

Executive Summary of
the Final report on

**BUILDING LIFE SKILLS THROUGH SCIENCE
EDUCATION**

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A project of

Let's Talk Science

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Let's Talk Science is a non-profit organization dedicated to improving scientific literacy through a variety of methods, including hands-on, participatory workshops for elementary students and teachers. Thanks to financial support from the Royal Bank of Canada Charitable Foundation, *Let's Talk Science* was able to provide a limited number of free workshops to elementary schools during the 2000-2001 academic year. This summary presents an overview of the effects of these workshops on participating students and teachers.

The study

Sixty *Let's Talk Science* workshops were delivered in Kindergarten, Grade 2 and Grade 5 classrooms in four elementary schools. Classes in the two *Fall Host* schools each received five workshops in the September to December period, and classes in the *Winter Host* schools received the same five workshops in the January to March period. Teachers of classes at

	Sep	Fall	Mid Term	Winter	Apr
Fall Hosts K x 2 Schs A & B Gr2 x 2 Schs A & B Gr 5 x 2 Schs A & B	Student & teacher attitude data	Workshops [Active phase]	Student & teacher attitude data	After workshops [Passive phase]	Student & teacher attitude data
Winter hosts K x 2 Schs C & D Gr2 x 2 Schs C & D Gr 5 x 2 Schs C & D		Before workshops [Passive phase]		Workshops [Active phase]	
Control classes K x 3 Schs A, B & C Gr2 x 3 Schs A, B & C Gr5 x 3 Schs A, B & C		No workshops		No workshops	
Three boys and three girls in all participating classes in all schools N=126		Life skills checklist data: Sept, Oct & Nov		Life skills checklist data: Jan, Feb & March	

Figure 1
Overview of design

approximately matching grade levels in three¹ of these four schools provided control data. As shown in Figure 1, teacher and student attitude data were collected from all 21 Host and Control classes in September, January and April. Teachers in all these classes also completed observation checklists on the development of student life skills in September, October, November, January, February and March.

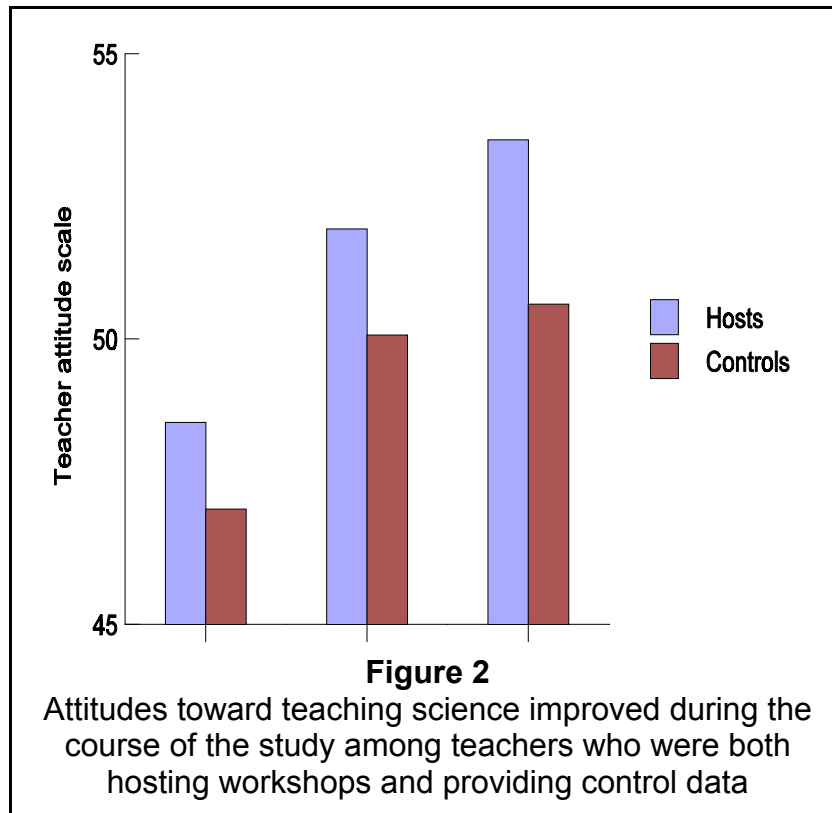
Workshops

Topics for the workshops delivered in the hosting classrooms were selected in consultation with participating teachers during a planning meeting held in June 2000. All workshops were delivered by the same highly experienced person. After each workshop, the presenter and the hosting teacher completed a seven-item, five-point rating scale. None of the mean scores for any of the workshops fell below 4.0, where 5 was the highest rating. The response item with the highest average scores overall was “level of student activity” which 90 percent of all respondents rated as “very high”. The second highest was “level of student interest” which was rated as “very high” by 82 percent of respondents.

Effects of the workshops on teacher attitudes toward science

Teacher attitudes were assessed using a version of the Riggs and Enoch (1990) Science Teaching Efficacy Belief [STEB] questionnaire. Figure 2 plots changes in STEB scores over the course of the study by classroom status and grade level. There was an overall increase in scores during the study, showing an emergence of more positive attitudes toward teaching science among teachers who participated in the study, regardless of whether or not their classes experienced workshops. A series of paired t-tests were conducted to compare each teacher’s scores in September with the *same* teacher’s scores in January and April. The average September STEB score was 47.9, rising to 51.15 in January and 52.28 in April. Both the September to January and September to April increases were found to be statistically significant

¹ *The original design called for Control classes in all four schools, but this was not realized.*



beyond the .05 level. When Host and Control teachers were considered separately, the September to April increase in STEB scores was found to be statistically significant for the 11 Host teachers but not for the 8 teachers who did not experience the workshops. Overall, there is good evidence for concluding that being involved in the study had a positive effect on attitudes toward teaching science among the teachers that

hosted workshops, and this effect was not directly linked or limited to the period when their classes were receiving workshops. The general rise in STEB scores among teachers that did not host the workshops but participated in the study suggests that they too may have developed more positive attitudes toward science teaching, but the data are not sufficiently robust to claim this as a conclusion.

Effects of the workshops on student attitudes toward science

In September, January and April, groups of students in each of the classes were asked to verbally complete a set of sentence stems, such as “What do you like about science?” A total of 3,702 student responses to five different sentence stems were recorded over the year.

Responses from the Kindergarten children were quite different from children in the Grade 2 and 5 classes. Perhaps not surprisingly, Kindergarten students had no clear idea of what science might be at the beginning of the study. As the year progressed this changed markedly in the classes that received the workshops. In Fall Host classes Kindergarten students were able to give specific examples from the workshops when asked “What do you like about science?” in

January and April. One said, “I liked the goop and the volcanoes and everything”, another “When the banana was frozen, she put it in this cloud stuff and she banged it like a hammer and it broke into pieces. It was funny!” Indeed, every Kindergarten student in Fall Host classes who responded to this question in January and April gave an example from the workshops. Those in Winter Host classes gave similar responses in April, after they had received the workshops, but gave markedly less well informed responses in January, before experiencing the workshops. Kindergarten students in the Control classrooms were able to answer the questions by the end of the year, but their responses were often very vague, such as “Building things” or “Talking about stuff”, or were related to the home, as in “Like on the TV show” or “Helping my Mommy make things.”

In the Grade 2 and 5 classes the effect of the workshops was clearly evident in responses to the sentence stem “When we do science, I like ...”. In the Grade 2 classes that received workshops in the Fall, responses such as “When she put the bananas in the liquid nitrogen and when she broke the onion” appeared in the January data, and persisted into April. In Winter Host classes similar responses, such as “Making the Science boats”, appeared in April but not before. Very few specific examples of what students liked about science were recorded in classes which did not receive workshops. Responses to the “When we do Science, I like...” question in the Grade 5 classes followed a similar but more marked pattern: practically all of the students said that they liked “experiments”, “doing activities”, “building”, “making” and so forth during the September data collection, but very few specific examples were offered. January responses from students participating in Fall workshops were richly sprinkled with specific examples from the workshops, such as “We made roller coasters and that was fun” and “That was cool getting the tennis ball through the large intestine.” In April, responses from these classes were still characterized by specific examples of activities from the workshops. In Grade 5 Winter Host classrooms, similar specific responses were recorded in April, but not January.

Students were also asked to respond to a 16 item written questionnaire. Each question was accompanied by a response scale with a smiling face at one end, a frowning face at the other, and three equally spaced ‘Xs’ between them.

Although students at the Kindergarten level were given direct assistance in responding to the written measure, analyses of response patterns raised serious doubts about the appropriateness of using this kind of measure with very young children. In consequence, only responses from the Grade 2 and 5 classes will be considered here. Overall scores on the Attitude Toward Learning About Science [ATLAS] scale constructed from the responses increased for both Fall and Winter Grade 2 and 5 Host classrooms during the term in which workshops were given, but decreased for the Fall Hosts when the workshops were withdrawn. In the Grade 2 classes the effect of the

workshops was most clear in the ATLAS score from Winter Host classes, but failed to reach statistical significance.

As shown in Figure 3, more definitive results were obtained for the Grade 5 classes. While the plotted ATLAS scores for the Control classes show a steady but slight rise from September to April, scores for the Host classes rise much more sharply during the term when they experienced the workshops. Moreover, there is an evident drop in

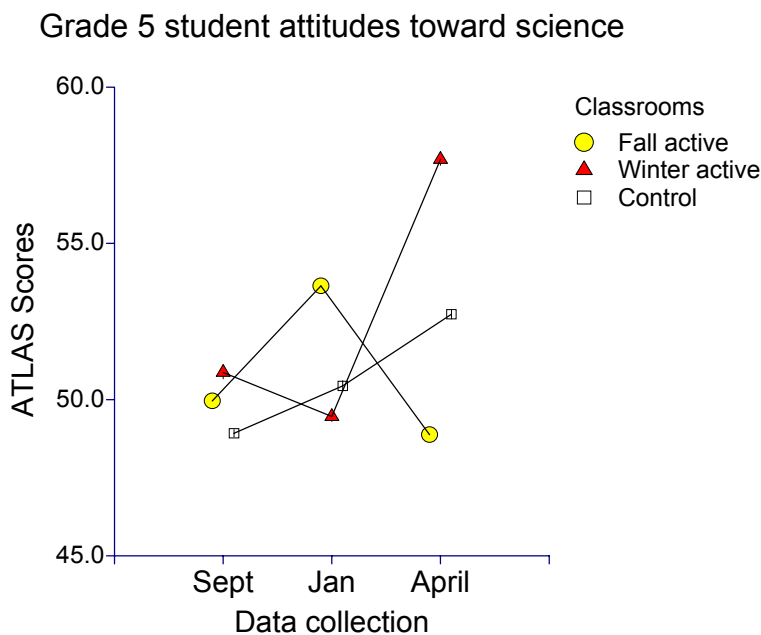


Figure 3

Grade 5 students developed more positive attitudes toward learning science when they were participating in the workshops

scores from the Fall Host classes after exposure to the workshops ceased. Statistical analysis identified the increase in the Winter Host ATLAS scores between January (49.45) and April (57.69) as significant beyond the .05 level.

Effects of the workshops on Life Skills

Let's Talk Science was particularly interested in investigating relationships between workshop participation and the development of the Life Skills identified by the Conference Board of Canada (2000). At the planning meeting held in June 2000, teachers who were to be involved in the study were asked to review the list of Life Skills and, working in grade specific groups, identify those which they believed were applicable to students at their levels. Their responses were used to develop checklists for rating development of the grade appropriate life skills. In each Host and Control class the teacher was asked to use these checklists to rate three male and three female students in September, October, November and January, February and March. A global indicator was developed by calculating the total month-to-month change in the ratings.

Figure 4 summarises the findings. While Fall workshops were being delivered, teachers in the classrooms receiving those workshops rated their students higher than did either teachers in Winter Host or Control classrooms, neither of which were receiving workshops at that time. When Winter workshops were being delivered, teachers in the classrooms receiving those

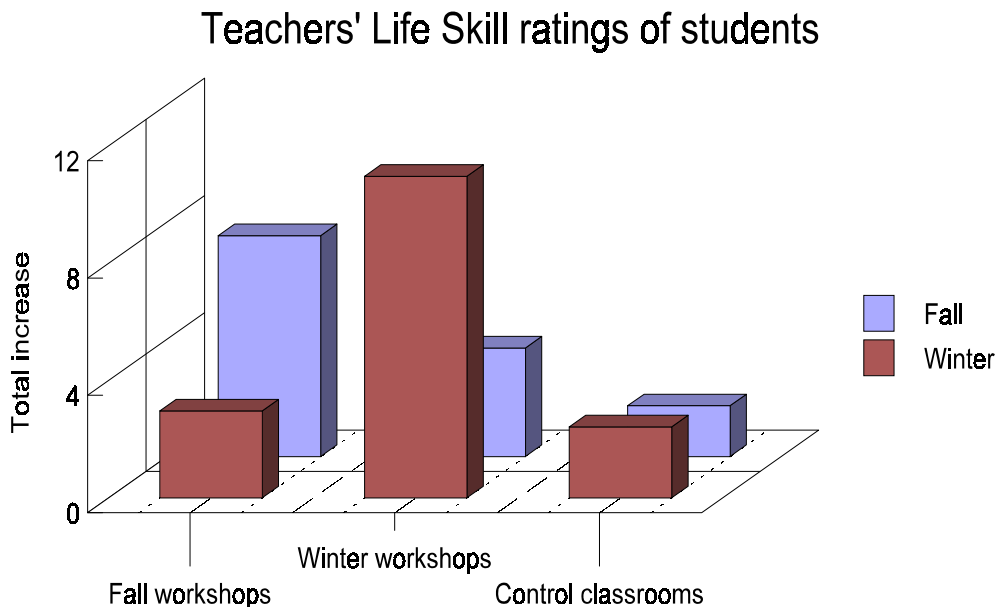


Figure 4
Teacher ratings of basic life skills exhibited by students increased when students were experiencing the workshops

workshops rated their students higher than did the other two groups of teachers. Viewed another way, ratings across all classrooms were very similar except for during the active term in each of the hosting groups, when there was a marked increase. Independent statistical analysis of an alternate measure found the increases in ratings in the Host classrooms to be significant beyond the .05 level.

The effects of workshops on ratings for specific Life Skills was investigated by comparing differences in item means over time. Substantial increases in the ratings for some items were found to have occurred during the course of the study, the greatest changes being for the items “Is creative in exploring different approaches to tasks”, “Tries to think through a problem ...”, “Evaluates possible solutions before making decisions” and “Identifies and accesses appropriate learning resources and opportunities”. Items for which there were the smallest changes in ratings were “Understands language used in a variety of ways” and “Generally observes classroom rules ...”.

Similar analyses were undertaken by grade Level and by student status. The overall pattern emerging from these analyses further supports the impression that the workshops had a greater effect in Grade 2 and Grade 5 classes and that they appear to have had a stronger effect on some of Life Skills associated with problem solving items, and that this was so for boys and girls as well as for “at risk” and as well as “bright” students..

Conclusions

The original purpose of the study was to develop, test and refine data collection methods and analytical techniques that could be deployed in a larger inquiry. The findings nonetheless provide support for the positive effect of *Let's Talk Science* workshops on student and teacher attitudes toward science, and the growth of Life Skills among students exposed to this approach to science learning. The findings summarized above provide evidence that student attitudes and information about science improved noticeably after engaging in the workshops and that at least some of this improvement sustains over time. They also provide evidence that teachers developed more confidence in teaching science when the workshops came into their schools. Recommendations for modifications to the research instruments for deployment to a larger inquiry can be found in the *Building Life Skills Through Science Education - Final Report*.

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