Intergenerational Influence in Environmental Education: A Quantitative Analysis

Roy Ballantyne
Queensland University of Technology
John Fien
Griffith University
Jan Packer
Queensland University of Technology

A B S T R A C T

The process of intergenerational influence has important implications for environmental educators who wish to promote discussion about and action for the environment beyond the bounds of the school classroom. This paper examines the process of intergenerational influence in environmental education through a quantitative analysis of the factors influencing the frequency and nature of intergenerational discussion. The relationships among eight sets of variables are explored, including student and parent environmental orientation, the quality of family communication, program features, student enjoyment of the program, student learning through the program, and the frequency and nature of discussion of the program. The findings are discussed both in terms of their implications for environmental educators and for future research in the field.

The concept of *intergenerational influence* in environmental education has been explored in a series of papers by Ballantyne, Fien and colleagues (Ballantyne, Connell & Fien 1998a, 1998b, Ballantyne, Fien & Packer 1999, in press) and previously by Uzzell and colleagues (Uzzell 1994, Uzzell & Rutland 1993a, 1993b). While other researchers have mainly examined the influence of older generations upon younger ones, Ballantyne, Uzzell and their colleagues have focussed on the process 'whereby school students act as catalysts of environmental change among their parents and other community members' (Ballantyne *et al.* 1998b, p. 286). Intergenerational influence, in this sense, is seen not as an attempt at environmental propaganda, but rather as a means of assisting students to develop environmental citizenship competencies which include informing and influencing the actions of others, and thus '"multiplying" the impact of school environmental education programs beyond the boundaries of the classroom' (Ballantyne *et al.* 1998b, p. 286).

The research reported to date by Ballantyne and colleagues has shed considerable light on the nature of intergenerational communication regarding the environment and environmental education programs; the extent to which such discussion occurs; the impact of environmental education programs on both the students who participate and their parents who have been 'drawn in' to the program in some way; and the program features that facilitate and encourage the process. In particular, it has been found that:

- Many students, even as young as ten years of age, consider the environment an important topic that is relevant to their lives.
- Approximately half of all students participating in selected environmental education programs at school take home to their parents an influential message about environmental issues and actions.
- The factors that influence *frequency* of discussion are not necessarily the same as those that influence the *nature* of discussion. For example, programs that incorporate novel, interesting and fun activities are discussed more frequently at home, but often such discussion remains at the level of 'I enjoyed the program' rather than progressing to the discussion of environmental issues and actions.
- Setting homework tasks, research assignments and class presentations that involve parents as partners in student learning at home is one effective strategy for promoting intergenerational discussion.
- Program features that engage students emotionally by focussing on the *evidence* of an environmental problem (through air and water monitoring or field visits); the *effects* of the problem (on local wildlife and the quality of students' own lives); and the *efforts* needed to alleviate the problem (simple actions that are within the students' sphere of influence) have a powerful influence on students' interest in and awareness of environmental problems, which they will often share with their parents or other adults in the community.
- Even young children can and do have an influence with regard to everyday household practices such as walking or riding a bike to school, taking shorter showers, turning off taps and lights, and purchasing environmentally friendly household products. In some cases, the impact of a school environmental education program can lead to changes in these behaviours.

This paper provides further insight into the process of intergenerational influence in environmental education through a quantitative analysis of the factors influencing the frequency and nature of intergenerational discussion. The relationships among eight sets of variables are explored, as indicated in Figure 1. *Student environmental orientation* and *program features* are examined in relation to their effects on *student enjoyment of the program* and *student learning,* as well as their direct influence on the *frequency and nature of intergenerational discussion.* In turn, the relationships among *student enjoyment, student learning* and *intergenerational discussion* are examined. While the effects of *parent environmental orientation* and *family communication* on the *frequency and nature of intergenerational discussion* are considered, there is no reason to expect that these should be related to *student enjoyment* and *student learning.* Finally, the relationship between the *frequency* and *nature of intergenerational discussion* is explored.

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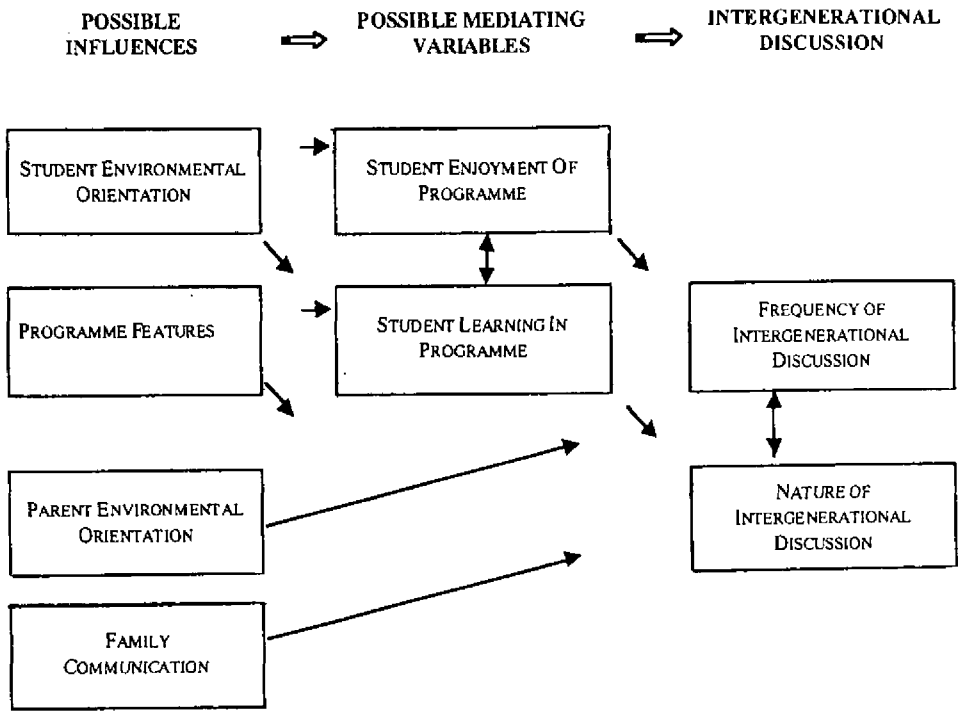
Figure 1. Eight sets of variables explored in the study



Method

Data on these eight sets of variables were collected in relation to six environmental education programs which were being conducted during the study period in metropolitan primary and secondary schools. These programs included studies of local environmental problems, catchment studies, air and water quality monitoring and energy conservation. A variety of teaching approaches were used in these programs, including teacher and student-directed strategies, educational drama, problem solving, environmental monitoring and local action. A total of 284 students participated in the six programs. A summary of these programs is provided in Table 1.

Table 1. Details of participating environmental education programs

Program	Participants	Topic: Teaching Method and Duration
Airwatch	32 students (aged 14-15) 16 students (aged 12-15) 14 parents	Air quality: Class discussion, particle sampling, car counting, surveys over 1 month. Air quality: Voluntary activities during lunch-hour over 1 year.
Six thinking hats	73 students (aged 13-14) 48 parents	Local environmental problems: Small group research, oral presentations, de Bono's (1992) six thinking hats strategy, written assignment over 3 months.
Kids, Companies, Creeks	35 students (aged 13-17) 19 parents	Water issues: Class discussion, interschool meetings, observations, surveys, industry visits, canoeing, water quality monitoring over 5 months.
Issue Investigation Action and Competence Project	26 students (aged 9-11) 20 parents	Self-selected issues: Small group investigation and action over 1 year
Storywalk	79 students (aged 9-12) 45 parents	Catchment awareness and land use: Role plays, class discussion, investigation, water testing, story, experiential learning both in class and at environmental education centre over 2-3 months.
Powerwise	23 students (aged 11-12) 15 parents	Electricity - safety, uses, conservation: Class discussion, instruction, hands on activity, homework over 2 months.
TOTALS	284 students 177 parents	

Data Collection

Data were collected through questionnaires, classroom observation, an analysis of teaching materials and interviews with the teachers and students. A total of 177 of the students' parents completed and returned questionnaires (see Table 1). Of these, 117 parents agreed to be interviewed by telephone about the frequency and nature of parent-student discussions of the particular environmental education program and environmental issues in general.

These research techniques provided data on the eight program variables illustrated in Figure 1. Table 2 illustrates how data on each of these variables were collected and coded for analysis. Wherever possible, scales or measures were used which had been developed and validated in previous research.

Data analysis

Relationships between the eight sets of variables, as hypothesised in Figure 1, were examined, two sets at a time. Correlational, chi-square and t-test analyses were used, depending on the kinds of variables (ordinal, nominal or integer) included in the comparisons. Composite variables were constructed for student environmental orientation, parent environmental orientation, family communication and student learning in order to attain an overall measure of the strength of relationships between variable sets. Intercorrelations between individual items were used to determine variables suitable for combination into a composite score. In some cases, ordinal variables were collapsed into binary variables in order to facilitate interpretation of chi-square analyses.

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Results and discussion

Factors influencing student enjoyment of the program

Table 2. Summary of data collection procedures

Variable Set	Measurement Technique	Description
Student Environmental Orientation	Pre-program student in-class questionnaire	25 items assessing general knowledge, attitudes and behaviour towards the environment based on Leeming, O'Dwyer & Bracken's (1995) 'Children's environmental attitude and knowledge scale'.
Program Features	Teacher interview, Course materials	Three program features identified by Ballantyne, Fien & Packer (in press) as contributing to student learning (the use of environmental testing/monitoring activities; environmental experiences; and projects/presentations) were used to characterise each program on a present/absent (0-1) basis. (A fourth feature – information/discussion – was not used as it was present in all programs.)
Parent Environmental Orientation	Post-program parent questionnaire	25 items assessing general knowledge, attitudes and behaviour towards the environment, as for student questionnaire.
Family Communication	Post-program student in-class questionnaire Parent interview	20 items assessing students' perceptions of the quality of communication with parents, satisfaction with communication, frequency of general communication; and frequency of communication regarding the environment, based on Bienvenu, 1969; Moos & Moos, 1981; Weigel & Weigel, 1993. Parents' perceptions of the frequency of communication regarding the environment.
Student Learning	Pre-post program differences Self-report on Post-program student questionnaire	Changes in knowledge, attitudes and behaviour towards the specific environmental topic covered in the program (15 items) and the environment in general (3 items). Open-ended responses to 3 questions: How much did you learn from the program?; How useful was it to your own life?; Do you think you have changed in some way as a consequence of the program?, coded according to (a) whether the response was affirmative, negative or neutral and (b) the number of aspects (knowledge, attitudes, skills and behaviour) in which students reported learning or change.
Student Enjoyment	Post-program student in-class questionnaire	Students' rating of their enjoyment of the program on a 5-point scale.
Frequency of Intergenerational Discussion	Post-program student in-class questionnaire, Parent interview	Students' and parents' responses regarding if, and how often, they had discussed the program at home.
Nature of Intergenerational Discussion	Post-program student in-class questionnaire, Parent interview	For those students who *had* discussed the program, students' and parents' responses regarding what they had talked about, coded on a 3-point scale according to whether the discussion extended beyond the program itself (level 1) to the environmental issue (level 2) or possible environmental action (level 3).

Student enjoyment of the program was measured by a single item using a 5 point scale (see Table 3). Unless otherwise noted, the following results are based on bivariate correlation analyses with the 5-point scale. In cases where the comparison variable was nominal, however, the 5 point scale was collapsed into a binary variable (low vs. high enjoyment) and chi-square analyses were used.

Student environmental orientation. Students' composite environmental orientation scores were positively correlated with their enjoyment of the program ($r_{266} = .375$, $p < .01$). Individual items which correlated most highly with enjoyment were the student's interest in learning about the environment, the perceived importance of the environment, and their willingness to do things for the environment.

Program features. Programs that involved students in environmental experiences were more likely to be enjoyed by students than those that did not ($c^2_1 = 26.17$, $p < .001$). Programs that involved students in projects and presentations were *less* likely to be enjoyed ($c^2_1 = 5.50$, $p < .05$).

Summary of influences. Student environmental orientation and the inclusion of environmental experiences as a program feature were positively related to student enjoyment of the program.

Table 3. Student enjoyment of program

How much did you like the program?	No. of responses	Percentage	Binary Variable
Not at all	4	1%	Low enjoyment 38%
Not much	18	7%	
A little	82	30%	
Quite a lot	124	45%	High enjoyment 62%
Lots	47	17%	

Factors influencing student learning in the program

Student learning in the program was measured both by before-after comparisons of students' environmental knowledge, attitudes and behavioural intentions, and by students' self-reports regarding the extent and nature of their learning. A composite score was computed for each of these two approaches and these were found to be positively, but not strongly correlated ($r_{220} = .310$, $p < .01$). When used in chi-square analyses, these scales were collapsed into binary variables – positive vs negative change (51% and 49% of the sample respectively) and high vs. low self-reported learning (divided at the median).

Student environmental orientation. Students' composite environmental orientation scores were positively correlated with their self-reported learning in the program ($r_{252} = .430$, $p < .01$). Individual items that correlated most highly with learning were the student's willingness to do things for the environment, their interest in learning about the environment, and their attitudes towards environmental issues. However, students' environmental orientation was not correlated significantly with before-after changes ($r_{233} = -.03$).

Program features. Students were more likely to report learning in programs that involved environmental testing/monitoring experiences than those that did not ($c^2_1 = 7.59$, $p < .01$). Students were also more likely to display before-after improvements in knowledge, attitudes and behavioural intentions in these programs ($c^2_1 = 8.53$, $p < .01$).

Summary of influences. Student environmental orientation and the inclusion of environmental testing/monitoring activities as a program feature were positively related to student self-reported learning.

Relationship between student enjoyment and student learning

Enjoyment was correlated positively with both self-reported learning ($r_{259} = .39$, $p < .01$) and before-after differences ($r_{231} = .18$, $p < .05$). This relationship is also reflected in the chi-square analyses using collapsed (binary) data, with $c^2_1 = 12.57$, $p < .001$ for self-reported learning and $c^2_1 = 10.55$, $p < .01$ for before-after differences, in all cases greater enjoyment being associated with greater learning.

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Factors influencing the frequency of intergenerational discussion

The frequency of intergenerational discussion was measured by a single item using a 4 point scale which was collapsed into a binary variable - low vs. high frequency - for some analyses (see Table 4). The validity of this measure was confirmed by the significant positive correlation between student and parent reports of the frequency of discussion (r_{117} = .43, p < .01), these measures being obtained independently from students via in-class questionnaires and parents via telephone interviews.

Table 4. Frequency of intergenerational discussion

Have you talked at home about what you learnt in the [name] program? If yes, how much did you talk about this?	No. of responses	Percentage	Binary Variable
No	49	18%	Low frequency 56%
A little	105	38%	
Quite a lot	85	31%	High frequency 44%
Lots	37	13%	

Student environmental orientation. Students' composite environmental orientation scores were positively correlated with the frequency of discussion of the program at home (r_{267} = .41, p < .01). Individual items that correlated most highly with frequency of discussion were the student's willingness to do things for the environment, the perceived importance of the environment, their interest in learning about the environment, and their attitudes toward environmental issues. There was a weak negative relationship between students' age and frequency of discussion (r_{175} = -.17, p < .05), i.e., younger students reported a higher frequency of discussion than older students. This weak negative relationship is confirmed in parent reports of frequency of discussion of the program (r_{81} = -.20, p<.05) and also in students' reports of the frequency of general discussion in the family (r_{176} = -.15, p<.05). This is not altogether unexpected as this reflects the general pattern of social development in teenage years.

Program features. Programs that involved students in environmental experiences were more likely to be discussed by students than those that did not (c^2_1 = 9.93, p < .01), as were programs that involved environmental testing/monitoring activities (c^2_1 = 6.91, p < .01). Programs that involved students in projects and presentations were *less* likely to be discussed (c^2_1 = 4.01, p < .05). One possible explanation for these results is that the effect of program features was mediated by students' enjoyment of the program, which was positively related to environmental experiences, negatively related to projects and presentations (see above) and positively related to frequency of intergenerational discussion (see below).

Parent environmental orientation. Parents' composite environmental orientation scores were not correlated with the frequency of discussion of the program at home although students' perceptions of how important the environment was to their parents was positively related to frequency of discussion (r_{233} = .36, p < .01).

Family communication. The family communication composite score was positively correlated with frequency of intergenerational discussion (r_{266} = .32, p < .01). Individual items that correlated most highly with frequency of discussion were the extent to which students reported discussing environmental issues in general with their family, and the student's satisfaction with family communication.

Student enjoyment of the program. The extent to which students enjoyed the program was positively correlated with the reported frequency of intergenerational discussion (r_{273} = .45, p < .01), confirmed also by chi-square analyses using the binary variables (c^2_1 = 32.42, p < .001).

Student learning through the program. Both student self-reported learning and before-after differences were positively correlated with the frequency of intergenerational discussion (r_{259} = .38, and r_{232} = .23 respectively, p < .01). Again, these results were confirmed by chi-square analyses (c^2_1 = 23.34, p < .001 and c^2_1 = 5.67, p < .05 respectively).

Summary of influences. Student enjoyment, student learning, the quality of family communication and the inclusion of environmental testing/monitoring activities as a program feature were all positively related to the frequency of intergenerational discussion.

Factors influencing the nature of intergenerational discussion

The nature of intergenerational discussion was assessed by coding students' and parents' qualitative responses regarding what they had talked about. This variable was only included for those students who *had* discussed the program, in order to maintain the independence of the frequency and nature variables. It should be noted, therefore, that the following analyses have been conducted with a smaller number of respondents (n = 192) than the above (n = 276). Frequencies of student and parent responses are reported in Table 5. (The 3 levels of response are hierarchical in that discussion of environmental action is assumed to incorporate both discussion of the issue and discussion of the program itself.) In this case, neither correlations between students' and parents' scores, nor chi-square analyses, were able to confirm the validity of this measure. For this reason, all of the following analyses are performed using both student and parent data.

Table 5. Nature of intergenerational discussion

What did you talk about?	Students: No. of responses	Percentage	Parents: No. of responses	Percentage
The program itself	53	28%	35	42%
The environmental issue or information	69	36%	23	28%
environmental action	70	37%	25	30%

Student environmental orientation. Students' composite environmental orientation scores were not significantly correlated with the nature of intergenerational discussion (r_{187} = .12 using student data and r_{83} = .14 using parent data). There were no significant age or gender-related relationships.

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Program features. Using student reports of the nature of discussion, programs that involved students in environmental testing/monitoring activities were the most likely to lead to discussion about issues and action ($c^2_2 = 6.37$, $p < .05$). Using parent reports of the nature of discussion, programs that involved projects and presentations were most likely to lead to such discussion ($c^2_2 = 32.78$, $p < .001$). Qualitative data reported by Ballantyne, Fien and Packer (in press; 1999) shed some light on this finding. For students, environmental testing/monitoring activities were influential in 'bringing home' the reality and urgency of environmental issues and problems, thus leading to their heightened perception of having discussed these at home. For parents, student projects and presentations were often the trigger for environmental discussions, with parents being enlisted in providing or collecting information, and checking or hearing students' work, again leading to a heightened perception or recollection of these discussions. In both students' and parents' reports, programs that involved environmental experiences were more likely to be discussed at the 'program only' level than at the level of issues or actions ($c^2_2 = 7.01$, $p < .05$ for students; $c^2_2 = 18.62$, $p < .001$ for parents). Again, this is consistent with findings within the qualitative data reported elsewhere (Ballantyne, Fien & Packer 1999; in press).

Parent environmental orientation. Parents' composite environmental orientation scores were not correlated with the nature of discussion, from either the students' or the parents' perspectives.

Family communication. Family communication composite scores were not correlated with the nature of intergenerational discussion.

Student enjoyment of and learning through the program. None of these variables were significantly correlated with the nature of intergenerational discussion.

Summary of influences. The inclusion in the program of student projects and presentations, and/or environmental testing and monitoring activities, were the factors most strongly related to the nature of intergenerational discussion.

Relationship between frequency and nature of discussion

Student reports of the nature of intergenerational discussion were not significantly correlated with their reports of the frequency of discussion ($r = .08$). Parent reports of the nature of discussion, however, were weakly but significantly correlated with both student and parent reports of the frequency of discussion ($r_{83} = .29$ and $.32$ respectively, $p < .01$). This may indicate that the parent reports were more reliable, or may reflect differences in the data collection methods in that the student questionnaires gave prompts regarding the possible nature of discussion and thus (perhaps falsely) elicited a larger number of higher level responses than emerged from the telephone interviews with parents, in which no such prompts were given.

Overall summary of relationships

The network of factors contributing to intergenerational environmental influence is depicted in Figure 2. No attempt has been made to quantify these relationships as the dependent variables were not considered adequate for regression analysis, however, the relative strength of the relationships is depicted as relatively weak or relatively strong, in relation to other effects. Most noteworthy are the influence of program features on the *nature* of intergenerational discussion, and the importance of student enjoyment as a mediating factor contributing to the *frequency* of intergenerational discussion.

Conclusions

This analysis has confirmed the findings previously reported through qualitative analysis that the factors that influence *frequency* of intergenerational environmental discussion are not necessarily the same as those that influence the *nature* of discussion (Ballantyne, Connell & Fien 1998a, Ballantyne, Fien & Packer in press). In particular, the extent to which students enjoy a program contributes significantly to the likelihood that they will discuss the program at home, however, such discussion is often limited to a report of the activities themselves, without extending to a discussion of the environmental issue or appropriate environmental actions. In order to encourage discussion at this 'deeper' level, features such as the inclusion of environmental testing/monitoring activities or student projects and presentations that involve parents as partners in student learning at home, need to be built into the program.

Student environmental orientation was found to contribute significantly to student enjoyment of the program, student learning through the program and the frequency of intergenerational discussion about the program. It is not surprising that students who consider themselves to be interested in and concerned about the environment are more likely to involve themselves deeply in environmental education programs than those who express less of an interest. At one level, this finding may be discouraging as it suggests that environmental education programs are merely 'preaching to the converted'. However, there is also an encouraging aspect for environmental educators in that the gains achieved by one program, in terms of heightened student interest and positive attitudes, are likely to multiply in the future as the student becomes more deeply involved in later environmental education experiences. This supports the need to program a succession of environmental education experiences.

By contrast, parent environmental orientation was found *not* to contribute to intergenerational environmental discussion, perhaps because discussion arising from school environmental education programs was, in most cases, initiated by the students rather than by the parents. There was some indication, however, that students' *perceptions* of their parents' level of interest may have influenced the frequency of discussion. Students' perceptions of and satisfaction with the general quality of communication within their family also help to

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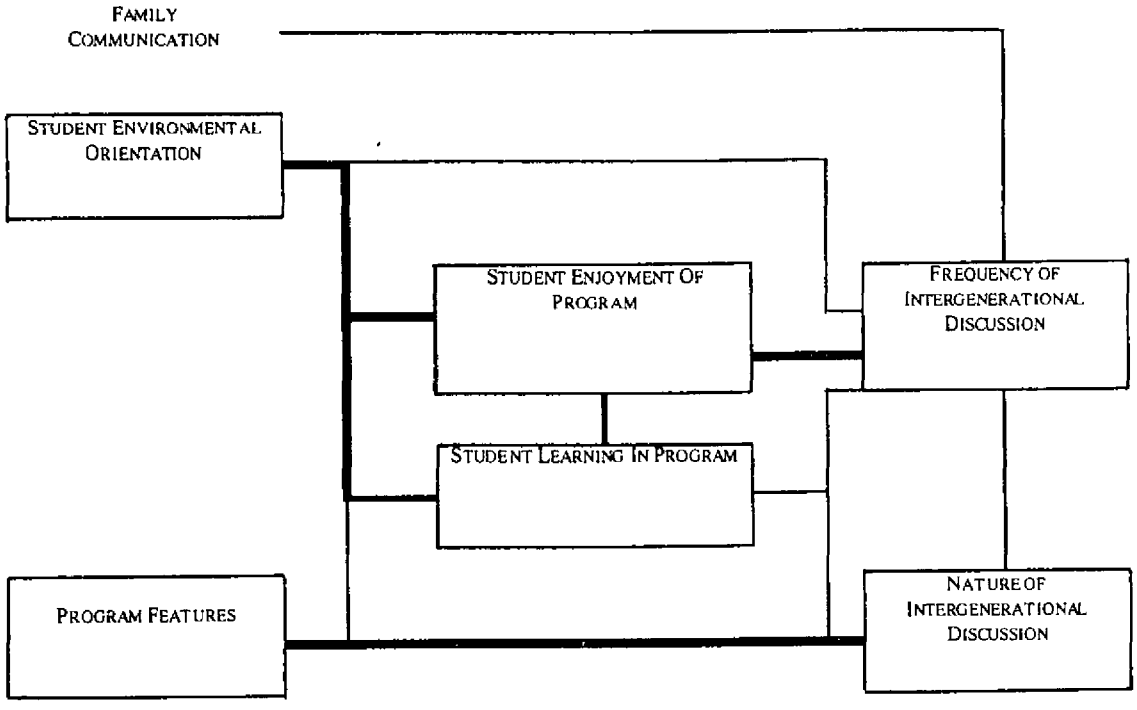
Figure 2. Revised model of intergenerational influence (heavier lines indicate relatively stronger relationships)



provide an atmosphere conducive to intergenerational discussion.

Program features such as the inclusion of environmental experiences, environmental testing/monitoring activities and student projects and presentations contribute in different ways to encouraging intergenerational discussion. Projects and presentations are not necessarily popular with students and tend to dampen their enjoyment of the program in some cases. However, these can be a powerful means for encouraging meaningful discussion between students and their parents (Ballantyne, Fien & Packer in press). Involvement in environmental activities such as canoeing, bushwalking, cleaning creeks or planting trees is clearly enjoyable for students and often leads to discussion of the program at home. Environmental educators need to capitalise on this opportunity by encouraging students to discuss with their parents not only the activities themselves, but also the associated environmental issues and actions. Environmental testing/monitoring activities are particularly important as they contribute to student learning and to both the frequency and nature of intergenerational discussion.

The finding that older students discuss environmental concerns (and other issues) less with their parents than do younger students indicates the need for environmental educators to either concentrate their efforts with regard to intergenerational influence in the pre-adolescent age groups, or to explore new strategies for reaching the parents of older youth. The influence of older youth on *other* adult members of the community, e.g., in local businesses and government authorities, could also be further explored.

This study has helped to clarify some of the processes facilitating intergenerational environmental influence. Further research is needed, however, in determining those factors that contribute to the quality rather the frequency of discussion. If the aim of environmental education programs is to bring about discussion that leads to changes in household practices, it is not enough that students discuss their participation in the program. Strategies need to be devised to encourage students to discuss with their parents particular environmental issues and actions. In this way, students can take 'indirect action' towards environmental change (Uzzell & Rutland 1993b). The ability to discuss and promote awareness of environmental issues within the family and community should thus be regarded as an important aspect of environmental competence, especially as environmental problems can rarely be effectively addressed by individuals.

Other areas that could also be further explored include:

- The effect of environmental interest on student learning and intergenerational discussion;
- Strategies for increasing students' environmental interest;
- The effect of students' perceptions of parental environmental interest, both on their own attitudes and on intergenerational discussion;
- The use of student projects and presentations as a strategy for encouraging intergenerational environmental discussion; and
- Strategies for building on the powerful influence of environmental testing/monitoring activities and other environmental experiences.

It is hoped that this line of research will contribute not only to improving school environmental education programs, but also to meeting the need of adults in the community for

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information, debate and challenge on environmental issues and actions.

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