

Sustainability Across The Australian Curriculum: Will It Remain A Priority?

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Abstract: The purpose of this article is to articulate the significance of education for sustainable development in order to support the integration of sustainability as a cross-curricular priority within the newly developed Australian Curriculum. An investigation into the implementation of sustainability across the curriculum was carried out in two Australian public schools in order to identify its relevancy to various learning areas. The developmental history of the Australian Curriculum will be explored to contextualize this article within the current socio-political environment. Discussions with teachers suggested that the political agendas surrounding the curriculum had influenced the implementation of sustainability in different learning areas. The school located in the Labor electorate had demonstrated their ability to implement sustainability in all six learning areas investigated. Results from the school located within the Liberal electorate showed that sustainability was less of a priority with the implementation of three out of the six learning areas teaching sustainability organizing ideas to students. Semi-structured interviews were conducted with the head of curriculum of both schools and their perception of the environment was determined using Sauvè's (1992, 1994) typology of conceptions for the environment. Focus group discussions with year seven and ten students had identified conceptions similar to that of their head of curriculum. Students identified environmental issues in their discussions and suggested education, as a means for combating climate change. Students expressed that sustainability was important and did so with concerns for the future.

Keywords: Australian curriculum, education for Sustainable Development, explicit teaching, sustainability, relevancy.

Introduction

Humanity is faced with unprecedented environmental challenges that can be attributed to climate change. There is a global responsibility to educate individuals to practice and lead the way for sustainable development. Since the United Nations Earth Summit convention in 1992, there has been increasing recognition of the critical role that education could play in promoting sustainable development. Furthermore, discussions within chapter 6 of Agenda 21 had placed emphasis on sustainable development and its role in all streams of education (UNSD, 1992). Agenda 21 (1992) provided the catalyst for the progression of traditional environmental education, known for its single focus on ecological knowledge. Thus created the movement towards a more comprehensive approach in addressing environmental issues within education, through the adoption of the economic and social perspectives within sustainability education.

In 2005, the United Nations declared a Decade of Education for Sustainable Development (DESD). This was the first globally recognized initiative of education for sustainable development (DESD, 2008). The United Nations Educational Scientific and Cultural Organization (UNESCO) describe their vision of education for sustainable development as “*A world where everyone has the opportunity to benefit from quality education and learn the values, behavior and lifestyles required for a sustainable future and for a positive societal transformation*” (DESD, 2008). Although the decade for education for sustainable development is coming to an end in 2015, one could hope that this vision will remain a powerful and positive influence on education.

The Australian Education for Sustainability Alliance (AESA) supported the declaration by promoting sustainability education as a prerequisite for building a sustainable future. AESA (2012) is also optimistic in achieving a sustainable world, “*One in which all ecological, social and economic systems have the capacity to renew themselves indefinitely.*” Despite the government’s efforts to cut the AESA funding, it is continuing to support Australian Schools in providing sustainability education strategies. Both UNESCO and AESA demonstrate homologous visions for sustainability within their ethos in respect to the inclusion of the social, economical and environmental aspects that interconnect within education for sustainability.

Education for Sustainability Development (ESD) encompasses the three elements of the United Nations pillars of human development: social development, economic development and environmental protection. These form the foundations on which education for sustainable development are built and distinguish ESD from traditional environmental education. Birdsall (2011) suggests that there is a fine line separating this distinction on the grounds that environmental science is now involving socio-scientific issues and political agendas within its pedagogical practices.

ESD is described by Tilbury (1995) as being interdisciplinary, values-focused, participatory and aimed to politicize students. Australia is demonstrating an interdisciplinary approach towards sustainable development by implementing ‘Sustainability’ as a priority across the national curriculum. The Australian Curriculum has harmonized both UNESCO and the AESA visions of education for sustainable development within many of the Sustainability organizing ideas. Throughout their foundation, primary and secondary years of schooling students will be taught sustainability ideas such as “*The sustainability of*

ecological, social and economic systems is achieved through informed individual and community action that values local and global equality and fairness across generation into the future” (ACARA, 2013).

The purpose of this article is to articulate the significance of education for sustainability in order to support the Australian Curriculum Assessment and Reporting Authority (ACARA) in their decision to incorporate sustainability as a cross-curricular study. The development of the Australian Curriculum will be explored to contextualize this report within the socio-political environment the Australian Curriculum is currently associated with. The Australian Curriculum is a new national syllabus and has become contentious with the recent political decision to review the national framework. Pending the outcomes of the review, in this paper I will discuss the findings of an investigation into the curriculum in two Australian schools in order to identify the implementation of the sustainability organizing across the curriculum and its relevancy to various learning areas, students and teachers.

The importance of education for sustainable development

The importance of education for sustainable development (ESD) is reflected in the need to respond to the social, economic and environmental challenges the world is facing, while providing an antidote to a sense of hopelessness regarding our future. In addressing sustainability within the national curriculum, Australia has joined countries such as Japan, Netherlands, Canada and Switzerland in their attempts to develop a sustainable future for generations to come through education (DESD, 2008).

Learning outcomes associated with ESD have been described in literature with eloquence, emphasizing the significant benefits for students. Ray, Wei & Barrett (2013) believe in preparing students in becoming system thinkers, critical analyzers and creative problem solvers that can arise to the challenge for building a sustainable world in which we live. They suggest that an improvement in students' attitudes towards school, especially for those who are disconnected from their current education, can be recognized in those partaking in ESD (Ray, Wei & Barrett, 2013). Ray, Wei & Barrett (2013) looked to science, technology, engineering and mathematics (STEM) as the learning areas that can form foundational content knowledge in which ESD can flourish through experience based learning activities. They also support ESD as it can help to improve students overall grades, particularly in science and mathematics (Ray, Wei & Barrett, 2013). A 2006 international survey conducted by the Program for International Student Achievement (PISA) suggests that the integration of ESD can better students' understandings of science (OECD, 2007). In doing so students are more aware and have greater feelings of responsibility for sustainable development (Uitto et al., 2011). ESD promotes learners to be involved in real word problems in which they can relate to, allowing them to become driven and informed individuals. Students are encouraged to voice their concerns for environmental issues using their scientific understanding and skills (Birdsall, 2013).

The Department of Environment, Water, Heritage and Arts (2010) suggests that education for sustainability is not simply the acquisition of knowledge and skills, although very important in understanding the complexities of sustainability, these alone will fail to generate actions towards sustainability. Demonstrating a holistic approach towards ESD by addressing the intrinsic elements students hold about social, economic and environmental issues is paramount in facilitating commitment and motivation amongst individuals to take sustainability action. According to the Commonwealth of Australia (2010) ESD can help to

promote active and informed citizens within our society. As it provides students with the opportunities to explore and evaluate contested and emerging issues, gather evidence, and create solutions for a sustainable future.

The developmental history of the Australian Curriculum

Australian schools have been encouraged to implement the Australian curriculum since 2010 (ACARA, 2013). The Australian Curriculum Assessment and Reporting Authority (ACARA) began to develop the national curriculum under the Labor Government early in 2008 (ACARA, 2013). It has been a rigorous endeavor that endured an eighteen-month drafting process with educational experts and advisors. The draft was then open to the public for a further ten weeks where over 12,000 consultations took place. This was done in order to revise and provide feedback before the document was trialed in over 2,100 Australian schools (ACARA, 2013).

The result was a three dimensional national curriculum including general capabilities, learning areas and three cross-curricular priorities. The members of the ACARA board and all educational ministers had endorsed all three dimensions. However, the finer details are still being refined. Learning areas such as Information Technology and Languages are still under development or are awaiting final endorsement from States and Territories. Learning areas undergoing these circumstances are continuing to be governed by their previous state curriculum.

The three cross-curriculum priorities were designed by ACARA to incorporate aspects of the 2008 Melbourne Declaration on Educational Goals for Young Australians and provide topics that are relevant to student lives. They included: Aboriginal and Torres Strait Islander histories and cultures; Asia and Australia's engagement with Asia; and Sustainability. During the development of the curriculum respondents had asked for more details to be provided for the implementation of the cross-curriculum priorities. The chairman of ACARA, Professor Barry McGraw responded by including content elaborations within the learning areas that offer ideas about how the priorities can be taught (McGraw, 2014).

There have been tensions regarding the cross-curriculum priorities since the Liberal Government came to office in 2013. In regards to the three cross-curriculum priorities Educational Minister Christopher Pyne has said that "*there's some questions about whether those themes fit with maths and science*" and that the curriculum has a left-wing bias (McGrath, 2014). As mentioned earlier, according to the PISA report sustainability education has the potential to improve over all grades in science (OECD, 2007). The 2012 PISA results showed that Australia dropped six places for scientific literacy and four places for mathematical literacy (Department of Education, 2013). At the same time the federal funding for the Australian Sustainable Schools Initiative (AuSSI) had ended, "*Governments don't understand the value of a program like AuSSI and the richness of learning it can offer by being so hands on*" said the president of the Victorian branch of the AEU (Australian Education Union) in relation to the funding cut (ACTS, 2013). The PISA results were used by the Education Minister to emphasize the need to introduce performance pay for teachers, for what he believes is the answer to the decrease in academic results. There have been no recent efforts by the Education Minister in supporting sustainability education programs. To the contrary the minister has been accused of deeming sustainability as 'green politics' that have made their way into the curriculum.

The educational minister had called for a curriculum review in January 2014, in order to evaluate the “*robustness, independence and balance of the Australian Curriculum*” (Schriever, 2014). The announcement of the review concerned educational leaders across Australia. Some 176 teaching professions had expressed their trepidation about the timing for the review in a signed letter to the Educational Minister -considering the curriculum had not been finalized. Another concern expressed in the signed letter to Christopher Pyne was the suitability of Dr. Kevin Donnelly as one of two to review the curriculum. According to ABC world today’s reporter, Pat McGrath (2014) Dr. Donnelly is a former teacher known for his writings on traditional practices in education with titles such as ‘*Why our schools are failing*’, ‘*Dumbing down*’ and ‘*Educating your child: It’s not rocket science*’. He has stated “*the fact that the only perspectives through which every subject, including history, must be taught are indigenous, Asian and environmental reveals an ideological slant*” (Marshall & Preiss, 2014). Donnelly is suggesting that the curriculum is skewed towards a particular ideology, yet there have been attempts to impose his own ideology on education with the push to introduce bibles in schools (McGrath, 2014). The liberal government supports Christian ideologies and their place in education. This was demonstrated by actions to set aside twenty thousand dollars from the so-called ‘deficit’ budget to provide public school with chaplains.

In response to the federal review, ACARA released a statement in March of 2014, welcoming the idea. ACARA believes they are “*obligated to provide our future generations with the best possible learning opportunities and outcomes*”. The authority also stated, “*Work on the national curriculum is never completed. It will always be a work in progress*”.

Sustainability as a cross-curriculum priority

Education for sustainability is implemented as a cross-curricular priority, as no single learning area provides all the essential knowledge and opportunities to enable students to contribute to sustainability alone (Commonwealth of Australia, 2010).

The Australian Curriculum defines sustainability as “*addressing the ongoing capacity of Earth to maintain life*” (ACARA, 2013). The sustainability curriculum is divided into three main categories: Systems, World Views and Futures. These categories were developed based on ACARA’s interpretations and prioritizations of the sustainability curriculum framework recommendation made by the Department of Environment, Water, Heritage and the Arts (DEWHA) (2010). The recommendation formally acknowledges sustainable action as their central learning goal, it states that sustainable knowledge and skills have little meaning if they do not lead to effective action. This can be achieved through what the DEWHA calls the “*sustainability action process*” (See figure A) and can be identified easily within the organizing ideas within the Australian sustainability curriculum.

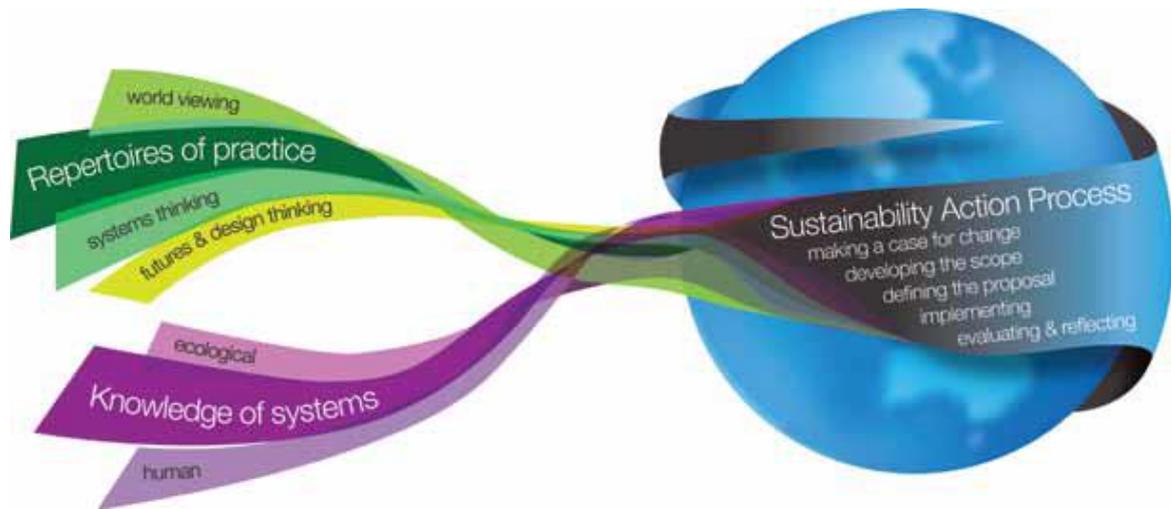


Figure A: A schematic demonstrating the components of the ‘Sustainable Action Process’ as a part of the recommendations for developing the sustainability cross-curriculum priority. The process acknowledges world viewing, system thinking, futures & design thinking as well as ecological and human systems. The Sustainable action process promotes the following: Making a case for change; developing scope; defining the proposal; implementing, evaluating and reflecting (from Department of Environment, Water, Heritage and the Arts, 2010, p. 9).

Underneath each category are the nine ‘organizing ideas’ for sustainability (refer to Table 1), which reflect the essential knowledge, understandings and skills that students will gain whilst being incorporated into their studied learning areas. In developing the sustainability curriculum ACARA has rectified the recommendations in its fundamental ideas of what constitutes sustainability. The organizing ideas present sustainability within an environmental, social, cultural and economic interdependent context. The cross-curricular study places an emphasis on the sustainable patterns of living for future generations and improving sustainability for local and global communities through individual and collective endeavors (ACARA, 2013).

The Australian Education for Sustainability Alliance (AESAs) (2012) believes that incorporating sustainability into the curriculum is step in the right direction. For it will create epicenters of sustainable knowledge and experiences in schools that will influence surrounding communities. Involving the community is a significant point, for individuals are not educated purely to benefit themselves and to maintain their knowledge and skills in isolation. In fact it’s quite the opposite, they share their knowledge and skills with the society in order to benefit and prosper- and education for sustainable development is no different.

The Australian Curriculum states that, “Cross-curricular priorities are embedded in all learning areas. They will have a strong but varying presence depending on their relevance to the learning areas” (ACARA, 2013). As this statement suggests, all learning areas will encompass sustainability in some form or another and to a degree that reflects the relevancy of sustainability to that particular learning area. This will be explored during the investigation into the implementation of sustainability as a cross-curriculum priority within two Australian schools.

Table 1: *The Australian Curriculum organizing ideas for sustainability (developed from ACARA, 2013).*

Sustainability Organizing Ideas	
Systems	
OI.1	The biosphere is a dynamic system providing conditions that sustain life on Earth
OI.2	All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.
OI.3	Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.
World Views	
OI.4	Worldviews that recognize the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.
OI.5	Worldviews are formed by experiences at personal, local, national and global levels, and are linked to individual and community actions for sustainability.
Futures	
OI.6	The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.
OI.7	Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.
OI.8	Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.
OI.9	Sustainable futures result from actions designed to preserve and/or restore the quality and uniqueness of environments.

Methods

A qualitative and interpretive methodological approach was used for this research project. Results will demonstrate if sustainability is a priority that is embedded in all learning areas. The investigation involved co-operations with the head of curriculum, six teachers and twenty-four students from two Australian public schools. One of the schools offers environmental science for students to study (School B) and the other does not (School A).

In preparation for this investigation three research questions were proposed:

- 1) Is the sustainability organizing ideas being implemented across the six different learning areas?
- 2) Is sustainability relevant to all learning areas?
- 3) What does sustainability mean for students?

A hypothesis was formed based on a statement from the Australian sustainability curriculum. It was hypothesized that the sustainability organizing ideas will be embedded in

all learning areas for both schools. The explicit teachings of sustainability will reflect the relevancy of sustainability to that learning area.

Barraza, Duque-Aristizbal & Rebellodo (2003) suggest that environmental education has served as a vehicle for education for sustainable development (ESD) and for this they share similarities in terms of their knowledge on the environment and sustainability. On this basis a second hypothesis was formed that the school offering environmental science (School B) will demonstrate a greater ability to implement sustainability across all six learning areas. Background information on the schools can be found within Table 2 below.

Table 2: Background information on the two schools chosen for conducting research (based on information from the school's vision and values and the Australian Electorate Commission (2014))

School Background Information		
School	A	B
Electorate	Deakin (Liberal)	Bruce (Australian Labor Party)
Demographic	Outer metropolitan	Outer metropolitan
Values	Mutual respect, trust, contribution of all, tradition, loyalty. Promotes students to become flexible, adaptable and innovative leaders in the local and global community.	Values for learning: Creativity, curiosity, discipline, reflection and resilience. Values for community: Compassion, empathy, integrity, respect and responsibility.
Offers environmental science studies	No	Yes For years 10, 11 & 12.

The schools were chosen based on the researchers previous professional experience placement, using those connections seemed most appropriate to account for the time constraints of the research. Formal invitations for the research were emailed to the principal of each school and supervising teachers were assigned to aid the organization process for data collection. Data collection required co-operation from a number of staff to ensure time was allocated from their busy schedule in order to participate.

The head of curriculum for both school A and B were interviewed using numerous prompt questions to facilitate discussions about the curriculum, issues surrounding education, and the implementation of sustainability across different learning areas. In order to document the discussion for interpretative analysis transcripts and voice recordings were analyzed. Using Sauvè (1992, 1994) typology of conceptions for the environment, participants were asked to tick a box description that represented how they perceive the environment. This would provide the researcher with information for the type of relationship and principal characteristics in which the head of curriculum associates with the environment.

There are currently seven main learning areas in the Australian curriculum including English, Mathematics, Science, Humanities and Social Sciences, The Arts, Health and

Physical Education, and Technologies. The criteria for selecting staff was that they worked full time as practicing teachers and did so solely within the school where they were interviewed; their willingness to participate; and co-operate with the research. Teachers from each of the following learning areas were interviewed: English, Mathematics, Science, Humanities, The Arts and Health. Unfortunately, the Technology staff from both schools was unable to partake in the interviews. Totaling six teachers as participants for each school. The science teacher interviewed at school B was specifically chosen because they taught environmental science. This was done to ensure the variable of school B offering environmental science was considered in the research. Teachers participated in a semi-structured interview where they discussed what sustainability means to them and whether or not sustainability is relevant to their learning area. Transcriptions and voice recordings were employed in order to interpret and analyze the discussions. Using a survey sheet the teachers of each learning area were asked to identify the sustainability organizing ideas in which they explicitly, implicitly or did not address during their teaching practices. Explicit teaching was explained to educators as a mode of teaching whereby the students were acquiring the knowledge and understanding deliberately or directly as a consequence of planning for a desired learning outcome. Implicit teachings of sustainability were considered to be incidental and were indirectly taught to students, usually through discourse. Explicit and implicit teaching is also referred to as directly or indirectly teaching students sustainability and should not be interpreted as explicit and implicit (or tacit) *knowledge* described by many educational theorists such as Reber (1989).

Year seven and ten students were asked to partake in the research. For the purpose of this research year seven students are representing the foundations of sustainability that is taught in their first year of secondary school. Year 10 students were chosen to represent the progression of sustainability understandings and the conclusion of the secondary Australian curriculum before moving onto VCE studies. Focus group discussions with students were conducted with six (6) year seven boys and six (6) year seven girls and likewise with year ten students. This was done at either the beginning of recess or lunch to avoid disruptions in students' class time. Discussions involved how students rely on the environment, environmental issues, describing an ecosystem and the subjects where they had learnt about sustainability and whether or not they thought sustainability was important and why.

In conducting the research three out of four paradigms based on Seale (2002) were considered to enhance the validity and reliability of the qualitative and interpretive methodological approach. These include: truth-value, applicability and neutrality. The fourth paradigm consistency was avoided, as the purpose of the research was to determine a comparison between the two schools rather than achieve a replication of results, for this would interfere with the true nature of the research if this paradigm were considered. Consistency could be accounted for if this research involved numerous schools with similar backgrounds (Table 2). The truth-value relates to the researchers confidence in the truth of the responses from each respondent, asking participants to answer truthfully and stating that the discussions will remain confidential had helped to achieve this.

Applicability determines whether the findings are applicable to other contexts or with other subjects, this was addressed by conducting the investigation within two schools rather than one. The research would benefit from interviewing numerous teachers of the same learning area, as this would increase the applicability of the results. Conducting the investigation in more Australian schools will most likely be suggested to ensure that reliable inferences could be made for a population of Australian schools. However, this research

primarily focuses on the quality of discussions that took place. To provide a deeper understanding of how the sustainability curriculum was being incorporated in the different learning areas rather than providing a longitude representation of Australian schools as a populace. Determining the neutrality of the researcher was addressed by using the same questions for each participating teacher, the researchers background and educational interests were not disclosed to prevent the inquiry from being subject to bias or motivations of the researcher. The discussions were informal allowing students and teachers to openly voice their thoughts and opinions. The researcher advocated this by allowing the participants to elaborate during discussions between questions.

Results and discussion

In investigating the implementation of sustainability within two Australian schools three research questions were proposed to identify the implementation, relevancy and the meanings of sustainability for students and teachers. First and foremost, the implementation of the sustainability organizing ideas within different learning areas will be discussed. The results obtained will then provide a means for determining the relevancy of sustainability to particular learning areas. Comparisons between the rank of relevancy determined by the researcher and the relevancy determined by the number of sustainability elaborations provided by the Australian Curriculum will be discussed. The meaning of sustainability to students and teachers will be explored to identify if they perceive sustainability through a social, economic and environmental perspective as indented by the curriculum, rather than traditionally perceiving sustainability purely from an environmental standpoint. The three aspects (implementation, relevancy and meaning) focused on during the research will provide an insight to how the new educational framework is being addressed in two Australian schools and what challenges teachers are faced when implementing the sustainability curriculum.

Implementation

School A had implemented sustainability in three out of six learning areas that were investigated including: Mathematics, Science and Humanities (see Table 3). The science teacher at School A had embedded all nine organizing ideas of sustainability into their pedagogical practices using both explicit and implicit methods. This suggests that the organizing ideas regarding the biosphere as a system and sustainability in terms of worldviews were not explicitly taught.

Khishfe & Abd-El-Khalich (2002) suggests that implicit approaches towards teaching students is not effective in helping students to develop informed conceptual knowledge, in particularly the concepts regarding the nature of science. Therefore, the indirect teachings of the biosphere and worldviews may not have been fully acquired by the science students. For the purpose of this article explicit teaching will be considered the most effective approach for teaching the sustainability organizing ideas. The sustainability organizing ideas that were taught directly to students (O.I 2, 3, 6, 7, 8, & 9) were demonstrated during student focus group discussions at School A. Students in year ten at School A discussed matters that effect ecosystems such as biodiversity and species extinction but failed to connect these issues with the impacts they would have on the biological, social and economic systems within the biosphere.

The year ten students had contextualized the environment as a resource that needed to be managed. The head of curriculum at this school also perceived the environment as a resource that was to be managed, through the use of in Sauvè's (1992, 1994) typology of conceptions of the environment. Perceiving the environment in this light demonstrates principal values such as "our collective biophysical heritage and sustaining quality of life". Both the head of curriculum and year ten students had recognized reduce, reuse and recycle as a strategy for sustainable action, which coincidentally are synonymous with the teaching strategies described by Sauvè (1992, 1994) in regards to perceiving the environment as a resource. This demonstrates the understandings of sustainability in a more socio-political context as there is a focus on the environment as a resources that belongs to humanity and needs to be managed more so to maintain the quality of our lives rather than the quality of life as a biosphere.

The humanities teacher at School A had explicitly taught five out of the nine organizing ideas, which were spread over the three sustainable categories. In doing so, this teacher had provided students with a range of sustainable concepts from systems, worldviews and a futures perspective. In doing so will create informed individuals that have the potential to be facilitators for sustainable action.

Table 3: Summary of the results obtained from the sustainability organizing ideas survey for school A representing the sustainability organizing ideas embedded in each learning area and number of those that are explicitly or implicitly taught to students.

School A				
Learning area	The Sustainability Organizing ideas (SOI) embedded within learning area. (Refer to table 1 for full description of organizing ideas (OI)).	Total SOI implemented out of 9	Explicitly taught (Directly)	Implicitly taught (Indirectly)
English	None	0	0	0
Mathematics	OI. 5	1	0	1
Science	OI. 1, 2, 3, 4, 5, 6, 7, 8 & 9	9	6	3
Humanities	OI. 2, 4, 5, 7 & 9	5	5	0
The Arts	None	0	0	0
Health	None	0	0	0

The English, The Arts and Health learning areas did not implement any of the sustainability organizing ideas at School A (see Table 3 above). English is a subject that all students must study, and the students being taught by the English teacher interviewed at school A was not provided with the opportunity to learn sustainability from a literacy perspective. This includes how sustainability is perceived in the media and how professionals in the sustainability field are communicating ecological, economical and social issues to the general public. The English teacher had explained why they had not learnt about any of the cross-circular priorities and even in some circumstances had failed to address the English curriculum fully. This was due to the needs and diversity of the students as many students

were from a non-English background or had learning disabilities, therefore a focus on basic literacy was required.

Throughout the year seven to ten Australian curriculum The Arts learning area has the greatest number of sustainability elaborations with a total of fifty-five (Table 6). One would expect that with so many elaborations for ways to include sustainability within The Arts, these teachers would implement a great number of sustainability organizing ideas. This was not the case for School A, as no sustainability organizing ideas were addressed. This teacher had stated that the Arts faculty had not yet addressed the Australian Curriculum as a whole and that they were unaware of the cross-curricular priorities. At the same time this teacher thought that sustainability could be incorporated into any learning area, as it was just a matter of planning and preparation.

In School B, the Science, Humanities and Health learning areas had implemented all nine of the sustainability organizing ideas (see Figure B). Science and Humanities had used explicit methods for teaching sustainability. These learning areas are obvious contenders for implementing sustainability due to the environmental education influence on the content regarding ecosystems and the environment in subjects such as biology and geography for example. The year 10 students of both schools said that they had learnt about ecosystems in science but failed to articulate what an ecosystem is or the interrelated elements within an ecosystem. Unlike the year sevens from each school who could explain that an ecosystem “*involves interactions between living things like plants and animals with non living things such as water and soil*”. The year sevens from School A had said that they had learnt about sustainability from sources other than school. One student said “*my cousin goes to primary school and she told me about climate change*”. Others said that they learnt about sustainability from the Internet and movies such as Wall-E and back to the future.

The English curriculum has the least number of sustainability elaborations, with only one between the year seven and ten (Table 6). This was not represented in the research for the English learning area at School B. The English teacher had addressed eight out of nine sustainability organizing ideas (Table 4), and had said in the interview “*I think that sustainability is very important for our future*”.

Mathematics for both School A and B had only implemented one sustainability organizing idea (see Figure B), although the organizing idea for each school was different, each mathematics teacher had taught them implicitly. Mathematics is a discipline that can develop students understanding and skills required for engineering and economics. Ashford (2004) believes that those who are educated in engineering, technology and economics can help to produce comprehensive policies designed to promote sustainable development in the future. Ray, Wei & Barrett (2013) also advocate technology, engineering and mathematics to be incorporated within education for sustainable development in what they call the STEM program for sustainable development. This is a science, technology, engineering and mathematics interdisciplinary professional development program designed to improve teacher and students attitudes towards sustainability education.

The Science and Humanities learning areas for each school had implemented the greatest number of organizing ideas within their pedagogical practices (see Figure B). However, in School B the health teacher had also addressed all nine organizing ideas, whereas the health teacher in School A did not address any sustainability organizing ideas. In school B the health teacher discusses sustainable development similar to that of the United

Nations they stated that “sustainable development is generally thought to have three pillars: Environment, society and economy”. They also explained “if we are to have a healthy and prosperous community we need to have a healthy environment that provides clean air, drinking water as well as food and resources for it members”.

Table 4: Summary of the results obtained from the sustainability organizing ideas survey for school B representing the sustainability organizing ideas embedded in each learning area and number of those that are explicitly or implicitly taught to students.

School B				
Learning area	The Sustainability Organizing ideas (SOI) embedded within learning area. (Refer to table 1 for full description of organizing ideas (OI)).	Total SOI implemented out of 9	Explicitly taught (Directly)	Implicitly taught (Indirectly)
English	OI. 1, 2, 3, 4, 5, 6, 7 & 9.	8	4	4
Mathematics	OI. 8	1	0	1
Science	OI. 1, 2, 3, 4, 5, 6, 7, 8 & 9	9	9	0
Humanities	OI. 1, 2, 3, 4, 5, 6, 7, 8 & 9	9	9	0
The Arts	OI. 2, 3, 4, 5, 6, 7, 8 & 9	8	3	5
Health	OI. 1, 2, 3, 4, 5, 6, 7, 8 & 9	9	5	4

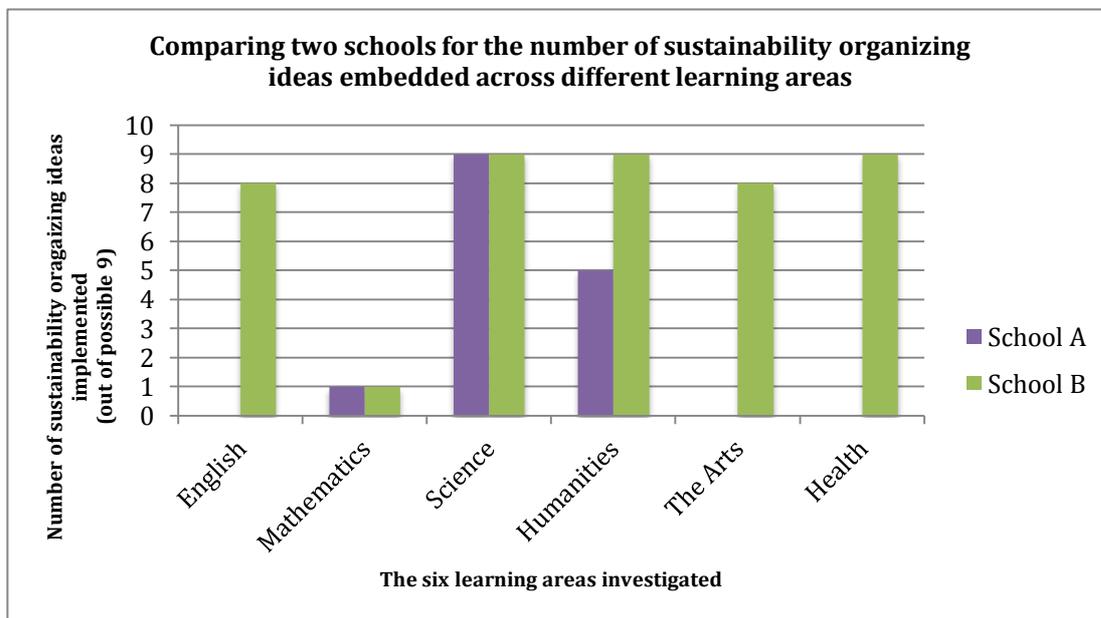


Figure B: A graph comparing the total number of sustainability organizing ideas that were embedded across six different learning areas in two schools, School A located within a Liberal electorate that does not offer environmental science (purple) and School B located within a Labor electorate, that does offer environmental science (green).

Sustainability was not embedded in all six learning areas investigated during the research at School A (refer to Table 3) but those that did showed a range of sustainability organizing ideas taught to students, with the exception of mathematics. Therefore, the hypothesis that the sustainability organizing ideas will be embedded in all learning areas was rejected because this was not applicable to all learning areas investigated within two schools (see Figure B). However, the teachers from School B had implemented sustainability in all learning areas investigated and did so with strength and variance as the curriculum suggests. Therefore the second hypothesis, that the school offering environmental science (School B) will demonstrate a greater ability to implement sustainability across all six learning areas was supported.

Environmental education was offered at School B and may provide explanations as to why all learning areas had embedded sustainability. It could be suggested that students at this school value sustainability due to their understanding of environmental issues demonstrated in the focus groups. But students at school B also demonstrated their knowledge in regards to environmental issues such as biodiversity and species extinction. Interviews with teachers suggest that the teachers from school B were more aware of environmental issues and the sustainability curriculum than those teachers at School A. For the English teacher and Arts teacher from School A were unaware of the cross-curricular priorities.

Another reason proposed as to why the majority of the teachers from School A did not address sustainability within their learning area could be due to the political agendas surrounding the curriculum. These include the liberal views, which were expressed by mathematics teacher from School A, suggesting that the curriculum “had a left wing bias”. Therefore based on the data collected and comparisons drawn, the politics surrounding the curriculum had inadvertently influenced the implementation of sustainability in the School located within the Liberal electorate.

Relevancy

The relevancy of sustainability to a learning area was determined by considering two factors. The first was the combined total of the implemented sustainability organizing ideas for each learning area. This was considered the fundamental attribute for relevancy, for the implementation of a variety of sustainability organizing ideas; as this will achieve the erudition and skills related to systems, worldviews and futures of sustainability. In doing so will address the social, environmental, economical and political constructs within sustainability that will create active and informed individuals motivated to take sustainability action.

The second factor determining the relevancy of sustainability to a learning area was the combined total of explicit implementation being larger than the combined total of implicit implementation. This assumes that the sustainability organizing ideas were directly implemented into the learning outcome being taught by the teacher as apposed to being indirectly implemented through discourse alone.

According to this taxonomy, sustainability was regarded as highly relevant to the science learning area. It demonstrated the greatest total of implemented sustainability organizing ideas and these were explicitly taught to students. All nine of the sustainability organizing ideas was addressed in both schools for science. The difference between the two schools was that School A had taught the sustainability organizing ideas using both explicit

and implicit teaching practices and the school that offered environmental science (School B) had taught all the sustainability organizing ideas explicitly to students. Demonstrating the progression of environmental science in addressing social and economic contexts when teaching sustainability.

The humanities learning area is also considered to be relevant to sustainability as a total of fourteen the sustainability organizing ideas were explicitly taught to students. The humanities teachers did not teach sustainability indirectly and therefore it could be argued that sustainability is most relevant to this learning area. However, School A did not address all sustainability organizing ideas and as a result students would lack knowledge regarding the social, economic and ecological contexts of sustainability as these were included in the organizing ideas that were not addressed (see Table 3 & Table 1).

The sustainability rank of relevancy data did not correlate with the number of sustainability elaborations embedded within the seven to ten curriculum for each learning area. The Arts curriculum demonstrates the greatest amount of sustainability elaborations (see Table 6), which implies that there are explicit directions for implementing sustainability. This was not reflected in the results as The Arts teacher from school B had taught sustainability indirectly more so than they did directly (see Table 5 below) and the Arts teacher at school A did not address sustainability within their pedagogical practices at all.

Table 5: *The six learning areas investigated and their rank of sustainability relevancy determined by the total number of organizing ideas implemented and the total number of explicit implementation that is greater than total number of implicit implementation (explicit > implicit).*

Sustainability Relevance ranking	Combined total of implemented SOI		Combined total of explicit implementation		Combined total of implicit implementation	
1 st Science	9 + 9	18	6 + 9	15	3 + 0	3
2 nd Humanities	5 + 9	14	5 + 9	14	0 + 0	0
3 rd Health	0 + 9	9	0 + 5	5	0 + 4	4
4 th English	0 + 8	8	0 + 4	4	0 + 4	4
5 th Art	0 + 8	8	0 + 3	3	0 + 5	5
6 th Mathematics	1 + 1	2	0 + 0	0	1 + 1	2

Table 6: *Table showing the number of times a sustainability elaboration has been included in each learning area's curriculum between years seven to ten (based on ACARA, 2013). And whether or not teachers from each learning area thought that sustainability was relevant to that learning area.*

	The Arts	Humanities	Science	Health	Mathematics	English
Number of sustainability elaborations	55	45	28	10	3	1

School A: Is sustainability relevant to your learning area?	“No, not really but I’m sure it could be”	“Yes”	“Yes, when we learn about fossil fuels”	“Not in health, no”	“ I don’t think it’s important in maths, so no”	“ Not for my class this year as their literacy skills are low level”
School B: Is sustainability relevant to your learning area?	“Yes, definitely, especially in vis-com”	“Yeah it is, when we learn about resources such as the Murray-Darling Basin”	“Yes, definitely”	“Yes, when learning about population and resources”	“ Not really, more so when I was teaching science and maths together”	“ I think it is relevant , especially when reading how the media represents climate change ”

During the research teachers were asked if sustainability was relevant to their learning area (See Table 6). Amongst the 12 teachers interviewed for both schools five of them expressed that sustainability was not relevant to the learning area they teach. Reasons as to why, were primarily due to teachers being unaware of the inclusion of sustainability as a cross-curricular priority within the curriculum. The learning areas include: The Arts, Health, Mathematics and English. Four out of five of these teachers were employed at School A, which is located within a Liberal electorate.

There were discussions regarding the politics of the cross-curricular priorities with the mathematics teacher from School A. They gave insight to how the curriculum changes with the arrival of new political parties. This teacher suggested that the cross-curricular priorities “*were just a result of some greeny in politics*”. Demonstrating similar views to Christopher Pyne suggesting that the curriculum has a left wing bias. This teacher also expressed concerns that the curriculum is already “*too packed*” and that technology has made it harder to implement cross-curricular topics because of all the online paper work. They stated “*moving from paper to online was supposed to make things easier but it actually has made things more difficult because it takes up too much time*”. Birdsall (2013) explains that education for sustainability is marginalized due to “*teachers viewing it as yet another pressure in an already over crowded curriculum*”. Birdsall (2013) also discusses the politics involved in ESD and suggested that with the arrival of right wing governments the funding that is supporting teachers in implementing ESD is usually cut and this has been evident in New Zealand and Australia.

The Mathematics teacher at school B had said *“sustainability was more relevant when science and maths was taught together via a cross-curricular approach and this was when the students would calculate their ecological footprint and complete energy audits, but we don't do that anymore”*. Unfortunately, a reason as to why they no longer practice this approach was not discussed further. The remaining teachers from School B had stated the importance and relevancy of sustainability to their learning area. The head of curriculum at School B had stated that implementing the cross-curricular priorities *“relies on the individual teacher to actively seek out ways to incorporate it into their field and will require some fairly complex planning to make it a true cross-curricular priority”*. The head of curriculum also explained how the implementation of sustainability requires teachers to employ an explicit approach. They said *“it's going to require each faculty to be explicit in how they are going to incorporate it as apart of an overall curriculum focus on sustainability”*.

The meaning of sustainability for students and teachers

The students from school B had also demonstrated perceptions similar to that of their head of curriculum, implying that the head of curriculum has an influence on the sustainability culture within both schools. Using Sauvè's (1992, 1994) typology for conceptions of the environment, the head of curriculum at School B perceived the environment as a biosphere. The principal values associated with perceiving the environment as a biosphere include; a world in which we all live together into the future; and a world of interdependence between beings and things. The year seven students from School B articulated these values during a focus group. They talked freely about the interconnections between human beings and their environment, *“no matter where you live you need to look after your environment because it will impact on others”* the students had said. They discussed how *“the earth is like a massive ecosystem that's really hard to understand”* and that *“what ever we take from the earth we need to give it back because there will not be enough to go around for all the animals and sea creatures”*.

The students from both schools had expressed that sustainability was important and did so with concerns for the future, *“what are we going to do when all that we have left is money, you can't spend your money on things if you don't have a place to live”* said one year seven student from School A. All groups discussed how education could play a vital role in combating climate change, *“we need to be educated about these issues because that might make us passionate to want to change things and make a difference”* remarked the year ten boy from School A. Another student then joined the discussion *“ I am passionate about whaling and I would like to stop that”*. Year ten students from School A talked about whaling and made suggestions for joining the Sea Sheppard organization in their gap year.

The year seven students from School A (Liberal electorate) were considered to be highly informed individuals when compared to all the other students. These students were the only ones to articulate economical and social matters within environmental issues. They did this by initially talking about climate change, which then turned into a passionate discussion about the car industry. One student has said *“I heard that there was this car that didn't run on petrol and I think it ran on solar or something, and this car was bought by a car company so no one could buy it so they could still sell petrol cars”*. Another student had replied *“It's scary because all the car people have all that power”*. They had provided suggestions for solving the climate change issue *“we need to get away from fossil fuels and learn more about solar and wind power to help reduce climate change”*. These year seven students were asked

if they would like to learn more about sustainability and all unanimously replied “yes”. It was clear that sustainability was relevant to the students and their lives as many of the students from School A said that they had learnt about sustainability from sources other than school. If given the opportunity to learn about sustainability in classes other than science and humanities, I believe that the students from School A could really facilitate sustainable action within their community with the support of the school and their implementation of sustainability within their education.

The progression of sustainability knowledge from year seven to year ten was unidentifiable, in fact, the year seven students had demonstrated a greater ability to articulate what defines an ecosystem. In one school the year sevens had discussed sustainability using the social, economic and environmental contexts of sustainability described by the United Nations and Australian Curriculum. This may be due to the 2010 implementation of the Australian Curriculum and that the year ten students were not exposed to sustainability within their education until this time. While the year seven students had already learnt about sustainability in their primary school years under the Victorian Essential Learning Standards (VELS) curriculum.

Teachers from each school were asked, “What does sustainability mean for you?” Many of their responses resembled the sustainability definition provided in 1987 by the United Nations in “Our Common Future” stating “*Sustainability is meeting the needs of the present without compromising the ability of future generations to meet their own needs*”. The United Nations has since developed their definition of sustainability but it should be recognized what the 1987 definition lacks. Langhelle (1999) discusses the ethical implications of basing sustainability in terms of needs in a journal titled ‘Sustainable Development: Exploring the ethics of Our Common Future. Langhelle (1999) suggests that ‘Our Common Future’ places emphasis on the relationship between sustainable development and economic growth and that the ethical considerations have been overlooked in that document. Social justice, humanistic solidarity, a concern for the world’s poor, and respect for ecological limits are other aspects that should constitute within sustainable development and these are explored and justified by Langhelle (1999). Sustainable development currently encompasses three interdependent fundamentals: environmental protection, economic and social development that when taught to students can facilitate sustainable action within individuals, local and global communities.

In exploring the Australian Curriculum as a new national framework and how it was being implemented generally across the board. It was clear that the finalization of the document had created fragmentation in terms of learning areas addressing the new syllabus. The head of curriculum at both schools had expressed their concern that many of the learning areas were “*lagging behind*” or “*had not yet addressed the curriculum and were in a transitional process moving from VELS to the national curriculum*”. Tensions were identified by the head of curriculum at School B in regards to the “*haphazard nature of implementing sustainability*”. They also explained that the cross-curricular priorities require complex planning and that if the cross-curricular priorities are not supported from political leaders “*then everyone suddenly thinks this might not get through... so why waste time planning for such a comprehensive cross-curricular topic*”.

Planning was identified as a common theme precluding the implementation of sustainability within various learning areas. Although, the curriculum provides elaborations for how the topic might be covered, teachers interviewed described the elaborations as “too

broad” and “*lacking in how the priority might be assessed*”. To overcome this hurdle, it is recommended that ACARA should include the sustainability curriculum framework document designed by the Department of Environment, Water, Heritage and the Arts (DEWHA) (2010) as a link within the curriculum that can be easily accessed. Although this document was designed for curriculum developers and policy makers, it does provide details of the topics within sustainability and how they might be assessed. This would be beneficial for teachers as it provides them with a comprehensive resource for addressing sustainability within their learning area.

Chambers et al. (2013) subscribe another method for teaching and discussing sustainability in which they call the sustainability stew method. It includes an education module that is flexible and has the ability to introduce sustainability into different disciplines via problem framing. They looked at contextualizing sustainability for each classroom and addressed sustainability directly to the learning area. This enabled the multifaceted dimensions of sustainability to be explored, as the definitions and interpretations were different for each subject. This was achieved by exploring sustainability of what, for whom, when and where as a template for education for sustainability across multiple disciplines.

Final remarks

Education for sustainability should be prioritized within schools to ensure that the young people of today can provide a sustainable future for tomorrow. Australia has emphasized that sustainability education is a priority by addressing sustainability within the curriculum. Australian educators are faced with a new endeavor with the implementation of the national curriculum. I hope that schools around Australia take the necessary action to facilitate the implementation of all the cross-curricular priorities. To ensure an engaging and enriched educational experience that is relevant to students' lives by addressing their concerns for the future and enlightening their understandings of the past. Education for sustainability promotes the values of community whereby the social, economical and environmental aspects are holistically discussed in order to facilitate active and informed citizens. Individuals educated on sustainability will induce a cascade effect on the wider community and in turn, will facilitate a positive societal transformation and a sustainable future for all.

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