



Higher Education Research and Development Society of Australasia, Inc

The Student Experience

Proceedings of the

32nd HERDSA Annual Conference

6-9 July 2009

Darwin, Australia

Shephard, K., Mann, S., Smith, N. & Deaker, L. (2009) Customising educational approaches to the needs of students: but how well do we know our students' needs?, in *The Student Experience, Proceedings of the 32nd HERDSA Annual Conference, Darwin, 6-9 July 2009: pp 379-387.*

Published 2009 by the
Higher Education Research and Development Society of Australasia, Inc
PO Box 27, Milperra, NSW 2214, Australia
www.herdsa.org.au

ISSN: 0155 6223
ISBN: 0 908557 78 7

This research paper was reviewed using a double blind peer review process that meets DEEWR requirements. Two reviewers were appointed on the basis of their independence, expertise and experience and received the full paper devoid of the authors' names and institutions in order to ensure objectivity and anonymity. Where substantial differences existed between the two reviewers, a third reviewer was appointed. Papers were evaluated on the basis of originality, quality of academic merit, relevance to the conference theme and the standard of writing/presentation. Following review, this full paper was presented at the international conference.

Copyright© 2009 HERDSA and the authors. Apart from any fair dealing for the purposes of research or private study, criticism or review, as permitted under the Copyright, Design and Patent Act, 2005, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the publishers, or in the case of reprographic reproduction in accordance with the terms and licenses issued by the copyright Licensing Agency. Enquiries concerning reproduction outside those terms should be sent to the publishers at the address above.

Customising educational approaches to the needs of students: but how well do we know our students' needs?

Kerry Shephard

University of Otago Dunedin New Zealand
kerry.shephard@otago.ac.nz

Samuel Mann

Otago Polytechnic, Dunedin, New Zealand

Nell Smith

University of Otago, Dunedin, New Zealand

Lynley Deaker

University of Otago, Dunedin, New Zealand

How much do teachers in tertiary education know about the values, attitudes and dispositions of their incoming students, and if this knowledge were to be available, how could their educational approaches and the resulting student learning experiences be customised in relation to it? Tertiary education institutions internationally are involved in various ways in promoting sustainability through education; an activity that in many cases is designed to influence students' affective attributes. In New Zealand, Otago Polytechnic has committed itself to the goal that 'every graduate may think and act as a sustainable practitioner'.

Polytechnic staff has teamed up with researchers from the University of Otago to benchmark the sustainability world view attributes of an incoming cohort of Otago Polytechnic students. The research was designed to support academic staff in Polytechnic departments who need to know more about the sustainability interests and characteristics of their students, so they may provide appropriate educational programmes to support the students' needs. The research was also designed as the first stage of a longer term programme to evaluate the impact of institutional changes on how students transform during their tertiary education experience.

The data demonstrates that even before students start to study in the institution, they have different sustainability values, presumably related to their different interests and previous experiences that may have led them to choose particular programmes. This in turn may influence the nature of the learning programme that the teachers in each setting may wish to devise.

Keywords: first year students, affective attributes, sustainability.

Introduction

There is increasing interest in the affective attributes of higher education students. Affective attributes are those relating to values, beliefs and dispositions. Affective attributes complement knowledge and skills within learning taxonomies (Bloom & Krathwol, 1956; Bloom, Hastings & Madaus, 1971; Carter, 1985). The focus of attention has often been on the attributes of our graduates as they leave our institutions; graduate attributes. But how much do teachers in tertiary education know about the values and attitudes of their incoming students

and, if this knowledge were to be available, how could their teaching approaches and the resulting student learning experiences be customised in relation to it?

One example of increasing interest in values and attitudes in higher education relates to education for sustainability. Significant advances have been made in recent years in relation to campus sustainability and to curriculum change to increase the skills and knowledge that students have about sustainability (see, for example, Sterling & Scott, 2008 for a review of developments in one particular country). Increasingly attention is being paid to students' affective characteristics as they relate to sustainability (Shephard, 2007; 2008) involving, for example, an individual's disposition to put the knowledge that they have about sustainability to sustainable ends and how these change as students pass through the education system. Equivalent development is occurring in other fields that relate to affective attributes such as social justice and citizenship (see, for example, Maas Weigert, 2006). The term 'action competence' has been developed to describe some higher-order affective attributes (Mogensen, 1997; Jensen & Schnack, 2006).

In New Zealand, Otago Polytechnic has committed itself to the goal that every graduate may think and act as a sustainable practitioner. The Polytechnic's public commitment to sustainability was established in 2004 and its formal campus-sustainability programme in 2008, (<http://www.otagopolytechnic.ac.nz/about/sustainable-practice/livingcampus.html>). The Otago Polytechnic sustainability vision is that

"...our graduates, our practitioners and our academics understand the concepts of social, environmental and economic sustainability in order for them to evaluate, question and discuss their role in the world and to enable them to make changes where and when appropriate. Our goal is that every graduate may think and act as a sustainable practitioner. Moreover, educators must take a lead in sustainability so that our graduates can be encouraged and supported to promote sustainable practices in their chosen career. This can primarily be achieved by fostering education for sustainability in all our qualifications and by re-visioning and changing our approach to teaching and learning to model a transformative context for all learners.
(<http://www.otagopolytechnic.ac.nz/about/sustainability.html>)."

Most Otago Polytechnic academic departments have developed a sustainability statement to outline how and why education for sustainability is being incorporated within their departmental courses and many academic staff members are transforming their teaching programmes. This is supported by graduate profile statements and in many cases specific learning outcomes around sustainable practice.

Otago Polytechnic is also concerned to ensure that changes to their programmes reflect the needs of their incoming students and to evaluate the impact of these institutional changes on how students themselves change during the period of their tertiary education experience. Academic staff in the Polytechnic worked with researchers from the University of Otago's Higher Education Development Centre to research how the Polytechnic's students' sustainability knowledge, skills and values could be initially benchmarked, and then subsequently re-measured to record changes. A research project was implemented that incorporates both quantitative and qualitative research methodologies within a survey format. Its introduction was reported to the HERDSA Conference in 2008 (Shephard, Smith and Mann, 2008). This current paper describes the early implementation of this broad research

project. It also provides an early analysis of part of the resulting research data; with an emphasis on incoming students' affective attributes of, primarily, environmental values, attitudes and beliefs, and within this area, on the use of a quantitative research methodology based on questionnaire research design. Detailed analyses of the wider project's research results are published elsewhere (Mann, Smith & Shephard, 2008; Shephard, Mann, Smith and Deaker, in preparation, focussing on quantitative analysis; Mann, Shephard, Smith and Deaker, in preparation, focussing on broader sustainability perspectives with disciplinary emphases; and Smith, Mann, Shephard and Deaker, in preparation, focussing on alternative, qualitative, methodologies).

What we did

After a pilot project in 2007, a questionnaire was designed to include a combination of quantitative and qualitative research approaches. The questionnaire included the revised New Ecological Paradigm Scale (Dunlap, Van Liere, Mertig and Emmet Jones, 2000, styled as Revised NEP); questions taken from an international study into young people and the environment (Fien, Yenken and Sykes, 2002); and an adaptation of a Personal Meaning Map (Storksdieck, Ellenbogen and Heimlich, 2005). The full questionnaire is available online (<http://akoaootearoa.ac.nz/communities/education-sustainability>). The questionnaire was distributed on paper to all incoming students in Otago Polytechnic at the start of the 2008 academic year, for all students enrolled for 0.8FTE (full time equivalent) or greater, and was also available online.

The questionnaire contained 15 items that were developed by Dunlap et al. (2000) as the Revised NEP. The use of the Revised NEP for research into environmental, ecological and sustainability worldview values and beliefs has been extensively reviewed elsewhere (Dunlap, 2008). The items related to five hypothesised facets of an ecological worldview: reality of limits to growth; anti-anthropocentrism (the belief that humans should not be considered at the centre of, and above any other aspect of, reality); fragility of nature's balance; rejection of exemptionism (rejection of the belief that humans are exempt from environmental forces) and the possibility of an ecocrisis. Respondents were asked to indicate their agreement with each item on a five-point Likert scale (Strongly agree, mildly agree, unsure, mildly disagree, strongly disagree). The Revised NEP Scale contains seven items worded so that disagreement indicates a pro-ecological worldview and eight items worded so that agreement indicates a pro-ecological worldview. These former items are reversed in the analysis so that a low overall mean score items indicates a pro-ecological worldview.

- 1 We are approaching the limit of the number of people the earth can support.
- 2 Humans have the right to modify the natural environment to suit their needs.
- 3 When humans interfere with nature it often produces disastrous consequences.
- 4 Human ingenuity will ensure that we do not make the earth unlivable.
- 5 Humans are severely abusing the environment.
- 6 The earth has plenty of natural resources if we just learn how to develop them.
- 7 Plants and animals have as much right as humans to exist.
- 8 The balance of nature is strong enough to cope with the impacts of modern industrial nations.
- 9 Despite their special abilities humans are still subject to the laws of nature.
- 10 The so-called 'ecological crisis' facing humankind has been greatly exaggerated.
- 11 The earth is like a spaceship with very limited room and resources.
- 12 Humans are meant to rule over the rest of nature.

- 13 The balance of nature is very delicate and easily upset.
- 14 Humans will eventually learn enough about how nature works to be able to control it.
- 15 If things continue on their present course we will soon experience a major ecological catastrophe.

The questionnaire also asked respondents to record their gender, age group, ethnicity and current programme of study. Respondents were also asked to record a code-word or number so that they could remain anonymous within the survey yet allow later data to be collected and time-tracked to this benchmarking exercise.

The data set was analysed by Principal Component Analysis (PCA) using an approach described by Dunlap et al. (2000) and the software package SPSS. This analysis sought to determine the extent to which responses to individual items correlate with one another and whether the total of the responses can be considered as a single component or as a number of relatively discrete, but interacting, components. The analysis also sought to correlate the Revised NEP Scale output of individual students with the range of self-reported variables included in the questionnaire.

What we found

There were 539 respondents (the response rate was 65% with two substantial departments, from a total of 14, unable to contribute as groups due to organisational difficulties). Some students from these departments may have responded as individuals online but only 20 responses came via this route in total). Respondents were predominantly female (68.5%; for comparison, 75.1% of students in this institution were female in 2007) with 53% between the ages of 15–19 years old and 84% under the age of 29. 82% described their ethnicity as NZ European/Pakeha (a New Zealand term for citizens of predominantly European decent), 6.5% as Maori, 2.6% as Pacific Islander, 4.8% as Asian and 3.7% as other.

PCA demonstrates that there is sufficient internal consistency in the data set to use the Revised NEP Scale within this study as a single measure of respondents' ecological worldview. This is styled as an individual's Revised NEP score. But PCA also revealed four significant factors contributing to this overall score. The distribution of Revised NEP items to these four factors provides a means to divide respondents' overall ecological world-view into four contributory domains. To help characterise groups of students who may emphasise particular factors as behavioural traits, an 'everyday' descriptive title is suggested for each factor. These relate to tendencies: to conserve; to recycle; to be cautious about the future; and to support animal rights. These descriptions, and their potential problems, are discussed in more detail in the discussion below.

Individual's Revised NEP Scale score was determined as the mean of their individual 15 item Revised NEP Scale responses and resulted in a value between 1 and 5. This value was related to respondent's stated age group, gender and ethnicity. One-way analysis of variance with a post-hoc Tukey test demonstrates that the 30–39 age group has a significantly lower Individual mean Revised NEP Scale score (higher pro-ecological stance) than the overall value ($P < 0.05$) and than the 15–19 age group ($P < 0.001$). One-way analysis of variance demonstrates that women in this study had a greater pro-ecological stance than men. The mean Individual Revised NEP Scale score for women was 2.425 (SD 0.496, $n = 369$) and that for men was 2.598 (SD 0.502, $n = 155$) ($P < 0.001$). One-way analysis of variance with a post-hoc Tukey test finds significant differences within this data set but this was particularly

influenced by one very small group. The bulk of respondents identified themselves as Pakeha (mean Individual Revised NEP Scale score 2.252, SD 0.501, n=442). Others were Maori (2.482, SD 0.570, n=35), Pacifica (3.558, SD 0.185, n=14), Asian (2.631, 0.430, n=26) and Other (2.534, SD 0.535, n=20). The mean Individual Revised NEP Scale score for Pacifica was significantly higher (lesser pro-ecological stance) than for all other groups ($P<0.001$), but this does represents a very small group.

Individuals were also identified by their primary subject of study to be affiliated with particular departments. Departmental names, mean Individual Revised NEP Scale scores and numbers of respondents in some of Otago Polytechnic's department are provided in the first 3 columns of Table 1, ranked by their mean Individual Revised NEP Scale scores. The mean Individual Revised NEP Scale score of departmentally-based individuals was compared with the overall mean Individual Revised NEP Scale score. ANOVA and a post-hoc Tukey test demonstrated that there were significant differences between some departments and between some individual departments and the overall mean. As examples, students in the Veterinary Nursing Department have significantly lower Individual Revised NEP Scale scores (greater pro-ecological stance) than the whole group ($P<0.01$) and students in the Hospitality Department have significantly higher Individual Revised NEP Scale scores (lesser pro-ecological stance) than the whole group ($P<0.05$). Departmental differences were analysed in more depth by looking in detail at the four scale factors identified by PCA. The mean Revised NEP Scale scores for students for each of the four factors was analysed for each department. The resulting data is also shown in Table 1.

Table 1: Mean Revised NEP Scale scores for the four principle components for some of Otago Polytechnic's academic departments

Department	N	Overall individual revised NEP score (Mean)	Tendency to conserve Mean (SD)	Tendency to recycle Mean (SD)	Tendency to be precautious about the future Mean (SD)	Tendency to support animal-rights Mean (SD)
Veterinary nursing	16	2.12	1.78 (0.467)	2.80 (0.754)	2.58 (0.848)	1.69 (0.755)
Midwifery	62	2.36	2.07 (0.725)	3.02 (0.762)	2.50 (0.777)	2.13 (0.762)
Design	78	2.39	2.16 (0.720)	2.95 (0.846)	2.68 (0.729)	2.02 (0.845)
Nursing	71	2.46	2.15 (0.619)	3.08 (0.740)	2.70 (0.728)	2.22 (0.741)
All departments	529	2.47	2.17 (0.693)	3.02 (0.836)	2.74 (0.761)	2.26 (0.836)
Sports institute and adventure	50	2.51	2.16 (0.584)	3.01 (0.857)	2.85 (0.560)	2.37 (0.856)
Information technology	59	2.58	2.21 (0.527)	3.10 (0.833)	3.00 (0.824)	2.39 (0.833)
Applied business	59	2.59	2.28 (0.565)	3.04 (0.670)	2.94 (0.787)	2.44 (0.693)
Hospitality	26	2.68	2.42 (0.652)	3.27 (0.995)	2.91 (0.740)	2.35 (0.995)

Implications for Otago Polytechnic and New Zealand's tertiary education sector

Getting to know incoming students better

The data in Table 1 emphasises the diversity that exists within these student groups. Some intake groups have statistically different environmental worldviews from some others and from the combined group, as measured by the Revised NEP instrument. The data indicates that even before students start to study in the institution, their different interests and experiences, that may have led them to choose programmes in, for example, hospitality rather than midwifery, may have contributed to these different value-sets.

The data provides additional insights, albeit in a preliminary fashion, about how students' environmental value-sets may be analysed. The descriptive titles for each principal component (or factor) are, at this stage, an approximation. In allocating the distribution of factors between departments' intakes the researchers thought it desirable to identify in everyday terms some of the sustainability characteristics of students. For example, the range of affective attributes of anti-anthropocentrism, as determined within this NEP-based research instrument, with notions that 'nature does not exist for the benefit of humans' may be best interpreted by teachers as 'a tendency to support animal-rights'. This description could be extended to include a wide range of pro-environmental and anti-anthropocentric characteristics and certainly would include the tendency to support the rights of plants and indeed of all species, communities and ecosystems to exist. In New Zealand, the term 'tree hugger' is widely but pejoratively used to convey this range of meaning; but the term should not necessarily be extended to include notions of 'animal-rights activism'. Similarly, the range of affective attributes that respond to perceived limits to growth and the need to use resources wisely have been interpreted here as 'a tendency to recycle', but would include notions of reuse and reduction in the use of resources. Naturally all students will display all of these characteristics to some degree, but these results suggest that the students in some departments may be more, or less, inclined to recycle; or may take more, or less, interest in animal, and plant, rights; or may be more, or less, sympathetic to conservation; or to being cautious about future environmental prospects. These tendencies may have natural corollaries in students' needs. As the Polytechnic moves towards its sustainability goals it will need to address the issue that its students have different value-sets that make up the different worldviews on environmental matters and that these may represent different educational needs.

This study has produced some anticipated results. Gender differences in pro-environmental stance in the Otago Polytechnic are marked and no doubt contribute greatly to departmental/programme differences in student characteristics. All of the respondents from the Veterinary Nursing group (the group with the lowest overall mean Individual Revised NEP Scale, and most pro-environmental stance) were female and the majority of those from the Hospitality Department (the group with one of the highest overall mean Individual Revised NEP Scale scores, and least pro-environmental stance) were male. It is important, therefore, that departments consider interactions between gender and environmental attitudes when making use of this data to plan educational interventions in line with their institutional mission and the corresponding needs of their students. Gender differences in environmental attitudes have been extensively researched and reviewed by Zelezny, Poh-Pheng Chua and Aldrich (2000) and these results accord strongly with these broadly based research findings. Age has also proved to be a relatively predictable indicator of pro-environmental stance. The data reported here distributes in a similar fashion to that reported elsewhere (for example by Environment Waikato, 2006). The data shows that highest levels of environmental stance

occur in the age group 30–39. It will be interesting to observe how reported ethnicity and environmental stance relate to one another in subsequent surveys. It is important to interpret the present benchmarking data with respect to respondents' stated ethnicity with care as numbers in some groups are very small. The literature on this topic is fragmented and inconsistently reported. Johnson, Bowker & Cordell (2004) for example used the Revised NEP Scale to determine the different environmental worldviews of ethnic groups in the USA, as part of research to build a broad causal model of environmental beliefs and behaviours. Their study demonstrated that data on ethnicity needed to be integrated with criteria such as immigration status, level of acculturation, language and country of origin for meaningful incorporation into a causal model.

This aspect of our research does not address the environmental knowledge and skills Otago Polytechnic's intake have, although these facets are addressed in other parts of our research. In some ways, however, affective attributes underpin others. In Bloom's taxonomy of the affective domain, for example, affective attributes of 'listening' and 'responding' underpin 'being open to the views of others' and 'contributing to discussion' and are arguably important elements of learning for knowledge and skills. Affective attributes of valuing, organising and internalising may underpin learners' abilities to show 'action competence' (Jensen & Schnack, 2006; Mogensen, 1997) and have significant bearing on what students choose to do with their knowledge and skills when they graduate. Whether the concept of 'needs' is addressed from the position of students, or from that of teachers charged with the task of delivering the institutional mission, there are challenges to addressing the different needs of a varied intake.

Addressing students' needs

Otago Polytechnic has established a Sustainability Review Team. This team does not prescribe how education for sustainability should be incorporated into teaching programmes, but it does seek approaches that best meets the needs of each department's staff and students. For example, the Design School has elected to integrate all education for sustainability initiatives into existing courses, whereas the Health and Community School has decided to offer a stand alone 'Education for sustainability 101' type paper for all first year students, then integrate education for sustainability themes into year two and three courses. All new programmes under development are required to contain education for sustainability content and processes. The Otago Polytechnic Graduate Profile across all disciplines will in future include being action competent as a sustainable practitioner in their field.

The data as presented therefore should be useful to teachers in this institution. The data suggests, for example, that for all students in this sample, Factor 2 (Nature provides limited resources; expressed here as a tendency to recycle) is not as well developed as the other contributors to the Revised NEP Scale. All departments may choose to consider this information as they develop educational interventions designed to achieve the institution's mission with respect to sustainability. Individual departments may make further use of the data. Some departments show across the board relatively poor pro-ecological stances although in some cases it is likely that the differences reflect no more than the student gender-balance, and possibly age distribution, in the department's cohort of students. Some departments, however, show particular patterns of NEP factor distribution. Midwives, for example, appear to be generally in favour of conservation and animal rights, cautious about the future of the planet, but perhaps not as inclined to reduce, reuse and recycle as some other groups. The Polytechnic's Sustainability Review Team recognise that teaching staff need significant help

in developing, creating, and implementing effective learning experiences around sustainable practice in their field.

Benchmarking this cohort against others and Otago Polytechnic students against other students

This data set provides a benchmark against which changes in the key parameters can be followed in subsequent years. It should be possible to repeat the process for subsequent incoming cohorts to identify changes in the characteristics, and therefore needs, of incoming students. It should also be possible to repeat the process with these same student groups as they leave the institution, to begin the task of mapping changes associated with a post-compulsory education experience and, potentially to compare these changes with specific circumstances, and developments, within departments.

It will also be interesting to compare this data with those from other surveys used elsewhere. The authors have been approached by other tertiary education institutions in New Zealand interested in benchmarking their students' sustainability knowledge, values and attitudes and the full survey has been put on-line to support this process. There is, in addition, already a substantial body of data available based on the Revised NEP that will be of interest to Otago Polytechnic staff. It is possible to interpret the NEP data at several levels, but cohort analysis based on mean Individual Revised NEP Score does provide an indication of pro-environmental worldview worthy of scrutiny. Dunlap (2008) describes the NEP as the world's most widely used measure of environmental concerns and records several hundred published accounts of its use. This current article does not attempt to make these comparisons but it is apparent from the data available that other groups express greater, or lesser, levels of pro-environmental values stance.

Addressing concerns and future research

This article has deliberately adopted a neutral, but research-led, stance on a range of controversial issues relating to education for sustainability, affective learning and the roles of tertiary education. For example, Jickling (2003) and Shephard (2007; 2008) have explored advocacy for sustainability. Tertiary teachers, who may struggle with their personal sustainability-identities and role as teachers and the identity and role of their institutions, are starting to have access to substantial knowledge of the expectations and needs of their students, alongside the expectations of their institutions and professions. The authors of this work recognize the potential burden that this may place on them. Variation in how even the most proactive higher education institutions around the world go about addressing sustainability has been described by Beringer (2007). The diverse conceptions, and understanding, of university teachers about their potential roles and responsibilities in sustainability have been addressed by Reid & Petocz (2006). This data combines with new knowledge of the diversity of student expectations to create an exciting, but challenging tertiary environment!

Future research is planned. Otago Polytechnic has reissued the questionnaire in 2009 for its current intake. It will encourage the 2008 intake to use the questionnaire again so that researchers can monitor changes. The research programme includes substantial qualitative elements that are currently being analysed. Research in the future will address the sustainability worldview of Otago Polytechnic teachers and researchers will learn more about the educational interventions in place within departments. Researchers from Otago Polytechnic and the University of Otago encourage other tertiary education institutions to join this research programme by sharing research instruments, data and expertise. A community

has been established for this purpose supported by Ako Aotearoa, New Zealand's National Centre for Tertiary Teaching Excellence (<http://ako.aotearoa.ac.nz/communities/education-sustainability>).

References

- Beringer, A. (2007) The Lüneburg Sustainable University Project in international comparison: an assessment against North American peers *International Journal of Sustainability in Higher Education* 8 (4) 446–461.
- Bloom, B.S., Hastings, J.T., & Madaus, G.F. (1971). *Handbook on formative and summative evaluation of student learning*. New York: McGraw-Hill.
- Bloom, B.S. & Krathwol D.R. (1956) *Taxonomy of Educational Objectives: The Classification of Educational Goals*. New York, David McKay.
- Carter, R. (1985) A taxonomy of objectives for professional education. *Studies in Higher Education* 10 (2) 135–149.
- Dunlap, R. E. (2008) The New Ecological Paradigm Scale: from marginality to worldwide use. *J Environmental Education* 40 (1) 3–18.
- Dunlap, R., Van Liere, K., Mertig, A. and Emmet Jones, R. (2000) New Trends in Measuring Environmental Attitudes: Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale, *Journal of Social Issues*, Vol. 56, No. 3, pp. 425–442.
- Environment Waikato (2006) *People's environmental attitudes*. Accessed 17/02/09 at <http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Community-and-economy/Communities-and-their-views/p2c-keypoints/>.
- Fien, J., Yenken, D. and Sykes, H. (Eds)(2002) *Young People and the Environment: An Asia-Pacific Perspective*, Kluwer Academic Publishers: Dordrecht.
- Jensen, B. B. & Schnack, K. (2006). The action competence approach in environmental education. *Environmental Education Research*, 12(3/4), 471–486.
- Jickling, B. (2003). Environmental education and environmental advocacy: revisited. *Journal of Environmental Education*, 34(2), 20–27.
- Johnson, C. Y., Bowker, J. M. & Cordell, H. K. (2004) Ethnic variation in environmental belief and behaviour *Environment and Behaviour* 36 (2) 157–186.
- Mann, S., Smith, N. & Shephard, K. (2008) Understanding our intake: sustainability knowledge, skills and values of incoming students. *8th Australasian Campuses towards Sustainability Conference* (abstract) Accessed 17/02/2009 at <http://www.sustain.canterbury.ac.nz/acts/abstracts/manmsmithsheppard.shtml>
- Mogensen, F. (1997) Critical thinking: a central element in developing action competence in health and environmental education *Health Education Research* 12(4). 429–436.
- Maas Weigert, K. (2006) Justice, Integrity and Action: Individuals and Institutions. *Improving University Teaching. 31st International Conference*. July 2006 Dunedin, New Zealand.
- Reid, A. & Petocz, P. (2006) University lecturers' understanding of sustainability *Higher Education* 51 105–123.
- Shephard, K. (2007) Is it the role of higher education to teach students to value our environment, and if it is, how do we do it and how well do we do it? *2nd International Conference on Education for Sustainable Development: Graduates as Global Citizens* September 2007, Bournemouth UK.
- Shephard, K. (2008) Higher education for sustainability: seeking affective learning outcomes. *International Journal for Sustainability in Higher Education* 9 (1) 87–98.
- Shephard, K., Smith, N. & Mann, S. (2008) Answering the Call: Otago Polytechnic's role in creating sustainable practitioners *31st Annual HERDSA Conference* Rotorua, New Zealand (Abstract)
- Sterling, S. & Scott, W. (2008) Higher education and ESD in England: a critical commentary on recent initiatives *Environmental Education Research*, 14(4) 386–398
- Storckdieck, M., Ellenbogen, K. and Heimlich, J. (2005) Changing minds? Reassessing outcomes in free-choice environmental education, *Environmental Education Research*, Vol. 11, No. 3, pp. 353–369.
- Zelezny, L. Poh-Pheng Chua and Aldrich, C. (2000) Elaborating on gender differences in environmentalism-statistical data included *Journal of Social Issues* 56 (3) 443–457

Copyright © 2009 Kerry Shephard, Sam Mann, Nell Smith and Lynley Deaker. The authors assign to HERDSA and educational non-profit institutions a non-exclusive license to use this document for personal use and in courses of instruction provided that the article is used in full and this copyright statement is reproduced. The authors also grant a non-exclusive license to HERDSA to publish this document in full on the World Wide Web (prime site and mirrors) on CD and in printed form within the HERDSA 2009 conference proceedings. Any other usage is prohibited without the express permission of the authors.