

Trembath

# Siemens Science School – three years later

Richard Trembath

Division of Science Education, Faculty of Education, Monash University, Australia

## Abstract

*The Siemens Science Schools were started at Monash University, Melbourne, Australia in 1990, when 179 Year 10 students attended. Schools have now spread to 20 universities across Australia. Siemens Ltd. is the major sponsor.*

*The three-day schools aim to give participants a hands-on experience of science and technology in an effort to raise their interest in careers in engineering and science. Students engage in lectures, problem-solving laboratory activities, and visit several technology-based industries which give hands-on experiences (e.g. Telecom Australia, BHP Steel, medical laboratories, scientific instrument makers).*

*The promoters were particularly interested in whether the Schools increased participants' interests in science/technology and commissioned a study of the participants three years after the first School (by which time they had made career choices). An extensive survey, with a high response rate, showed that the School had increased students' interest in science/technology and had influenced many into seeking a career in these areas.*

## Introduction

During the summer vacation for secondary schools, in January 1990, the Australian Scientific Industries Association (A.S.I.A.) in conjunction with Rotary Clubs in Victoria, promoted a three-day Science School for students entering Year 10. One of the chief objectives of the organisers was to give students, at this critical stage in their schooling, information on and experience of careers and courses in science/technology, so that they would be better placed to make decisions about:

- (a) subject choice in Years 11 and 12
- (b) career choice after leaving school (work, university or T.A.F.E.)

Another objective of the School was to present science/technology as exciting and offering the opportunity for excellent careers. Participants of the school engaged in a series of lectures, hands-on activities and excursions to science laboratories and science-based manufacturing industries.

The present study is concerned with the perception of the participants three years after the Science School was held. By this time they have chosen their subjects in Years 11/12 and most have left school to start work or to undertake further university or T.A.F.E. study. Did experiences at the Science School help them with subject choices at school? Did these experiences help them choose a career/university course/T.A.F.E. course? Did these experiences increase their interest in science/technology?

## Nature of the science schools

Following the success of the first School in 1990, the Schools have spread to all Australian states and are held in 20 universities. In the 1993/4 season, over 2,500 Year 10 students attended. Siemens Ltd., the multi-national electrical manufacturer, has become the major sponsor of the Schools and its support has aided their rapid growth. A Course Director at each university arranges the local program using staff of that university and other interested people and organisations (industries, laboratories). Most staff are volunteers. The Federal Committee issues a set of guidelines for the use of each local Science School.

## The present investigation

The present study aims to find the perceptions of participants three years after the conclusion of the School and to find how experiences at the School helped participants in making crucial life decisions concerning choice of school subjects, career and university course.

In designing such a study it is interesting to look at investigations of other enrichment programs. The Lockheed Technology Emphasis Camp,<sup>1</sup> the Science Summer Camp for Gifted 9th Grade Students,<sup>2</sup> the Texas Education Agency,<sup>3</sup> the 1984 Science Schools Program,<sup>4</sup> the Math, Science and Technology Summer Youth Enrichment Program,<sup>5</sup> and the METRO Achievement Program,<sup>6</sup> were all interested in the long-term effects of enrichment programs.

However, the number of participants in most of these programs was small ( $n < 30$ ) and no program

followed students until they had made career choices and choice of university course.

### Design of present study

To find the opinions of the 179 students who attended the 1990 Science School at Monash University three years later (after they had made decisions about careers and university courses) it was decided to post a questionnaire to the home address recorded when they enrolled in the School. If no response was elicited a further questionnaire was posted to this address.

### Results

#### 1. Characteristics of the Respondees

##### (a) The Respondees

Responses were received from 56 participants and another 48 responded when a reminder was posted to them. In all, 104 responded (60%) which is remarkably high when it is considered that the addresses were three years old.

##### (b) Subjects Taken in Year 12

As might be expected, more than half of the participants chose science-type subjects. However, the Science School attracted small, though significant, numbers of students who were not taking a science course.

##### (c) Occupation in 1993

The occupation of these students in 1993 was as follows:

University	87
School (Year 12)	6
Apprenticeship	2
Work	1
Unemployed	1
No response	7

It is clear that a very high proportion of participants of the Science Schools chose university study in preference to work or apprenticeship. The prudent conclusion is that the Science Schools attract those who are university-bound rather than to conclude that attendance at the School encourages University attendance.

Of the 87 who attended university, 66 were enrolled in a science/technology-type course (e.g. Engineering 14, Science 22). However, 11 were enrolled in Arts, 5 in Business and single individuals in other courses.

In summary it is apparent that the Science Schools

attracted many students who choose "science" subjects at Year 12 and who ultimately choose to take a science/technology course. The extent to which the Science Schools influenced these choices is not clear from these raw data. To find the extent of this effect the participants were asked some further questions.

#### 2. General Effect of the Science School

(a) Effect of the Science School on Career Choice  
More than half of the respondees (56/104) considered that the Science School affected their career choice. The most frequent responses about the Science School were:

- showed me science was varied and interesting 17
- made me consider a science/technology career 9
- reinforced my existing interest 12
- confirmed my likes and dislikes 5
- introduced me to a particular field of science 3
- guided me into engineering 3
- showed me science was not my preferred area for a career 6

One student decided not to pursue a career in science "because I learned that industrial employers wanted PhDs"!

About half of the students (44/104) considered that the School had no effect on their choice, but 11 of these already knew what they wished to do (4 in science/technology). Two participants considered that "I still do not know which career I will have".

Responses to the question on the effects of the Science School on career choices gave some interesting insights into the ways in which secondary school students make career choices. While some students had already chosen their career and others had their tentative choices in science/technology confirmed, there were others who were alerted to the different career possibilities in science/technology. A few enjoyed the Science Schools but decided not to take a career in this area. "When completing the School I decided I wanted to do a business course although I found every aspect (of the School) educational and interesting". Another respondee "decided not to pursue any courses in science because the key note speaker said that their intellectual demands were greater than those of Arts or Law degrees".

**(b) Effect on Choice of University Course**

Although the choice of university course must be closely related to the career choice, separate questions were asked on this matter.

Forty two of the 104 respondees considered that the Science School affected their choices at university in the following ways:

- helped me to choose my course 4
- made me aware of the possibilities in science 6
- introduced me to Engineering 1
- chose Monash University over Melbourne University/other universities 9

Four students realised that they did not wish to pursue a career in science, "Because of the intellectual demands required".

**(c) Reaction to Small-Group Hands-On Activities**

Participants were asked whether the small-group hands-on (laboratory) activities influenced them to further their science/technology studies. More than half (56/104) were influenced by these activities because they:

- were enjoyable/fun/actually relevant 14
- showed me different parts of science and increased my interest 11
- added variety and personal interest – not just lectures 8
- made me feel I achieved something/made science seem "touchable" 9

There was a great deal of interest in the construction of an electric motor which participants were able to take home.

The favourable reaction to the hands-on activities when compared with similar school activities was because:

- they were in different areas from school subjects 20
- they were more interesting/fun 22
- secondary school does not have the equipment for such experiments 10

On the other hand, some students (41/104) did not react favourably to the hands-on activities for a variety of reasons which included:

- we didn't get to choose the activities that interested us 3
- they were boring 2
- "I'm not a hands-on person" 1
- I just wasn't interested in science – they confirmed this 4

- I found them intellectually intimidating 1

Respondees thought the experiments were different from those at school because:

- something that worked was built
- they were more advanced than those at secondary school
- more time was allowed
- the botany experiment was interesting/exciting

Most of the participants (75%) would like to have done more experiments. Many students requested more:

- biology (e.g. microbiology, plant tissue culture) 26
- chemical reactions 24
- physics (surprisingly high!) 16
- electronics 9
- various other single requests

**(d) Reaction to Excursions**

Participants visited laboratories (university and industry). Recollections of these visits show that participants had the opportunity to closely look at industrial and scientific processes and to talk to engineers and scientists.

About half of the participants (44/104) thought that the excursions made them more interested in science as a career because science seems to be "enjoyable", has a "wide variety of job options" and "people working in science showed me the value of their work".

About the same number of participants thought that the excursions did not make them more interested in science as a career because the excursions were boring, they could not go to a chosen venue, and the excursion venues were not in their areas of interest for a career. Many of these students commented that, as they had already decided on a career, the excursion did not influence them.

**(e) General Comments**

General comments were invited from participants and elicited the following:

- the difficulty of remembering events three years earlier
- the good organisation of the program
- the confirmation of whether to take a career in science/technology or not
- the exposure to previously unknown fields of science.

### (f) Attendance at other Science Schools

Only 13 of the participants had attended other Science Schools, so it is apparent that the Siemens Science Schools are providing an opportunity for students who would otherwise miss out.

### Discussion

The Siemens Science Schools were set up to offer all interested students an experience which was intended to increase their interest in science/technology and to give them experiences which would help them make decisions about selecting appropriate subjects in Year 12 of secondary school, choosing a career, and selecting a suitable university or T.A.F.E. course.

About three-quarters of respondees to the questionnaire took science/technology subjects in Year 12. This probably shows the natural preference of many of the participants in the Science School, but the School did influence a few students into taking science subjects at Year 12. Of more significance were the small, but significant, number of participants in the Science School who stated that they wished to have a science experience at the School even though they had decided to seek a career in another area.

The percentage of participants who went on to university (84%) is amazingly high. Of these students a high percentage (63%) is taking science/technology courses. Over half of all of these students consider that the Science School helped them make a career choice. In some cases the decision was made not to make a career in science/technology. From the viewpoint of the organisers of the Science School a decision made against a science/technology career is just as valid as one made for such a career. It should also be kept in mind that some of those who stated that the School did not assist their career choice had already made their choice and the School merely confirmed that choice.

The School also influenced nearly half of the respondees in their choices within tertiary course (university and T.A.F.E.). This influence included the awakening of participants to the wide range of available courses in science and technology. Students of the Science Schools were more likely to realise that a BSc includes subjects other than just Physics, Chemistry and Biology and that an engineering degree can have many facets. Significant number of respondees found the Science School, which was located in a large university, to be an enjoyable introduction to university life. Some students even changed their preference of university

to Monash University.

More than half of the respondees considered that the "hands-on" activities influenced them to choose further science/technology studies. A few more also found that these activities helped them to decide not to take such a career. Respondees were impressed with activities where they made something that worked – particularly if they could take it home. It is clear that the successful hands-on activities were those which were different from those done at secondary school (because they used more elaborate equipment and had more real-life applications). About 80% of participants would like to have done more experiments.

The success of the excursion program was limited. Some students could remember little about the excursions and some made adverse comments about attempts to explain the industrial processes they were examining. These students found much of industry "boring". Conversely, other students valued the excursion program because they had an opportunity to closely examine a small aspect of technology in operation.

### Conclusion

The results of this survey show that for more than half of the respondees the Science School was effective in increasing their interest in science/technology and was effective in helping them make decisions about careers and tertiary courses.

Some of the rest of the students had already made career decisions and found the School to be enjoyable and valuable. Some participants had already decided not to make a career in science/technology, but enrolled for the laudable reason of finding out more about science.

Judged by its objectives, the School was a great success and it is easy to see why they have spread all over Australia so quickly.

### References

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- 4 Mares, KR *et al* *1984 Summer Scholars Participants. A Follow Up* (1985) ED 261630.
- 5 *Keeping America Working – Math, Science and Technology Summer Youth Enrichment Program*. Delgado Community College, New Orleans, LA (1989).
- 6 Thompson, DR *METRO Achievement Program*. ED 317 651 (1989).