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Two models for implementing Citizen Science projects in middle school

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Abstract

Australia, like other developed countries grapples with the education of its citizens, particularly the scientific aspects of global environmental problems that require well-informed literate citizens and an urgent need for more scientifically literate knowledge workers. This paper takes this crisis as a provocation for thinking about one approach developed internationally—the *citizen science* approach. Whilst there are a lot of reports from citizen science projects, especially in scientific journals, there is a paucity of research about how citizen science has been taken up in the public culture and in schools. This paper outlines two different models both using an action research model that has teachers as co researchers with tertiary educators. Firstly, teachers have engaged with a large public *citizen science* program in which students collect scientific data around iconic species, such as possums, magpies, blue tongue lizards and spiders. Secondly, middle school teachers select a citizen science topic that connects to their student life worlds, in an attempt to raise the educational aspirations for learners through tertiary participation, and excellence in school-based curriculum development. This paper describes the two models used to develop scientific citizenship in middle schools in Adelaide, South Australia.

Key words: Citizen science, socially critical pedagogy

A crisis for science

> There can be few more pressing and critical goals for the future of humankind than to ensure steady improvement in the quality of life for this and future generations, in a way that respects our common heritage— the planet we live on' (UNESCO 2006, p.9).

Unfortunately, the planet is in trouble. To mention a few significant environmental issues: climate change, pressures of population on natural resources (e.g. peak oil, deforestation, water and food security) and environmental decline (e.g species extinction, impact of pollution). 'The available evidence suggests that in many areas our current way of living cannot be sustained' (DEWHA 2009, p.3), and 'to master our destiny we need new thinking, new values—a new consciousness' (Laszlo 2001, p.4). As well, post-industrial countries such as Australia, are increasingly shifting their economies towards a global knowledge economy (Kenway et al, 2006). Even though Australia is still very much reliant on exporting raw material such as coal and gas, our future will be dependent on the development of knowledge industries, knowledge workers and hence a critical mass of university qualified and scientifically literate citizens.

At this crucial time, there is also a crisis for science, and specifically in the relation between science and society. We now live in times in which public opinion matters in national decision making. The public 'is increasingly asked to vote on scientific and technological issues beyond their untrained grasp' (Elam & Bertilsson 2003, p.239). There is a compelling case that our times are defined by a 'profound disjuncture in science and society relations' (p. 233). This disjuncture in Australia can be characterised by:

- emergence of a *vocal anti-science movement* in the public culture evident by 'ignorant and over-emotional attitude of some publics' (p. 239);

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- a *crisis of public confidence in science* (eg. climate change debates, genetically modified food) that is aggravated by 'unnecessary arrogance and over-assuredness of some scientists' (p.239);
- a '*flight from science'* by students in final years of secondary school and at university: year 12 enrolments in physics, chemistry and biology fell by 31%, 23% and 32% respectively between 1992 and 2009;
- school science is too *heavily skewed towards the abstract conceptual canon of science*, and too often ignores the realities of students' own lives and interests;
- *poor national performance in science learning* by Australian primary and secondary students (eg. TIMSS and PISA testing) in comparison to other OECD and even developing countries; (Thomson 2009)
- a relatively *low percentage of university qualified citizens* compared to other OECD countries; (*OECD 2012)*
- increased urbanisation coupled with densification of cities and the loss of natural preserves has led to a disconnect between people and the natural world (Louv 2008); and
- *low levels of public understanding of science* in 'western' countries, that seem immune to educational interventions (Raza et al, 2009).

In summary then, Australia, like other developed countries, now grapples with the education of the scientific citizen, as defined by a confluence of global environmental problems requiring scientifically literate citizens; the urgent need for more scientifically literate knowledge workers; and a crisis of science itself.

Responses to this disjuncture in science and social relations—between science, policy making and the wider publics—include advocacy for 'greater transparency and openness with decision-making' and with that greater 'public engagement and participation' (Irwin, 2001, p.2). There is international interest in 'scientific citizenship' and many frameworks proposed for consideration, including 'a *social research* framing of science-citizen relations', a *deliberative democracy* model (Irwin 2001, p.15-16), and more recently a *citizen science* approach. The first two alternatives propose variations on consulting with citizens about socio-scientific issues, and especially those that are controversial such as bioscience. The citizen science approach goes still further and involves citizens in actual scientific projects and hence nurtures actual 'public engagement and participation'. Of course, also, the scientific citizen is being developed through formal educational processes determined in large part by national science curriculum projects, such as, the *Australian National Curriculum* (ANC), *Education for Sustainability* (ARIES, 2009) and *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools (*EfSF*).*

Rather than focus on further diagnoses of the crisis for science as outlined briefly above, this paper proposes instead, to examine one of the hopeful responses that are being developed internationally, that is, the *citizen science* approach. This approach is relatively new and whilst there are a lot of reports from citizen science projects, especially in scientific journals, there is a paucity of research about citizen science, and certainly not research framed by concerns for the education of the scientific citizen. The paper draws on (inter)national exemplars of *citizen science*; and a description of two models of a *citizen science* approach to curriculum and pedagogy in the middle years of schooling. The paper draws on conceptual resources from three key themes, citizen science studies, socially critical science education and new pedagogy studies, which we briefly outline in the next section.

This paper also draws on various research the authors have undertaken with the collaboration between Barbara Hardy Institute for Sustainable Environments and the School of Education, including an ARC Linkage Project *Redesigning Pedagogies in the North* and a DEST funded project *School of Education*

Aspirations Project. The focus of these projects has been the development of citizen science informed school curriculum in the middle years.

Citizen Science Studies

The changing relationship between science and society is exemplified by the relatively recent turn to '*citizen science'* as a reputable research methodology that involves participation by citizens, who are not necessarily scientists, in scientific projects. Citizen science is a new and rapidly evolving methodology whereby citizens, learn by doing and participate in science led research activities that engage and provide a forum for informed debate. These activities are more than data collection (otherwise the citizens would simply be technicians) but are instructive activities that support open discussion. The results of these projects lead to policy and strategy formation which in turn are adopted by the community because they themselves were part of the process. Citizen science has emerged as an approach that is able to respond to the problem of *nature deficit disorder* that is especially evident in Australian cities. Australia is also one of the world's most urbanised nations with 89% of the population in urban centres. Hence the potential for *nature deficit disorder* is relatively greater here. It is in cities that we can improve the community connection with nature or biophilia, to create a community sense of place based on the natural resources of the region, conserve biodiversity and manage pests. Citizen science not only enables large scale questions to be answered using thousands of volunteers, but it also determines the community views on 'wicked' issues enabling the formation of better policies and management strategies by governments.

There are now hundreds of citizen science projects being conducted worldwide. A few significant Australian examples include Barbara Hardy Institute (UniSA), CSIRO, Atlas of Living Australia, and the Federal Department of Land and Water Australia. The number of projects is increasing, as is the number of research papers published in peer-reviewed scientific journals that have used data collected, or analysed, by citizen scientists (Trautmann *et al.*, 2012). Most of the published work on citizen science has focused on Informal Science Education (ISE) (Zoellick *et al.* 2012). For example, there has been a focus on the ISE benefits of Public Participation in Scientific Research (PPSR; including citizen science) (Bonney *et al.*, 2009). Citizen science studies are designed to include citizens in the production of scientific knowledge and hence construct the scientific citizen as integral to the process of scientific knowledge production. Education is an important component of citizen science projects. In citizen science projects conducted in the public sphere volunteers often need to learn how to participate (e.g. specific protocols for data collection or how to use scientific instruments)(Jordan *et al.* 2012).

Recently the citizen science approach has informed the formal teaching of science especially in primary and middle schools. There are examples of school-based approaches to citizen science associated with State-wide citizen science projects (Paige *et al*., 2010; Zeegers *et al.*, 2012) and school-based designs based on the citizen science model (Paige et al, 2012). Scientists, teachers, students and school communities benefit when citizen science projects are used in formal education settings (Trautmann *et al.* 2012). Scientists benefit by gaining additional project participants (e.g. to collect data) and also may benefit by increasing scientific literacy (Zoellick *et al.*, 2012). The education programs can be formal, where they are developed to work within the education system (e.g. schools), or informal, where they are conducted in the broader community. Through the formal connections between citizen science projects and schools, both teachers and students benefit because they participate in the collection of, and work with, real data (Moss *et al.*, 1998) which can be highly engaging (Trautmann *et al.*, 2012). Citizen science projects also assist primary teachers who may have limited scientific knowledge and experience (Spillane *et al.*, 2001). Further, for projects with an environmental focus, it has been noted that experiential programs delivered in schools can help students develop positive attitudes towards the environment, who can, in turn, influence the attitudes of adults around them (Ballantyne *et al.*, 2001; Vaughn *et al.*, 2003). When developing ideas for a citizen science project, it is important to consider the needs of both teachers

and students, as well as the needs of the project (Zoellick *et al.,* 2012). Literature on scientist-teacher-student partnerships (STSPs) suggests that as project outcomes required by schools (e.g. meeting curriculum standards) are often different from the project outcomes desired by scientists (e.g. data collection), it can be beneficial to have a third party to assist in the development of collaboration between scientists and teachers (Houseal 2010 cited in Zoellick *et al.,* 2012). As citizen science programs have grown, the educational outcomes that teachers and students achieve are as important (if not more important) as any other aspect of the citizen science project (Zoellick et al., 2012).

Socially Critical Science Education

In the last three decades, science educators internationally have come to recognise the importance of the social and cultural context in which learning occurs (Leach & Scott, 2003; Matthews, 2009). In part such approaches have developed in response to a range of factors including:

- the importance of interrupting pre-scientific understandings of students/citizens and hence move towards constructivist approaches to knowledge and learning
- the enormous problems we face globally require interdisciplinary (Wallace, Venville & Rennie 2005) and/or transdisciplinary (Balsiger 2004) approaches to knowledge and hence a need to frame science education in relation to the social sciences and technology studies.
- debates in the public sphere are not amenable to solely scientific approaches: contemporary problems have philosophical/political and empirical dimensions (Horlick-Jones & Sime 2004).

As a consequence the field of science education is now informed by the studies of: science, technology, society and the environment (Solomon & Aikenhead 1994); history, philosophy and sociology of science (Matthews 1992); socio scientific issues and science for sociopolitical action (Hodson 2003; Roth & Désautels 2002); science for all (Fensham 2003); and science and sustainability (Daniels & Tait, 2008; Paige, 2011; 2012). As well, in recent years, a concern about ways of reconnecting children to nature (Daniels & Tait, 2008; Louv, 2008; Sobel, 2008). Miles (2008) argues that if '[science and environmental] educators develop a sense of place in children that fosters attachment and bonding with the natural world, and is grounded in the resources and context of the community, then these children will not only develop a sense of the place that they are in, they will also (hopefully) develop care and concern for other places as well' (p.4).

For this paper we draw on both, Education for Sustainability (EfS), and Socio scientific Issues (SSI) approaches for the following themes that provide a framework for our research:

- Science curriculum organised around 'socioscientific issues' foregrounds points of contention regarding problems for the wellbeing of individuals, societies and environments associated with fields of science and technology
- EfS should 'not just be an isolated transmission of specialist information, but a process whereby students are empowered to take their learning into their own hands and capable of contextualising what they learn into their practical life.
- Educating for scientific citizenship should be 'based on meaningful rather than token empowerment, participation and ownership' (Sterling 1996, p.35)
- EfS requires an integrating pedagogy across the school curriculum and between the school curriculum and the wider community, particularly students' homes. 'The starting point [for] curriculum projects is the identification of a socio-scientific issue in the community rather than a pre-ordained syllabus of conventional science content' (Robottom 2012, p.100).

- EfS aims to collaboratively develop a vision of a sustainable community which includes both an understanding of how the world (ecosystems) works but also the associated values that underpin community-wide cultural change towards sustainability
- the need to have a more sophisticated representation of science practices in the school setting and to better engage students in contemporary settings of science' (Tytler 2012, p.159).

New Pedagogy Studies

Internationally, and in Australia there has been a long history of research in education focused on advancing democracy, social justice, and more recently environmental sustainability. For the past few decades this research has been framed in the field of Curriculum Studies, but the field has shifted recently with the emergence of what Green (2003) calls the 'New Pedagogy Studies' (p.18). The term 'pedagogy' is a keyword in the field of education and increasingly in the related fields of cultural studies, media studies and social theory more generally (Morton & Zavarzadeh 1991). Some now even claim that we live in a 'totally pedagogized society', a society in which all sites of socialization and work become, in effect, pedagogical sites (Bernstein 2001; Ball 2009). Lingard (2007) captures this logic of pedagogy studies in his phrase: 'it is through pedagogies that education gets done' (p. 247). Invoking the term pedagogy, foregrounds the 'why' questions, and links educational practice explicitly to debates over purposes, and against defining teaching/ learning/ education to a prescription of methods or highly scripted approaches that undermine local interpretation.

Historically, pedagogy studies have focused almost entirely on teaching and learning in schools and many of the key debates constitute what is called 'critical pedagogy'. 'Critical pedagogy now' reflects an ongoing rejuvenation of critical social theory from sources such as, feminism, postcolonial theory, antiracism, Indigenous studies, and for our purposes from Educating for Sustainability (EfS) and Socio scientific Issues (SSI) approaches. Critical pedagogy studies now informs public policy in many states of Australia, including the adoption of multiliteracies, development of productive pedagogies in Queensland, Quality Teaching in NSW, and the Teaching for Effective Learning (TfL) model in South Australia. Broad contours of critical pedagogy are provided by Gore's (1993) analysis of two strands of 'critical pedagogy'; one that she rightly argues is 'not critical *pedagog*y, but [rather] critical *educational theory*' (p. 42); and the other that 'makes pedagogy, the central concern' (p. 42). The first provides an elaboration of pedagogy as politics and engages with the key challenges of our times, such as:

- how to learn to live together in communities of increasing cultural diversity
- how to rethink environmental and science education in light of the urgent need for sustainable futures or educating for sustainability (EfS).
- how to advance citizenship as practice in education with an ethic of care (Zembylas, 2010)

The second 'offers concrete suggestions and examples taken from … pedagogical practice' (p. 40), 'that is, pedagogy as the politics of classroom practice' (p. 42) and more recently the practice of public pedagogy. A focus on pedagogy as practice for new pedagogy studies focuses attention on:

- how to sustain pedagogical innovation in schools and in the public culture
- how to cultivate approaches that treat seriously both lifeworld knowledges of students and citizens, and subject specific knowledge in the pedagogical encounter

In the last decade, critical public pedagogy studies (Sandlin, Schultz et al. 2010; Sandlin, O'Malley et al. 2011) has gained traction for scholars interested in the pedagogical/political aspects of cultural studies. An interest in pedagogy outside of educational institutions, such as schools, seems obvious given that we are 'being educated' by popular culture and media culture (Giroux 2004), other institutions such as museums (Ellsworth 2005) and everyday life (Luke 1996). We are all 'learning' about who 'we' are as individuals, as groups such as nations, and even the possibility of thinking past the nation (cosmopolitan

imaginary) through our engagements in a 'total pedagogised society'. In our brief account below are beginnings of an innovative dimension to this new field: the public pedagogy of 'citizen science'.

Two models of 'citizen science' in middle schools

The rest of this paper outlines two different models of using citizen science to design science teaching in the middle years in South Australia. These two models were developed as part of larger teacher professional development projects that used an action research approach involving collaboration between middle years teacher-researchers and academic researchers. For the first model—researching an iconic species—teachers have engaged with a large public *citizen science* program in which students collect scientific data about a specific iconic species, such as possums, magpies, blue tongue lizards and spiders. In the second model, middle school teachers selected a local urban ecological issue and developed their own 'citizen science topic'.

Model One: Researching an iconic species

This model was developed when we sponsored the participation of a few schools/teachers in a large public *citizen science* program established by Barbara Hardy Institute.[i] Such citizen science projects require a bilateral exchange of information between scientists and the wider community (Roetman, 2013; Roetman & Daniels, 2011). Scientists provide educational information about the project predominantly via local ABC radio and a webpage with information about the species being researched, (eg ringtail possum, pygmy possum) For the first two projects (Operations Bluetongue and Operation Possum), CD-ROMs with education resources, devised by urban ecologists and the ABC marketing team, were sent to a small number of schools in the hope they would participate. These resources focused on scientific information about the species involved, and included basic lesson concepts. Through connecting to the Barbara Hardy Institute's formal citizen science program, educators were able to access expertise on the iconic species.

In the last two projects (Operations Magpie and Operation Spider), more comprehensive and sophisticated resources were created in partnership with science teacher educators from the University of South Australia, and these were disseminated online and during face-to-face workshops (Zeegers *et al.*, 2012). The materials developed for these last two projects utilised established teaching frameworks, the Interactive Teaching Sequence (after Faire & Cosgrove 1988) and the 5Es (Australian Academy of Science 2014) approaches which centred on student inquiry, and included explicit links to the South Australian school curriculum (South Australian Curriculum Standards and Accountability framework DETE 2001) and the Australian Curriculum (ACARA, 2013).

The development of this first model focused on teachers implementing citizen science units of work about magpies (2009) and spiders (2010) and researching an aspect of their pedagogy and involved:

- a successful application of a small internal grant to research the impact of citizen science projects on teachers confidence to teach science and engage students in meaningful science which connected them to the natural world, and provided funds to release teachers to meet in focus groups;
- teachers working in research roundtables in 2009 to design curriculum informed by the Operation Magpie citizen science materials either after attending a professional development workshop or accessing online materials through the Barbara Hardy Institute Website. Thirteen of these primary teachers shared pedagogical strategies that supported students to connect with their local environment and who volunteered to plan and teach a unit of work on birds (see Paige et al 2010).

- professional development workshops for Operation Spider at various locations in 2010. In addition an action research network was funded by the *School of Education Aspirations Project* (SEAP)[ii] involving two primary teachers and three Year 8 teachers teaching a unit of work on spiders and researching an aspect of their teaching practice. The pedagogical model again focused on the two established teaching frameworks. Action research topics emerged as these teachers explored their practice, including innovative use of ICTs and a focus on students' questions as the basis for investigations.

One key outcome of the citizen science units was the teachers' positive use of the school grounds to engage students in meaningful science.

Model Two: Citizen Science *not* connected to iconic species

In the second year of the SEAP project (2011) the Barbara Hardy Institute did not run a statewide iconic species citizen science project. Instead we devised an alternative model for a 'citizen science' curriculum. Or put simply, given there was no iconic species to drive the curriculum focus, we had to deal with this question: what curriculum themes could we work with that would enable a citizen science approach? We implemented the action research model as per previous years that followed this sequence:

- term 1 – provocation and induction into 'citizen science';
- term 2 – designing curriculum and pedagogy;
- term 3 – enacting the redesigns using action research methods;
- term 4 – evaluation and documentation.

During 2011, the network involved the teachers from 2010 and teachers from two additional schools. During term 1 and 2, the teachers developed their own citizen science themes including: 1) a Year 8 exploration of a cross-curriculum unit between Science and the Humanities, using cane toads as the focus; 2) an exploration of how the introduction of a school kitchen garden changed student behaviour and attitudes towards their learning; and, 3) An exploration of how learning about the weather in year 8 science positively impacted on the development of middle school students' scientific language.

The first project began with a cross-curriculum unit of learning on vertical gardens. But due to engineering implications and cost involved in establishing a vertical garden in the time available, the teachers changed their topic to an interdisciplinary topic to focus on a cane toad invasion. The two teachers taught the same class, one taught the Science and one Humanities. They co-planned learning activities for students in this class utilising both ways of knowing. Time was spent in class developing an agreed set of symbols for each of disciplines and the students became quite adept at knowing the discipline focus for each learning activity. The students visited the local park regularly collecting data about specific fauna and flora and used grids to record location and density. The intention was to develop a model using their data about what would happen over time if a cane toad or two made their way to Salisbury. The final task involved students presenting their findings through an assessment-as-exhibition. The teachers found that giving students responsibility for developing solutions and actions allowed them to understand how each of the disciplines were different and how they were connected.

The second project involved year 5/6 students establishing garden beds at school, cooking healthy lunches once a week from garden produce and the re-invigoration of the Indigenous garden in the schoolyard. Their research question was "In what ways can the introduction of a school 'kitchen garden' change student behaviour and attitudes towards their learning?" The focus of the study was on food, where it comes from and how to grow it. They established a school composting system, set up a propagating compound to raise seedlings, explored salinity of soil and effects on plants, reported it in a school newsletter, established a hay bale garden, collected data about flowering plants, wrote letters to local companies for donations and kept veggie journals. A year later this school had established a

butterfly garden and walking trails with painted poles (students designed and painted with an artist in residence funded by the project) with names of local plants explicitly included. The garden is in a public school not fenced and has not been vandalised during the two years of operation.

The third group of teachers focused on weather and climate and the research question they investigated was 'What learning is gained from engaging/connecting students in micro climate data gathering? 'They focused on thinking and working scientifically through procedural writing. After collecting prior knowledge about students' understanding of atmospheric systems, types of weather and how to measure it, students worked in groups of four to collect data on different attributes, rotating tasks each week and comparing their data with that from the *Bureau of Meteorology*. Students were required to write up their procedure for collecting data about air pressure, humidity and temperature thus providing a context for writing. Teachers listed the following key points about their unit of work at the final presentation: 1) using the micro-climate at the school was the motivation that engaged the students to think and work scientifically 2) students cognitive learning was enhanced through personal connections with the micro-climate 3) the link between the natural world and implications for improved scientific language and understanding and, 4) inspiration from a movie titled *PLAY AGAIN* encouraged teachers to organize a student excursion to a wilderness area.

The quality of the action research increased significantly over the two years as teachers realized the benefits for their students and their own professional learning. Through providing an opportunity to develop their own topic connected to their students' life-worlds (Moll, 1992) rather than rely on an iconic species resulted in rich learning for the teachers and their middle school students. The three projects described above provided rich learning outcomes that evolved as a result of encouraging teachers to construct learning programs that connected with student life-worlds.

What did we learn? And the future?

Both models of citizen science provide a way of connecting citizens to the natural world through involvement in citizen science projects. The first large-scale model involves school and community members collecting and submitting data in 'real science surveys" around iconic species broadening the knowledge of the urban ecology and making the participants more aware of the world around them. The second model focused on teachers building their confidence to teach science through developing their own topics using socio-scientific issue as the context for learning.

At the conclusion of the SEAP we identified the following key findings:

- Modelling a pedagogical framework which encompasses contemporary practices provides early career teachers with the confidence and capacity to independently plan sequential, transdisciplinary, interactive learning experiences in science.

- Action research formalizes teachers' reflective processes, and supports school-based curriculum and the redesigning of pedagogy

- Participation in a research based professional learning experience provides teachers with opportunities to move from classroom technicians to pedagogical intellectuals.

- Connecting young learners to the natural world through a citizen science approach provides a meaningful context for learning about science in the primary/middle years of schooling.

- Building relationships amongst educators (classroom teachers, teacher educators, ecologists) contributes to students' aspirations to be successful at school, and beyond.

Long term participation in small professional learning communities that were supported by University academics, proved to be a context for powerful learning for these teachers. If citizen science approaches to teaching science in schools are to continue and to be sustainable further support for professional learning of the kind we describe here are required. To advance what we have been calling our first model, we think there are many large scale citizen science projects being conducted in Australia (and elsewhere) that teachers could connect up to. We have identified a few of these in an early part of this paper. Of note here though is the scaffolding that the Barbara Hardy Institute has conducted, in collaboration with staff from the School of Education, to produce materials that could be used by teachers in schools who are keen to connect with their iconic animal projects. Further curriculum work by other projects would assist teachers who wanted to adopt these projects as part of their science courses.

On our second model, we want to invoke Smyth and Wrigley (2013):

> *If we are serious about democracy and social justice, schools must become a site for critical and engaged thinking about the world's big problems including climate change, racism, hunger and war. If we truly wish to generate wisdom, we need to help young people to become more critical about the goods and values promoted by a consumer society*. (p. 11)

Our citizen science teachers network focused on big global problems, in particular, educating for sustainability and developing scientific literacy. Another strength was exploring pedagogical ideas of 'open architectures' in which teachers provide learning structures whilst still allowing space for students to make their own decisions. The idea of valuing what students bring to school is not new but is something that was a focus of this project and requires ongoing support by education systems and from national curriculum projects. In which case, in the future we need further research that asks these questions: How do teachers interpret the various curriculum frameworks into actual classroom practice? Are curriculum frameworks empty slogans, or do they contribute to real and lasting change at the level of practice? How do middle school teachers use citizen science to engage students in learning science? What do the students learn? Is there a change in attitude by teachers and students towards science? How does citizen science connect with ANC and EfSF?

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[i] See http://www.unisa.edu.au/Research/Barbara-Hardy-Institute/Research-1/Citizen-Science/

[ii] In 2010 the University of South Australia (UniSA) was awarded funding by the Commonwealth Department of Education, Employment and Workplace Relations under the Diversity and Structural Adjustment Fund, to improve the aspirations of students in schools in the northern suburbs of Adelaide. These schools fall into the low socio-economic bracket where young people are less likely to consider a tertiary education once leaving school. Participating schools worked with university educators on action research based projects that would help teachers' engage their students in intellectually demanding learning experiences and support them to be successful learners. Four Action Research Networks were established one of which was *Citizen Science-Urban Ecology in the Middle Years of schooling.*