

IMPACT OF A GENDER-BALANCED SUMMER ENGINEERING AND SCIENCE PROGRAM ON FUTURE COURSE AND CAREER CHOICES

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ABSTRACT

A study was carried-out in the spring and summer of 1997 to assess whether the summer camp (Worlds Unbound, University of New Brunswick) had achieved its goals: to increase the understanding of science and engineering; to improve the confidence and skills of the students in this area; have a positive influence on selection courses in mathematics and science in their future high school years; and increase the likely-hood of a choice of career in these fields.

INTRODUCTION

A research endeavour¹ looking at whether science promotion programs make a difference reported that the impact varied not only by program, but also by gender. Results of that study indicated that the strongest positive impact on girls came from a single-sex program called GIRLS IN SCIENCE. Many of the mixed gender programs to promote science had a stronger impact on boys than on girls. Of the almost 1600 students surveyed in that British Columbia study, 44 % of the young women indicated that Medicine was their career choice, versus 26 % of the young men. In the same survey, 4 % of the women versus 20 % of the men chose Engineering as a profession.

Another interesting aspect of the study cited above was the analysis of the factors that affect career choice for females and males. Vickers et al.¹ found that both females and males highly valued 'future job security' and 'interesting work', but females rated the factor 'contribution to society' more highly than males did. The impact of parents was similar for both sexes and higher than friends, teachers, guidance counselors, and the media. That study raised many questions about the gender impact (and success) of outreach science and engineering programs.

The Worlds Unbound (WU) program was specially designed to attract an equal number of girls and boys, and the activities designed with the interest of both groups in mind. The second major principle was to ensure that doing science and engineering was fun and would build the self-confidence of the

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1998 WEPAN National Conference

young students. The policy at WU was to admit an equal number of girls and boys. If the number of boys was greater than the number of girls, the excess was placed on a waiting list. If one of the boys on the list found a girl to join the program, he was admitted preferentially over the others on the list. This allowed boys and their parents to be part of the solution, that is, to attract girls to the program. After the first year, the entire community knew that this program was great for girls and this rule was rarely had to be exercised in the following years. The spontaneous admission of girls was generally 50%. However, this ideal situation may change at some point in the future and the rule should remain in place to deal with a downturn in applications from girls should this occur.

METHODOLOGY

In the study reported here, the impact of a science and engineering summer camp (Worlds Unbound (WU), at the University of New Brunswick, for young students in grades 5-8) was assessed. Each student attends the day program for a week (Monday to Friday); six such weeks are held every summer. Two to three of the weeks are held in French, depending on the number of French students who subscribe. A questionnaire was sent to all young students who had attended the summer science and engineering program in the past four years and to their parents or guardians; 81 responses were received: 46 from girls and 35 from boys, and 81 parents also responded. [Note: the questions were not necessarily asked in the order shown below, but the selected order below facilitates the discussion. Moreover, not all questions are included here, as some were designed to improve the program's activities and not related to the objectives of this report.]

RESULTS

Questions and answers (students)

1. "How have your feelings changed towards Engineering and Science since attending WORLDS UNBOUND's summer program?"

	Not Changed	More positive	No answer
Girls	24 %	70 %	6 %
Boys	46%	43 %	11 %

2. "Has anyone tried to discourage you from doing math, science, or technology?"

	YES	NO	No answer
Girls	2 %	87 %	11 %
Boys	6 %	91 %	3 %

3. "Has anyone encouraged you to do math, science, or technology?"

	YES	NO	No answer
Girls	80 %	7 %	13 %
Boys	74 %	23 %	3 %

4. "Reasons given for the encouragement."

	Girls	Boys
I'm smart	9 %	14 %
good field, many jobs	57 %	46 %
fun, interesting	4 %	3 %
I am a girl	2 %	
I can make a difference	2 %	

5. "What was your favourite activity at Worlds Unbound?"

	Girls	Boys
Liked everything	4%	11%
hands-on activities	42%	40%
sports	7%	3%
project (Goldberg)	20%	17%
computers	2%	14%
dissection	22%	9%

6. "Did the experience affect your choice of courses in high school?"

	Girls	Boys
strongly	15%	0%
some	37%	43%
not at all	22%	23%

7. "How has attending Worlds Unbound changed your ability to do math and science at school?"

	Girls	Boys
very positive	24%	6%
mildly positive	20%	31%
didn't change	33%	34%

8. "What would you like to do when you grow up?"

	Girls	Boys
medicine	28 %	3 %
engineering	7 %	14 %
computers	4 %	11 %
teacher	9 %	0
lawyer	4 %	6 %
science	4 %	0
don't know	13 %	21 %
biology	4 %	6 %
architect	2%	6%
[total sc. & eng.]	[19 %]	[31 %]

9. "Are you interested in being a junior counselor in the future?"

	YES	NO	No answer
Girls	74 %	22 %	4 %
Boys	69 %	29 %	2 %

10. "Did you enjoy the camp experience or were you bored?"

	Very positive	Mildly positive	Bored	Missing
Girls	54 %	59 %	7 %	0
Boys	46 %	46 %	3 %	5 %

11. "What would you like to see more of next time?"

	Girls	Boys
Computers	13 %	20 %
hands-on/experiments	11 %	11 %
outdoor sports	15 %	9 %
physics	7 %	0
nothing missing	15 %	14 %

Questions and answers (parents)

12. "Do you feel your child has a greater probability now of pursuing a science career than before attending the camp?"

	YES	NO	No answer
Parents of girls	43 %	28 %	28 %
Parents of boys	49 %	26 %	26 %

13. "Is one of the parents in the field of science, engineering, or technology?"

	YES	NO
Parents of girls	41 %	52 %
Parents of boys	34 %	66 %

14. "Does your child have access to":

	Girls	Boys
Computer	93 %	97 %
Internet	76 %	74 %
Calculator	89 %	100 %

15. "Do you feel that the WU camp has had a positive impact on your child's math and science marks in school?"

YES Parents of girls : 67 % ; Parents of boys: 77 %

16. "How has your child's attitude towards engineering, science, and technology changed after attending WU?"

More Positive Parents of girls 72 %; Parents of boys 63 %

17. "What was the most important result of your child's attendance in the program?"

	Parents of girls	Parents of boys
fun while learning	4 %	14 %
got child out of the house for a week	2 %	0
opportunity to work with others	9 %	9 %
built confidence, interest	43 %	40 %
negative effect	0	6 %

18. "Would you encourage a career in Science and Engineering?"

	YES	NO	No answer
Parents of girls	70 %	9 %	21 %
Parents of boys	80 %	6 %	14 %

DISCUSSION

This study illustrates that a very positive impact can be achieved on both girls and boys when the outreach activity is designed with equity in all its aspects. The Worlds Unbound program succeeded in increasing the interest of the students in science and engineering; moreover, many students reported an increased confidence level in dealing with these subjects. A large number stated that they would pick mathematics and science courses in high school. As for their career choice, 19 % of the girls and 31% of the boys indicated a future in science or engineering. The choice of medicine was lower than that reported in the Vickers et al.¹ study: 23% for girls and 3% for boys. But this choice is still much higher for girls than for boys in both studies.

It is likely that, before their summer experience, more girls than boys would have had a negative attitude or lack of information on these fields and therefore the camp experience opened-up many new interests for the former group. For the boys, the experience seemed to have re-enforced their former choices. This was obvious by some of the answers to the questionnaire. Thus, a summer experience where girls and boys (grades 5 to 8) were in equal numbers, and where gender equity was a policy of the camp's operation, succeeded in making both genders, and girls in particular, more aware of careers in engineering and science.

Previous to performing this survey, the author had received anecdotal evidence of the WU Program's success with both girls and boys, through several comments made by parents and by the participants at the end of each week. However, the actual survey enabled to confirm to what extent each of the goals had been met by this out-of-school activity. The gender balance in the participants, the instructors, and in the leadership roles, the careful selection of content with sensitivity as to approaches that would work best with girls, all contributed to the success of the camp. In its first year of operation, everyone was attentive as to how girls and boys reacted to various visits of laboratories and on the 'child-friendliness (or opposite) of the presentations in the laboratories visited. Many improvements were made in the second year by removing from the list a few 'poor speakers' and replacing them mostly by young women graduate students who related well to the young students. Thus, coed activities can be made to work very successfully, but single-sex activities, if well designed, can do even better, as reported in another study ^{2,3}. In the future, the author will continue to design various outreach activities, some with both genders, and others just for girls and young women.

CONCLUSION

Much financial investment is made into science and engineering promotion programs and few have been assessed for impact. This study will hopefully stimulate many programs to assess how they are doing with respect to having a positive impact on each gender, with a special attention placed on how the participation of girls and young women can be increased substantially, especially in fields where the job market is excellent. In particular, designing an activity for females only ^{2,3}, until such a time as obstacles and stereotypes disappear from our society, and insuring a mix of activities (hands-on components, career choice guidance, visiting people actually doing engineering and science, games) can be a recipe for outstanding success. The long-term impact of these programs on actual career choices will be assessed when these students graduate from high school.

References

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ACKNOWLEDMENT

The author thanks Victoria Campbell, Jane McGinn-Giberson, and the staff of Worlds Unbound at the University of New Brunswick for helping to distribute and collect the questionnaire.