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Author

Pascoe, Joanne, Wyatt-Smith, Claire

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Curriculum literacies and the school garden

Joanne Pascoe and Claire Wyatt-Smith | Griffith University

ABSTRACT

This paper reports an investigation of the potential of school gardens as an effective middle years learning environment in which to teach curriculum literacies in a cross disciplinary manner. Drawing on the school garden literature and on interview data from key stakeholders at two Brisbane State primary schools, the paper provides perspectives on school garden curriculum literacy learning in the following curriculum areas: English, Mathematics or Numeracy, Science, Environmental Education, ICT and Art. The documented enthusiasm of the students when involved in school garden activities goes some way towards making the school garden an effective literacy learning environment. The study revealed that the students who were reported by teachers as benefitting most from curriculum literacy learning in the school garden were those with learning difficulties and behavioural issues. The literature often associates these students with lower literacy levels. The stakeholder comments point to an overall improvement in some skills, particularly writing and attitude to learning through meaningful integration of curriculum literacies to support classroom learning through garden lessons.

Introduction

The focus of this paper is the school garden as a site for engaging students in learning literacy in the curriculum. Of particular interest is how the garden works as a physical and curriculum learning space to bring into focus curriculum literacies across a range of learning areas. Literacy teaching opportunities occur both explicitly and incidentally during school garden lessons. Examples of several curriculum literacies accommodated within the school garden focus are provided together with descriptions of how discipline-specific literacy learning can occur in a school garden environment. The starting proposition for the study reported here is that literacy teaching is a cross-curriculum priority and the school garden allows curriculum literacies (Wyatt-Smith & Cumming, 2003) to flourish in a concrete learning setting. The authors draw on the school garden literature and on interview data from key stakeholders from two Brisbane State primary schools to inform this paper.

Background

School gardens are engaging, authentic learning sites, with various writers identifying students' enthusiasm for these spaces (Nutall and Millington, 2008; Alexander, 2009; School Food Trust, 2007). There are many different types of school gardens in practice today including indigenous gardens, kitchen gardens, garden clubs, re-vegetation projects (or native gardens), and permaculture gardens. They cover a wide array of aspects of the school curriculum, most with some form of environmental education or sustainability component. The garden programs may carry on across several teaching years and vary in size from container gardens run by an individual classroom teacher to large gardens which employ specialist garden staff. Malone and Tranter (2003, p. 289) describe school grounds as having

‘potential as a rich resource for formal learning’, as well as providing learning ‘via unregulated exploration and play’. As Henderson (2009) identified, central to student engagement with learning about literacies was the opportunity to engage with tasks with authentic purposes and audiences. The two school gardens investigated for the current study were established primarily to teach about nutrition and sustainability; however, many examples from middle years teachers and teaching staff included literacies across a variety of disciplines, including: English, Mathematics or Numeracy, Science, Environmental Education, ICT and Art.

Nuttall and Millington (2008) documented a teacher’s school garden development at Seville Road State School in Brisbane, Queensland in the early 1990s. The action to make a vegetable garden as a result of her Year 5/ 6 class’s suggestion to grow a rainforest, became ‘child initiated experiential learning’ (2008, p. 21). The teacher explained that from the students’ ideas, ‘It became my job to find the curriculum links and that, surprisingly, was not difficult’ (2008, p. 21). Examples of curriculum literacies included Maths – volume (ordering soil) and probability (fundraising by running a raffle); and English – report writing; speech writing and speaking skills (giving talks on field days).

Further afield, in Waynewood Elementary School, Virginia, one teacher integrated every subject into the garden lessons. For example, Science investigations included observing and documenting lifecycles of plants and nutrient analysis; mathematics covered design of gardens and measurements of plant growth; SOSE looked at the cultural and historical aspects of the plants; English involved reading stories about gardens of the world; and Art lessons involved drawing plants and animals in the garden (Miller et al., 2002).

She taught environmental education using a cross-disciplinary approach and simultaneously taught such core subjects as math, science, and geography. (Miller et al., 2002, p. 139)

Significance

The literacy learning outcomes of Queensland primary school students are significantly below those in New South Wales, Victoria, the ACT and many OECD countries. Further, within year levels there is a large difference between achievement of the highest and lowest performing students (Masters, 2009). Students from lower socio-economic schools and remote Indigenous schools remain amongst the lowest literacy performers in Queensland (MCEECDYA, 2009).

Minimum standards of literacy and numeracy are defined as ‘the critical level of skill an understanding without which a student will have difficulty making significant progress at school’ which leads to ‘significant effects on students’ future learning and functioning in society’ (ACARA, 2010, p. xvi). Not surprisingly, the Masters Report identified that at risk students or those who are struggling the most become *disengaged* and *disenchanted* with learning (Masters, 2009, p. 78).

Literacy

It is now widely recognised in practice, research and policy that literacy skills are a major determinant in students’ ability to learn in school (QDEA, 2009). The focus on literacy in Australian schools increased with the release of the Australian Federal Government’s Literacy goal that every child leaving primary school should be, ‘able to read, write and spell at an appropriate level’ (DEETYA, 1998). Literacy teaching is ‘about listening, speaking, reading, viewing and writing that engages students in cognitively demanding and intellectually rich work’ (Education Queensland, 2000, p. 7). The *Literate Futures* report defines literacy as: ‘the flexible and sustainable mastery of a repertoire of practices with the texts of traditional and new communications technologies via spoken language, print, and

multimedia' (Education Queensland 2000, p. 9). Wyatt-Smith and Cumming's definition includes 'reading, writing, listening, speaking, viewing and critical thinking' (2003, p. 47) and recognises that curriculum areas present particular literacy demands so that it is no longer appropriate to think of literacy as a set of basic skills spread homogenously across the curriculum.

Curriculum literacies

A review of literacy in Queensland state schools determined that literacy should be taught across the curriculum rather than confined to traditional English lessons (Education Queensland, 2000). Orr (1991) argues that mainstream education has dismantled knowledge into separate disciplines and that students graduate without any 'integrated sense of the unity of things' (Orr, 1991, p. 100). All states and territories in Australia adopt the position that literacy is integral to all curriculum areas and contributes to overall literacy progress of an increasingly diverse learning community.

Wyatt-Smith and Cumming (2003) show that literacy is not a generic skill across all curriculums, but instead, students require explicit discipline-specific instruction to learn the 'curriculum literacies' essential for students to be able to 'switch among' classroom activities (p. 51). For example, writing science reports requires specialised vocabulary, structure and graphics that are specific to Science. When these are not explicitly taught, 'they provide barriers to learning' (Education Queensland, 2006, p. 4). Tilbury and Wortman (2006) note that primary schools tend to be able to implement whole school programs more effectively than high schools because they generally have one main teacher across the core learning areas. Green (2009) made a similar point, arguing that 'developing literacy practices, repertoires and capacities has been perceived as distributed across the school and accepted as a shared responsibility by all curriculum areas' (p. 45).

Research design and method

The study reported in this section was a qualitative research project involving case studies as the research method. The data techniques employed included observation, semi-structured interviews and collection of secondary data source material such as National Assessment Program – Literacy and Numeracy (NAPLAN) results and the Australian Bureau of Statistics data.

Two Queensland State primary schools participated in the project. To protect the privacy of participants, the schools have been assigned the pseudonyms, Barindon State School and Cobdale State School. They represented two different types of school garden programs, namely, a sustainability-focused food garden based on a permaculture design and a kitchen garden program which is part of the Stephanie Alexander Kitchen Garden Program. Both schools differ in size, resources and socio-economic status. Barindon State School had a 2011 enrolment of over 600 students from Prep to Year 7, and Cobdale State School, a 2011 enrolment approaching 300 students from Prep to Year 7.

Both case study schools utilised the Australian Building Education Revolution (Federal Government) funding to pay for construction of their teaching kitchen facilities and utilised free labour from Government employment programs for building the structural aspects of their garden beds and terracing. Both had helpful groundkeepers who assisted with the gardens and took part in constructing and operating outdoor, clay cob ovens. Both schools relied on the P&C for some funding, employed specialist staff to coordinate the kitchen/kitchen garden on a part-time basis and relied on parent volunteers for assistance during lessons, with fundraising and garden duties and for minding the garden's chickens over the

holidays. The major difference between the Barindon and Cobdale school garden programs was that Barindon adopted the full Stephanie Alexander Program.

Data were gathered on primary school classes from key informants who had extensive knowledge of, and involvement in each program. Interviews averaged 25 minutes and with one exception, all were audio-recorded and transcribed verbatim in full. Observations of activities in each school garden were taken as notes. The researcher interpreted the interview data by noting emerging themes that were written thematically rather than being presented as two separate case studies (Silverman, 1993). While the middle school sample size was small (See Table 1), the interviews yielded rich insights into the impact of the garden initiative from the following five participants:

Table 1: Interviewee details

Participant	School	Participant Currently teaching
1	Barindon	Year 5
2	Barindon & Cobdale	Kitchen Garden Coordinator (Years 5–7 at Barindon and all years at Cobdale)
3	Cobdale	Art, Kitchen Garden and Behaviour Teacher (previously Year 5)
4	Cobdale	Year 5
5	Cobdale	Principal

Cross-curriculum activities

‘Garden-based learning should not be viewed as an adjunct to the primary curriculum but rather as an interdisciplinary portal through which places and subjects can be explored and woven together.’ (Green, M., 2008, p. 15)

Barindon State School is part of the Stephanie Alexander Kitchen Garden Program, which involves growing food and cooking it fresh from the garden. Only Grades 5 to 7 take part in the program, with each class going to the garden/kitchen once every three weeks for 45 minutes harvesting what they are to cook and working in the garden (e.g. planting, weeding, turning over mulch). Then they are in the kitchen for an hour-and-a-half, cooking a meal from the food they harvested. The class breaks up into groups to cook at the five kitchen bays. Each group contributes something different for the meal, for example, one group may prepare a salad while another cooks potato rostitis. Parents volunteer to assist and the meal is shared with volunteers and visitors. The garden coordinator emails the classroom teacher with a list of tasks for the class to do a couple of weeks prior so the class is prepared. The kitchen specialist prepares the menu and does all of the cooking pre-preparation as well.

A typical school garden day at Cobdale State School has children of all ages coming and going routinely, adding to compost, helping with tuckshop food preparation and having a cooking/gardening lesson. The place is dynamic, with teachers, students, the tuckshop convenor and volunteer helpers working together. For example, some Year 5 students work in the kitchen while Year 7s prepare seed packets decorated with Year 1 artwork for sale as a school fete fund raiser. The kitchen garden lessons occur once weekly with the kitchen garden coordinator and school garden coordinator. Students visit the garden on other occasions on a less regular basis for various learning activities.

Barindon State school uses the Stephanie Alexander Kitchen Garden Curriculum Documents while Cobdale State school has recently purchased some units for use in their program. These documents, *Tools for Teachers*, provide learning units, lessons, activity and

extension ideas, student worksheets and proformas that link the Kitchen Garden Program to the Australian Curriculum across subject areas including science, maths, English, history, geography and ICT. An example from *Tools for Teachers* illustrates the cross disciplinary nature of the program. The Year 5 sample unit, titled, 'Measurement' (Alexander, 2011b), has curriculum links to Mathematics (measurement), Science (mass versus weight), literacy aspects (vocabulary, the genre and linguistic features of reporting and discussion) and Environmental Education (sustainable use of water). The mathematical literacy includes inquiry style learning of new concepts and vocabulary. The unit details the curriculum links, including the Australian curriculum learning outcomes identifier; preparation, activity and discussion ideas; recommended length of lesson; recommended location for sections of the lessons (classroom/ garden/ kitchen); resources required, and assessment suggestions. New concepts and vocabulary include: drafting a plan using grids; using different measuring techniques and equipment (e.g. garden perimeter, weight and volume of recipe ingredients); mass versus weight; and discussion of measurements of ingredients. The garden perimeter lesson is given relevance by linking it to practical garden issues such as the length of drip hose required and number of seedlings to plant relevant to plant size. The accurate measuring lesson is given practical emphasis resulting in the successful production of lemon slice. Other available units, such as that entitled *Planet Food*, have curriculum links to Environmental Education (Sustainability), Science and English and the focus is on cross curriculum format by planning, drafting and publishing in different genres including imaginative, informative and persuasive texts (Alexander, 2011b). In these activities students are encouraged to use interaction skills such as acknowledging another's point of view.

Curriculum literacies

Green (2009) argues that **English** should not be the sole provider of literacy learning, however there is a 'distinctive repertoire of literacies' and literacy practices in English (2009, p. 45). He suggests English literacy practices include metaphor, imagination, narrative and creativity.

Opportunities for incorporating English literacy skills and learning into school garden lessons were discussed with participants and observed in class lessons.

Cobdale State School, T4: *Just an interesting side-effect, we wanted them down there [the school garden] because it is actually lovely but they have actually explicitly mentioned that in their writing. I've got a theory because I've got a PE background, so playing with something and getting their hands moving, it stimulated their brains and the thinking around it and the conversations between each other, so I gave them quiet time at the end of the day, quiet time to reflect about it, and with a question, and I think that was one of the best writing pieces I had from them all year.*

... some of them even used bits of the garden in their clay work, so leaves and sticks, which was unexpected. I just wanted them to be there because it is a lovely place to do clay and they actually used the environment to enhance their writing.

Barindon State School, T2: *In the kitchen at [Barindon State School] the children of course read the recipes and write the recipes, so that is all part of it.*

Within the field of **numeracy**, there is a subset called quantitative literacy, which is the language or *literacy* of numeracy, which can be applied in most disciplines (Steen, 2001). Quantitative literacy is embedded in the context rather than the more abstract orientation of mathematics (Hogan, Maurcia & vanWyke, 2004). Their *Numeracy Across the Curriculum* study found that students were more engaged in learning numeracy when 'they had a purpose to their learning' (Hogan et al., 2004, p. 83). This study also noted that some tasks outside formal mathematics lessons were 'rich in numeracy potential' and the 'mathematical idea or technique' should be 'identified, recognised and applied' (Hogan et al., 2004, p. 81).

The school garden provides a physical learning environment suited to numeracy activities, as indicated in the talk segments below:

Barindon State School, T1: *Maths is a good example. I know that the year 6 class and my class last year they had to map the garden and work out the area of the garden and from there they had to decide the types of seeds they would put in each bed based on the bed's length and width and then it was taken further. It brought in science as well. How much sun would this part of the garden get as opposed to that one?*

Barindon State School, T2: *The maths of course is always there. So we have a hole and we've got to measure the hole, so it is 1 by 2 by 3, so how many cubic metres of soil will we need to order? Or we have a roof. Let's measure this. How many meters of tin do we need to buy? How heavy is that. How long is that piece of pasta you've just made? So it is really easy. I do it by stealth really. I don't really make it into a maths lesson.*

Turning now to **science**, minimum benchmarks for scientific literacy have not been set by the Australian Curriculum Assessment and Reporting Authority (ACARA), which is responsible for national testing of literacy, numeracy and scientific literacy. However, ACARA have devised four levels of proficiency. Level 3.2 is deemed 'proficient', where a student 'interprets reports; uses observed data; collates and compares data; draws conclusions' (ACARA, 2010, p. xviii). From a representative sample of Australian Year 6 students in 2009, only 48.8% of Queensland students met this proficiency level or above. Lower than the national average (51.9%), it was only higher than the Northern Territory (33.6%) and South Australia (46.5%). Science educators generally agree that science learning is enhanced by utilising children's natural curiosity in a real-life setting (Malone & Tranter, 2003). They argue that outdoor environments 'enhance pedagogical pursuits in science' as found in their study of NSW school landscapes (2003, p. 300).

Barindon State School, T1: *I'm doing a plant unit ... We were looking at plants that pollinate and germinate, but it is not a scheduled thing, it just fits with whatever we are doing ... it makes it so much easier. We can go into the garden and look at the paw paws and how they pollinate, we can go down and look at the beans and look at how they germinate. It makes it so much easier to do.*

Cobdale State School, T5: *[The kitchen garden coordinator] does a lot of work with them on how to make good soil, the biology of what is happening in the soil, the science of what is happening in the soil, caring for the plants, the rotation of the crops.*

Definitions of **environmental literacy** include: environmental attitudes and values, practical skills, active learning, self-reflection, community involvement, ecological intelligence, systems thinking, holism, cultural literacy, knowledge of environmental concepts and action or active involvement (Orr, 1993; Stibbe & Luna, 2009; Green, 2007; Roth, 1992; Stables & Scott, 2002). Another term that appears in the literature is 'sustainability literacy' (Stibbe & Luna, 2009, p. 1). Barindon State School claimed that 'Sustainability is embedded in every aspect of our school' and that the students demonstrate their contribution to a sustainable future. The school uses the Department of Education, Training and the Arts' definition of sustainability from the *Statement on Sustainability for All Queensland Schools*: 'Enough for all for ever' (DETA, 2008).

Another related term is 'eco-literacy', which Peacock (2004) defines as 'understanding how ecosystems are organised and using these principles to live by' (2004, P15). The application of ecological principles into daily lives recurs in the Environmental Education literature (Orr, 1991; Peacock, 2004; Calvin, 2009; Sterling, 2001). Literacy definitions which include critical thinking link well to Scott's (2009) assertion that critical thinking is a fundamental skill for Environmental Education in order for students to face unknown futures which may demand the ability to critically assess solutions to environmental problems. Environmental literacy includes general literacy skills across a range of media, including the ability to read,

be creative, apply critical thinking, solve problems and communicate well (Stibbe & Luna, 2009, Orr, 1991). Stables and Bishop (2001) discuss a scale of environmental literacy from the narrowest ('weak') text based definition of 'functional literacy', which involves reading and writing basic texts, expanding to including critical literacy, to their broad ('strong') definition of 'any "reading" of the biophysical world' (p. 90).

Orr suggests that education in a group garden provides direct, active experience in sustainability literacy skills which would not be as effective in a classroom environment (1991). The school garden acts as a contained site, where students observe inputs and outputs in the system and can 'learn how environmental impacts are related to everyday choices and values' (Orr, 1992, p. 1). Students can actively learn environmental literacy that is potentially transferrable to their own lives (Calvin, 2009). Sustainability skills are taught through the garden program in both schools, where students learn about and in many cases implement sustainability skills including watering from the rainwater tank, composting, reducing waste, reusing/recycling, caring for animals, producing food, providing nutrition, and improving soil health.

Cobdale & Barindon State Schools, T2: *One of the things that we are really passionate about is healthy soil, so we do a lot of composting, how to make healthy soil, because if you've got healthy soil you've got healthy plants. [Other activities include] seed saving, making paths, we made worm hotels ... we've constructed things, hammers and nails; no dig gardens; rain gauges, science, seed Olympics; we've built native gardens; a bog garden, bush tucker garden; we've had lots of chicken workshops because both schools have chickens; weaving – I planted some flax, so we learnt about that; making fertiliser sausages; weed teas; recycling; cooking; biodiversity audits; debugging – all sorts of making sprays.*

Barindon State School, T2: *I think [Barindon State School] is doing a really terrific job but because the school is now almost in a garden. Wherever you look there's things growing and so there is this passive learning all the time.*

The theme carries across the whole school community and the sustainability skills are occasionally transferred to outside the school.

Cobdale State School, T5: *I've talked to parents who have started gardens at home because of what their kids have done at school. So I think there are many ways in which the school contributes to the change in the culture of the whole community when their kids become very interested in these kinds of things.*

For inspiration and for practical application of **artistic knowledge and skills**, the garden was well utilised at both case study schools, as indicated in the following talk segments:

Cobdale State School, T3: *[The school garden] ties into the teacher's curriculum. In this case the teacher, H, is using the sunflowers as inspiration for their art.*

... The grade 5s were doing clay and they sat in the garden to get inspired by the garden.

... When the kids did clay in the garden, the year 5s, when they wrote about it a lot of them said, 'Being in the garden gave me inspiration, it made me think and it was creative'.

Barindon State School, T1: *Last year we made a recipe book. We used all of the Stephanie Alexander recipes we cooked throughout the year and the kids had to, oh it was more an ICT task. Had to present it in a recipe book format and made sure that they used colours, images and a set out that was appealing and yeah we did that as a little text type recipes and we produced a book at the end of the year which we gave to all the parents of Grade 5.*

The effectiveness of the school garden as a curriculum literacy learning environment

The primary learning goals of both case study schools, as stated by key stakeholders, were:

1. To improve students' nutrition and interest in good food and
2. For students to learn about sustainability and put this knowledge into practice.

These two goals are evident in the following talk segments:

Cobdale State School, T5: *A lot of kids who come here with really poor nutritional food, so we wanted to change their attitude to food and this seemed like a really good way to work on that. So that is when we started on the whole idea of growing food and cooking it.*

... Sustainability is one of our core values in the school ... and yes you can obviously see the links for sustainability as well, so that all came together in that one activity [school garden].

Cobdale & Barindon State Schools, T2: *It is all about healthy eating, healthy living and plus becomes a tool for learning.*

Ozer (2007) argues that theoretically, students' academic achievement could improve indirectly through school gardens by improving nutrition, parental involvement and improved bonding or attitude to school. A key observation here concerns the potential of the school garden as a focal point for building students' literate capabilities, their knowledge of nutrition and moreover, school community: connecting parents, teachers and student learners.

Academic improvement

Malone and Tranter (2003) report on several quantitative US studies which demonstrate 'improved cognitive development' as a result of learning in the school grounds outside the classroom and a number of qualitative research studies which report improved attitudes, behaviours and learning skills' in students (p. 291).

Using the annual National Assessment Program – Literacy and Numeracy (NAPLAN¹) test data, the next part of the discussion seeks to relate the results to the garden program. Results are only to sit alongside anecdotal evidence of learning achievement at the school since the garden implementation. To minimise effects of changes in cohort the results of the same cohort of students over time at each school from 2008 were compared from the period before the current garden program was implemented to 2010 when the school garden program was well established.

The data below show that Barindon State School students do not have a problem in achieving or exceeding the benchmark in literacy or numeracy. However, at Cobdale State School, Year 5 students began with results below the 2009 average state value. After implementation of the current garden program, literacy and numeracy results improved in some areas dramatically, with the exception of Grammar and Punctuation & Spelling. The number of students reaching beyond the benchmark for writing improved in Cobdale State School by 16% from Year 5 in 2008 to Year 7 in 2010. At Cobdale State School, for both reading and numeracy, there was an increase of 9% from Year 5 to Year 7 resulting in every student achieving above the benchmark for reading and numeracy in 2010.

The data shown in the charts supplement the interview data to provide a richer account of student achievement over the period 2008–2010. The authors recognise that there may be no direct causal link between improved reading, writing and numeracy with the introduction of the school garden. Despite this, the upward trend at Cobdale State School is noteworthy. This observation holds, even though the teachers themselves showed different participation levels. Other factors could also be influencing changes in the NAPLAN scores such as the fact that the cohort of students in the respective schools is not identical; improved literacy and numeracy pedagogy was implemented in the schools other than through the garden project; the growing familiarity of students with the standardised testing regime, and that the tests differed across the years.

Chart 1: Barindon State School NAPLAN Results

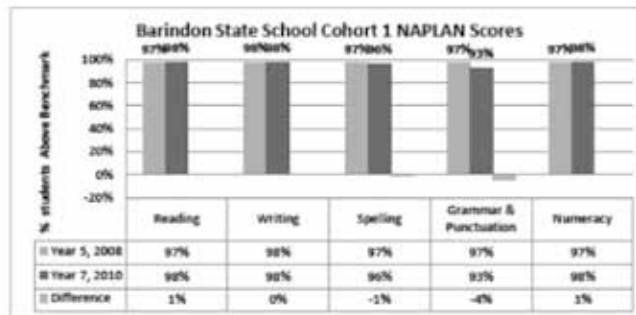
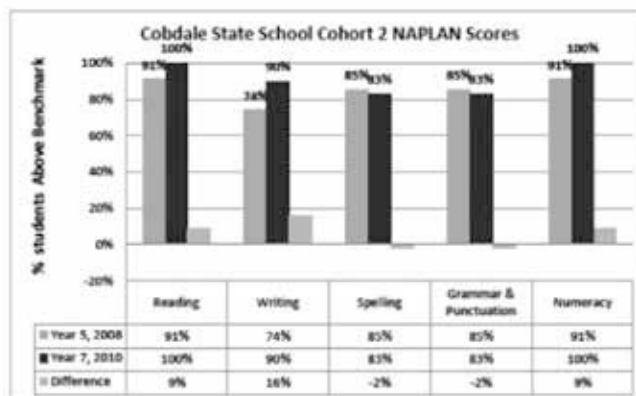


Chart 2: Cobdale State School NAPLAN Results



While recognising the impact of these variables on students' literacy learning, participants uniformly reported that students enjoyed themselves and were actively engaged in the learning. This finding is consistent with Malone and Tranter's (2003) finding that environmental features, such as school gardens, 'provide sensory stimulation through variations in colour, shape, pattern, dimension and texture' (2003, p. 290). However, no interviewees in the study reported in this article had measured the impact of heightened enjoyment and engagement on improved scores or results. Some did, however, report that enjoyment did relate to doing a 'great job'. Further, there was general agreement across the participants that improved writing skills and outcomes were notable improvement measures to support the continuation of the school garden programs.

Cobdale State School, T4: [The school garden] ... *stimulated their brains and the thinking around it and the conversations between each other ... and I think that was one of the best writing pieces I had from them all year.*

Similarly, the school garden improves numeracy engagement, which is said in the literature and case study interviews to benefit students by providing learning in a real-life context.

Cobdale State School, T3: *I've noticed interest in doing projects related to the garden ... I'd certainly say if there was maths that could be related to the garden they'd say, 'Yes I enjoy that more'.*

The Principal of one school indicated that while the school garden may not directly improve student results, making the school an enjoyable place to be improves both students' pride in the school (noted at both schools and in the literature) and attitudes to learning.

Cobdale State School, T5: *I think kids' results improve when school is a place that they love being with a really positive culture, where there are things they can do where that they can engage in a positive way, expanding their abilities in a range of interests. I think if you have that whole cultural element to the school, then results improve. But I don't think it is possible to say 'this child went to the garden 20 times and therefore their results improved'. It is not linear like that. It is much more holistic in my opinion.*

Which students benefit most from curriculum literacy learning in the school garden?

The literature indicates that students who are disengaged from mainstream classroom practices would benefit most from explicitly taught literacy lessons in a real-life setting, such as a school garden (Kraft, 1993; Moje, 2004; Santrock, 2004). The staff at both case study schools noted that students with behavioural problems benefitted greatly by spending time in the school garden. However, Flanagan (2010) referred to school gardens as a time filler, distracting students from their key educational needs, that is, being taught to read and write. She considered the garden time as taking away from valuable teaching time, therefore reducing the equity chances for students from disadvantaged backgrounds. This argument can be countered where the regular curriculum is taught through, or in conjunction with the school garden. Hayes, Mills, Christie and Lindgard (2006) argue that mainstream education is often not suited to the education of students who are from backgrounds other than socio-economic and cultural norms. At risk students require assistance and the environment in which to build curiosity, skills and confidence (Perkins, 1992). The case studies and literature, therefore, point to school gardens affording increased engagement and concrete learning experiences, and as good learning spaces for disadvantaged learners. In Queensland, students from lower socio-economic schools and remote Indigenous schools were amongst the lowest literacy performers (MCEECDYA, 2009). Such students might benefit from a school garden program as demonstrated at Cobdale State School:

Cobdale State School, T3: *The children who have social concerns and don't fit in with other kids. They find lots of fun and enjoyment in the garden. More purpose gives them a meaningful way of engaging with other kids.*

A study in the UK found that, 'Some challenging children, who find lessons difficult to engage with, have blossomed as part of the gardening club' (Growing Schools, 2008). In Queensland, the teacher quoted in Nutall and Millington's case study said, 'I saw children at their best, working cooperatively on a project of their own design, using skills that they had to learn ... A particular satisfaction was to see a child who had no success in the regular classroom blossom in this one' (2008, p. 21). The Victorian teachers who Green (2008) interviewed indicated that in the school garden, student engagement improved, particularly for those who had low self-esteem in the classroom. Likewise, case study teachers reported:

Cobdale State School, T3: [About students who were sent to the school garden for behaviour issues] *Watering is very therapeutic ... It's great. It is a very structured activity compared to others. They're digging, there's lots of things in the garden. We've got a cobb oven. They're fixing that up all the time with the clay ... I think it calms them right, especially the watering. And also doing something worthwhile as compared to just wasting time. That's what they feel.*
... *They love it. Absolutely.*

Cobdale State School T5: *We also use it [the school garden] if we have kids that we are managing behaviour of then they can go and work in the garden as part of that. That is good for them ... Nothing like holding a chook to calm you down.*

Cobdale State School, T2: *A lot of the kids that were obviously having problems in the classroom just came out and were with us [in the school garden]... having them in the garden they were focused, they worked.*

Barindon State School, T1: *They love it. I can see this with all the classes in the school. When you say to them, 'This is our Stephanie Alexander day, 'They put up a little cheer'.
... They really enjoy what they get from the program and they know that they are lucky as well and I think that they appreciate that. They definitely have a lot of respect for the garden and keeping it in a nice state and in the kitchen as well.*

Opportunities to improve the school garden program in order to teach curriculum literacies more effectively

School gardens add a 'level of complexity' to running a school, as noted by one school principal. The reason for this is that funding, volunteer and planning resources are required. To overcome any resistance to using the school garden for teaching, and gain the greatest value for the effort involved in setting up and maintaining school gardens, teachers need assistance in the form of training and teaching resources in order to make the most of the resource.

Cobdale & Barindon State Schools, T2: *A lot of teachers don't know what parsley looks like, or how to plant anything, how to water, just the basic things, composting, recycling. So if they don't know, how could they possibly be expected to carry it into the classroom? ... I do think that training the teachers is very important.*

It was reported at the school which provided professional development for the teachers, that teachers' attitudes to the school garden as a teaching resource had improved.

Cobdale & Barindon State School, T2: *Stephanie Alexander put out a book just recently. A curriculum integrated training and they do a lot of training for teachers and so the teachers are starting to realise they can pick up what is happening in the garden and just then use it in the classroom. And that is working so it is about training the teachers really.*

The schools were linking the curriculum to the school garden by documenting their practices and sharing them and by utilising school garden program curriculum resources.

Cobdale & Barindon State Schools, T2: *There are plenty of writings out there that have curriculum links to the garden. Like Carolyn Nuttall [(2008) co-author of *Outdoor classrooms: a handbook for school gardens*].*

The main curriculum unit resources being utilised in the schools are those produced by the Stephanie Alexander Program, namely the *Toolkit for Teachers* (Alexander, 2011b).

Barindon State School, T1: *The 'Toolkit for Teachers' which was sent by the Stephanie Alexander Program, has a set of units in it for grades 3,4,5,6,7. But there is a set of mini units that can definitely be tailored to our classroom units. ... those tool kits have come out, they are ACARA* aligned.* [*Australian Curriculum, Assessment and Reporting Authority]

At both schools, using these unit resources was seen as a positive step towards engaging teachers in the program's use and countering the feeling that the curriculum was too crowded to fit the school garden program in.

Barindon State School, T1: *The toolkits that we've been sent can be part of a unit, so one activity might be for example that garden mapping activity that I spoke about earlier so that will fit into teaching area in maths or teaching a little bit about the sun in science, where you could tick those things off because you used the garden to help.*

Where teachers take the opportunity to teach aspects of the curriculum in the garden, students are enjoying themselves and engaged in concrete learning. It is then important for teachers to take the school garden lessons back into the classroom to follow up by generalising and applying the new knowledge.

Conclusion

Meaningful integration of middle years curriculum literacies into the school garden supports classroom learning through increased learner engagement. At both case study schools excellent examples of learning in the school garden were evident and plans to build on reported successes were in place. A systematic approach to school garden implementation which includes a steady source of income for maintenance and personnel, documented curriculum links and resources, feedback mechanisms, enthusiastic leadership and relevant

professional development, in combination, could ensure successful results for staff and students utilising a school garden curriculum literacies program. Nevertheless, the school garden alone, despite increased learner engagement, does not in itself guarantee effective student learning. Teacher pedagogy, with a focus on linking curriculum and literacy, is what turns the productive teaching resource of a school garden into good teaching.

Notes

- 1 NAPLAN results come with a caution from the Australian government that the reported test results show only a 'snapshot' of School achievement (ACARA, 2010, p. iv). The authors recognise and support this observation, though the tracking of the NAPLAN reported results over time serves to open the space for reflecting on the impact on the garden as a site for teaching curriculum literacies.

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Joanne Pascoe's MSc (Environment) research thesis was titled, 'Impact of School Gardens on Primary School Children's Learning'. After completing her Secondary teaching Graduate Diploma at Canberra University, ACT, she supported students with literacy and numeracy difficulties at several Queensland Primary schools. From 1999, Joanne managed the Australian Government's Clearinghouse for Literacy and Numeracy at Griffith University, Brisbane. Currently, Joanne is the Research Project Officer for Griffith's Arts, Education and Law Group. j.pascoe@griffith.edu.au

Claire Wyatt-Smith is Professor of Educational Assessment and Dean (Academic) in the Arts, Education and Law Group, Griffith University. She has been a chief investigator on a significant number of ARC and government funded research projects over the last decade and works closely with the teaching profession in linking research policy and practice. Her research areas include literacy, assessment, standards and moderation. c.wyatt-smith@griffith.edu.au