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PRE-SERVICE TEACHERS' UNDERSTANDING AND CONCERN FOR SUSTAINABILITY ISSUES: IMPLICATIONS FOR TEACHER EDUCATION

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Abstract

Education for sustainability (EfS) represents an important educational agenda both nationally and internationally, with growing support for its inclusion in teacher education programs. Recently, EfS has been prioritised in the School of Education at James Cook University, which is reflected in the development of an undergraduate EfS subject for students studying early childhood and primary education. At the commencement of the teaching semester, a sample of 142 pre-service teachers undertaking this subject completed a Likert-style questionnaire that examined their perceived relevance of EfS in schools and pre-service teacher education, how informed they were about selected sustainability issues and their concern for these issues. While the data tells a 'good news story' about the pre-service teachers' perceptions of the importance of EfS, it tells a concerning one regarding knowledge. The percentage of respondents who indicated that they could not explain what the sustainability issues surveyed were really about ranged from 15%-45%, even though they thought they presented a serious concern for themselves and for other people in Australia. The implications of these findings for pre-service teacher education are also discussed.

Introduction

As education for sustainability (EfS) continues to grow as an important educational agenda in schools both nationally and internationally, the development of skilled teachers to support this agenda and lead change in schools has been identified as a key priority (UNESCO-UNEP, 1990). According to the *Sustainability Curriculum Framework* (DEWHA, 2009), pre-service teachers require a repertoire of skills to facilitate action-oriented learning, and knowledge of ecological and human systems.

Pre-service teachers' knowledge of EfS, and in particular, environmental issues, has been widely investigated in Australia and overseas. Such studies have generally found that pre-service teachers hold misconceptions and have little understanding of environmental issues and concepts such as air pollution, the greenhouse effect and climate change, atmospheric ozone depletion, acid precipitation, biodiversity, carrying capacity and intergenerational equity (Bahar, Bag, & Bozkurt, 2008; Boon, 2010; Boyes, Chambers, & Stainisstreet, 1995; Cutter-Mackenzie & Tidbury, 2002; Khalid, 2001; Summers, Corney, & Childs, 2004; Tuncer et al. 2009). While these studies assert that these findings are detrimental to the quality of environmental education delivered in schools, some pre-service teachers' may not agree with this viewpoint. For example, a sample of 21 primary pre-service teachers surveyed in Australia found that while the respondents demonstrated a limited understanding of environmental concepts, the majority disagreed that teachers required a thorough knowledge of such concepts, instead valuing the importance of developing students' positive attitudes toward the environment (Cutter-Mackenzie & Tidbury, 2002).

While pre-service teachers' poor environmental knowledge is well-documented, fewer studies have investigated their concern for environmental issues. Tuncer et al. (2009) surveyed 648 pre-service teachers at a Turkish university about their environmental knowledge, attitudes and concern for environmental problems such as pollution, waste and global warming. The study found that the majority of the respondents were very concerned about the environment, despite having unacceptable

levels of environmental knowledge. At an Australian university, significant increases were reported in primary pre-service teachers' concern for environmental issues, which were perceived as being less important than media-driven social issues such as teen pregnancy and substance abuse prior to undertaking a 14 week EfS unit (Taylor, Kennelly, Jenkins, & Callingham, 2006).

EfS has been prioritised in the School of Education at James Cook University (JCU), which is reflected in the development of an EfS subject for students studying early childhood and primary education as part of the Bachelor of Education. The research reported here aims to support the School's efforts to embed EfS into the program by informing ongoing development and refinement of the subject, and enhancing our ability to integrate EfS effectively by coming to understand better our local context and learners. Unlike the studies that have examined pre-service teachers' knowledge of environmental issues, the purpose of this research was not to test the participants' understanding. Instead, we were interested in examining the relationship between pre-service teachers' awareness of sustainability issues and their concern for these issues. At the same time, we acknowledge that an understanding of these issues alone is not sufficient to engage students effectively in inquiry into sustainability issues, and recognise the importance of pedagogical content knowledge in this context (see Cutter-Mackenzie & Smith, 2003; Cutter-Mackenzie & Tidbury, 2002; Kennelly, Taylor, & Maxwell, 2008; Stevenson, 2011). The aim of this study, therefore, was to investigate the perceptions of pre-service teachers regarding the relevance of EfS in schools and pre-service teacher education, and, more importantly, the extent to which they were informed and concerned about selected sustainability issues.

Research Methods and Procedures

A sample of 142 early childhood and primary pre-service teachers completed a Likert-style questionnaire prior to commencing their studies in the EfS subject in Semester 1, 2010 (i.e., 53% of the subject cohort). The questionnaire consists of 20 items within three subscales that examine how informed pre-service teachers are about sustainability issues (Subscale 1), how concerned they are about these issues (Subscale 2), and their perceived relevance of EfS (Subscale 3) (Tables 1 and 2). A space is also provided at the end of the survey for any comments about EfS. Subscales 1 and 2 were adapted from Section 4 of the internationally validated student questionnaire for PISA 2006, which includes questions regarding students' views on environmental issues (OECD, 2005). The items belonging to Subscale 1 require respondents to indicate how informed they are about seven selected sustainability issues that form an integral part of the curriculum in the EfS subject. Subscale 2 requires participants to indicate for whom these issues, or particular aspects of these issues, are of concern. Subscale 3 was developed specifically for the current study. Items 3a-3c in this subscale concern EfS in schools; items 3e and 3f concern EfS in pre-service teacher education programs; and item 3d refers to EfS more generally (Table 2). While the small number of participants in the current study did not allow for a reliability analysis to be conducted with this group of students, the internal consistency of each of the subscales is quite high (Table 1).

Modelled on the format used by PISA, the participants responded to each item using a four-point scale specific to each subscale. These responses were then scored on a scale of 1-4, so that higher scores represented more positive responses (Table 1). Descriptive statistics were used to calculate the frequency of the pre-service teachers' responses to the items belonging to Subscales 1-3, and comments made by the participants in the free-response item have been used to support this analysis.

Table 1

A summary of the characteristics of the subscales of the pre-service teacher survey and their corresponding response options. The scoring of participants' responses applied in the analysis is presented in parentheses.

| Subscale | Number of items | Chronbach's α Reliability N=142 | Subscale response options (Score) | | | |
|--|-----------------|--|--|--|---|---|
| 1. Awareness of sustainability issues | 7 | .81 | I have never heard of this (1) | I have heard of this but I would not be able to explain what it is really about (2) | I know something about this and could explain the general issue (3) | I am familiar with this and I would be able to explain this well (4) |
| 2. Concern for sustainability issues | 7 | .89 | This is not a serious concern to anyone (1) | This is a serious concern only for people in other countries (2) | This is a serious concerns for other people in Australia, but not for me, personally (3) | This is a serious concern for me, personally, as well as others (4) |
| 3. Perceived relevance of education for sustainability | 6 | .81 | Strongly disagree (1) | Disagree (2) | Agree (3) | Strongly agree (4) |

Findings and Discussion

A summary of the survey data is presented in Table 2. In the following subsections, we discuss the findings arising from each of the subscales.

Perceived relevance of EfS

In regards to the respondents' perceived relevance of EfS, the survey data tells a 'good news story'. The majority of the pre-service teachers agreed or strongly agreed on the importance of EfS in schools and pre-service teacher education, and rejected the notion that its longevity is short-lived (Table 2). As one respondent commented, "It [EfS] is an important issue and we as pre-service teachers need to be educated to educate our future students". These findings suggest that the pre-service teachers are likely to engage positively with EfS-specific subjects and content within their program. According to one respondent, "I am looking forward to becoming more informed about sustainability and the impact that sustainability issues have on my life personally or on the community in which I am unaware. I feel this subject is important for a teacher to include and integrate into various aspects of the school curriculum". The provision of positive and engaging teaching and learning experiences in EfS as part of their pre-service teacher training should seek to support and nurture this disposition.

Awareness of sustainability issues

The findings from Subscale 1 suggest that the majority of the pre-service teachers knew something about the issues presented (Table 2). 19.0% of respondents indicated that they could explain the issue of deforestation well, compared to only 3.5% for atmospheric ozone depletion and 7.0% for climate change, which supports findings reported in other studies of pre-service teachers' lack of knowledge and understanding of climate change and depletion of the ozone layer (e.g., Cutter-Mackenzie &

Tidbury, 2002; Boon, 2010; Summers, Kruger, Childs, & Mant, 2000). Most interestingly, between 15.5% and 44.4% of respondents indicated that they had heard about the sustainability issues, but would not be able to explain what they are really about – this was the case for more than half of the respondents regarding Government efforts to reduce carbon emissions. As one pre-service teacher’s comment on the survey exemplifies, “I know a bit about each [sustainability issue] but not enough to feel comfortable talking, teaching or explaining to students”.

Table 2

Summary of all results from the pre-service teacher survey (N=142). The mode for each item is shaded.

| Subscale | Items | Response scores (N) | | | | | Mean (SD) |
|--|---|------------------------|---------------|---------------|---------------|----------------|----------------|
| | | 4 | 3 | 2 | 1 | No response | |
| 1. Awareness of sustainability issues | 1a. Depletion of the ozone layer | 3.5% (5) | 49.3% (70) | 44.4% (63) | 2.1% (3) | 0.7% (1) | 2.55 (0.60) |
| | 1b. The causes of species extinction | 12.7% (18) | 67.6% (96) | 19.0% (27) | 0 | 0.7% (1) | 2.93 (0.57) |
| | 1c. The consequences of clearing forests for other land use | 19.0% (27) | 64.8% (92) | 15.5% (22) | 0 | 0.7% (1) | 3.04 (0.59) |
| | 1d. Water shortages in Australia | 10.6% (15) | 62.0% (88) | 26.0% (37) | 0.7% (1) | 0.7% (1) | 2.82 (0.61) |
| | 1e. The enhanced greenhouse effect | 7.0% (10) | 60.6% (86) | 31.7% (45) | 0 | 0.7% (1) | 2.74 (0.58) |
| | 1f. The impact of land run-off on marine systems | 9.9% (14) | 46.5% (66) | 39.4% (56) | 3.5% (5) | 0.7% (1) | 2.63 (0.71) |
| | 1g. Government efforts to reduce carbon emissions | 2.1% (3) | 39.4% (56) | 53.5% (76) | 4.2% (6) | 0.7% (1) | 2.40 (0.61) |
| 2. Concern for sustainability issues | 2a. Air pollution | 81.0% (115) | 15.5% (22) | 1.4% (2) | 1.4% (2) | 0.7% (1) | 3.77 (0.54) |
| | 2b. Extinction of plants and animals | 67.6% (96) | 28.9% (41) | 0.7% (1) | 1.4% (2) | 1.4% (2) | 3.65 (0.57) |
| | 2c. The consequences of clearing forests and bushland for other land use | 64.1% (91) | 33.1% (47) | 0.7% (1) | 1.4% (2) | 0.7% (1) | 3.61 (0.58) |
| | 2d. Water shortages in Australia | 78.2% (111) | 19.7% (28) | 0 | 1.4% (2) | 0.7% (1) | 3.76 (0.52) |
| | 2e. Climate change | 81.0% (115) | 15.5% (22) | 1.4% (2) | 1.4% (2) | 0.7% (1) | 3.77 (0.54) |
| | 2f. The health of the Great Barrier Reef | 72.5% (103) | 25.4% (36) | 0 | 1.4% (2) | 0.7% (1) | 3.70 (0.54) |
| | 2g. The rising cost of producing and manufacturing goods as a result of emissions trading schemes | 58.5% (83) | 35.9% (51) | 0.7% (1) | 3.5% (5) | 1.4% (2) | 3.51 (0.69) |
| 3. Perceived relevance of education for sustainability | 3a. Teachers can play an important role in solving environmental problems through education | 56.3% (80) | 42.9% (61) | 0.7% (1) | 0 | 0 | 3.55 (0.51) |
| | 3b. It is important that education for sustainability is a regular part of the school curriculum | 58.5% (83) | 39.4% (56) | 1.4% (2) | 0 | 0.7% (1) | 3.57 (0.52) |
| | 3c. It is important to teach environmental education to school students from an early age | 54.2% (77) | 45.1% (64) | 0.7% (1) | 0 | 0 | 3.53 (0.51) |
| | 3d. Education for sustainability is a fad that will pass in time | 1.4% (2) | 6.3% (9) | 47.2% (67) | 44.4% (63) | 0.7% (1) | 1.63 (0.67) |
| | 3e. It is important to include education for sustainability in pre-service teacher education programs | 43.7% (62) | 54.9% (78) | 0.7% (1) | 0 | 0.7% (1) | 3.43 (0.51) |
| | 3f. The inclusion of education for sustainability in my pre-service teacher education program will directly benefit my ability to teach students about sustainability | 50.7% (72) | 47.2% (67) | 2.1% (3) | 0 | 0 | 3.47 (0.56) |

Concern for sustainability issues

The data arising from Subscale 2 of the survey revealed that the majority of the pre-service teachers felt that each of the sustainability issues was a serious concern for them and for other people in Australia. Air pollution ($M=3.77$, $SD=0.54$), climate change ($M=3.72$, $SD=0.54$), the health of the Great Barrier Reef ($M=3.70$, $SD=0.54$) and water shortages ($M=3.76$, $SD=0.52$) elicited the highest mean scores for concern of all the surveyed issues. There is evidence that the environmental issues of most concern to young people vary with geographical location and the nature of the local socio-physical environment (see Rickinson, 2001). The amount of media coverage afforded to particular issues in various locations can also influence their levels of concern. The fact that JCU's Townsville campus is located in a coastal city in the dry tropics may have influenced the pre-service teachers' perception that water shortages, climate change and the health of the Great Barrier Reef are issues of most concern to them. For example, the City Council's water restrictions policy is widely covered by the local media. Air pollution and climate change, in particular, also receive considerable media coverage as issues of global concern; issues that were identified by 81.0% of the pre-service teachers as being of serious personal concern.

The group of respondents who indicated that they had heard about the sustainability issues surveyed but would not be able to explain them were examined more closely by comparing their responses to the items belonging to Subscale 2 (Table 3). Interestingly, while this group of pre-service teachers indicated that they were not well-informed about the sustainability issues, between 71.4% and 100% of them perceived these issues to be of serious concern for them and for other people in Australia.

Table 3

A summary of the number of pre-service teachers who indicated that they had heard about the sustainability issues belonging to Subscale 1, but would not be able to explain what they are really about (i.e., response score of 2), and the number of these respondents who scored 3 or 4 in the corresponding items belonging to Subscale 2 (i.e., identified these issues as being of serious concern to themselves and other people in Australia).

| Subscale 1: Awareness of sustainability issues | N | Subscale 2: Concern for sustainability issues | N | | Total |
|---|----------|---|----------|----------|---------------|
| Items | 2 | Items | 4 | 3 | |
| 2a. Depletion of the ozone layer | 63 | 3a. Air pollution | 37 | 8 | 45 (71.4%) |
| 2b. The causes of species extinction | 28 | 3b. Extinction of plants and animals | 16 | 11 | 27 (96.4%) |
| 2c. The consequences of clearing forests for other land use | 22 | 3c. The consequences of clearing forests and bushland for other land use | 11 | 11 | 22 (100%) |
| 2d. Water shortages in Australia | 38 | 3d. Water shortages in Australia | 29 | 9 | 38 (100%) |
| 2e. The enhanced greenhouse effect | 46 | 3e. Climate change | 37 | 8 | 45 (97.8%) |
| 2f. The impact of land run-off on marine systems | 56 | 3f. The health of the Great Barrier Reef | 40 | 15 | 55 (98.2%) |
| 2g. Government efforts to reduce carbon emissions | 76 | 3g. The rising cost of producing and manufacturing goods as a result of emissions trading schemes | 44 | 27 | 71 (93.4%) |

Note. The figures in parentheses in the 'Total' column represent the proportion of respondents who recorded a score of 2 for items 2a-2g that scored 3 or 4 for items 3a-3g.

Implications for pre-service teacher education

Overall, it seems that while most of the pre-service teachers surveyed felt that the chosen sustainability issues are of serious concern, a small proportion (i.e., 3.5%-19.0%) indicated that they were familiar with these issues enough to be able to explain them well. Of particular interest, 71.4%-100% of respondents who indicated that the issues were of serious concern to themselves and to other people in Australia felt that they would not be able to explain what they are about. While it is encouraging to find that the pre-service teachers are concerned about the sustainability issues that were surveyed, we argue that being concerned is not sufficient to engage with EfS in the classroom – if they are to be confident in engaging with sustainability issues in the classroom, they must have a sound understanding of these issues in order to do so.

The primary pre-service teachers in the study conducted by Cutter-Mackenzie and Tidbury (2002) felt that developing students' positive attitudes toward the environment was more important than their own knowledge of environmental concepts; however, some studies have shown that being aware of environmental issues and their consequences in the absence of knowledge and understanding can foster 'learned hopelessness' (Nagel, 2005) or emotional non-involvement (Kollmuss & Agyeman, 2002). While schools and television are students' primary sources of information about environmental issues (Rickinson, 2001), both school students' and pre-service teachers' understanding of environmental issues arising from television and other forms media is likely to be erroneous and fraught with misconceptions due to the nature and quality of the information presented, and their own interpretations of this information (Bahar et al., 2008; Rickinson, 2001). In particular, the media's representation of the potential consequences of environmental issues tends to be limited to those of a general and/or short-term nature (Gomez-Granell & Cervera-March, 1993). There is evidence to suggest that such portrayal of environmental issues can foster a sense of pessimism among students about the future state and health of the environment (e.g., Barraza, 1999; Hutchinson, 1997). If schools, then, are another important source of information about environment issues for students, teachers play a critical role in addressing students' misconceptions and fostering an understanding about these issues, rather than just awareness and concern.

Conclusion

In order to come to understand the characteristics of the learners undertaking an EfS subject as part of their teacher training, this study sought to investigate a group of early childhood and primary pre-service teachers' perceptions of the relevance of EfS in schools and pre-service teacher education programs, and their understanding and concern for particular sustainability issues. While the majority of the respondents perceived EfS to be pertinent and were concerned about the issues surveyed, they were not sufficiently informed about these issues to be able to explain them well. If pre-service teachers, then, are willing to engage with EfS as part of their teacher training and in the classroom beyond, it is imperative that universities support this disposition while developing their knowledge of sustainability issues, alongside the necessary values, attitudes and pedagogical skills to facilitate action-oriented learning.

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