

# Australian Waste Wise Schools Program: Its Past, Present, and Future

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The Waste Wise Schools program has a longstanding history in Australia. It is an action-based program that encourages schools to move toward zero waste through their curriculum and operating practices. This article provides a review of the program, finding that it has had notable success in reducing schools' waste through a "reduce, reuse, and recycle" (or "three Rs") approach. Since the program's conception, an evaluation process has continually occurred alongside the actual program. This report presents the most recent program evaluation results: a 2007 statewide survey that was administered to 1,015 primary (elementary) and secondary teachers. The article outlines the past, present, and future directions of the Waste Wise Schools program and, in doing so, discusses the broader implications for school-based environmental education programs. In particular and of most significance, the findings reveal a growing sustainability culture in Australian schools and communities.

**Keywords** "reduce, reuse, and recycle," school-based environmental education programs, school-community partnerships, waste and litter education, Waste Wise Schools, whole school engagement

## WASTE WISE SCHOOLS PROGRAM: ITS PAST

The Waste Wise Schools program<sup>1</sup> began in 1997 when it set a new standard in environmental education program development and delivery. Waste Wise Schools was the first Australian whole school environmental education program integrating teacher professional development and learning, practical tools and resources, and a structure and process for creating a Waste Wise culture across the whole school from classroom to operations and administration.

The overarching goals for the program are:

1. to bring about lasting change in school culture toward waste/litter minimization (and ultimately sustainability) through whole school engagement in learning and action for waste/litter minimization and sustainability, integration of school curriculum and operations and the building of links with local communities; and
2. to bring about lasting cultural change toward waste/litter minimization and sustainability in families and the wider community through learning and action (Kinns, 2006).

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The Waste Wise Schools program is currently operating in over 50% of Victoria's schools (1,015) and in hundreds of schools in other Australian states and territories. The Waste Wise Schools program offers a range of support services to schools to assist them to develop and run their own waste and litter reduction programs. According to Sustainability Victoria, the key benefits (to schools) of the program are:

- reduce waste, litter and associated costs;
- free access to resources and ongoing specialist advice;
- enhancement of reputation and improved public perception;
- recognition and reward for achievements;
- free use of the Waste Wise logo;
- improved compliance with environmental responsibilities; and
- contribution to a sustainable future (Sustainability Victoria, 2008).

Prior to 2006, there were two stages of accreditation, Becoming Waste Wise School and Accredited Waste Wise School. Becoming Waste Wise Schools signed a commitment to complete the following activities within 12 months:

1. form a **committee** to plan and monitor their waste and litter program;
2. undertake a **waste assessment** to determine the resources used and the waste generated by the school;
3. identify **opportunities** to reduce, reuse, recycle and compost, so that less waste is produced;
4. prepare a waste reduction **action plan**;
5. develop and adopt a waste and litter minimization **policy**;
6. make a commitment to: implement waste and litter reduction plan; strive for continuous improvement by monitoring, reviewing and reporting back on progress; integrate waste and litter operating practices with the curriculum; and involve all members of the school community in the goal of waste minimization and to inform and involve people and other organizations that are associated with the school about this goal;
7. set **targets**;
8. develop a curriculum **plan** to incorporate the topics of waste and litter into relevant parts of the curriculum;
9. commence **implementation** of the waste reduction and curriculum plans; and
10. **monitor and evaluate** your program to find out what is working well, and identify areas for future improvement (EcoRecycle Victoria, 2004; cited in Kinns, 2006).

Schools were awarded Accredited Waste Wise Schools status for three years when they provided documentation showing they had completed the above activities and had achieved substantial implementation of the waste reduction plan and curriculum plan (EcoRecycle Victoria, 2004; cited in Kinns, 2006).

In 2007 the certification process was simplified and renamed from "accreditation" to "certification." New templates were developed to assist schools with the paperwork required to certify as a Waste Wise school. Three levels of certification were introduced—bronze, silver, and gold—to provide an opportunity to give special recognition to leading schools while still rewarding new

participants. Bronze certification is awarded to beginning level schools that complete the application form and action plan templates provided. Silver certification is awarded to schools that provide evidence of their progress in waste and litter education and minimization, and submit an action plan for continuous improvement. Gold certification is awarded to schools that meet the requirements of silver certification and also provide leadership for other schools and their local community. Certification now expires after two years instead of three years, after which time schools have an opportunity to re-commit and potentially move up to a higher level of certification. A school may re-certify at bronze level or conversely apply for the first time and receive gold certification if they meet the requirements of that level of certification.

Integrated into the new certification system is a five-step process provided to schools as a means of working through the various certification levels. The five steps have been adapted and simplified from the previous accreditation model and include:

- commitment;
- developing an action plan;
- implementing the action plan;
- monitoring and reporting results; and
- building on experience to achieve continual improvement (Sustainability Victoria, 2008).<sup>2</sup>

### Existing Waste Wise Schools Research

A number of research studies have been undertaken to measure the impact of the Waste Wise Schools program in educational and community settings (see Armstrong, 2004; Armstrong & Grant, 2004a, 2004b; Sharpley, 2003a, 2003b).

In 2004, Armstrong presented two Waste Wise Schools case studies revealing the beginnings and progress of their respective programs. Armstrong (2004, p. 1) presented data showing that the program had “*changed the thinking and behavior of many families at the schools, suggesting that the children may be acting as catalysts to influence their parents’ Waste Wise behavior, i.e. having an intergenerational influence.*” In accordance with existing research undertaken by Ballantyne, Fein, & Packer (2001), Ballantyne, Connell, & Fien (2006) and Uzzel (1994), Armstrong emphasized the influence of environmental education programs (such as Waste Wise Schools) in changing parent behavior through their children. There is an implicit assumption here that parents are not catalysts. While these researchers collectively expose students as catalysts, there is a dearth of literature about the role that parents themselves play in acting as catalysts to children, communities, and indeed schools.

Notwithstanding, Sharpley (2003a, 2003b) reported that the Waste Wise Schools program has had marked success in being sustained long term by schools, in addition to providing a springboard to other sustainability initiatives. Armstrong and Grant (2004a, pp. 13–14) identified a number of success factors, including:

- the school principal and leadership team are committed and supportive;
- the whole school community is involved in the planning and implementation;
- students are empowered and encouraged to take ownership of the program;

- the program is planned and implemented in a strategic way with a committee or team, audit, policy, targets, action plan and curriculum plan;
- operational changes are integrated into the curriculum;
- there are good systems in place—these are simple, easy to use and well-maintained;
- the school community strives to achieve cultural change, while understanding that change is often a long-term process;
- there is a process of continuous improvement; and
- there is fun and enjoyment in the program, a sense of common purpose and opportunities to celebrate successes.

Existing Waste Wise Schools research has been somewhat limited in revealing the impact of the program on the wider education community. Areas that have received little consideration include: teacher professional development in environmental education, the nature and extent of external partnerships in the implementation of school-based environmental education programs (including Waste Wise Schools), teachers' perceptions of their school's Waste Wise performances and practices in enacting the 3 Rs (reduce, reuse, and recycle), whole-school engagement and the barriers encountered when implementing a school-based environmental education program.

## Research Methods

Given the longevity of the Waste Wise Schools program, a semi-longitudinal research approach was adopted whereby participating schools were surveyed commencing in 2007 (Cutter-Mackenzie, 2006b; 2007). The rationale of this approach is to create a complex research data base where schools can be tracked from year to year, allowing researchers to analyze the intricate layers of the Waste Wise Schools program and its impact on the wider education community.

Two questionnaires were developed; a student questionnaire and teacher questionnaire. Both questionnaires were initially piloted in 2006 and then administered in 2007. The focus of this article is the 2007 teacher data. The student results will be reported in a forthcoming article. The questionnaire consisted of 28 question items designed to measure teachers' perceptions about and experiences of the Waste Wise Schools program. Numerical scales were applied for collating demographic data, such as certification/accreditation level, age, gender, and teaching experience. Ordinal and ranking techniques were utilized in the construction of the closed-ended questions, such as Likert, multiple choice, and ranking questions (all five-point scales). The questionnaire also included open-ended questions so as to seek further clarification about the teachers' perceptions and experiences in regard to the Waste Wise Schools program.

The questionnaire was administered online to 1,015 teachers where their school was identified as either becoming a Waste Wise School or already certified as a Waste Wise School. The 1,015 teachers were identified as the Waste Wise School coordinator and/or contact in their particular school. A total of 374 teachers participated in the survey representing a 36.45% response rate.

Key elements of Dillman's (1978, 2000) total design method for Internet (online) surveys were applied regarding administration of the teacher questionnaire in an attempt to increase the overall response rate. As such, an 11-step approach was implemented in the administration of the survey:

1. all participants were e-mailed one week prior to the administration of the survey so as to alert the sample to the survey and thus attempt to obtain their support;

2. the Waste Wise Schools delivery organization (Gould Group) were provided with two messages to e-mail to all participants at different stages throughout the administration of the survey;
3. the teacher questionnaire was administered to the entire sample by the researchers;
4. the questionnaire was limited in length and completion time (10–15 minutes);
5. all chances of embarrassment, subordination, and direct monetary costs were eliminated from the questionnaire;
6. the questionnaire was identified with known organizations that have legitimacy (Monash University, Gould Group and Sustainability Victoria);
7. the respondents were personally rewarded by showing positive regard to their contribution;
8. a reminder e-mail message was administered to all nonrespondents one week after the questionnaire had been originally administered;
9. a second reminder e-mail message was administered to all nonrespondents a further two weeks later;
10. a random selection of 200 nonrespondents were mailed a hard-copy of the questionnaire a further two weeks later; and
11. a final e-mail message, thanking all participants, was administered six weeks after the original administration of the survey.

While Dillman's (1978, 2000) total design method was applied, a relatively low response rate was still achieved. A possible explanation for this is that existing research shows that teacher participation levels in survey research are generally quite low in Australia despite extensive attempts to increase survey response rates (Holbrook et al., 2000).

Notwithstanding, so as to increase the survey's reliability and validity, specific techniques were also applied. These techniques were originally trialed in the pilot survey (2006), allowing the researcher to redevelop the survey for administration in 2007. To increase the reliability of the teacher survey, a large sample was drawn upon so as to reduce the severity of random error. Further, to gauge the "measurement error" of the questionnaire, particular questions were worded differently to measure the same attribute (de Vaus, 1995). This is what de Vaus (1995, p. 55) describes as the "test-retest method". This technique also allowed the reliability of the subjects' responses to be measured. In addition to reliability techniques, validity techniques were adopted to determine the performance of the questionnaire, including face, content, criterion, and construct methods (Litwin, 1995).

The survey data was analyzed using the Statistical Software Package for the Social Sciences (SPSS Version 15.0) using univariate (descriptive), bivariate, and multivariate techniques. Univariate analysis techniques (specifically descriptive statistics) were applied to measure frequencies and cross-tabulations of and between data. Factor analysis techniques (bivariate) were also applied to specific items. Significance testing was applied between the data categories (questions) and demographic data. Open-ended questions were analyzed using qualitative thematic analysis techniques (Lofland, 1995).

## DATA PRESENTATION AND ANALYSIS: PRESENT STATUS

The data are presented in four sections. The first section describes the participant demographics. Section two presents an overview of the participants' (*their school's*) participation in

environmental education programs, including the Waste Wise Schools program. In the third section, teachers' perceptions of their Waste Wise Schools performance are presented. The final section presents the participants' perceived barriers and challenges in implementing the Waste Wise Schools program.

### Participant Demographics

Of the participants, 74.39% were primary (elementary) government teachers ( $n = 276$ ), 8.63% primary independent (private system) teachers ( $n = 32$ ), 7.28% secondary government teachers ( $n = 27$ ) and 2.16% secondary independent (private system) teachers ( $n = 8$ ). Further, 73% of the participants were female ( $n = 270$ ) and 27% were male ( $n = 100$ ) which is representative of the general teaching population in Victoria, Australia. The 41–50 (28.8%) and 51–60 (36.5%) age groups were most represented ( $n = 220$ ). A further 17.8% were in the 20–30 age group ( $n = 60$ ) and 15.73% in the 31–40 age group ( $n = 53$ ). Again, this is representative of the general teaching population in Victoria, Australia.

### A Growing Sustainability Culture in Schools

Participants were asked if their school had undertaken professional development in environmental education/sustainability prior to participating in the Waste Wise Schools program. A percentage of 45.28% indicated that their school had participated in teacher professional development ( $n = 163$ ), 28.9% had not ( $n = 104$ ) and 25.56% were unsure whether their school had participated in such professional learning ( $n = 92$ ). This is a considerable result as existing research in environmental education indicates that professional development undertaken in environmental education by Australian teachers has been relatively low (Cutter-Mackenzie, 2006a, 2006b; Cutter-Mackenzie & Smith, 2003; Spork, 1992). Increasing levels of professional development in this area represent a growing culture of environmental education and sustainability in Australian schools.

Of the participating schools 30.9% were fully certified ( $n = 90$ ) and 69.1% were becoming certified ( $n = 201$ ). As shown in Table 1, under the new certification system 21.6% were at Step 1 (Commitment) ( $n = 43$ ); 21.1% Step 2 (Developing an Action Plan) ( $n = 42$ ); 29.1%

TABLE 1  
Step—Certification

<i>Step</i>	<i>Frequency</i>	<i>Valid Percent</i>
Step 1 (Commitment)	43	21.6
Step 2 (Developing an Action Plan)	42	21.1
Step 3 (Implementing an Action Plan)	58	29.1
Step 4 (Monitoring and Reporting Results)	16	8.0
Step 5 (Building on Experience to Achieve Continual Improvement)	39	19.6
Total	199	100.0
Missing		
No Response	175	
Total	374	

Step 3 (Implementing an Action Plan) ( $n = 58$ ); 8.0% Step 4 (Monitoring and Reporting Results) ( $n = 16$ ); and 19.6% Step 5 (Building on Experience to Achieve Continual Improvement) ( $n = 39$ ). It is important to note that a large number of teachers skipped these two questions (Q11 = 22.2% and Q12 = 46.8% missing), possibly revealing that they were unsure about which stage or step they are at. From 1990–1994, 1.3% of schools commenced the Waste Wise Schools program ( $n = 3$ ); 3.9% 1995–1998 ( $n = 9$ ); 22.4% 1999–2003 ( $n = 52$ ); 53.0% 2004–2006 ( $n = 123$ ); and .4% in 2007 ( $n = 1$ ). It is apparent that a substantial increase occurred in participation rates in the Waste Wise Schools program since 2004, again representing a growing culture of environmental education and sustainability in Australian schools.

The latter findings are also supported by schools’ participation in other school-based environmental education and sustainability programs. In addition to participating in the Waste Wise Schools programs, 72.2% of the participants indicated that their school was also currently participating in other school-based environmental education programs ( $n = 124$ ). Furthermore, 80.8% of the participants indicated that the Waste Wise Schools program had acted as a springboard in leading to their school’s participation in other environmental education programs and sustainability initiatives ( $n = 222$ ).

In addition, participants were asked to identify if they had formed partnerships with groups external to their school in meeting their Waste Wise goals. Of the participants, 38.77% indicated that they had formed a partnership ( $n = 145$ ). The most commonly formed partnerships were with local government (district) departments (12.1%,  $n = 32$ ) and environmental organizations (11.7%,  $n = 31$ ). Further analysis revealed that a significant relationship exists (.179,  $p < .01$  Kendall’s *tau\_b*) between a school’s certification level and their links with external partners (see Table 2). Schools with external partnerships tended to be at Step 4 or 5 (certification) which signals external partnerships as a key success factor in the Waste Wise Schools program and potentially school-based environmental education programs generally. Similar findings were also alluded to in Robottom, Malone, & Walker (2000), emphasizing the importance of a community and partnership approach in the success of environmental education programs.

TABLE 2  
Significant Relationship Between Waste Wise Schools Step (Certification) and External Partnerships

<i>Kendall's tau_b</i>	<i>Waste Wise Step</i>	<i>External Partnerships</i>
Waste Wise Step		
Correlation Coefficient	1.000	.179(**)
Sig. (2-tailed)		.004
N	199	199
External Partnerships		
Correlation Coefficient	.179(**)	1.000
Sig. (2-tailed)	.004	
N	199	374

\*\* Correlation is significant at the .01 level (2-tailed).

### Waste Wise Schools Report Card (Performance)

To gauge teachers' perceptions of their school's performance in the Waste Wise Schools program, three items (questions) were designed to measure waste reduction, waste management, waste and litter plan, policy and curriculum development and implementation, Waste Wise resources, occurrence of Waste Wise practices, and overall rating of the Waste Wise Schools program. A five-point Likert scale was utilized with 1 representing very good, 2 good, 3 unsure, 4 poor, and 5 very poor. Means of responses are reported and these can be interpreted in terms of above 3 being positive (high) and below 3 being negative (low).

As shown in Table 3, teachers' rated their overall performance in waste reduction, waste management, waste and litter plan, policy and curriculum development, and implementation as positive (high) with the average mean response being 2.42. Waste reduction (2.35) and management (2.2) were rated highest with 70% of schools ( $n = 200$ ) revealing a sizeable reduction in waste. Using factor analysis, the abovementioned items were reduced to one component (variable). As shown in Table 4, a significant relationship was found between a school's stage/step of certification and teachers' perception of their school's overall performance (.397,  $p < .01$ , and  $-.482$ ,  $p < .01$ , Pearson Correlation). A descriptive analysis of the data revealed that those schools further progressed in the Waste Wise Schools program rated their performance higher than those commencing and/or in the earlier stages of the program. Thus, it could be concluded that as schools progress through the program their perceptions of their performance positively changes in accordance with their progress.

In addition to gauging the participants' perceptions of their school's performance, the researcher also sought to gauge the frequency of Waste Wise practices, specifically recycling, reusing, and reducing (3 Rs). The overall rating of the participating schools' Waste Wise practices was high with the average mean response being 2.69. Recycling paper and cardboard (2.18) was identified as the most commonly practiced Waste Wise practice, followed by reusing materials (e.g., for art) (2.46), reusing containers (2.57), and regularly turning off lights and fans (2.59). Entering the annual Waste Wise Schools awards (3.6), having package-free lunches (3.1), and sustainable transport to school (3.0) were the least practiced initiatives. The overwhelming reliance on motor vehicle transport in Australia and the logistics of organizing package-free lunches are possible explanations as to why these actions are not practiced as frequently as others. Further

TABLE 3  
Teachers' Overall Performance Ratings in Waste Reduction, Waste Management,  
Waste and Litter Plan, Policy and Curriculum Development and Implementation

<i>Waste Wise Performance Indicators</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>
Waste Reduction	286	2.3531	1.06513	.06298
Waste Management	282	2.2801	.97453	.05803
Waste and Litter Plan or Policy	280	2.4893	1.06082	.06340
Implementation of Waste and Litter Plan or Policy	280	2.6179	1.07449	.06421
Waste Wise Curriculum	284	2.6197	1.05825	.06280

TABLE 4  
Significant Relationship Between a School's Certification Step and Teachers' Perception of Their School's Overall Performance

	<i>Stage of Waste Wise Accreditation (Old System)</i>	<i>New Waste Wise Schools Certification System (Steps)</i>	<i>Waste Wise Performance (Reduction, Management &amp; Policy/Plan and Curriculum Development/Implementation)</i>
Stage of Waste Wise Accreditation (Old System)			
Pearson Correlation	1	-.529(**)	.397(**)
Sig. (2-tailed)		.000	.000
N	291	198	260
New Waste Wise Schools Certification System (Steps)			
Pearson Correlation	-.529(**)	1	-.482(**)
Sig. (2-tailed)	.000		.000
N	198	199	187
Waste Wise Performance (Reduction, Management & Policy/Plan and Curriculum Development/Implementation)			
Pearson Correlation	.397(**)	-.482(**)	1
Sig. (2-tailed)	.000	.000	
N	260	187	269

\*\* Correlation is significant at the .01 level (2-tailed).

research is required to offer further explanations as to why these items (actions) are practiced least frequently.

The overall rating of the Waste Wise Schools program was also very high with 73.21% of the participating schools rating the program as “very good” to “good” ( $n = 205$ ). The mean rating was 1.95, therein revealing that the Waste Wise Schools program is rated very highly by Victoria teachers. Similarly 78.9% of participants rated the Waste Wise Schools program highly in terms of promoting whole-school engagement ( $n = 224$ ) with a mean rating of 1.88. As shown in Table 5, further analysis also revealed a significant relationship between a school's rating of

TABLE 5  
Significant Relationship Between a School's Rating of the Waste Wise Schools Program and Whole-School Engagement

<i>Kendall's tau_b</i>	<i>Waste Wise Schools Program</i>	<i>Whole-School Engagement</i>
Waste Wise Schools Program		
Correlation Coefficient	1.000	.562(**)
Sig. (2-tailed)		.000
N	280	275
Whole-School Engagement		
Correlation Coefficient	.562(**)	1.000
Sig. (2-tailed)	.000	
N	275	284

\*\* Correlation is significant at the .01 level (2-tailed).

TABLE 6  
Significant Correlation Between Waste Wise Certification Step and Rating of Program

	<i>Waste Wise Step</i>	<i>Rating of Waste Wise Schools Program</i>
Waste Wise Step		
Pearson Correlation	1	-.322(**)
Sig. (2-tailed)		.000
N	199	195
Rating of Waste Wise Schools Program		
Pearson Correlation	-.322(**)	1
Sig. (2-tailed)	.000	
N	195	280

\*\* Correlation is significant at the .01 level (2-tailed).

the Waste Wise Schools program and whole-school engagement (5.62,  $p < .01$ , Kendall's *tau\_b*). This finding signals a whole-school approach as a key success factor in the Waste Wise Schools program and potentially school-based environmental education programs more broadly. Similar findings have also been reported by Henderson and Tilbury (2004) in an international review of whole-school environmental education programs.

Further, there was a significant correlation ( $-3.22$ ,  $p < .01$ , Kendall's *tau\_b*) between a participant's rating of the Waste Wise Schools program and their school's level (step) of certification (see Table 6). For example, those schools who are at Step 3, 4, or 5 (new certification system) are more likely to rate the program favorably. Those who are in the early stages are more likely to rate the program less favorably, which may be a result of lack of understanding about the requirements and challenges in implementing the Waste Wise Schools program and/or an environmental education program. Existing research supports such a contention where lack of teacher knowledge and skills has been identified previously as a key barrier in implementing an environmental education program (Cutter-Mackenzie & Smith, 2003).

### Challenges, Barriers, and Accomplishments

Using open-ended questions, teachers were invited to comment on the barriers and challenges faced when implementing an environmental education program such as the Waste Wise Schools program. Secondary teachers identified time, crowded curriculum, and staff/student commitment/dedication as the greatest challenges as shown in the following representative comments:

It can be a challenge to change behavior. You need to work with all sections of the school community. People are busy. The curriculum is crowded. You have to encourage people and try to get them to see this way of living and operating and not another add on to the curriculum.

Lack of ongoing staff committed to the program is a challenge, in addition to a large school population.

I am the only teacher committed to and trying to implement the changes. I have very little support and no time allowance.

I believe how a school implements the program is crucial. The program itself is well established and adheres to the ideas of sustainability and truly does good things. But, while Waste Wise can suggest how a school should best implement the program—it is the dedication of the people involved at the school level that makes it successful.

Primary school teachers reported similar issues with a particular emphasis placed on teacher commitment/leadership, changing students' behavior and the lack of breadth of the Waste Wise School program as shown in the following representative comments:

The program needs to increase the breadth of its reach— include all Waste Wise areas— rubbish, water, resources, energy and encourage the implementation with government providing funding for viable well-planned changes.

Lack of total staff involvement at times—consequently most falls on the shoulders of the few.

Waste Wise practices such as rubbish-free lunches are a real challenge. For example, students contaminating the waste stations or improper use of the waste stations.

It really is down to the momentum of one or two teachers pushing—but essentially teachers are fairly well focused on student outcomes and learning activities, that sustainability outside the science classroom becomes less of a priority. Administration and teachers are mostly focused on the litter around the school—rather than changing practices.

Similar barriers have been reported in existing research, particularly regarding issues of lack of teacher and administration (management) commitment, lack of time, and overcrowded curriculum (Cutter-Mackenzie & Smith, 2003; Ham & Sewing, 1987; Spork, 1992). These participants also identified additional barriers, including changing student behavior and extending the breadth of the Waste Wise Schools program, which have not been identified previously in research.

Teachers were also asked to report what they most liked about the program (key accomplishments). Secondary school teachers tended to emphasize student empowerment, whole-school approach, and school-home transitions as key accomplishments. On the other hand, primary school teachers tended to emphasize student commitment and recognition as key achievements. The following comments are representative of the sample:

The impact that we are making is having a difference at a school level and it is flowing into the home environment. The secondary students enjoy the responsibility of planning and implementing the program—feeling a real sense of ownership (empowerment). It gives the students in each class the option to take on responsibilities for assisting the whole project. It is great to see students from all classes taking out the compost; feeding the worm farm and separating out their recyclable rubbish.  
[secondary school teacher]

Recognition for our efforts and reduction of litter. Particularly, support from a program so that it is not just a 'person' with an 'enviro bee' in their bonnet. We also like being able to support other schools.  
[primary school teacher]

## CONCLUDING COMMENTS AND FUTURE DIRECTIONS

The data analysis of the Waste Wise Schools program reveals that it is becoming increasingly ingrained in the growing sustainability culture taking place in Australian schools. This growing sustainability culture is evidenced by multiple factors.

1. Schools are readily engaging in teacher professional development in environmental education, which represents a marked increase in professional learning in this area. Past research has shown that this has been quite the contrary with consistent low levels of teacher professional development in environmental education in Australian schools (Cutter-Mackenzie & Smith, 2003; Spork, 1992). Increasing participation in professional development in this area represents a growing culture of environmental education and sustainability in Australian schools.
2. Consistent with increased teacher professional development in environmental education, the findings also reveal increased participation in other school-based environmental education and sustainability programs. The participants identified that the Waste Wise Schools program had acted as a springboard or catalyst in leading to their participation in other environmental education programs and sustainability initiatives as also reported in Sharpely (2003a, 2003b).
3. Strong links with external partnerships, namely local government and environmental organizations, were signaled as a key success factor in the Waste Wise Schools program. In 2004, Henderson and Tilbury reported that there had been limited success in Australian schools with respect to building meaningful external partnerships that furthered environmental education in schools. They also identified that there is a serious dearth of empirical research regarding the characteristics of successful or effective partnerships in implementing school-based environmental education programs. The findings of this study suggest that schools are having success in this area and that it is an essential component of a successful environmental education program. However, the nature and extent of such external partnerships warrants significant further research.
4. Teachers' ratings of their school's overall performance in waste reduction, waste management, waste and litter plan/policy, and curriculum development and implementation were high. Waste reduction and management were rated highest. It was also shown that as schools progress through the Waste Wise Schools program (certification system) their perceptions of their performance becomes more positive potentially leading to further success in environmental education.
5. Participants rated their Waste Wise practices (the 3 Rs) consistently high with significant reductions in recycling paper and cardboard, reusing materials, reusing containers and regularly turning off lights and fans. Entering the annual Waste Wise Schools awards, having package-free lunches, and sustainable transport to school were the least practiced initiatives. Further research is required to offer explanations as to why these practices (actions) are practiced least frequently by Australian schools.
6. Participants rated the Waste Wise Schools program very highly in terms of promoting whole-school engagement. This finding signals a whole-school approach as a key success factor in the Waste Wise Schools program and potentially school-based environmental education programs generally. Similar findings have also been reported by Henderson and Tilbury (2004).

7. Consistent with the results of Armstrong and Grant (2004a, 2004b) student empowerment, whole-school approach, school-home transitions, student commitment, and recognition of environmental education practices were identified as key successes in being involved in the Waste Wise Schools program.

In conclusion, this study has provided insights about the Waste Wise Schools program and school-based environmental education programs more broadly. It is evident that a growing sustainability culture is active in Australian schools. Further research and development is now needed that moves beyond a 3 Rs (recycle, reuse, and reduce) approach that the Waste Wise Schools program espouses, and more appropriately considers the additional Rs, namely refuse, rethink, resist, and replant in order to encapsulate the impact and depth of school-based waste and litter education programs.

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### NOTES

1. The Waste Wise Schools program forms one of Sustainability Victoria's environmental education school-based programs. Sustainability Victoria is a Government environment and sustainability department for the state of Victoria. From 1997–2007, the Waste Wise Schools program was delivered by the Gould League with assistance from the Centre for Education and Research in Environmental Strategies (CERES), the Victoria Primary Principals' Association and the support of regional waste management groups and councils. The program has been evaluated since its conception by various researchers. In 2006, Monash University was engaged to undertake the research in an attempt to offer another perspective.
2. From 2008, the Waste Wise Schools program in Victoria was replaced by the ResourceSmart Schools—Waste Program which has a similar ethos, albeit integrating the Australian Sustainable Schools initiative and the Waste Wise Schools programs.

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