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Connecting Pedagogies and Learning.

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Abstract: Modelling inter-disciplinary teaching and learning practices in pre-service education courses has produced powerful learning outcomes for graduate entry learners completing their Primary/Middle Bachelor of Education degree at the University of South Australia. The notion of connecting pedagogies, realised through an inter-disciplinary approach to teaching Society and Environment has provided rich contextual meaning for student-centred learning.

The researchers were particularly concerned with the learning outcomes of this cohort, and their view of themselves as designers of curriculum.

Studies of society and the environment are a compulsory area of learning for all learners up to Year 10 completing their formal education in South Australia. This learning area draws from the fields of social science, ecology, humanities, anthropology, history, geography and political science and in South Australia is organised around the four multidisciplinary strands of Time, Continuity and Change; Place, Space and Environment; Societies and Culture and Social Systems (DECS 2004).

Studies of society and environment are unique in that it is driven in ideology by three core values – democratic process, ecological sustainability and social justice. While tensions exist around the definition of the values and the degree of political control over their interpretation (Fien 2001), they encourage the inclusion of education for sustainability that ‘integrates goals for conservation, social justice, cultural diversity, appropriate development and democracy into a vision and mission of personal and social change’ (Department of the Environment and Heritage 2005).

Studies of society and the environment are a core curriculum course in the Graduate Entry Bachelor of Education Primary/Middle teacher education program in the University of South Australia. In order to prepare pre-service teacher educators well, the value of democratic

process, social justice and ecological sustainability are used as curriculum organisers and a focus on social issues grounded in these values, determine the approach. Evans (2001) states 'issues are the proper focus for social studies because they pose real life problems, raise issues of doubt, motivate reflection, stimulate the need to gain knowledge and highlight problematic areas of culture' (p. 294).

In order to provide pre-service teachers with exposure to this learning area over a period of time longer than a semester, and to accentuate the powerful learning outcomes made possible when taught with other disciplines, studies of society and the environment is currently taught in an integrated format with mathematics and science. All Primary/Middle pre-service educators complete a minimum of three core curriculum courses entitled Science, Mathematics, Society and Environment 1, 2, & 3 across the three semesters of their Bachelor of Education program. Each of the three courses models an interdisciplinary approach to the teaching and learning of science, mathematics and society and the environment.

Interdisciplinarity in society and the environment and more particularly, education for sustainability, has had a history of strong support both nationally and internationally. A report entitled 'Education for Sustainability: an agenda for action', from the US National Forum on Partnerships Supporting Education about the Environment held in 1994 stated:

'Professionals in higher education play one of the most decisive roles, that of initiating innovative programs. By finding ways to integrate interdisciplinary and systems approaches in their own undergraduate and graduate courses, they will train a new generation of teachers who will more effectively inspire creative thinking and sound decision making among their learners. Through university level research activities, these professionals can break down the barriers between disciplines and enliven their own teaching.' (p. 2)

UNESCO, through its draft of the International Implementation Scheme for the UN Decade of Education for Sustainable Development (2003) describes the centrality of an interdisciplinary and holistic learning curriculum that is values driven, locally relevant and prioritises critical thinking and problem solving. In a paper, 'Rising to the Challenge: Education for Sustainability in Australia', Tilbury (2004) cites the importance of 'working across disciplines' (p. 103) and Flint (2000) states 'in preparation of future teachers, college/university curricula will need to offer an opportunity for obtaining exceptional skills in interdisciplinary teaching' (p. 201).

Schneider (1997), in referring to *environmental literacy*, defines interdisciplinarity as being ‘the combination of knowledge, methods or paradigms from multiple disciplines that together help to explain some systems phenomena that cannot be understood by single disciplinary ways of knowing or help to solve a real problem’ (p. 457). In Australia, interdisciplinarity in teacher education across the fields embraced by studies of society and the Environment and across multiple disciplines is found only in small components in single courses. Sherren (2005) states, ‘The Education for Sustainability literature is dominated by discussion of pedagogical methods and generic skills, but explicit discussions of discipline mix – although implicit in the oft cited need for interdisciplinarity – are almost completely absent’ (p. 98). Pre-service teachers undertaking the Bachelor of Education Primary/Middle Graduate Entry Program at the University of South Australia complete three core curriculum courses in Science, Mathematics, Society and Environment that prioritises an interdisciplinary approach, making explicit powerful ways of knowing across the discipline paradigms. It is the intention of this paper to describe the powerful learning outcomes of the first cohort of learners completing this Program who reflect upon the interdisciplinary approach to the teaching and learning of studies of society and the environment.

Curriculum construction within the Bachelor of Education primary/middle Program is built around ‘constructivist pedagogy’ (Fosnot 1996). The central tenet of constructivism is that learners construct their own knowledge and give meaning to things they think about or perceive (Van de Walle 2007). In this context knowledge is personally constructed and socially mediated (Driver, Asoko et al. 1994), ‘highlighting the school’s role as a critical agency within society, aiming to transform it so that it is a fairer and more just place for all citizens’ (Marsh 2005). Klein and Merritt (1994) describe four components of constructivism. They include, providing a real life context through a problem to be solved, student-centred teaching and learning strategies, productive group engagement and finally authentic assessment structures and strategies. Constructivist teaching easily lends itself to teaching in environmental education (Klein and Merritt 1994) and in our context in South Australia to the learning in studies of the society and the environment.

Within a constructivist frame, the interface between teaching and learning is characterised by pedagogical choices. Those choices, made by teaching practitioners, need to work within the constructivist paradigm and have as their goal the creation of powerful learning experiences for all students. What is it that we as educators want those learning experiences to achieve? If we have clarity around the learner we seek, then our pedagogical choices will follow. The National Environmental Education Statement for Australian Schools (2005) describes a learner who is a reflective and deep thinker, an ethical and responsible citizen, a connected

and autonomous learner. While the National Environmental Education Statement for Australian Schools (2005) cites experiential learning, values clarification and analysis, creative thinking, future problem-solving, story-telling, inquiry learning and science in the community as being valued teaching and learning strategies, the scope of pedagogical approaches need to be identified. It is the implementation of a range of pedagogies in society and the environment that enables teachers to respond to specific student's needs, maximise knowledge acquisition and conceptual understandings and utilise the contextual environment in which the learning takes place.

Place-based pedagogy (Smith 2002) values the use of primary learning resources, the local community, the world outside of the classroom and students' lived experience. Engagement in activities in the local community encourages students to realize their worth as citizens who, given the opportunity, can become informed decision makers and provide a much needed perspective to community development. Productive pedagogy (Lingard, Hayes et al. 2003) also prioritises students', connections to their life worlds and experiences beyond the classroom. Intellectual quality, relevance or connectedness, socially supportive learning environments and recognition of difference are key dimensions to the productive pedagogical approach. This approach to framing teaching and learning, values student empowerment through intellectual challenge.

Originating in social theory, critical pedagogy (Giroux 1994) seeks to recognize knowledge that challenges established disciplinary boundaries and creates new interdisciplinary ways of knowing. The pedagogy utilizes a critical lens, identifying the connectivity between power, identity and culture. Critical pedagogy promotes the development of multiple literacies, particularly social literacies that value diversity across social, cultural and political boundaries (Giroux 1999). Freirean pedagogy (Farahmandpur 2006) has also strongly impacted planning and teaching in studies of society and environment. Freire (2004) in his book 'Pedagogy of Indignation', also challenges the established boundaries, promoting intervention and transformation in the world and imploring educators to exercise their 'epistemological curiosity' and recognize connections between the moral, the ethical and political dimensions of teaching and learning.

This pedagogical framework has provided the context for the conceptualization of an interdisciplinary approach to the teaching of society and the environment. Central to the pedagogical framework is critical social inquiry, systems thinking, change management, futures orientation and participation where learners are at the centre of the educative process. That process seeks to develop conceptual understandings around social issues firmly

grounded in the values that underpin society and environment and Education for Sustainability. The pedagogies identified enable teachers and learners to work within Studies of society and the environment in powerful and life changing ways. This paper will describe how the connecting pedagogies utilised in this interdisciplinary approach have produced powerful learning outcomes for pre-service graduate entry teacher educators at the University of South Australia.

The suite of interdisciplinary courses is strongly related to the guiding principles of the Bachelor of Education primary/middle program. The principles were developed in response to the report, “Shaping the future: Educating professional educators” (2001), which aimed to develop educators for the 21st century who:

- can work across established educational boundaries;
- can integrate knowledge across traditional discipline boundaries;
- are aware of the broad educational context, and not just their area of 'specialisation';
- can adapt to and shape change;
- can work powerfully with diversity; and,
- are flexible/ creative/ politically aware/ committed to goals of social justice in and through education (pp 23 – 29).

They provide a contextual ideology that describes intended planning and implementation directions and a framework for measuring learning outcomes in their broadest sense. The principles include: social justice and equity, futures thinking, sustainability, education for community living, wellbeing and relationships development, professional competence and course delivery. The guiding principles provide a strong ideology through which innovation, creativity and interdisciplinarity have continued to grow and challenge the discipline divides found in university facilities, particularly that of teacher education.

Methodology

Interpretive research involves a detailed examination of data obtained from interviews and written words to find embedded meaning, in order to develop an understanding of how one part relates to the meaning of a whole. In this study, mixed methods were used to assist the researchers to make sense of the data. An initial questionnaire was distributed during the final class of Science, Mathematics, and Society and Environment. This occurred prior to a final practicum experience and was intended to evaluate the learners’ learning outcomes and perspectives of themselves as designers of curriculum of society and environment after having completed three courses at university in Science, Mathematics, Society and

Environment. Volunteers were sought to participate in a semi-structured interview after the completion of the practicum to ascertain any new perspectives they may have developed as a result of planning, teaching and evaluating units of work in studies of society and environment. Patton (2002) reminds us that qualitative findings derived from mixed methods, may be presented alone or in combination with quantitative data. The approach used here, of a questionnaire that asks fixed questions and an interview with open inquiry type questions, are complimentary (p 5). The quality of the research depends on the methodological skill, sensitivity, and integrity of the researchers so skilful interviewing, that involved more than just asking questions, was combined with the content analysis of the questionnaires. Transcripts were produced from the interviews and verified by the participants as a true and accurate record.

Results

The first cohort of graduate learners in the Bachelor of Education (primary/middle) program at the University of South Australia participated in stage one (the questionnaire) of this study (n=23). The program is a two year graduate degree offered in an intensive mode over 18 months. Of the 23 participants in this study, 15 were female and 8 male aged between 21-44 years of age (see table 1). All learners have a recognised prior degree, for example, Bachelors of Journalism, Business, Nature Resource Management, Human Movement, Arts, Nursing or Engineering. Previous experiences in Science, Mathematics, Society and Environment for this group were minimal and included volunteer community project work, employment in horticulture or ecology, and/or work experiences in schools.

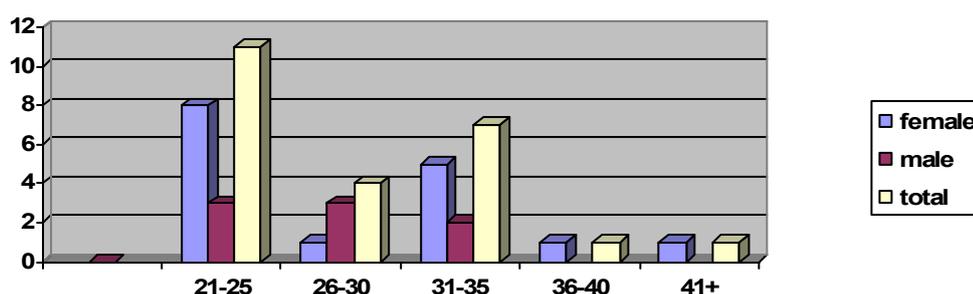


Table 1: Gender and age distribution of participants in stage one

Feelings about the interdisciplinary approach

Prior to the commencement of the Science, Mathematics, Society and Environment courses learners recorded mixed feelings about the intended approach to the teaching of studies of

society and environment as an interdisciplinary course integrated within Science, Mathematics, Society and Environment. Some had no idea what to expect (22%), others were surprised with the courses chosen for the integration (8%), some thought it was a smart idea and consequently were keen to learn more (25%) and 14% didn't like the idea at all and felt studies of society and environment should have been taught as a separate course. After completion of the three Science, Mathematics, Society and Environment courses, there appeared to be a more positive response to the integration of studies of society and environment within Science, Mathematics, Society and Environment. It was 'good' (25%), there were obvious links to studies of society and environment and mathematics and science (20%), it contributed to mathematics coming 'alive' (8%), and it was evident that studies of society and environment was actually integral to all subjects and life experiences (15%). For example, one student commented that

I'm very happy to have had the experience with studies of society and environment – I've found it so interesting and rewarding. It has made me want to be more involved with many studies of society and environment issues in my own life and motivated to teach learners studies of society and environment topics. (female aged 32)

For another student, the experience acknowledged their own ability to teach studies of society and environment,

I feel confident – now I don't feel I have to address History/Geography etc but know that it is more important learners achieve intended learning outcomes not content in order to achieve life long learning. (female aged 31)

However, there were adverse comments too. 25% felt that the focus on studies of society and environment was lost and that all curriculum areas were 'too thin'. Another student commented that this approach was suitable for primary classrooms but not in a high school setting.

Learners' learning outcomes

Student learning outcomes for studies of society and environment were measured by evaluating their learning in the areas of values, thinking and working and planning for learning.

In order to prepare pre-service teacher educators well, the value of democratic process, social justice and ecological sustainability are utilized as curriculum organizers and a focus on social issues grounded in the values, determine the approach. Learners were asked to list the values inherent in the studies of society and environment curriculum. 25% identified democratic process, 32% social justice, and 45% sustainability. Other values like equity (8%), interdependence (7%), respect (7%) and empathy (7%) were mentioned. But learners also included inquiry, critical thinking, and action as studies of society and environment values that they had learnt about.

Various society and environment ways of thinking and working were reported which made evident the pre-service teachers' understanding of teaching and learning strategies that facilitate successful learning outcomes. These included the use of groupwork, activity based learning, critical thinking, investigating, sorting, analysing, collecting, inquiry, questioning, social action, and data gathering and processing. 7% stated they were not sure and thought that studies of society and environment could be depressing and that a positive approach was needed with a focus on the learners and their feelings.

Elements of the planning for learning sequence were identified: tuning in, finding out, sorting, taking action; as were numerous skills and worldviews: exploring, being a constructivist, open-mindedness, weighing up issues, using a range of resources, critically analysing, groupwork, teamwork, collaboration, reflective thinking, challenging stereotypes & world issues, research, being empathetic, questioning, interacting with others, student centredness, equitable look at world issues, indepth topics increase understanding, awareness of global issues and listening.

Designers of curriculum

The interdisciplinary approach used to teach studies of society and environment influenced the learners, to a degree, as designers of curriculum although the researchers felt that the participants struggled with the idea of what this meant. They saw themselves as using an interdisciplinary approach to teaching as a motivating technique to engage learners rather than as a way to design curriculum. They commented that the approach enabled them to be a more creative teacher which enabled them to teach about current and real social issues. They measured this as successful teaching. When they were asked if they could design curriculum in this way for learners in the school years of 3 - 9, they were all quite positive. 40% were

very confident and 26% saw the benefits but were still coming to terms with some aspects of it (eg planning). They listed a number of topics that they were going to teach in their upcoming final practicum as a student-teacher. For example, Migrants & refugees; Water catchment; Team building and cooperation; Environmental sustainability; Human rights; Introduced species; Poverty and wealth; Cultural foods; Australian climate/Antarctica; Place and space; Physical health; Local environment/community to school; Landcare; 19th century Australia. All but one student were planning to teach the studies of society and environment topic in an interdisciplinary way and this was because the school did not support it. Reasons given for their interdisciplinary choices included,

Absolutely because as a primary or year 6/7 teacher there is so much to cover and so little time – this approach means you can integrate a range of learning experiences together and provide more enriched learning experiences. (female aged 24)

I will. As an artist I work this way – combining media + means of expression. It's a natural approach for me. Nothing exists in a vacuum. (female aged 32)

Connecting pedagogies and learning

Stage two of this study involved six volunteers in a semi-structured interview. This occurred at the completion of their final practicum where they had had the opportunity to plan, teach and evaluate their studies of society and environment topic. Information sheets were provided and explained, participation was voluntary, and participants could withdraw from the study at any time. The interview was taped and transcripts verified by the participants. The interview was interested in the learners' views of how their curriculum design transpired during the practicum, and how the interdisciplinary approach used in the teaching of studies of society and environment connected with constructivist pedagogy.

Actualisation of learning about “values”

Post practicum, pre-service teachers reported that units of work were designed in collaboration with their mentor teachers. Subjects that they integrated with studies of society and environment included: english, information technology, drama, visual arts, science, health, physical education, outdoor education, and mathematics. This integrated approach enabled studies of society and environment beliefs and values to be enhanced that aimed to

progress learners from an awareness level to one of social action. These included democratic values that focussed the learning outcomes on a political level and therefore enabling learning about rules, law, government processes, power plays, and decision-making. As one beginning teacher reported ... *you know when they make comments in their papers about how democracy is important and you know they've got the hang of it.* Morals were also 'learnt' and learners were placed in spaces that encouraged them to form opinions, make decisions, argue for right or wrong, and consider action. One unit of work on children's rights was successfully achieved when the preservice teacher shared that ... *my aim was that I wanted the kids to be aware that we have human rights and children's rights and I also wanted them to understand that organisations that are committed to human rights can actually make changes and that they themselves can also participate in that.* Appreciation of the plight of children living in third world countries focussed the learners from their own disadvantaged lives and created some level of confusion for others, as this student shares;

... and then they started questioning like "oh yeah, well why does Nike do that" so then we started to look at exploitation of children especially, because them being kids I wanted to relate it straight to them, so they could see that us in the west are actually taking advantage, but by the same token we're in the situation where we don't have much money and don't have much option but to buy cheap clothes, so everyone's stuck in this predicament. (female aged 32)

The teaching methodology used in this example enabled the learners to know that there are others who are worse off than they and they then made connections between, "what can we do", and, "what can we do to make their lives a bit better". Values related to sustainability were strongly realised in one experience where the learners participated in outdoor learning opportunities. Connections were made between understanding environmental sustainability and working together towards ethical action. An indigenous focus to the environment included learning about a cultural perspective to sustainability as the learners were involved in,

...looking for artefacts, finding some bush tucker trails in the park, building traditional type shelters and going on a dreaming trail that was a true story about the Park that talked about survival by working together, using what was around the environment, and things like not taking more than they need, environmental sustainability, so the kids got things out of it like if they fished all the fish out of the pond there wouldn't be any more food. (male aged 32)

Pedagogies that connect and re-connect

Interestingly, it was found that units of learning were planned with deliberate pedagogies in mind to enhance student learning outcomes, assist with time management of the broader curriculum, and to enable the learners to 'take action'. These 'turn around pedagogies', a term described by Comber and Kamler (2004), are practices that re-connect learners with schooling and education (p 298).

The research participants planned a variety of teaching and learning pedagogies that connected the learners. These included:

- Moving from a teacher directed approach (as this was the mode the class were used to) to a student centred one that was fairly interactive. On some occasions this included self selection of free choice activities within a planned structure.
- Teaching self-help tools of organisation, meeting timelines, and setting goals so that the learners could complete projects and learning tasks successfully.
- Providing opportunities for learners to self-select sub-topics within the teaching and learning unit so that interest was maximised, and learners were enthusiastic about and enjoyed their learning. This also created a sense of healthy competition to complete work to a high standard.
- Lots of small group work eg in a unit on religion where small groups researched similar aspects of different religions to present to the whole class. Also in a class on exploitation of learners's rights where small group work was used to investigate where our clothes were made. Small groups were also used to develop group learning and also to develop research skills by ensuring groups were made up of mixed ability or skill levels.
- Breaking down large learning tasks into smaller, achievable tasks so learners were more focussed and experienced success more often in their learning. This contributed to the production of editorials on the political situation in East Timor which included making an opinion about independence after having completed various smaller research tasks. Despite this complex task, the student-teacher reported,
Even though it was only a page editorial these kids wrote, it was great because they communicated a lot when I was reading them, I thought, you could tell that the kids were really getting into it and it was quite rewarding. (female aged 31 in a metropolitan public school with a year 6/7 class)

- Open-ended questioning that challenged learners' thinking at a variety of levels from low to high order. This enabled the learners to construct informed opinions. Questioning was also used in prior knowledge activities to enable the learners to discover things and ask questions about their own level of knowledge.
- Using 'games' that consolidated learning in a fun and interactive way. In one class, team-building games were used to teach social skills and working together as a team.
- 'Hands-on' activities that provided constructive learning.
- Going outside and using different teaching and learning spaces.

Pedagogies that re-connected learners were used when the beginning teachers realised that traditional modes of teaching and learning were ineffective or didn't achieve the studies of society and environment learning outcomes. For example,

- ICT's (used in a studies of society and environment unit on convicts with year 8 boys class) that engage learners in taking control of their own learning (eg research why convicts were transported to Australia, create a convict profile by designing physically a convict, naming him/her, researching convict type crimes and selecting one, and predict the future outcomes for their convict).
- Integrating studies of society and environment with other areas eg drama, english, visual arts, and making sure learning was interactive.
- Planning units of teaching and learning to ensure they included rigorous tasks which kept the interest level high. (This particular class were used to a teacher who did not plan for learning and would decide what was to be done as she arrived at school each day. This included a lot of 'worksheet' type learning tasks).
- Having a 'hook' that kept learners engaged throughout a lesson.
- Making sure you include a 'wow' factor in the learning so that they 'get it'! This was used in an outdoor studies of society and environment unit that involved freshwater studies where the learners thought they were collecting water to investigate yabbies. When they returned to the class to have a look at the sample under the microscope they found the water included lots of things and they even witnessed one creature lay an egg and give birth, which was put up on the big screen for everyone to watch. (An intended society and environment inquiry became a scientific investigation).
- mentoring was used where older learners worked with younger ones in the area of studies of society and environment and literacy to make a storybook on endangered Australian animals.
- Teacher and learners negotiating about what and how to learn together which included establishing criteria for assessment.

Powerful teaching and learning insights

Having completed an eight week teaching practicum, the research participants were asked to reflect on the teaching and learning approaches used in the three integrated science, mathematics and society and environment courses that were taught in the Bachelor of Education, primary/middle degree (graduate entry). The following summary of reflections about the pedagogy used in science, mathematics and society and environment are that it:

- enables the classroom teacher to manage and/or change the learning environment which results in a higher than normal level of engagement by learners and more successful learning outcomes;
- results in a more student-oriented approach to teaching and learning;
- allows for increased flexibility in the classroom timetable;
- allows the teacher to learn with the learners on many topics rather than be the ‘fountain of knowledge’ that delivers the content for the learners to absorb in an expository way;
- assists the teacher to use prior knowledge activities to find out what the learners already know and therefore give direction for new learning;
- enables the teacher to learn about the learners and get to know them better;
- gives the teacher more confidence to teach in areas and ways where they may be lacking in confidence;
- has prepared graduates for beginning teaching;
- has shown the research participants that other curriculum areas can also be integrated;
- providing a model for preservice teachers because it was modelled so well by the university staff;
- enables the preservice teachers to implement effective teaching strategies immediately into the classroom setting;
- provides a new framework for teaching studies of society and environment called *Integrated studies*;
- connects learning from other curriculum areas in an implicit way as ‘hidden’ sub-subjects;
- learners are more successful in subjects that they would normally not be eg maths or literacy, compared to if these were taught as discreet subjects;
- allows the teacher to make links to successful learning when teaching in other subjects;

- connects learning of content with values enabling learners to make sense of issues in a realistic way;
- has a long-term effect on learning acquisition and memory;
- invites the learners to influence the way curriculum is constructed as their opinions and feedback are valued and acted upon in an explicit manner;
- gives beginning teachers the confidence and strategies to work across discipline areas or faculties in schools to make a difference;
- means that you teach the kids not the content; and,
- maximises learning as resources are made and used specifically for the learning context.

Some final quotes from the pre-service teachers included:

I've even made up stories for kids and cut them all up and got them to put them back together and the teacher said 'Why are you doing all that work, people have done it all before you, why are you going to so much effort?', and when I did that for kids, when I said to the kids "I wrote that story", they were like "Oh, you wrote it!", and I said "Yes" and then they became really interested. (Female aged 24)

I think it doesn't really matter in my lessons whether I'm a maths teacher, I'll be able to bring all that SOSE and science in to make that maths learning much more rich. (Female aged 31)

There's a comment in the students' editorials about how democracy is important, and you know they've got the hang of it, that was really important for me, that you think at least you're building kids who are going to question as they get older, that was important for me. (Female aged 32)

Well, it's a good thing to challenge (and take this learning into secondary settings), if we can go into schools and do that maybe we can make differences to how they actually run their curriculum. (Female aged 24)

Conclusion

Whilst the pre-service teachers struggled with the idea of what being designers of curriculum meant, in their final practicum they used their pedagogical knowledge to design rich society and environment learning experiences for learners in years 3 – 9 settings. Critical social inquiry, learner-centred frameworks, a commitment to intervention, transformation and social action dominated student evaluative discussion, indicating the powerful learning outcomes for pre-service teachers through their exposure to a range of pedagogical models. The impact of pedagogy on conceptual understandings and interdisciplinary curriculum construction has been well described by the research participants and identifies the need for further research into pedagogy and curriculum design.

The unexpected findings of this research were the pre-service teachers' descriptions of their powerful learning outcomes that have impacted in both a personal and professional sense. The researchers propose that teaching and learning structured around values, beliefs and worldviews (as modelled in the three core curriculum courses), enriched through an interdisciplinary approach and expressed in a significant practicum have created the powerful learning outcomes that hold the potential for these teachers to transform and rethink curriculum in middle school settings in the future. Transformative pedagogy engages at the level of values and worldviews and is enriched through interdisciplinary teaching and learning.

Comber and Kamler (2004) disclose that the current teaching profession lacks serious mechanisms for change and in particular for the ongoing induction of new teachers, a problem exacerbated by the predicted mass retirement of teachers within the decade (p 294). This small research project has allowed the researchers to learn from a new generation of teachers – those in the initial stages of their careers and who entered the profession as graduates from other disciplines. Our aim was to explore if the teaching and learning pedagogies introduced and modelled to the pre-service teachers through new and innovative courses at university, would or could influence practice and ultimately be sustained and transferred into new pedagogical (or curriculum) challenges. This aim has been realised.

References

- Comber, B & Kamler, B (2004) 'Getting Out of Deficit: Pedagogies of reconnection.' *Teaching Education*, Vol 15, No 3, pp 293-310.
- DECS (2004). R-10 Society and Environment: Teaching Resource. Hindmarsh, SA, DECS Publishing.
- Department of the Environment and Heritage (2005). Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools. Carlton South, Victoria, Curriculum Corporation.
- Department of the Environment and Heritage (DEH) (2005). Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools. Carlton South, Victoria, Curriculum Corporation.
- Driver, R., H. Asoko, et al. (1994). "Constructing Scientific Knowledge in the Classroom." *Educational Researcher* **23**(7): 5-12.
- Evans, R. W. (2001). Teaching social issues: Implementing an issues-centred curriculum. The Social Studies Curriculum - Purposes, Problems and Possibilities. E. W. Ross. Albany, NY, State University of New York Press.
- Farahmandpur, R. (2006). Freire, Paulo. (2004) Pedagogy of Indignation. Boulder, CO: Paradigm Publishers. Education Review - a journal of book reviews: 3.
- Fien, J. (2001). Education for Sustainability. TELA: environment, economy and society issue 8, The Australian Conservation Foundation.
- Fosnot, C. (1996). Constructivism: a psychological theory of learning. Constructivism: theory, perspectives and practice. C. Fosnot. New York, Teachers College Press: 8-33.
- Freire, P. (2004). Pedagogy of Indignation. Boulder, CO, Paradigm Publishers.
- Giroux, H. A. (1994). Disturbing Pleasures UK, Routledge.
- Giroux, H. A. (1999). What is the Role of Curriculum in Critical Pedagogy?, Rage and Hope.
- Klein, E. S. and E. Merritt (1994). "Environmental Education as a Model for Constructivist Teaching." Journal of Environmental Education **25**(3): 1-14.
- Lingard, B., D. Hayes, et al. (2003). "Teachers and Productive Pedagogies: contextualising, conceptualising, utilising." Pedagogy, Culture and Society **11**(3): 399-424.
- Marsh, C. (2005). Teaching Studies of Society and Environment. Frenchs Forest NSW, Pearson Education Australia.
- Patton, M. Q. (2002). Qualitative research and evaluation methods. Thousand Oaks, California, Sage Publications.
- President's Council on Sustainable Development (1997). education for sustainability: an agenda for action, U.S.Global Change Research Information Office.
- Reid, A & O'Donoghue, M (2001) Shaping the Future: Educating Professional Educators. University of South Australia, Adelaide.
- Schneider, S. (1997). "Defining and teaching environmental literacy." TREE **12**(1): 457.
- Sherren, K. (2005). "Balancing the Disciplines: A Multidisciplinary perspective on Sustainability curriculum Content." Australian Journal of Environmental Education **21**: 97-106.
- Smith, G. (2002). "Going Local." Association for Supervision and Curriculum Development: 30-44.
- Tilbury, D. (2004). "Rising to the Challenge: Education for Sustainability in Australia." Australian Journal of Environmental Education **20**(2): 103-114.
- UNESCO (2003). United Nations Decade of Education for Sustainable Development (January 2005 - December 2014): Framework for a Draft International Implementation Scheme. Paris, France, UNESCO.
- Van de Walle, J. A. (2007). Elementary and Middle School Mathematics: Teaching developmentally. Boston, USA, Pearson Education Inc.
- Warren Flint, R. (2000). "Interdisciplinary education in sustainability: links in secondary and higher education." International Journal of Sustainability in Higher Education **1**(2): 191-202.

