging.

INTRODUCTION

This paper reports on a research study funded by the *Teaching and Learning Research Initiative* that investigated the teaching and learning in environmental education (EE) in New Zealand schools. In 2002/2003 a national research project (commissioned by the Ministry of Education) was conducted to investigate the practice of EE in New Zealand schools (Bolstad, Cowie, & Eames, 2004a). That project called for further research into the teaching and learning of EE in our schools, and this current study responds to that call.

There is currently no mandatory requirement for New Zealand schools to teach EE. However, in 1999 the Ministry of Education published the *Guidelines for Environmental Education in New Zealand schools* (Ministry of Education, 1999). The *Guidelines* are intended to assist teachers and schools to plan and provide education "in, about, and for the

environment" in a way that integrates with learning objectives from the seven mandatory learning areas of the *New Zealand Curriculum Framework* (Ministry of Education, 1993). As such, school-based curriculum development of EE programmes is encouraged. More recently, the concept of education for sustainability which broadens EE approaches to include concepts of human rights and social justice for sustainable development has been promoted (Parliamentary Commissioner for the Environment(PCE), 2004; Tilbury, Stevenson, Fien, & Schreuder, 2002). While this study has incorporated these ideas, the term environmental education has been retained in line with the terminology currently used in the school system.

The earlier national project provided evidence that in teaching EE, some teachers were developing student-centred pedagogical approaches (Cowie et al., 2004). The study also reported a general under-emphasis on the dimension of education *for* the environment. The project report concluded that further research was needed to "evaluate whether environmental education teaching practices promote long-term learning value for students (i.e., whether they act to develop students' 'action competence' and ability to be decision-makers with regard to environmental issues in the present and the future)" (Bolstad, Cowie, & Eames, 2004b, p. 72).

TEACHING FOR ACTION

An action orientation is seen as a key feature that defines EE (Fien & Greenall Gough, 1996; McLean, 2003; Tilbury, 1995). The New Zealand *Guidelines* highlight action-taking as one the five aims of EE, one of the three dimensions and a fundamental part of personal and social responsibility for action, one of the four concepts (Ministry of Education, 1999). The notion of action competence acknowledges this need for action, and was first posed in the 1990s by researchers in the Royal Danish School of Educational Studies. Jensen and Schnack (1997) defined action competence as the ability to act – in this case with reference to the environment. They argued that "the aim of environmental education is to make students capable of acting on a societal as well as a personal level" (p. 163). In order to do this, students need to study the root causes of environmental problems within the context of their society (Wals, 1994). Jensen and Schnack (1997) further argued that education is not about simple behaviour modification without understanding, but about creating a democratic process of participation in which students decide for themselves the action they will take.

In this concept, actions are considered to be consciously taken and targeted, being intentions based on experiences. Action is not seen as behaviour change – the process of influencing students in a predetermined direction (Breiting & Mogensen, 1999; Courtney-Hall & Rogers, 2002). Equally, action is seen as different from activity – the process of involving students in environmental tasks which do not address solutions to the underlying environmental problem. An example of an activity would be litter collection, whereas an action would be addressing how to prevent littering. Action competence is then seen as a process involving students in identifying environmental issues, determining solutions and taking actions in ways that develop their competence to take actions in the future to solve or avoid environmental problems (Bolstad, Baker, with Barker, & Keown, 2004).

Jensen and Schnack (1997) noted that actions could be direct or indirect. Direct actions involve actions that contribute directly to solving environmental problems, whereas indirect actions are those which seek to influence others to contribute to solving the problems. The authors are careful to emphasise, however, that any action taken should be placed in the context of the problem to be solved. They noted that in classroom work, actions are often taken at the individual, class or even school level, but that unless students are made aware of the greater problem that their action is contributing to (ie turning lights off helps reduce overall consumption of unsustainable energy sources), education may be limited. It is

important that children not only take action, but also understand why they are taking that action (Palmer, 1995) .

Four aspects of action competence were identified (Jensen & Schnack, 1997). These were knowledge and insight of the environmental problem, commitment to solve the problem, a vision for the future without the problem, and action experiences to draw upon. A further component noted by Breiting and Mogensen (1999) is student confidence in their ability to influence. Jensen and Schnack (1997) concluded their discussion of action competence by calling for further research into how these components are constructed and interconnected through teaching. This study is an attempt to contribute to that call.

The research team in this study met at the outset of the study to debate the components of action competence. The notion of competence itself requires some definition, and has been described through the current review of the New Zealand Curriculum as the "ability to successfully meet complex demands in a particular context through the mobilization of knowledge, cognitive skills but also practical skills, as well as social behaviour components such as attitudes, emotions, and values and motivations" (Rutherford, 2004). In considering taking action for the environment, we agreed that students need to be involved in deciding what to do, and that what is done should be focused on solving an actual problem. In linking these ideas of competence in taking action together, we identified five components that underpin action competence:

- Knowledge and understanding for decision-making – student competence requires knowledge upon which to base soundly reasoned decisions. Knowledge could include technical, social, political, historical and economic factors.

- Planning and taking action – students require skills to identify and solve problems, to set goals, to gather information, to communicate, and to manage time and logistics to take action (indirect or direct).

- Participation – students require skills in being consultative, democratic, collaborative and cooperative.

- Emotional response – students need to understand their own and others' attitudes and values towards issues to enable them to decide upon the appropriate action to take, and their own personal responsibility and commitment.

- Critical thinking and reflection – students require skills to think critically about the causes of issues and actions that could be taken, and to reflect upon their knowledge, actions, participation and attitudes and values to make meaning.

The challenge for us in this research study was to be able to determine the students' development of these elements through teaching and learning in EE. This dimension of the study led to some promising ideas of how action competence can be determined in students. This involves collection of data on student action competence prior to the unit and after the unit (see findings section). The other dimension of interest is the use of particular teacher pedagogies and strategies to foster that development.

PEDAGOGIES AND TEACHING STRATEGIES FOR ACTION COMPETENCE

The elements of action competence that we identified led us to consider that a transformative mode of teaching and learning was likely to be more in keeping with developing action

competence than the transmissive mode. A number of authors have previously argued for the consideration of transformative learning in EE (Sterling, 2001).

We explored the possible pedagogies that could lead to a transformative mode. A 'pedagogy' we understood, was wider than just "what the teacher does"; pedagogy also refers to the values, aims and philosophy of education – it is a "method of teaching interpreted in its widest sense" (Winch & Gingell, 1999). It was recognized that transformational learning may involve at least five pedagogies and strategies that we described as:

- Experiential learning – this is an over-arching concept that appears to be useful in the transformative approach. Characteristics of experiential learning include involving students in meaningful experiences, decision-making and taking action for an agreed purpose; helping them to think critically and reflect upon their experiences; engaging them in questioning and discussion; acknowledging and valuing their prior knowledge and experiences; assisting them to develop knowledge to inform their decision-making.

- Inquiry learning – this is a process that involves identifying and solving problems, thinking critically and reflecting to gain understanding or make informed decisions.

- Reflective practice **–** this involves the teacher either consciously (usually afterwards, by hindsight) or intuitively (on the spot, in the classroom) analyzing the state of learning and making strategic decisions for future implementation. It also involves the student in conscious reflection about their learning, their values and attitudes and their actions for the environment.

- Student-centred learning **–** this involves placing the learner at the centre of the learning experience. In environmental education this is seen in holistic (not merely cognitive) terms.

- Affective-aware teaching **–** in addition to the usual focal awareness on cognitive learning this involves a teacher's subsidiary awareness of how individual learners or groups of learners are feeling about a situation. It also acknowledges the dimensions of values and attitudes in teaching and learning.

RESEARCH DESIGN AND METHODS

This study then investigated the pedagogies and strategies in EE that teachers use that can promote students' action competence. The investigation was based around a series of case studies of New Zealand school classrooms where researchers worked alongside teachers and students in an action research model (Wals, 1994; Wals & Alblas, 1997).

The study brought together in active research partnerships three groups of people. Firstly, there were five teachers who teach EE in their schools. Secondly, there were five EE school advisers (the Regional EE Coordinators) who each worked with one of these teachers. The teacher and their adviser acted as partners in this study. Finally, there were three mentors who are experienced researchers in EE who each mentored one or two of these partnerships.

The aims of the study were:

- To inform future teaching and learning classroom practices in EE.
- To build research capability in the EE school advisers and teachers, particularly for EE.

- To widen the understanding of teaching and learning of EE in the school community and education sector.

The study addressed the following research questions:

- What pedagogical approaches are successful in promoting student action competence in environmental education?
- What action competence skills did students possess before the unit?
- What pedagogical approaches did teachers select (before and during the teaching) and why?
- What action competence skills did students demonstrate during and after experiencing the teaching and learning process?

The research employed a case study methodology (Bassey, 1999; Merriam, 1998). A case study design permits researchers to gain an in-depth understanding of the issue and to explore meaning from a number of angles (Merriam, 1998). Case studies have been used previously to investigate EE by a number of researchers (Bolstad, Eames, Cowie, Edwards, & Rogers, 2004; Fien, 2001; Hart, 1998; McLean, 2003).

The research constituted five case studies of New Zealand classrooms. The study involved the school adviser and teacher in each case working together in the design, implementation and evaluation of an EE unit. Mentors provided the direction for the project, support and advice in methodology and evaluation, and oversight of reporting. The advisers and teachers (see below) collected and analysed the research data.

In the first phase of the study, the advisers and the teachers met with the mentors to discuss case study methodology, and agreed on the components of action competence that would be explored, and the pedagogies and strategies that might enhance students' action competence.

In the second phase of the research, each adviser met with their teacher to discuss the EE unit that the teacher was designing for their class. The teacher and adviser then co-planned the research strategy. Before the unit began, the adviser conducted an interview with the teacher about their views on EE, pedagogy and action competence, and collected data from students about their current levels of action competence.

In the third phase of the research, the teacher implemented the EE unit. During this phase the teacher kept a journal, recording observations on classroom activity and in particular, elements of student critical thinking, input and decision-making. The adviser also spent time observing the classroom, talking to the students and the teacher, and analysing the relevant documents that might impact on the EE unit, i.e. teacher unit plans, school policies.

In the fourth phase of the research, the teacher and the adviser evaluated the unit with regard to development of students' action competence. This involved interviewing the teacher about their experiences in the unit, interviewing students in groups about the components of action competence and analyzing student work. They drew conclusions on their case study, and reflected on what the teaching experience in the unit can contribute to an understanding of students' action competence in a New Zealand context. The adviser and teacher collaborated in writing a case study report.

In the fifth and final phase of the research, the advisers and the teachers met with the mentors to discuss the findings of the five case studies and examine some emerging themes. These are discussed below.

Validity and reliability of the study was enhanced by the multiple methods of data collection used. These comprised student and teacher interviews, observation and document analysis. Ethical approval was gained for the research and the principles of informed consent, privacy and confidentiality, and the right to decline observed throughout the project.

FINDINGS

At the time of writing the final case study reports are being written and some themes are emerging. This section briefly describes the five cases, and introduces those themes.

FIVE CASE STUDIES

The following are brief introductions to each case study and some of the key findings:

School One – a term-long unit entitled "Healthy water – who is responsible?" was delivered to a Year 7 highly diverse class in a decile 1B intermediate school in a large city. The unit was underpinned by knowledge development through English language competence, a matrix of Gardners' multiple intelligences (Gardner, 1999) and Bloom's taxonomy (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956), experiential learning and action learning. Allowing students to make a choice about context, content and resources empowered and emotionally engaged the students in their progression towards action competence. Students worked collaboratively and communicated, verbally and through power point presentations with peers and other adults. This built up their self-confidence and self esteem. Importantly they learn that other people listened to them when they presented well-written and accurate information and that they *could* make a difference to their school and wider environment.

School Two – a term-long unit was taught on the topic of "Our Place" in an induction class of year 0 and year 1 children and focussed on a review of the appearance and use of the junior courtyard area in a decile 9 primary school in a small city. The unit of teaching took place within a school which has a strong culture of EE, which drives the school based curriculum. The unit was delivered using a mix of teacher role modelling, cooperative learning and experiential learning pedagogy. The fact that teacher role-modelling was the most significant is hardly surprising considering the age of the children and the need to consistently show them so much to get them started. Evidence suggested that whilst at this age, the children were unlikely to engage in critical thinking, some did become emotionally engaged which led to decision-making and greater willingness to be involved in activity, if not action.

School Three - a six month case study followed the teaching of an EE unit "Clean Green New Zealand: Yeah right!" to a co-educational Year 9 combined English and Social Studies class from a decile 9 secondary school in a small town. The unit was underpinned by experiential, inquiry and cooperative learning pedagogies, and strategies such as brainstorms, teacher facilitated discussion, scaffolding in research skills, use of action planners, students making decisions on whom to work with and then identifying local issues, and choosing and taking their actions. The teacher experienced a certain amount of risk-taking in allowing students more control over their own learning. These strategies led to students demonstrating emotional engagement, increased confidence in their abilities and willingness to give opinions. This was shown by their ongoing concern about environmental issues e.g. NZ lake pollution, litter in the school, waste management and water use in the community, and enhanced engagement in subsequent units not related to EE.

School Four – a unit entitled “Seeing Our City With New Eyes” was facilitated in a mixed Year 5-8 group of students in a decile 6 special character school in a large city. The special character revolves around students taking an active role in their own learning, setting learning goals and planning their learning path. Encompassed within this notion, the teacher planned an inquiry to build awareness of the city neighbourhood and the associated environmental resources, challenges, issues, and concerns. An inquiry learning pedagogy was adopted in the unit, incorporating critical thinking and reflection. A matrix was developed for evaluating student action competence, which was used to map development over the unit. Student engagement was related to support in their inquiry, and continuity in their learning, and the importance of achievable action-taking for students was highlighted.

School Five – a two–term unit on eco-housing for birds in the school environment was delivered in a sole-charge, decile 4, rural primary school. The school caters for twenty-two Year 1-6 students. The unit was part of a long-term plan that immerses students in EE projects, and is characterised by a flexible timetable, continuity of learning and a strong relationship with the community. The unit was underpinned by experiential learning, inquiry learning and student-centred learning. This created experiences that were meaningful for students, based in their milieu, with a high degree of their input into decision making and action-taking. This on the one hand was seen as risky for the teacher but, on the other hand, empowering for the students.

EMERGING THEMES

A cross-case study analysis was initiated by all the participants in the research project at a meeting held towards the end of the project. At the time of writing these themes are still being clarified but the following ideas are emerging:

Many of the case studies reported use of experiential, inquiry and/or cooperative learning pedagogies in delivering their EE units. These pedagogies and appropriate strategies within them such as experiences in the environment, reflection, brainstorming, facilitated discussions, problem identification, critical thinking, scaffolding in research skills and action planning, student decision-making and group work appeared to contribute to the development of aspects of student action competence.

These pedagogies appeared to empower students leading to deeper and more durable engagement in learning, as they developed a sense of ownership for what they were doing. An increased level of confidence and self-esteem amongst students has also been reported, and was related to the discovery that they were able to actually achieve something.

Across all the cases there was recognition that teaching and learning in EE involved the affective domain. Emotional engagement of both the teacher and students was highlighted as important in the motivation to take action for the environment. Inevitably, the teachers involved in this project had a disposition towards EE and they felt that that contributed towards motivating the students, but was not essential. Importantly, some students who had previously shown little commitment to their learning became significantly emotionally involved in the EE unit. This was particularly the case for some students who appeared to find it difficult to work in logico-mathematical and linguistic tasks in the classroom, and who revelled in the opportunity to participate in the more kinaesthetic activities of EE, and subsequently became more confident in their engagement in the other tasks.

The traditional roles of teacher and student appeared to undergo shifts within some of the units. This was particularly evident when the teacher noted that they took the risk of handing over responsibility for directing their own learning to the students. The teacher became more

of a facilitator who responded to questions, and the students posed their own challenges. There was some evidence of students taking on the role of teacher to their fellow students.

It was evident that the context of the teaching and learning was important. This related to the choice of topic for the EE unit, the location and culture of the school, the persona of the teacher, the nature of the students, and the location of the teaching and learning environment.

Finally, and not surprisingly in view of the above emerging themes, it is clear that teaching and learning in EE is complex. Whilst some of these themes were more evident in some case studies than others, the inter-relationship of the themes shows that there is unlikely to be one single contributing factor in teaching and learning that assists in the development of students' action competence.

SUMMARY

This paper has outlined the rationale and research design behind a national EE study into the use of pedagogies and strategies that can enhance student action competence. A series of case studies has collected research data around the teaching and learning within EE units in five schools. The units were underpinned by teacher and researcher-selected pedagogies and strategies. Data collection focussed on five components that were seen to be key determinants of action competence.

Rich case stories have emerged from the research pointing to the complex nature of teaching and learning that occurs in EE in schools. Through the teacher use of certain pedagogies and strategies, enhancement of student capability in the identified components of action competence was recorded. It should be emphasised that there is no implication of causality here as this data must be treated as indicative only at this stage.

Emerging themes, however, indicate that teaching and learning in EE can lead to greater student engagement in learning, emotional involvement, development of confidence and self-esteem, and a change in the nature of the educative relationships between teacher and student. Further analysis and theorising will explore the potential of this student empowerment to truly represent the development of action competence, which will be reported on in future publications.

REFERENCES

Bassey, M. (1999). *Case study research in educational settings*. Buckingham, UK: Open University Press.

Bloom, B. S., Engelhart, M. B., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives: Handbook I: Cognitive domain*. New York: Longman.

Bolstad, R., Baker, R., with Barker, M., & Keown, P. (2004). *Environment education in New Zealand schools: research into current practice and future possibilities. Volume 2: A review of national and international research literature on environmental education practices*.Wellington, New Zealand: Ministry of Education.

Bolstad, R., Cowie, B., & Eames, C. (2004a). *Environment education in New Zealand schools: Research into current practice and future possibilities* (Vol. 1-4). Wellington, New Zealand: Ministry of Education.

Bolstad, R., Cowie, B., & Eames, C. (2004b). *Environmental education in New Zealand schools: research into current practice and future possibilities. Volume 1: Summary of the research findings*. Wellington: Ministry of Education.

Bolstad, R., Eames, C., Cowie, B., Edwards, R., & Rogers, N. (2004). *Environmental education in New Zealand schools: research into current practice and future possibilities. Volume 4: Case studies of environmental education practice in eight schools and kura kaupapa Maori*.Wellington: Ministry of Education.
Breiting, S., & Mogensen, F. (1999). Action competence and environmental education. *Cambridge Journal of Education, 29*(3), 349-353.
Courtney-Hall, P., & Rogers, L. (2002). Gaps in mind: problems in environmental knowledge behaviour modelling research. *Environmental Education Research, 8*(3), 283-298.
Cowie, B., Eames, C., Harlow, A., Bolstad, R., with, Barker, M., Keown, P., et al. (2004). *Environmental education in New Zealand schools: Research into current practice and future possibilities. Volume 3: A critical stocktake of the characteristics of effective practice in environmental education in New Zealand schools and kura kaupapa Maori*. Wellington, New Zealand: Ministry of Education.
Fien, J. (2001). The learning for a sustainable environment project: a case study of an action network for teacher education. *Australian Journal of Environmental Education, 17*, 77-86.
Fien, J., & Greenall Gough, A. (1996). Environmental education. In R. Gilbert (Ed.), *Studying society and environment- a handbook for teachers* (pp. 200-216). Melbourne: Macmillan.
Gardner, H. (1999). *Intelligence reframed: Multiple intelligences for the 21st century*. New York: Basic Books.
Hart, S. (1998). *Visions of the future: a case study of twenty five students from a year ten social science class in a small rural Queensland state high school.* Unpublished Masters thesis, Griffith University, Queensland.
Jensen, B. B., & Schnack, K. (1997). The action competence approach in environmental education. *Environmental Education Research, 3*(2), 163-179.
McLean, T. (2003). Environmental education in Otago primary schools: education for the environment? *Set, 1*, 4-9.
Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass.
Ministry of Education. (1993). *The New Zealand Curriculum Framework*. Wellington: Ministry of Education.
Ministry of Education. (1999). *Guidelines for environmental education in New Zealand schools*. Wellington: Learning Media.
Palmer, J. (1995). Environmental thinking in the early years: understanding and misunderstanding of concepts related to waste management. *Environmental Education Research, 1*(1), 35-45.
Parliamentary Commissioner for the Environment(PCE). (2004). *See Change: Learning and education for sustainability*. Wellington, New Zealand: PCE.
Rutherford, J. (2004). *Key competencies in the New Zealand Curriculum: A snapshot of consultation*. Wellington: Ministry of Education.
Sterling, S. (2001). *Sustainable education: re-visioning learning and change*.Bristol: Green Books.
Tilbury, D. (1995). Environmental education for sustainability: defining the new focus of environmental education in the 1990s. *Environmental Education Research, 1*(2), 195-212.
Tilbury, D., Stevenson, R., Fien, J., & Schreuder, D. (Eds.). (2002). *Education and sustainability: responding to the global challenge*. Gland, Switzerland, and Cambridge, U.K.: IUCN Commission on Education and Communication.
Wals, A. E. J. (1994). Action taking and environmental problem solving in environmental education. In K. Schnack (Ed.), *Action and action competence as key concepts in critical pedagogy*.Copenhagen: Royal Danish School of Educational Studies.

Wals, A. E. J., & Alblas, A. (1997). School-based research and development of environmental education: a case study. *Environmental Education Research, 3*(3), 253-267.
Winch, C., & Gingell, J. (1999). *Key concepts in the philosophy of education*. London: Routledge.