Encouraging Water Saving: the Role of Knowledge, Attitudes, and Intention

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Few would doubt the need, in today's world, to promote behaviours that actively conserve environmental resources. At a general level, this often involves encouraging behaviours that involve a short-term cost for the individual in order to avoid a long-term negative outcome for the community. Examples of such behaviour are, taking the trouble to turn off lights to save electricity and fixing leaking taps to conserve water. It is these latter kinds of behaviours, namely those associated with the efficient use of water resources, which are the focus of this paper.

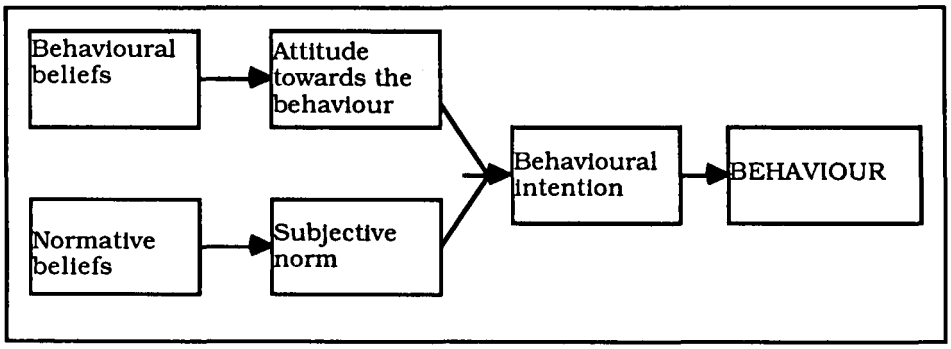
Faced with the high economic and practical costs of attempting to supply unlimited amounts of water for the Melbourne metropolitan area, the Board of Works has sought, by a number of means, to persuade its consumers to use water more efficiently. One aspect of its strategy was to promote water conservation within the educational curriculum by designing various educational materials and programs for different school levels. These and other promotional materials were made available to schools in the Melbourne metropolitan area in 1988. Prior to the distribution of this material, the data reported in this paper were gathered as the first stage of a longitudinal evaluation of the Board's education strategy.

The assumption underlying the Board of Works' educational program was that behaviour change is preceded by changes in knowledge. For example, it was assumed that a person, knowing something about the water cycle, and the system by which water is fed into our taps, would believe that it is important not to waste water. The result would be active water conservation in daily life. Some basis for this assumption has been provided by the report on domestic water use in Perth, Western Australia (Metropolitan Water Authority, 1985), where knowledge and attitudes were found to be predictors of actual water consumption. Such an assumption is based in a general way on a cognitive or information processing model of behaviour change, in which changes in behaviour are seen as proceeding from changes in relevant information or knowledge. This cognitive model is the basis for many social education programs both in schools and in the community. For example, the Quit Campaign and the AIDS campaign have both

used strategies that aimed to inform the public about particular health-related behaviours.

Although such cognitive models are often used in educational programs, there are other models which suggest that social factors may be more important in the prediction of behaviour. This approach assumes that the nature of the information is itself modified by social context. One well-known model based on such social factors is the Rational Action Model of Ajzen and Fishbein (Ajzen, 1988). In this model, behaviour can be predicted by an individual's intention, which in turn is predicted by beliefs about the behaviour, attitudes towards it, beliefs about how significant others (such parents and peers) view the behaviour, and motivation to comply with those beliefs (see Figure 1). This model predicts that a change in knowledge alone, or even in knowledge and attitudes, is not necessarily a sufficient prerequisite for a change in behaviour. For example, the decision whether or not to limit the length of a shower would be affected by factors such as one's intended behaviour, the perception of the relevant opinions of important others, the estimation of the relative benefits and deficits of long/short showers, and so on.

Figure 1 : A representation of Ajzen and Fishbein's Rational Action Model of behaviour prediction.



The study from which the findings reported here are derived took into account the possible influence of these social factors. However, it was also designed in a way that permitted the assessment of the impact of cognitive factors on water conserving behaviour.

Instrumentation

Using a pilot sample procedure, a measure comprised of the following instruments was developed:

a) Knowledge

This instrument consisted of 15 multiple choice items about the water cycle, the reticulation system, and domestic water use; for example: "On average, most water used around the homes is for the : a) garden, b) toilet, c) kitchen, d)

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bathroom." A small sample pilot study established a standardized alpha reliability coefficient of .63 for this instrument.

b) Attitudes

This instrument consisted of five dual scale items using the semantic differential technique. This approach allowed the possibility of evaluating the situations presented in each item in terms other than water conservation, eg, pleasure-cleanliness. An example of the items in this section is: "The owner of a house near you keeps his garden growing beautifully by using his sprinkler system every night. For him to do this is:

Bad	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	Good.
Useful	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	Useless.

Construction of this type of measure was seen as controlling to some extent for social desirability biases. A standardised alpha reliability coefficient of .62 was established for this instrument.

c) Behaviour

This instrument consisted of ten four-choice, Likert-type items, five measuring reported behaviour, and five measuring behaviour set. The five reported behaviour items measured the frequency and type of water use. The five behaviour set items measured various predictors of behaviour found in Ajzen and Fishbein's Rational Action Model (Ajzen, 1988), which together indicate an inclination or "set" towards water conservation. An example of the questions from this instrument is as follows: "If my family and friends told me to save water I would: (a) almost certainly not do it, (b) probably not do it, (c) probably do it, (d) almost certainly do it." The standardised alpha level for the Behaviour Instrument as a whole was .67. For the five items of reported behaviour, the standardised alpha was .24. For the five behaviour set items, the standardised alpha was .78. The comparatively low coefficient for the five reported behaviour items was found to be mainly due to an item on garden hosing. However, this item was maintained due to its good content validity. Moreover, as subsequent analysis revealed, reasonable correlations were found between other variables and total scores on these five reported behaviour items. Thus, while the reliability level for these reported behaviour items might be interpreted as indicating a multifaceted rather than a unitary variable, the size of the five-item correlations with other variables does suggest some kind of coherence among these items. Implications of these findings will be discussed below.

Because the data were derived from an evaluation of the Board of Works education strategy, students who would directly experience the products of this program were included in the sample. As representatives of the wider social milieu in which the program would operate, teachers and parents were also sampled. Thus, data were gathered from the following sample subgroups: students (primary, lower secondary, and upper secondary), and their parents and teachers. The usable sample obtained (that is, subjects who completed at least

one section of the survey) comprised 561 students (Years 4-12), 536 parents, and 262 teachers from 207 schools in the Melbourne metropolitan area.

The sample was obtained by randomly selecting schools from the Board of Works catchment area. Government and non-government schools and various denominations of the latter were selected according to the ratio found in the wider community (based on telephone directory listings). Within schools, individual subjects were randomly sampled so that approximately equal groups of gender and year levels were obtained.

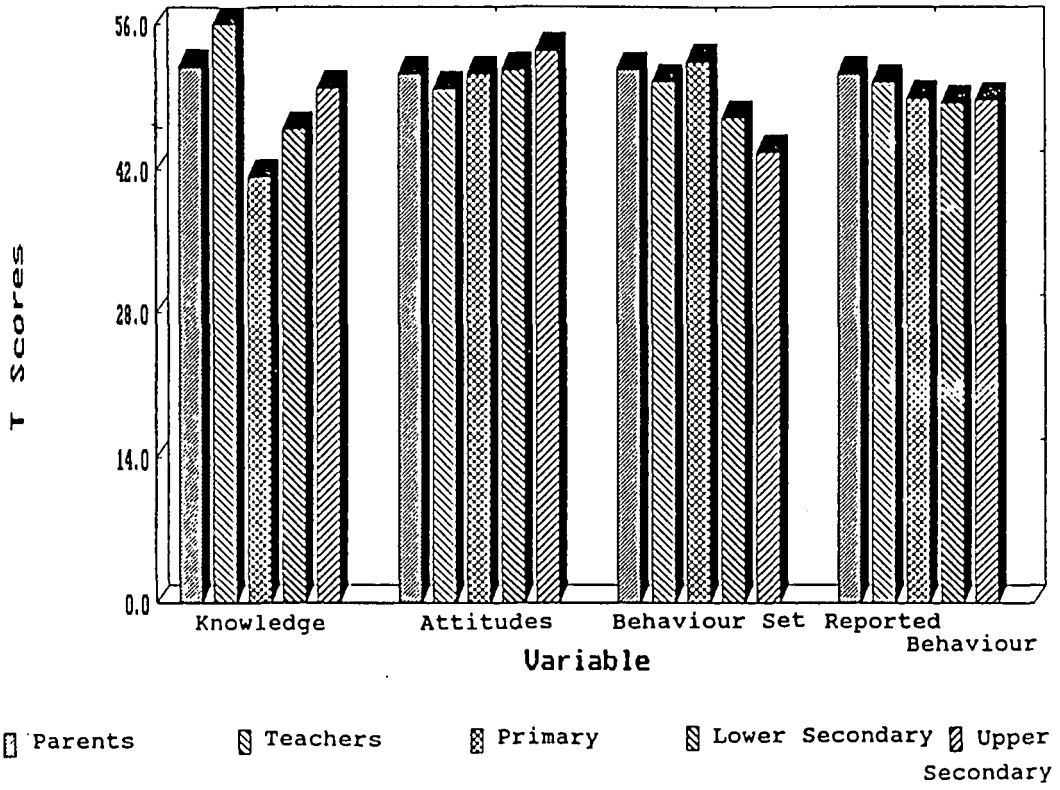
The sampling and survey procedures entailed a considerable amount of personal contact and yielded the highly satisfactory response rate of 78% for primary and 64.5% for post-primary schools in the sample.

Among the 1359 parents, teachers, and students surveyed, levels of knowledge were generally adequate, with the sample overall averaging 9 items correct from the total of 15. Scores for each subgroup are presented in Figure 2. Teachers were more knowledgeable than parents who were in turn more knowledgeable than students. The primary students obtained the lowest scores. Items of a general nature concerning the water cycle and the reticulation system were correctly answered more frequently than items about the amount of water used in particular situations, such as backyard swimming pools, handwashing, and so on. The item which was most poorly answered illustrated a misperception, in this case an underestimation, of the amounts of water used in domestic gardens in comparison with other areas.

Responses to the Attitude items showed, on the whole, positive attitudes to water conservation, with something of an attitudinal "dip" among secondary level students, particularly males. Analysis of the individual items suggested that attitudes about water conservation were influenced more strongly by the context than the amount of water used in a given situation. Thus, the use of a sprinkler to water (or even overwater) the garden was considered more favourably than squirting a hose for fun. This ties in with the finding about garden watering from the Knowledge items noted above and will be discussed in more detail below. With regard to the Behaviour items, there was a strong behaviour set to save water, with parents and primary school students expressing the firmest resolve.

In relation to this, nearly everyone said they intended to save water in the coming year (82% of parents and teachers, and 92% of students). Secondary students, however, especially upper secondary males were less likely to express this behaviour set to save water than the other groups. In terms of actual behaviour, water saving attempts were being made, more so by parents than teachers (despite the latter's higher knowledge level), and more so by teachers than students. Paradoxically, on the item concerning garden hosing, results showed that high water conservers in general were *more* likely to water the garden than low water conservers.

Figure 2 : Mean T-scores for parents, teachers, and students on the Knowledge, Attitudes, Behaviour Set, and Reported Behaviour



Mean scores for each of the variables were correlated with a view to establishing the strength of each scale in predicting reported behaviour. (See Table 1).

Table 1 : Intercorrelations between Knowledge, Attitudes, Behaviour Set, and Reported Behaviour

	Attitudes	Knowledge	Behaviour Set	Reported Behaviour
Attitudes	-	0.3	.35*	.27*
Knowledge		-	.00	.12*
Behaviour Set			-	.33*
Reported Behaviour				-

* Note: p<.01

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Results showed that attitudes, knowledge, and behaviour set were all positively and significantly related to reported behaviour. Of the three predictors, behaviour set scores were the best predictors, explaining 11% of the reported behaviour variation. The next best predictors were attitude scores (explaining 7%) with knowledge last (1%).

Examination of the scores of specific groups revealed an interesting pattern in the scores on Knowledge and Behaviour. The relationship between Knowledge and Behaviour was strongest for the parent subgroup, whose scores were significantly more pro-conservation than the other subgroups. While for parents, knowledge was a significant predictor of behaviour, it was not a significant predictor for either students or teachers. This is particularly notable given that, overall, teachers gained the highest scores on the knowledge instrument. For students the results were even more striking: while knowledge increased with age, positive attitudes and pro-conservation behaviours declined. This was particularly so for males. Thus, upper secondary males showed the highest level of knowledge among the student subgroups, and the lowest pro-conservation attitudes over the entire sample.

Conclusions

The data from this study indicate that an education strategy based entirely on a cognitive model, which assumes a direct translation between information and behaviour is deficient. What was shown was that behaviour set and, to a lesser extent, attitudes explain far more of the variation in reported behaviour than does knowledge. This is consistent with Ajzen and Fishbein's model in which attitude is considered as one component of the variables predicting behaviour. Where other variables, such as stated intention, are added as they were in the measure of behaviour set, predictive strength is increased.

One interpretation of the Ajzen and Fishbein model would suggest that the high levels of intention to save water derive from social desirability factors. However, the limitations of these factors are shown by the finding that positive intention is not always reflected in behaviour, as indicated by the relatively moderate correlation between these variables. This suggests that there is a need to consider intervening variables such as situational factors. For example, do pro-water conservers abandon their good intentions at the sight of a brown lawn or a drooping tomato plant? Further research could explore the role played by such factors in the non-performance of good water saving intentions. Given that only 19% of the variation in reported behaviour was accounted for by knowledge, attitudes and intentions, further research could aim to identify the situational factors responsible for the remaining variation.

The findings indicate that the relationship between attitudes and behaviour is complex in the sense that water conservation attitudes may be in conflict with other attitudes. For example, a person with a pro-water conservation attitude may also have a pro-garden attitude. Given such a conflict, it would be difficult to predict behaviour such as garden watering, in which both attitudes come into play. This potential for confounding measurement offers a further explanation for

the low proportion of variance in reported behaviour that is accounted for by the predictor variables in this study.

The discussion above ties in with the previous suggestion that water conserving behaviour might not be a unitary variable. As noted above the reliability coefficient for the reported behaviour subscale was comparatively low. When the information about the size of this coefficient is allied with the findings on Attitudes, it raises the possibility that, while conceptually convenient, "water conserving behaviour" as a general behavioural construct may have not have a firm grounding in reality. If this is so, it presents difficulties for those intending to measure such behaviour as well as for those charged with the promotion of such behaviours in the school and the community.

The measured components of the Rational Action Model (Ajzen, 1988) correlated significantly with reported behaviour. Thus, educators could use these components to try to influence intentions in a more positive direction. For example, in designing an education program for adolescent students, whose pro-conservation behaviour is poor, the influences of peer and family - that is, normative beliefs should be taken into account. An educational program that is antagonistic to experience at home or among peers will not be successful. Therefore the design of such a program would be strengthened by incorporating people from both of these influential groups in the hope of encouraging a supportive context for the development of pro-conservation behaviour.

The finding that secondary students' attitudes and behaviour tend to deteriorate despite increasing knowledge should be of concern to educators. The trend could perhaps be explained by developmental differences between older and younger students: older children are able to handle more complex cognitive patterns than are younger children. Hence discrepancies within attitudes and behaviour, and between attitudes and behaviour, according to different situational contexts, may be more commonly found among the older group. This could mean, for example, that older children are able to differentiate attitudes to littering in school amongst their peers from attitudes to littering on a family picnic. Thus, simple context neutral attitudes which may be developed in primary school will not be carried forward without modification into higher levels of education.

Further, adolescents are characteristically egocentric (Elkind, 1979). This means that they tend to focus on the way in which situations will impact on their own personal interests. Thus the pro-conservation behaviours of a younger age may be modified by the context of the adolescent developmental stage. For example, on reaching adolescence a person may begin taking long, hot showers, whereas as a child he/she had been taking short showers. Such a change can be explained by the increasing difficulty that the adolescent may have in engaging in behaviours which are for the good of the community , but which entail personal cost.

In summary, this study shows that social factors must be considered in the development of educational programs: the knowledge-based cognitive model is not sufficient. Although the Rational Action Model (Ajzen, 1988) provides useful leads, it is also not sufficient for accurate prediction. Thus, more complex models which include situational and contextual factors must be developed.

There is also a need to consider the allied problems of conflicting attitudes and developmental influences on behavioural outcomes. Finally, the overarching issue of the validity of the assumption that conserving behaviour is a unitary concept must be addressed. A series of follow-up research studies is planned with the aim of clarifying these questions, and thus increasing the effectiveness of community-wide programs aimed at promoting pro-conservation behaviour.

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