

## Efficacy, Agency and Behavioural Change: Evaluation of a Local/Global Sustainability Education Program

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### Abstract

*As world population increases, and as more and more individuals make increasing demands on the earth's resources, the mandate for effective Sustainability Education (SE) becomes more urgent. This paper describes a longitudinal evaluation of a project currently being undertaken in government primary and secondary schools in New South Wales, Australia, funded by the NSW Department of Education and Communities (DEC). The Climate Clever Energy Savers (CCES) Project is designed to raise awareness among school students about ways of reducing electricity consumption at their schools. Students are invited to tender for funds of up to \$2000.00 to support a program (such as an education campaign, or building or appliance modification) to reduce electricity consumption. The overarching research question concerns the extent to which and ways in which the program has achieved the desired behaviour changes and educational outcomes. We have found the project to be highly effective, but also suggest some modifications to further enhance its effectiveness.*

**Keywords:** Sustainability, environment, education, efficacy agency

### Introduction

A mandate exists for effective Sustainability Education (SE), to educate us how to "live as if the world mattered" (Jickling, 2009, p. 209). This paper describes a longitudinal evaluation of a project currently being undertaken in government primary and secondary schools in New South Wales, Australia, funded by the NSW Department of Education and Communities (DEC).

The Climate Clever Energy Savers (CCES) Project was established and is jointly managed by the NSW Department of Education and Communities and the state Department of Environment, Climate Change and Water. The \$5 million funding is delivered through the Asset Management Directorate and managed by the K-12 Directorate. The CCES project aims to raise awareness among school students about ways of reducing electricity consumption at their schools. The evaluation of this project was implemented by a university team who sought to answer a number of research questions, which are discussed later in this paper. The overarching research question concerns the extent to which and ways in which the program has achieved the desired behaviour changes and educational outcomes.

The project under evaluation

The following section derives heavily from the resource and information kit provided to participating teachers, *Resources for teachers 2010: Climate Clever Energy Savers* (NSW DET, 2009).

The CCES program's aims are to assist students in years 3-10, aged about 7-16 years, to devise proposals aimed at reducing electricity consumption at their school. The program provides an interdisciplinary approach to studies of sustainability; and offers a real-world, problem-solving

approach to issues of sustainability, supported and scaffolded by Department personnel and technology. As part of the program, students are invited to submit applications for funding to support an initiative that will reduce their school's electricity consumption and associated costs. Each project can apply for up to \$2000.00.

The DEC, via the CCES team, provides support in a number of ways for the projects, including in-service workshops, a resource kit with teaching/learning activities and advice on how to implement the program, and links to a variety of subject-based syllabuses. Support is also offered via a teacher wiki, an e-folio and via email, as well as the possibility of site visits from CCES team members.

## **Conceptual Framework**

### ***Sustainable development and the environment***

The NSW Department of Education and Training (DET<sup>1</sup>) defined 'environment' as "the aggregate of all the conditions that support living things" or "the aggregate of all the conditions that influence the life of an individual or population" (NSW DET, 2001, p. 7). Bridge and Demicco (2008, p. 9) discern four elements of the (Natural) Environment: the biosphere, lithosphere, atmosphere and hydrosphere. These are components of the biophysical system, which is one of four broader systems, each of which is sustained in the following ways, according to Fien (2004, pp. 185, 186): the biophysical system (sustained through conservation), the social system (sustained through peace), the economic system (sustained through development) and the political system (sustained through democracy). Each of these, we believe, is open to contestation.

'Ecologically sustainable development' describes "a pattern of activities that meet the needs of the current generation without prejudicing the ability of future generations to meet their needs" (NSW DET, 2001, p. 9). Purnell, Sinclair and Gralton (2004) discern direct and indirect sustainability behaviours. The former includes tree-planting, recycling and diligence in switching appliances off when not in use. The latter refers to political and social actions, such as writing to the media and politicians, and discussions with others. This definition would also include a good deal of current education for sustainability.

### ***Education for sustainable development***

Education is surely central to any significant response to concerns with regard to sustainability. UNESCO (2004, p. 11) reported "a common consensus that education is a driving force for the change needed" with regard to education for sustainable development (ESD). Both government policy documents and syllabuses are replete with statements affirming education for sustainability. It is acknowledged here that various terms exist for this field of education, such as Education for Sustainable Development (ESD; Summers, Childs & Corney, 2005) and Environmental Education, and Education for Sustainability (Littledyke, Taylor & Eames, 2009).

The Australian Department of Sustainability, Environment, Water, and Population and Communities (ADSEWPC, 2011) offers a helpful set of criteria against which to measure ESD. Such education must "involve everyone, be lifelong, be holistic and about connections, be practical and

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<sup>1</sup> In 2011, the funding body changed its name from the Department of Education and Training (DET) to the Department of Education and Communities (DEC).

be in harmony with social and economic goals and accorded equal priority" (paras 1-13). This equal accordance to environment, society and economy is the so-called "triple bottom line" or "three pillars".

### **Agency, Efficacy and Leadership**

The development of leadership and agency is vital to action on sustainability (Hill, Wilson & Watson, 2004). Similarly, Reynolds (2009, p. 109) refers to the agency potential of ESD, claiming that it "is about empowering people to contribute to a better future through mindset changes, critical reflection and building new skills". The NSW DET K-12 Curriculum Directorate developed a five-step Sustainability Action Process. Department of the Environment, Water, Heritage and the Arts further funded and developed this process: making a case for change; defining scope for action; developing a proposal for action; implementing the proposal; evaluating and reflecting (DEWHA, 2010, p. 9).

Fullan (2001) places teachers first and foremost in their role as change agents at a local level. And yet, leadership itself needs to be sustainable (Hargreaves & Fink, 2006), and needs, in turn, to be supported by appropriate and adequate resources. Similarly, collegiality and teamwork are essential, although there are some pitfalls associated with contrived collegiality (Grimmett & Crehan, 1992).

Fullan (2001) places teachers first and foremost in their role as change agents at a local level. And yet, leadership itself needs to be sustainable (Hargreaves & Fink, 2006), and needs, in turn, to be supported by appropriate and adequate resources. Similarly, collegiality and teamwork are essential, although there are some pitfalls associated with contrived collegiality (Grimmett & Crehan, 1992). Education for sustainable development needs to be 'enabling in nature', in affording learners a sense of agency, in terms of their capacity to effect change with regard to the natural world. This, it is hoped, will enable the natural environment to repair and renew itself with fewer human impediments. Summers, Childs and Corney (2005, p. 629) observe that ESD enables people to develop the knowledge, values and skills to participate in decisions about the way we do things individually and collectively, both globally and locally, that will improve the quality of life now and without damaging the planet for the future.

These two dimensions, the individual-collective and the local-global, offer another potentially useful frame of reference for both our education and our actions for sustainability.

Agency or efficacy (Bandura, 1977, 1997) refers to developing the capacity, confidence and sensed mandate for key stakeholders to take action on a matter considered important. There is a considerable body of literature on the significance of teacher efficacy and agency, particularly as predictors of resilience, satisfaction, commitment and retention. For the purposes of this study, we will adopt Tschannen-Moran and Woolfolk Hoy's (2001) definition of teacher efficacy as a teacher's, "judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated" (p. 783). Clearly, a teacher's perceived ability or inability to effect a love of learning on the part of their students is a key contributor to successful educational and behavioural outcomes on the part of students.

While the following refers broadly to teacher commitment and contentment, it has relevance for all of teachers' undertakings, including engagement in sustainability education. Chan, Lau, Nie, Lim and Hogan (2008) discovered that, along with identification with school, teacher efficacy was a strong predictor of commitment to teaching. Equally relevant to this study, they found that perceptions of organisational politics correlated negatively with commitment, while opportunities

for reflective dialogue formed a positive correlation with intentions to remain in the profession. Similarly, Ware and Kitsantas (2007), in a large-scale study of more than 26000 teachers and 6000 principals, identified strong links between teacher efficacy beliefs and commitment to the profession.

More recently, Skaalvik and Skaalvik (2010), in a study with more than 2000 teachers, established a link between teacher efficacy, job satisfaction and burnout. They discerned five contextual elements affecting teacher efficacy for the purposes of their study: time pressures, autonomy, relations with parents, discipline problems and supervisory support. Interestingly, relations with parents emerged as the most influential contributor to teacher efficacy. (See also Hoover-Dempsey, Bassler & Brissie (1987), who established a link between school-home relationships and teacher efficacy, but stopped short of ascribing causality.) Skaalvik and Skaalvik (2010) also identified a strong correlation between the two elements of autonomy and supervisory support. By contrast, discipline problems were found to correlate more weakly with teacher efficacy. This confirms anecdotal evidence and literature that teaching is most importantly about relationships, as part of a community of practice (Allen, 2007; Wenger, 1998). Secondly, Skaalvik and Skaalvik's (2010) findings also suggest that discipline problems, as might be encountered in schools that are difficult to staff, do not necessarily undermine teacher efficacy, at least when they are encountered in a context of strong support from supervisors. Similarly, Ross and Gray (2006) established a direct link between effective leadership and both teacher commitment and efficacy, in a study involving more than 3000 teachers.

In an Australian study, Le Cornu (2009) investigated the contribution of Professional Experience to teacher resilience. As with other studies, relationships emerged as central "to the complex and dynamic interactions between individuals and their 'student teaching' contexts" (p. 717). As mentioned above, this has important implications for any teacher undertaking, including the program under investigation here.

### ***Behavioural change***

While it is not our purpose to provide a treatise on behavioural change here, existing frameworks can inform our understanding of the processes involved in the program under evaluation, and reasons for its success or frustration. It is widely accepted that some combination of individual variables (such as knowledge, skills, belief, attitudes and values) interacts with social and environmental factors to operate on human behaviour (Kollmuss & Agyeman (2002). There is a range of views about the form that this interaction takes, or the relative importance of, or interaction among, these factors. They are discussed in relation to environmental behaviours or pro-environmental collective action. Ultimately, we concur with Jackson (2005, p.6), who asserts that, Human motivations are so multifaceted that about the only thing one can say with absolute certainty is that it is virtually impossible to derive universal causal models with which to construct behaviour change policies in different domains.

Nevertheless, as stated above, we discuss some approaches in terms of how they may inform our understanding of this program and its associated projects, in terms of changed behaviour and understanding on the part of both teachers and students.

Making sense of behaviour inevitably requires a multi-dimensional view that incorporates both internal and external elements. In particular, as Stern (2000) has noted, a useful model has to account for: motivations, attitudes and values; contextual or situational factors; social influences; personal capabilities; and habits. Kollmuss and Agyeman (2002, p. 240) summarise the main models

of behaviour in the literature on environmental behaviour/action as falling under the following categories: the linear progression model; altruism, empathy and pro-social behaviour models; sociological models.

Stern (2000) points out that there are several distinct types of environmentally significant behaviour and that varying combinations of causal factors determine the different types. There is a range of theories as to the determinants of environmentalism or the values from which pro-environmental behaviours arise. Further, Stern (p. 412) proposes the Value-Belief-Norm theory to explain why people take action due to pro-environment personal norms. With this theory, environmental action is motivated by: altruistic and biospheric values; an ecological worldview; a belief that something of value is under threat; a sense of responsibility to take action, coupled with a perceived ability to have an impact on the threat.

Bamberg and Moser (2007) assert that pro-environmental behaviour is best viewed as a mixture of self-interest and pro-social motives. They suggest that attitude, social norm, and perceived behavioural control (PBC) as well as moral norm, combine to predict intention. Intention to act in a pro-environmental way was identified as a key determinant, accounting for, on average, 27% of the variance of pro-environmental behaviours (p. 20), although how such a figure is determined is open to conjecture. Attitude, behavioural control and personal moral norm were identified as the three main predictors of pro-environmental behaviour, with problem awareness an indirect determinant of pro-environmental intention. The impact of problem awareness seems to be mediated by moral and social norms, guilt, and attribution processes.

Behavioural economics contends that we do not reach individual decisions in isolation, but look to others to determine our behaviour, a form of social conformity. Dawney and Shah (2005) identify a number of relevant theories underpinning the concept of social norms. Social learning indicates that we learn by observing what other people do; social proof contends that we look to others to see how to behave, especially in situations of risk and uncertainty; and social identity theory notes that we demonstrate a strong bias toward 'similar others' or members of the 'in-group'. For policy makers, the important lesson is that we may need to focus on changing social norms in the medium to long-term to achieve lasting behavioural change. Examples of where this has been successfully done include smoking in public places and, picking up one's dog's droppings.

## **Conduct of the Study**

The methodological approach is informed by the team's experience carrying out evaluations of school-based projects and sustainability initiatives in a wide range of settings.

The key principles that have embodied the methodology include: participatory inquiry; a mix of quantitative and qualitative methods; use of a variety of inputs; use of a mix of subjective and objective measures; drawing on existing materials to maximise time effectiveness for the project. The project obtained ethical clearance from the university and the funding body.

Further to the main research question, introduced above, on behavioural outcomes from the project, the following sub-questions have driven our work:

- How and to what extent have teachers linked syllabus and content outcomes to energy saving and greenhouse gas reduction projects? Similarly, how have they embedded sustainability education into their teaching and learning programs?
- How and to what extent have students been engaged in authentic learning (including those using an interdisciplinary or cross-curricular approach) in order to develop deep understanding of the purpose, content and processes?

- Within participating schools, has this program met students' expectations for support? (i.e. how well have students been supported to use the Sustainability Action Process to generate and implement proposals for energy reduction and engage in learning for sustainability?)
- Have some schools had particular success with the program, and if so what were the features of their approach and the factors that enhanced the CCES program?
- Have schools struggled with implementing the program, and if so what were the features of their approach and the factors that hindered the CCES program?\_What, if any, unanticipated outcomes have there been?

While the full report on the project comprehensively addresses each of these features of the program, a briefer account of these processes and their effects will be provided in this paper.

### **Data Collection**

The evaluation entailed a participatory enquiry approach, in which school stakeholders were asked to provide existing data pertinent to the Climate Clever Energy Savers (CCES) program.

An electronic survey of as many participating schools as possible. The purpose of the survey was to obtain a broad picture of the level and nature of participation in the program, as well as general perceptions of successes and barriers to implementing the program in schools. All 189 participating schools were invited to take part in this survey. Completion of the survey was a condition of funding, and a response rate of over 90 percent was attained by the time the survey closed. A pilot survey was conducted with small and diverse sample of schools.

Case studies of a sample of schools, six in total at the time of writing, to ensure a representative sample. Principally, these comprised those schools that emerge as sites of best practice. A smaller number of studies have been undertaken with schools that identified particular problems and difficulties in implementing the CCES Program.

Case studies comprised:

On-site visits or telephone conversations, each supplemented by a member check of notes arising from the interactions; interviews with key stakeholders, focusing mainly on project co-ordinators; analysis where possible and appropriate of documents such as the school's SEMP (School Environmental Management Program), curriculum documents, lesson plans and teacher evaluations thereof, teaching/learning resources, student work samples, evidence of energy consumption, saving and actions collected by in-school student project teams, utility bills over time; CCES curriculum and professional learning materials; records from CCES Regional meetings.

Data collection has been guided by advice obtained from the NSW DET Curriculum Directorate and consultations with school teams.

### **Data Analysis**

CCES is implemented through a five-step action process: making the case for change; defining the scope for action; developing the proposal for action; implementing the proposal; and evaluating and reflecting. The evaluation sought to determine: the extent to which this process scaffolded the energy reduction initiatives; and the capacity of the process to contribute to students' autonomy in sustainability action. Further to this, the project investigated effects on morale and pedagogy, of projects deemed by stakeholders to have failed or to have had limited success. The project

interrogated the initial criteria, stated or implicit, for the projects concerned, and factors that promoted or inhibited the projects. It also sought participants' views on what might be done differently in future.

Qualitative and quantitative data analysis was undertaken with regard to the ways in which schools have managed to achieve the stated aims of the program, that is, the extent to which schools:

- enabled students to undertake energy saving and greenhouse gas reduction projects, linked to syllabus-based outcomes and content;
- enhanced student engagement in learning through interdisciplinary, authentic project-based sustainability work;
- embedded learning for sustainability into the school curriculum;
- expanded the participation of primary and secondary teachers from a range of subject areas in student-directed, project-based sustainability learning by providing structured professional learning and scaffolded teaching and learning resources.

Investigations took place in the context of the Human Society and Its Environment (HSIE) and Science and Technology curricula in particular in senior primary years, and with regard to Technology, Science, Geography as well as Design and Technology syllabuses in the junior secondary years.

Data were gathered formatively and iteratively, providing opportunity to advise the DEC CCES Team about the findings as the project proceeded.

## **Findings and Discussion**

The findings are overwhelmingly favourable. For example, when asked how to improve the program, one primary teacher from the south coast replied,

I think it's quite good as it is and has enough broad scope to cover a multitude of approaches and provide option for different capacity levels. Generally it's succinct, well set up and clear. Don't mess with a good thing!

This project constitutes a helpful source of assistance for the school, albeit arguably small in school budgetary terms. We note that some schools 'topped up' their CCES budget with their own financial support. One Northern Sydney secondary teacher observed, "the implementation of the winning proposal has been an asset to the school" as well as being highly rewarding for the students.

## ***Nature of the project***

Programs were divided into five main types. Note that the total number of theme codes exceeds the number of projects analysed, as some projects corresponded to more than one category. It should be noted that probably all projects come under the umbrella of 'awareness campaigns'. Results are shown below.

**Table 10** Program type (n = 409)

PROGRAM TYPE	NUMBER	PERCENTAGE OF VALID RESPONSES
<b>AWARENESS CAMPAIGN</b>	<b>125</b>	<b>30</b>
<b>SWITCH OFF LIGHTS, APPLIANCES</b>	<b>110</b>	<b>26</b>
<b>APPLIANCE MODIFICATION (TIMERS ETC.)</b>	<b>75</b>	<b>18</b>
<b>BUILDING MODIFICATION (SKYLIGHTS ETC.)</b>	<b>62</b>	<b>15</b>
<b>ADAPTATION (E.G. WEARING A JUMPER)</b>	<b>37</b>	<b>9</b>

Examples of an awareness campaign include: the production of badges, posters, bumper stickers or dramatic performances educating and reminding people to switch unused appliances off.

Money was devoted to, among other causes:

- buying equipment such as lux meters to measure existing light in classrooms;
- materials and installations, such as skylights, insulation and automatic door closers;
- purchase of appliances such as cameras to record performances and the like;
- release from face to face teaching;
- paying a general assistant to undertake tasks such as replacing all light globes with more environmentally friendly ones;
- travel for site visits and/or and payment of guest speakers;
- consumables such as paper and lamination, or prizes and other incentives.

Most commonly, the projects involved the following subject areas: English, Human Society and its Environment, Science and Technology, and mathematics in primary school, and Geography Science in the secondary years.

As mentioned above, the CCES projects appear to have achieved a high degree of educational efficacy, and have garnered a good deal of interest across the gamut of students, including those with special needs or learning difficulties, and those in gifted and talented or opportunity classes, as well as other non-mainstream students.

Features of the projects and program that appear to be attractive, and to contribute to this success, include:

- Student-centredness. The projects are student-centred, -owned and -driven, in that they invite, indeed demand, responses and initiatives from students;
- Authenticity. The projects are authentic, practical and 'real-world', entailing applications for real funds. The CCES projects are significant and relevant to the lives and futures of students involved;
- Immediacy of context. The projects seek local solutions to identified local problems, as illustrations of a global issue, as part of a 'think global, act local' approach and philosophy;
- A problem-solving approach. The projects entail identification of a matter to be resolved at school. This results not only in a quest to solve a problem, but, as we have seen from



discussion of proposals at various schools, the problematising of solutions, with the evaluation of various ways forward.

- Capacity for service. The projects involve service learning, with its inherent capacity to extend students beyond, themselves, as well as to explore the experiences and perspectives of others, and to develop empathy;
- Transdisciplinarity. The projects often transcend subject areas, and also venture beyond sustainability matters, developing students' expertise in literacy, numeracy, team work and advocacy skills among others, as well as engendering higher-order thinking. They are ambiguous and unpredictable in nature, rendering them educationally rich, albeit with the potential problems that can accompany unpredictable teaching/learning experiences.
- Concrete outcomes. One of these is the success of the grant itself, resulting in the receipt of money. Beyond this, many projects resulted in physical reminders of changed or changing behaviour and attitudes, ranging from advertising posters and stickers, to skylights and appliance timers.

We also believe that the program 'positions itself' very effectively, with its ostensible rationale of saving money for the school, as much as saving the planet. This fiscal rationale serves to neutralise to some extent the arguments proffered by climate change sceptics or deniers, and establishes common ground and goals, regardless of one's views on the veracity of climate change. The argument of saving money for the school is a compelling one to put to principals, and to parents who contribute to their children's education through taxes and perhaps other support. The goal of reducing electricity costs is an attractive, local and measurable one. One Western NSW high school identified an estimated annual energy-related wastage of over \$5000.00. A school is an ideal microcosm for young people's investigation of energy use globally. As intimated above, a number of projects snowballed and took teachers and students in unexpected directions.

We add, however, some generic caveats with regard to the project:

- We believe the approach has much to offer. If overused, however, the approach could lose its current appeal, so we suggest this as a one-off for any particular student.
- It is not always a straightforward matter to separate CCES outcomes from other, related outcomes, some of which might arguably have happened in any case. This is not necessarily a shortcoming of the projects; arguably it is in fact a virtue. If the projects fit relatively seamlessly into existing programs, this is to their credit. We mention it, however, in order not to ascribe to the projects outcomes that may have occurred in their absence.
- By definition, these projects in their current form are not sustainable without continued funding. It is possible that savings effected by reduced electricity consumption could be devoted to future projects. Nevertheless, it should be kept in mind that money is not the only currency in this equation. The outcomes relate as much to education, citizenship and sustainability as they do to matters fiscal. We also note that some projects will need little or no ongoing funding, such as the installation of solar panels, appliance timers or skylights. It may be worth bringing this fact to the attention of prospective project leaders.
- The process is labour intensive, but perhaps no more so than any other suite of teaching/learning activities being planned for the first time. As ideas that have been tried accrue and are made available to new participants, the amount of planning and preparation work should diminish commensurately.
- While we want to applaud the creativity, energy and ingenuity of the teaching and learning activities that were reported to us, we do offer a few words of caution. There is a risk of

style over substance, or rhetoric over science. It is our view that the 'climate sceptics' are arguably more guilty of the latter (rhetoric over science). This only adds to the mandate not to fall into the same trap, however, particularly with young, impressionable people. Metaphor is an excellent way of linking the unknown to the known, the invisible or the nano- (minute scale) or tera- (immense scale) to the readily observable (Aubusson, Harrison & Ritchie, 2006). Metaphors are inevitably limited, however, and there is always a risk of style displacing substance in any teaching/learning endeavour.

Illustrating the above, one school correctly interpreted a declining trend in electricity consumption at school. It may be, however, that in the months from August to November, the last four months depicted in the graph, power usage declined in line with a reduction in heating use, during the southern hemisphere spring season.

More broadly, we note that schools, systems and assessment regimes tend to engender a 'culture of correct answers'. Children have become conditioned to this, and CCES is not immune to it. CCES is to be applauded for its capacity to challenge and transcend this, but this potential, along with the potential complexity of CCES projects, may need to be specifically brought to the attention of teachers and students.

### Concluding Remarks

Suffice it to say that the CCES projects meet many of the criteria associated with effective education, as set out at the beginning of this section. We offer again our congratulations to the teachers, students, regional coordinators and the CCES team.

Foster (2006) among others, refers to the so-called triple bottom line: social equity, economic prosperity and environmental quality (p. 126). Subsequently, however, he asserts that, "the environment is always the *bottom* bottom line" (p. 128, emphasis in original). He continues, "the other two goals, of material prosperity and social justice are important and must be pursued by any civilised society, but there can be no prospect at all of achieving them unless basic survival conditions are met". Our congratulations extend beyond solely organisational and educational ones. If the majority of scientists are correct, and climate change is real, these students are leading the way in mitigating its causes.

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