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School Environmental Education Programme Impacts Upon Student and Family Learning: A Case Study Analysis

By Roy Ballantyne, John Fien and Jan Packer

Abstract:

This article uses a case study approach to explore the impact of two school environmental education programmes, from the perspective of participating students, their teachers and their parents. A total of 152 students (79 from primary schools and 73 from a secondary school), 3 teachers and 62 parents contributed their perceptions regarding the impact of the programmes. Each programme is described in detail and students' responses compared across the two programmes and across different class groups participating in each programme. It is concluded that both programmes were successful in engaging students in thinking and learning about environmental issues, although some programme features were more likely than others to lead to impacts beyond the bounds of the classroom. Recommendations are made regarding those features that need to be included in school environmental education programmes in order to maximise student and family learning outcomes.

As awareness of the enormity of global environmental problems has increased in recent decades, school environmental education programmes have become increasingly widespread. Numerous studies indicate that teachers and students in many parts of the world are addressing outcomes relevant to environmental education and that students in many schools are actively involved in local environmental projects (Scoullos, 1999). Experiences such as planting trees, cleaning creeks, collecting information and taking positive action in the local environment are often incorporated into these programmes and students report having learned new information, skills, attitudes and approaches to environmental problems (Ballantyne et al., in press). It has also been suggested that school environmental education programmes can potentially reach a wider audience than the student population through the process of intergenerational influence (Ballantyne et al., 1998a). Some environmental education activities and approaches, for example, encourage students to discuss environmental issues and actions with their parents and other adults in the community (Ballantyne et al., in press). However, the extent to which involvement in such projects leads to students, their parents and other adults in the community developing an increased appreciation of the relationships between people and environments and

enhanced insights, commitments and skills for acting on behalf of the environment remains unclear.

This article uses a case study approach to explore some of the learning outcomes, attitudinal and behavioural changes and intergenerational influence effects resulting from students' participation in school environmental education programmes. The data reported here were collected as part of a larger study on the factors contributing to intergenerational communication regarding the environment, the results of which are reported elsewhere (Ballantyne et al., 1998b, 2000 in press). This article focuses on two programmes in Australia - one conducted in a primary school with Year 5 and Year 7 students (aged 9 - 12), the other in a secondary school with Year 9 students (aged 13 - 14). The two programmes are described, data collection procedures explained and the impact of the programmes on students and their parents explored from a variety of perspectives. Finally, conclusions are drawn regarding the type of impact environmental education programmes are likely to achieve and the factors which contribute to or limit their impact on student and family learning, attitudes and behaviour.

Description of the Environmental Education Programmes

Primary School Programme: `Story Walk`

The Story Walk programme (Pullenvale Environmental Education Centre, 1996) was developed and conducted by an environmental education centre on the outskirts of Brisbane, Australia, and aimed to develop students' environmental concepts, values and skills by exploring the theme `the past holds many stories about people and the environment that are essential to our understanding of the environmental situation we have today'. This was approached by allowing students to discover the fictional story of the friendship between Matthew and Kara, a young white boy and Aboriginal girl who lived in the mid-1800s in Australia. The story provides the context within which students can explore connections between the personal, social and natural world.

The Story Walk programme was designed to be integrated with the Year 5 Social Studies curriculum, although classes from other year levels were not excluded from taking part. Class teachers were given guidelines on activities that could be undertaken in class before and after the students' visit to the centre. To this end, the programme or `story' consisted of four sections called `chapters'. The first chapter was completed in the classroom and was designed to prepare students for their visit to the centre, set the scene for

the story and establish a commitment to the adventure at the centre. In this phase, students were involved in learning more about the past and the differing views of School Environmental Education Programme Aboriginal and non-Aboriginal people toward the land. In Chapter 2 the students visited the centre where the story continued to unfold. The educator from the centre presented the story within four specially made settings, each of which represented the home of one of the main characters. As the students visited the four sites around the centre, they gathered clues to investigate the main characters and their families. The emerging story highlighted the link between people and the environment, the complex issues that surround the use of water as a resource and the displacement of the Aboriginal people from their land in colonial times. During this process, students were confronted with an environmental problem that they were required to address when they returned to school for Chapter 3.

Chapter 3 set students the task of researching, writing and presenting their own ending to the story. To do this they had to address the environmental conflict faced by the characters in the story and 'save the catchment' in some way. The students also revisited the work they had done on Aboriginal and non-Aboriginal visions of the land at the beginning of the programme and related this both to the characters in the story and to the present-day context. In the final chapter in the story a member of the centre's staff visited the participating schools for a day and told the author's ending to the story. Links were drawn between the environmental problem posed in the story and the same problem in the present-day context in the students' local area. Students were introduced to the concept of a catchment, undertook basic water quality tests at a creek near their school and were asked to consider the major sites, such as townships and local industry, which might affect local water quality.

The Story Walk programme was observed with students from two different primary schools, a private school in an inner suburb of Brisbane (4 male and 27 female Year 7 students) and a state school in a small town approximately 80 km from Brisbane (18 male and 30 female Year 5 students). The teacher of the Year 7 group spent 12 weeks preparing the students for the Story Walk programme by introducing relevant themes into classroom activities in Social Studies, English and Science. Thus, for example, she developed their background knowledge of Aboriginal culture, European settlement, different writing genres and the chemical compounds used in water testing. After completing the programme, student learning was further consolidated by a class presentation on Aboriginal reconciliation for National 'Sorry' Week, and a continuing

Social Studies programme on 'Government' that focused on social and environmental issues in their state. The Year 5 group consisted of a double class with two teachers teaching as a team. These teachers spent 3 weeks preparing students for the programme, using the set activities. In Chapter 3 they used drama rather than story writing to present their story endings and in Chapter 4 they incorporated a rainforest walk with guided talks, sensory awareness and worksheet activities.

Secondary School Programme: 'Six Thinking Hats'

This programme used DeBono's 'six thinking hats' approach (De Bono, 1992) to explore a local environmental problem. According to this approach, there are six different modes of thinking, each of which is represented by a different colour hat (red hat - emotions; yellow hat - good points; black hat - bad points; green hat - creativity; white hat - information; and blue hat - organisation of thinking). The purpose of the six hats method is to encourage people to use all six modes of thinking and to switch easily between them.

The programme was incorporated into three Year 9 Studies of Society and Environment classes at a private girls' school in Brisbane. A total of 73 students participated in the programme. One class (referred to as Class A) was taught by the teacher who had developed the programme and the other two classes (referred to as Classes B and C) were taught by a different teacher. The programme had the following aims:

- to raise students' awareness of local environmental problems;
- to develop students' understanding of the research process involved in investigating a problem;
- to encourage students to think critically about the topic of their research; and to develop students' oral presentation skills.

As an introduction to the programme, the classes studied the problem of air pollution and were addressed by a local air pollution expert. This was considered to be a particularly relevant issue for these students as their school is situated on a main arterial road in Brisbane which carries heavy vehicles, both day and night. The students then looked at a second example of a local environmental problem derived from their class textbook, concerning the declining numbers of koalas in Brisbane, and considered how the six hats could be used to report on the problem.

The students then formed small groups of 2 - 4 to investigate a local environmental problem of their own choosing, using the six

thinking hats method. The topics chosen included air pollution, noise pollution, water pollution, graffiti, urban development, declining koala numbers, litter, animal abuse and stray dogs. Class time was allocated to allow students to work on their research, assisted where necessary by the teacher.

Using the red hat, the student groups considered how they felt about the particular problem they were studying. They then gathered information regarding their problem (white hat) from a variety of sources by telephoning and writing to local and state authorities, non-government groups and community action groups, visiting school and community libraries and searching the internet on the school computer. As part of this process, many students discussed the issue at home with their parents and enlisted their assistance in contacting organisations. Some student groups also conducted their own investigations by recording the amount and variety of rubbish in a local park, observing the health of flora and fauna, taking photos and conducting surveys.

The next three thinking hats involved students in discussing their issue and sharing their ideas within their small group. They considered the costs and benefits of existing solutions to the particular problem (black hat and yellow hat) along with creative ideas for alternative solutions (green hat). Finally, an organisation of thinking component (blue hat) was incorporated using two exercises, a 'habits of mind' table and a 'learning log'. The former involved students regularly rating their performance of certain actions or 'habits of mind' such as planning, using resources and using feedback from others. The latter involved students keeping a record of the things they had done which justified the ratings they had given themselves on the 'habits of mind' table.

The class teachers monitored the students' progress at regular points throughout the programme. Student groups were required to prepare three pieces of assessment: a written report, an oral presentation and an evaluation report which summarised the information collected in the habits of mind table and learning log. The oral presentation was considered particularly important as it provided students with an opportunity to express their feelings and opinions about the problem they researched as well as listening to other students' presentations. Students were encouraged to use a variety of visual aids in their presentations, including posters, puppet shows, costumes, photos, tables and figures.

Although both of the participating teachers followed the procedures outlined above, the teacher of Class A provided her students with more help than the teacher of Classes B and C, particularly in terms

of locating environmental information sources in the community, monitoring group progress and giving advice on improving oral presentation skills.

Data Collection Procedures

The impact of these two environmental education programmes was explored from the perspective of the students (using questionnaires), their teachers (using personal interviews) and their parents (using telephone interviews). The data reported here are part of a larger data set that includes general information on student environmental orientation and family communication. However, as this article focuses specifically on students' responses to the environmental education programmes and the programmes' impact on their lives, only those items relevant to the research questions are described here.

On completion of the programme, students were asked to complete a questionnaire which included a number of short open-ended questions regarding what they liked about it, what they had learned, whether the programme had made them want to change in any way, and whether they would like to participate in another similar programme. Three of the teachers involved in the programmes were interviewed about their perceptions of the successful elements of the programme and the reasons for this. Their comments provided useful insights into the aspects of the programmes that impacted most on the students. Students' parents were also invited to participate in a 15-minute telephone interview with a member of the research team. Parents were asked whether the student had discussed aspects of the programme with them, and if so, what was the nature of their discussion. They were also asked whether and in what ways they felt the programme had impacted on their children. Of the 152 students who participated in the two environmental education programmes, 62 had parents who agreed to be interviewed (41% in total; 42% from the Story Walk programme and 40% from the Six Thinking Hats programme).

Exploring the Impact of the Programmes

In the following analyses, the impact of the two environmental education programmes is explored from a variety of perspectives. By comparing the two programmes, as well as the different class groups within each programme, insights are gained into the extent to which impacts vary across different contexts. Both quantitative and qualitative analyses are used.

Students' Reports of their Enjoyment of the Programme

Students were asked to rate how much they liked the programme on a five-point scale, and then to indicate which parts of the programme they liked or disliked, and why. In terms of the quantitative rating scale, the students enjoyed the Story Walk programme more than the Six Thinking Hats programme (Mann - Whitney Test, $Z = 3.87$, $p < 0.001$), the modal response being 'quite a lot' for the former and 'a little' for the latter. Further investigation revealed that this effect was due to a very high level of enjoyment reported by the Year 5 Story Walk class and a very low level of enjoyment reported by the Six Thinking Hats Class C (83% of the former liking the programme at least 'quite a lot', compared with 28% of the latter). In all of the other classes, 55 - 58% of students reported liking the programme. An examination of students' qualitative responses to questions regarding what parts of the programme they liked and why sheds some light on these responses.

The Year 5 class (Story Walk programme) greatly enjoyed their visit to the environmental education centre and seeing the characters' homes that had been set up there. One site in particular that attracted their interest was a 'cubby' (children's playhouse) built and used by the children in the story. Students' comments indicated that they had been able to connect with this setting because it 'looked like it was made by kids' and 'felt like it was my own'. This group of students also commented on aspects such as the mystery, the reality and the novelty of the experience ('it seemed real and you felt a special sensation, as if you really were alive back then'), as well as the accessibility of the items on display ('I could touch things'). Students in this class also enjoyed the water-testing part of the programme and were interested by the practical application of scientific methods.

The Year 7 class differed quite clearly in their responses to the Story Walk programme. These students were more likely to cite the water-testing aspect of the programme as something they enjoyed rather than the visit to the environmental education centre (74% mentioned water testing and 61% mentioned the centre, compared with 38% and 64% respectively of the Year 5 class). Only a few students in the Year 7 class singled out the 'cubby' house as something they had particularly enjoyed, compared with nearly half of the Year 5 class who mentioned this site. Year 7 students were also more likely to refer to the story itself as something they enjoyed rather than the more concrete 'hands on' activities mentioned by the younger students. In general, the mystery, reality

and novelty of the experience were as relevant to the Year 7 students as they were to the Year 5s although a few students did report that they found aspects of the experience `babyish'. (It should be noted that the Story Walk programme was specifically designed for the Year 5 level.)

The differences between the three classes participating in the Six Thinking Hats programme were not as clear as those in the Story Walk programme as the students were all the same age and two of the classes were led by the same teacher. In general, the aspect students liked most about the programme was the opportunity to present their work to the class (37% mentioned this as an aspect they liked). Other aspects which students reported having liked were learning about the environment (21%), observing and investigating problems in the field (14%), preparing audiovisual materials to accompany their talk (13%) and hearing other students' presentations (7%). These patterns varied little across classes.

However, the extent to which students enjoyed the research aspect of the programme (finding out information) did vary between classes. Overall, 25% of students were positive about this aspect and 24% were negative. However, in Class A the balance was 29% positive and 4% negative; in Class B 35% positive and 30% negative, and in Class C 15% positive and 37% negative. The reasons students gave for disliking the research aspect were that it was difficult to find information, there was not enough time and they did not know where to start looking. These problems may have been alleviated in Class A by the extra attention given to this aspect by the teacher. As their enjoyment of the research aspect of the programme appeared to be the main difference among the classes, as well as the major aspect disliked by students in Class C, it is quite possible that the difficulty these students experienced in researching their topic contributed to their low level of enjoyment of the programme overall.

Students' Reports of their Learning from the Programme

Students were asked what they had learned in the programme and how useful they thought that learning would be to their lives. Again, in the Story Walk programme, there were marked differences between the Year 5 and Year 7 groups in their responses to these questions. The Year 5 students tended to give uni-dimensional responses to the question regarding what they had learned. Thus, they referred to different views and uses of the land, to the problem of water pollution or to the relationship between Aboriginal and white people but rarely to a combination of these concepts. The

Year 7 class, either because of their age or the extra attention given to pre- and post-visit activities by their class teacher, were more likely to report learning about two or even three of these concepts, and in some cases historical aspects as well. They were more likely than the Year 5 students to make the link between the story and a present-day concern for the environment and were more likely to focus on the issues involved rather than the information. The following responses illustrate these differences:

Year 5 students:

- We learned about how Aborigines and white people looked at land.
- I learned about how hazardous it can be if a catchment area is polluted.
- I learned that cattle made so much wreckage.

Year 7 students:

- How polluted Brisbane's streams are, how important water is, how the Aborigines cared for the land, how white people destroyed the land.
- The Aboriginal views of the land and how the whites got on with them, how polluted and disgusting creeks are nowadays.
- Aboriginal injustice and the pollution in our waterways.

When asked how or why what they learned would be useful to their lives, students in both groups focused on the importance of their environmental learning, e.g. caring more about the environment, knowing how to look after it, and understanding the dangers of pollution and littering.

Students in the Six Thinking Hats programme had worked on different topics, and so there were no consistent responses to the question regarding what they had learned. Most students simply referred to the particular environmental problem they had researched and, in some cases, the causes of or solutions to the problem. A small number of students, mostly in Class A, referred to process issues such as learning how to obtain information, the importance of thinking through issues and looking at different aspects of the problem. When asked how or why what they learned would be useful to their lives, students in all three classes stressed the importance of environmental awareness and mentioned simple actions they could take to address environmental issues in general, or the specific issue they had researched. The following student comments illustrate these responses:

- It's useful because knowing about these environmental issues I can do my best to stop myself from causing it to get worse.
- Because I learned how I can help to save the frogs, e.g. build ponds.
- Because we can let others know by telling them how important it is to protect them [koalas].
- Now I know where exactly water pollution comes from and how I may help reduce this problem.

In summary, then, it would appear that both of the programmes studied were successful in raising students' awareness of environmental issues. Students' responses indicate that they consider environmental issues an important topic which is highly relevant to their lives.

Students' Reports of the Impact of the Programme on their Lives

Students were asked to give a simple yes/no response to the question, 'Has the programme made you want to change in any way?' Those who responded in the affirmative were then asked in what ways they had changed and which parts of the programme had contributed to their desire to change. Overall, 84% of students in each programme indicated that the programme had made them want to change. There were no significant differences between classes, although the greatest variation was between Class A and Class C of the Six Thinking Hats programme (91% and 77% respectively).

In the Story Walk programme, students reported having changed in their knowledge, e.g. 'I am more aware of the environment' (14%), their attitudes, e.g. 'I care more about the environment' (22%) and their behaviour, e.g. 'I am careful to save water' (51%). Although the Year 5 students were more likely to report changes in attitudes and the Year 7 students changes in knowledge, similar proportions in both groups reported changes in behaviour towards the environment. For both groups, the aspect of the programme which contributed most to their desire to change was the water testing component (52% of the students who reported having changed cited this aspect as the major contributor). For the Year 5 students, the rainforest walk was also significant (cited by 36% of Year 5 students), while the Year 7s were more influenced by class discussion and the story itself (cited by 35% of Year 7 students). One particular aspect of the rainforest walk mentioned by a number of students was a chance encounter with a scrub turkey whose leg had become entangled in a piece of string - a vivid illustration of the effects of pollution and littering on the native

wildlife. Interestingly, only 14% of students overall mentioned aspects of the visit to the environmental education centre, including the story, as contributing to their desire to change. This highlights the importance of post-visit activities in reinforcing and extending student learning in environmental education programmes.

Students in the Six Thinking Hats programme also reported changes in their knowledge (22%), attitudes (17%) and actions (45%) regarding the environment. The major contributor to this change was the collection and presentation of information on environmental issues, including the presentations of other groups. It should be noted, however, that the information which had the greatest effect on students tended to be emotionally charged, e.g. 'finding out what it [pollution] did to the fish and other animals'; 'knowing that there are animals and people dying from pollution'; 'imagining and listening to what could happen if we don't change'. The emphasis in the programme on using audiovisual material to support presentations also had a powerful effect, encouraging students to make and record observations in the field and adding an element of realism and immediacy to their presentations, e.g. 'visiting the petrol station and seeing the mess'.

It is encouraging that a large percentage of students in all five classes reported having changed their behaviour as a result of participating in the environmental education programme. Despite the very different natures of the two programmes, the aspects that contributed most to student-reported change had common elements. They involved seeing the evidence of environmental problems, through field visits or audiovisual presentations, being made aware of the effects of these problems on both wildlife and humans and being challenged to make some sort of effort to help alleviate the problem. In all of these stages, engaging students' emotions appeared to contribute to the effectiveness of the learning experience.

Students' Reports of Future Participation

Students were asked whether they would like to participate in another programme such as the one they had just completed (yes/no/maybe) and why. Not surprisingly, students' responses were consistent with their reported liking of the programme. Most of the Year 5 Story Walk class said they would like to participate in a similar programme (62% yes, 23% maybe) while the Year 7 class was more ambivalent (45% yes, 42% maybe). In their reasons for responding 'yes', most students indicated that the programme was interesting and fun. In the Year 7 group a number mentioned that they had enjoyed the water quality monitoring component but not

the visit to the environmental education centre. In the Six Thinking Hats programme, 'maybe' was the modal response for all groups. Class A had the highest proportion of 'yes' responses (29%) and Class C the lowest (24%). In their reasons for responding 'yes' or 'maybe', students indicated that they had learned from the programme or enjoyed studying the environment as well as having found the programme interesting and fun.

Teachers' Perceptions of the Success of the Programmes

The teacher of the Year 7 Story Walk class was interviewed. She felt that the programme had been a great success and that the students had all enjoyed it immensely. 'What they really enjoyed was being immersed in the story by going up to [the environmental education centre] and seeing the sites - the kids like to make believe, they like to go into that time.' The catchment awareness component of the programme was also described as a big success - 'They were very proud they found lobsters and their own creek was not polluted ...The kids are ready to camp down at the creek and clean it up!' Aspects of this component of the programme also tied in with the class science programme. For example, the students identified the chemicals in household products and went home and told their parents which were and were not environmentally friendly. The main criticisms this teacher had of the programme included: (a) the requirement for students to complete the story by saving the catchment, as this was seen as restrictive and tended to compartmentalise issues rather than link past and present; and (b) the level of structure imposed on the visit to the environmental education centre, which was seen to be inappropriate for a Year 7 group. This teacher's perceptions were, in fact, borne out by the lack of integration between the Aboriginal and environmental themes in students' responses and students' comments regarding the 'babyishness' of the programme.

Both teachers involved in the Six Thinking Hats programme were interviewed and both felt the programme had been successful in improving students' knowledge about local environmental problems. The oral presentations in particular were considered highly effective as 'the students learned about a variety of important local environmental problems from the other student group presentations rather than the teacher having to go through each of the various problems with them'. They felt that the opportunity for students to choose their own topics, conduct independent research and interact with people in the community had all contributed to the students' enjoyment of the programme. The teachers found the Six Thinking Hats approach valuable because it encouraged students to think critically and learn actively. They also mentioned the importance of

the approach in focusing on the affective aspects, rather than simply the factual dimensions of environmental issues, a perception which again is borne out in students' responses.

Parents' Reports of Discussions Stimulated by the Programmes

When describing the ways in which they had changed as a result of their participation in the environmental education programme, some students in the Six Thinking Hats programme mentioned their desire to 'make others aware' of what they had learned. This 'multiplier' effect, particularly in relation to discussions between students and their parents, was the focus of the larger study from which these case studies were extracted. Data from parent interviews are presented here in order to explore the extent to which the impact of these programmes extended beyond the students themselves.

Parents were asked whether their children had talked about the programme at home, and if so, what they had talked about. Parents of 11 of the Year 5 Story Walk students and 24 of the Year 7 students were interviewed. While most had heard about the programme and knew a little of what the children had done, only in five families (two with Year 5 and three with Year 7 students) did the child's involvement in the programme elicit any discussion in the family about environmental issues. In three of these families, this discussion appeared to be at the parents' initiation while in the other two families the students (both Year 7) initiated the discussion. In both cases this occurred as a result of a visit to the creek where the students found evidence of aquatic life. These students were 'impressed the water was so clean near the city' and shared this experience with their parents. Most parents, however, did not connect what they had heard about the programme with environmental issues at all.

Parents of 29 students from the Six Thinking Hats programme were interviewed. All except one had heard about the programme and many had become involved in helping students research and present their projects. This often elicited discussion about the particular issue and steps that could be taken to address or resolve it (86% of parents reported having discussed the issue and 41% discussed actions that could be taken). The following parental comments illustrate this process:

My daughter had to write an assignment on pollution in the local area. She had to get facts about it. We talked about who was responsible, how it could be cleaned up, and what were the causes of pollution.

Her project was on air pollution. She had to do an oral. She went through the researching at school and at home. She went through her oral with me. She asked us what the word 'atmosphere' meant and then it expanded from there. She asked me what would be the best things to do to help fix the problem.

The two environmental education programmes studied here differed markedly in terms of the amount and nature of discussion elicited at home as a result of students' participation in the programme. Although not directly probed, some parents also indicated that discussions with their children led them to modify their own environmental attitudes and behaviour. This finding is in line with that found in the larger study (Ballantyne et al., in press). The case study findings suggest that if teachers want to extend the influence of their environmental education programmes beyond the students themselves, they need to incorporate certain elements into their programme. For example, in the younger grades, parents could be given suggestions on how to reinforce their children's learning through discussion at home and could be incorporated into the environmental learning through the design of homework activities (Ballantyne et al., 1998b). In the older grades, involving parents in student projects and presentations could be an effective way of enhancing intergenerational communication and promoting reflection on action in relation to local environmental issues.

Parents' Observations of the Impact of the Programmes on Students

Parents were asked what sort of impact they thought the programme had on their children. In Story Walk, most parents were positive about the programme but were unable to define any observable changes in their child as a result of their participation, e.g. 'She loved it and thought it was fantastic, so it must be good'; 'She did talk about it a lot at the time'. However, parents of two students in the Year 7 class reported that the programme had impacted on their children's behaviour, i.e. 'She turns the tap off and makes sure everyone else does'; 'She turns off the shower. It used to be a battle with her over taking long showers. She told me when cleaning the bathroom I should use vinegar now'. (It should be noted that these were the same two students who were reported above to have initiated discussion of environmental issues and action with their parents.)

In the Six Thinking Hats programme, most parents reported that the programme had prompted their child to think through the issue and become more aware of the environment in general. A number of students (mostly in Class A) had also adopted more responsible behaviour, i.e. 'She turns the tap off while brushing her teeth';

` She goes and cleans the creek and she has rung the council'; ` She organises with other families to carpool'; ` She wants to make a frog habitat in our yard'. Overall, however, parents' observations of the impact of the two programmes on students were less optimistic than the students' own perceptions.

Conclusion

It is encouraging that the students who participated in these case studies, even as young as 10 years of age, considered the environment to be an important topic and that it was relevant to their lives. These two programmes were clearly successful in engaging students in thinking and learning about environmental issues. In some cases, the impact of the programme was such that students said that they changed their behaviour and/or carried discussion of the issue beyond the bounds of the classroom. This occurred for the majority of students in the Six Thinking Hats programme and for a significant number in the Story Walk programme. Based on students', teachers' and parents' perceptions, a number of factors may be hypothesised to have either contributed to, or placed limits on, the impact of the programmes. Some of these factors are already well known to environmental educators; however, they are summarised here as an aid for programme planners and as a basis for further research:

- **Providing an enjoyable experience for students**

The five classes participating in this study varied markedly in the extent to which they reported having enjoyed the programme. Some of the reasons for this relate to other factors listed below. Although enjoyment itself might be considered a positive impact of the programme, its links with other impacts such as students' learning and behaviour change are by no means clear. Thus, as concluded by Ballantyne et al. (in press) the fact that students enjoy a programme does not necessarily mean that the impact of the programme will extend to a deeper understanding of environmental issues or a commitment to responsible environmental behaviour.

- **Connecting with the age and interests of the group**

The cubby house site and `hands on' activities were more interesting and relevant to Year 5 students than to Year 7s. The water-testing activity was more important to the Year 7s than the Year 5s. Discussion and presentation of information had the most impact on the Year 9 group. Clearly, a programme which is tailored to the age-specific interests and capabilities of students will have the greatest impact on both their enjoyment of the programme and their learning.

- **Providing adequate support for learning**

In the Six Thinking Hats programme, the Class A teacher provided greater support for students in the process of researching and presenting their topics. This resulted in greater student enjoyment of the programme and may have also contributed to the high impact of the programme on students' environmental understanding and action in this class. Similarly, in the Story Walk programme, the Year 7 teacher gave greater attention to integrating the personal, social and environmental aspects of the programme. This may have contributed to student learning in the programme, particularly with regard to making links between the story set in the past and present-day environmental issues. Unfortunately, the present data are inconclusive due to confounding with students' age. Nevertheless, these case studies suggest that the input and guidance offered by individual teachers can be vitally important in mediating and facilitating the effectiveness of an environmental education programme.

- **Liaising with students' parents**

Parents demonstrated a high degree of interest in the environmental education programmes in which their children had participated. In some cases, with the very young students, they had initiated discussions with their children in response to school activities. Similarly, with the older group, they had become actively involved in helping their children find and present information for their project. However, the fact that many parents, especially in the Story Walk programme, were not aware of the aims of the programme or how the different components fitted together, limited the potential impact of this programme on both students and parents.

- **Emotionally engaging students in environmental issues**

The programme features which students reported to have had the most impact were those that engaged them emotionally by focusing on:

- (a) the *evidence* of an environmental problem
- (b) the *effects* of the problem, and
- (c) the *efforts* needed to alleviate the problem.

It is suggested that programmes that incorporate a clear focus on these three aspects, and that include (without exploiting) the affective element of each, will be most effective in their long-term impact on students.

This case study analysis has focused on the impact of two environmental education programmes on students' learning and, in

particular, the extent to which the programmes were able to impact on students' environmental behaviour and discussions beyond the bounds of the programme itself. The findings reinforce and extend those of our previous work which indicate that the following programme features facilitate and encourage the process of intergenerational communication and influence in environmental education:

- combining research activities, environmental experiences and class discussion;
- focusing on a local environmental problem;
- providing positive experiences which demonstrate to students that they can have an influence in their own local environment;
- involving students' parents in activities such as homework assignments, research activities and class presentations;
- involving community members in programme activities by conducting surveys and interviews, presenting project reports and research findings in a public forum, having the programme reported in the local newspaper, asking local industries to demonstrate their environmental management strategies and involving local business and community groups in environmental action projects.

Together, these studies provide a valuable insight into the ways in which school environmental education programmes can have a major impact, not only on their students but also on their local communities.

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