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HOW WELL IS SSTP ACHIEVING ITS PURPOSES.

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THE EFFECTIVENESS OF SUMMER SCIENCE TRAINING PROGRAMS (SSTP) FOR HIGH ABILITY SECONDARY SCHOOL STUDENTS WAS INVESTIGATED. QUESTIONNAIRES WERE USED IN A STUDY 3 YEARS AFTER COMPLETION OF THE PROGRAM TO COMPARE THE SUBSEQUENT ACADEMIC PROGRESS, CAREER CHOICES, AND SCIENCE-RELATED ACTIVITIES OF SSTP PARTICIPANTS WITH THOSE OF PARTICIPANTS IN THE WESTINGHOUSE SCIENCE TALENT SEARCH (STS) AND A GROUP OF PEERS SELECTED BY TEACHERS AND SCHOOL ADMINISTRATORS. SSTP PARTICIPANTS, WHO HAD RATHER FIRM CAREER PLANS PRIOR TO PARTICIPATION, REPORTED THE PROGRAM EITHER MADE NO CHANGE OR REFINED AND INTENSIFIED THEIR PLANS FOR A SCIENCE CAREER. THE MAJORITY REPORTED BENEFICIAL EFFECTS OF THE SSTP ON THEIR SUBSEQUENT HIGH SCHOOL WORK. MANY REPORTED IMPROVED WORK HABITS AND INCREASED INTEREST IN SCIENCE. ABOUT 68 PERCENT OF THE SSTP PARTICIPANTS LISTED SCIENCE AND MATHEMATICS CAREERS AS THEIR FIRST CHOICE. A GREATER PERCENTAGE OF THE SSTP PARTICIPANTS SELECTED SCIENCE MAJORS IN COLLEGE AND RECEIVED SUPERIOR COLLEGE GRADES THAN DID THOSE INCLUDED IN THE STS AND THE PEER GROUP. INFORMATION RELATED TO TYPES OF SSTP AND THEIR GEOGRAPHICAL DISTRIBUTION IS ALSO INCLUDED. (AG)

THREE YEARS AFTER SSTP

A follow-up study of the participants in the 1960 Summer Science Training Program for high-ability secondary school students

NATIONAL SCIENCE FOUNDATION
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HOW WELL IS SSTP ACHIEVING ITS PURPOSES ?

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Washington, D.C.

A Research Study Conducted Under

Contract NSF/C-302

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ACKNOWLEDGMENTS

This study represents the effort and cooperation of many persons. Most importantly, it is the earliest answer to the question: "To what extent is the Summer Science Training Program for High Ability Secondary Students attaining its purposes?"

The study reflects the vision of Dr. Howard J. Hausman, Program Director, Secondary School Program, Division of Pre-College Education in Science, The National Science Foundation, who has given both guidance and encouragement to this project.

Our thanks go to Dr. Watson Davis, Director of Science Service, Inc., who made available all of the records from the 19th and 20th Annual Science Talent Searches, and to Mr. Joseph Kraus, Coordinator of National Science Fairs-International, who supplied the names and addresses of the participants in the 1960-61 and 1961-62 Fairs.

Thanks are also due for the cooperation of the participants in the 1960 Summer Science Training Programs, the 19th Annual Science Talent Search, the 1960 National Science Fair-International and the 1960 Selected Peers for taking time to complete their questionnaires in a thoughtful manner.

ABSTRACT AND SUMMARY

The present report summarizes a follow-up study of the participants in the 1960 Summer Science Training Program for High Ability, Secondary School Students. The purposes of the study were to find to what extent the program was beginning to achieve its purposes, to explore how the participants felt about their SSTP experience, and to compare the career development of the participants with that of other somewhat comparable groups.

Most of the SSTP participants were already settled in their career plans, and, hence, the program experience either made no change, or refined and intensified their interest in a career in science or mathematics. Career plans for many were upgraded. A few decided that they would not be happy in a science career and have changed their goals.

The majority reported beneficial effects of their SSTP in their subsequent high school senior year. Less than one-fourth indicated that SSTP had interfered in any way with later academic work, either in high school or college. The most common complaint was that later courses seemed dull or repetitious.

Many said that SSTP had improved their work habits, refined or increased their interest in science and mathematics, generally broadened their intellectual horizons, and increased their self-sufficiency. Reports of improved personal adjustment included learning of humility, increase in self-understanding, growth in self-confidence and improvement of skills in developing relationships with other people.

SSTP was really worth while in its effects on career plans and levels of ambitions, subsequent high school work and college work, and especially in improved self-understanding and confidence.

In terms of more objective evidence it is also clear that SSTP is beginning to attain its objectives. The greater number of its participants are showing themselves academically superior, planning to obtain advanced degrees, and aiming at occupations in the science or mathematics area.

About 68% of the group named a science or mathematics occupation

as their first choice. Of these, about 1 in 5 were research occupations. These proportions are about the same as for the Science Talent Search participants and distinctly higher than that shown by a "Selected Peer" group.

For the SSTP group there is a larger proportion reporting superior college marks (57%) than for either of the other two groups. Most significant is the proportion of SSTP participants reporting their actual field of study as science, mathematics or engineering (71% as compared to 59% for STS and 56% for the Selected Peers).

Relative effectiveness of the various SSTPs in supporting the purposes of the program is not clearly shown by the available data. In a simplified form the several evidences which might be used for this purpose are high level of science achievement motivation and superior achievement in training toward being a scientist. The SSTPs showed no evidence of using their science programs as devices for recruiting students. Institutions having the highest percents of SSTP participants returning as undergraduates were state supported schools largely in the south, southwest or midwest where such attendance would be a normal pattern.

Comparisons of kinds of programs such as Orientation, Residential and Research are confounded by factors of geography and probably by participant self-selection.

In analyzing the participants by kind of program and geography, the following evidences appeared:

Participants in Orientation programs appeared to be no different from participants in other programs.

Those in Research programs relative to other participants had participated more extensively in the Science Talent Search, and had a larger proportion aiming for doctoral degrees and more had science-mathematics jobs in the summer of 1961 and 1962.

The Residential programs sent a higher proportion of their participants on to college than did the Commuter programs.

Nine of the 1960 SSTPs were in Negro colleges for Negro students. Fewer of these participants showed superior academic performance in college and fewer participated in the Science Talent Search. More

named a "practitioner" career in science as their occupational choice than did the other SSTP participants. Their academic sights were not set quite so high as the others.

> Programs in the northeastern states had the highest percents of participants naming science, mathemtatics or engineering as their field in college. Programs in the Pacific coast and mountain states had the lowest.
>
> Programs in the northeastern states had the largest percents of participants making their occupational choice in some field of science or mathematics. Programs in the Pacific coast and mountain states had the least.
>
> Programs in the northeastern states had the largest percent of participants who changed their career aims to non-science areas while the programs in the southern states showed the lowest.

The question of students participating in more than one of these major programs for encouraging talented youth in science showed that there is no problem. Only 7.2% of the SSTP participants were also in the Science Talent Search and only 1.2% in the National Science Fair-International. Of the 1960-61 STS participants, 15 % also had been in the 1960 SSTP.

Those who participated in the two programs, SSTP and STS, in comparison to those who participated in only one of the two programs, were, on the average, younger, came from larger schools and also had higher relative standing in their high school classes. Those who participated in both programs had a higher average score on the Science Aptitude Examination (taken as part of their STS participation) than those who were in the STS and not SSTP.

Both at the time of participation and, again, almost three years later those students who participated in more than one program showed up more strongly than those in only one program in terms of most of the evidences of achievement motivation, ability and performance, and dedication to the areas of science, mathematics and engineering.

Several recommendations might be derived from the review of the evidence:

1. Participation in all of these programs should be en-

couraged and abetted.

2. Whenever individually feasible, multiple participation should be encouraged.

3. Whatever the differences in the kind of motivation pushing the participants in each of the programs, whether to learn more, to win prizes, or to win recognition, all such motivations are useful and legitimate in promoting the goals of the SSTP.

I. BACKGROUND

The National Science Foundation has the awesome responsibility of aiding in the development of science in the United States. This they do through a great variety of means. Along with support of research programs and provision of research facilities, they are deeply interested in furthering development of scientific and research manpower; for even with automation our increased technology, both in industrial and government services, requires more and more men and women trained in science and mathematics.

As one step in developing more of such trained manpower, the National Science Foundation in 1959 instituted the Summer Science Training Programs for High Ability Secondary School Students. These were operated under the design, teaching personnel and facilities of colleges and research organizations of the country. While each program has its own unique features and individual aims, all had these major goals in common:

1. Encouraging talented boys and girls, already interested in science, to continue into careers in science.

2. Encouraging boys and girls, wavering on the borderline between science and some other field to choose science as their career.

3. Providing educational and motivational experiences which would develop greater understanding of the problems and rewards of a life in science.

4. Interesting young scientists in careers of research by complete immersion in such activities.

Each summer from 1959 to the present some 6,000 to 7,500 boys and girls have participated in these programs. This report is concerned with

the achievement and career development of the 1960 SSTP participants through the spring of 1963. This period of time should have permitted all of the participants to have graduated from high school, and most of them should have had opportunity to have completed two years of college.

It is still too soon to measure the long-term effectiveness of these programs since that will be expressed eventually in the professional careers and scientific contributions of the participants. For this reason it seems highly desirable that the developing careers of one or more groups of participants be studied over a period of years. There remain, however, the immediate needs to:

1. Discover to what extent the program seems now to be achieving its purposes.

2. Seek information that may help in making the program more effective.

3. Maintain contact and communication with as many of the participants as possible; those who have left science as well as those who remain in the field.

Five successive studies were envisioned for studying the effects of the SSTP in terms of career development of its 1960 participants:

1. A study of the immediate effects of SSTP on its participants, attempting to find changes in attitude, career plans, course elections, etc., as an immediate result of the SSTP experience. This was a limited study encompassing only 18 of the programs

2. The present study was organized and timed to find most of the participants about the end of their sophomore year in college, ready to undertake major work and specialized study in the fields leading to their careers.

3. The third study is seen as collecting data at the time that most would be obtaining a Bachelor's degree and before they scatter to graduate study, professional schools or to jobs.

4. The fourth should be made about two years after the third, at a time when some have completed such graduate work as they are going to finish and others are midway along with their graduate study or professional school work.

5. The fifth study should be made some two or three years later, after most of them have had time to become identified with a career and a career field.

To understand the impact of the Summer Science Training Program on the careers of the individuals, it is necessary to know both:

1. how the individual felt at various times regarding the influence of his experience, and

2. the evidence of such influence both in terms of the performance of participants and in terms of their careers.

On the basis of these needs, two kinds of questions were asked of the participants in the 1960 SSTP:

1. Questions inquiring about the influence of the SSTP on career decisions, motivation, attitudes and other effects and impacts as seen and felt by the participants themselves.

2. Questions asking for information bearing on career choices and career development.

These questions were organized as a four-page questionnaire, Form K.

II. THE STUDY DESIGN

The design of this study is historic rather than experimental. It is an achievement report on the earlier steps taken by SSTP participants advancing toward their careers, with the hope that there will be a maximum of these in the areas of science, mathematics and engineering.

The need of 'control' groups, some sort of normative or comparison groups to which the performance of the SSTP participants could be compared, presented a problem.

The SSTP participants are not comparable to the 'college attenders' from their own high school classes. They are more select than such a group, in terms of average ability, grades, and, very probably, in terms of their career and academic motivations.

Three groups of students offer some possibility as comparison groups. None are sufficiently comparable initially to be designated as "controls" but they might serve as the "best available" for comparison purposes. These groups are:

1. The participants in the Annual Science Talent Search for the Westinghouse Science Scholarships and Awards: These were high school seniors who had an avowed interest in a career in science or mathematics. They are a highly motivated group with a high proportion who go on to careers in science or mathematics. There is some overlap here since 7.2% of the 1960 SSTP participants were also participants in the Annual Science Talent

Search. "Purification" of this group, by eliminating the overlapping cases would also introduce a bias, since those participating in both SSTP and STS are a more able, and perhaps better motivated group than those participating in one program and not the other.

2. The participants in the Science Fairs: Interest in science, technology or mathematics is certainly present. At the higher levels of participation in the science fairs, science career aims and motivation are definitely in evidence. The boys and girls participating are of about the same age-grade level as the SSTP participants, and operationally have demonstrated their deep involvement in science and mathematics by designing, constructing, exhibiting and explaining their science-math projects at science fairs or congresses. There are essentially three levels of participation in the science fairs, beginning with the local fair. Those having the better exhibits go on to a higher level of competition in regional and state fairs. The two best exhibits from each affiliated regional or state fair are entitled to attend the National Science Fair-International. Those selected for this honor have demonstrated some ability in science and some continuing and deep interest in science. This last group, the participants in the National Science Fair International, were considered as a possible comparison group. Because of the small numbers and the low percentage who were graduated from high school in 1961, this group was not used as

a comparison group.

3. A group of selected peers: This sample was made from 2 sub-samples:

   3.1 Individuals nominated by their high school teachers or principals as comparable to SSTP participants in ability, intensity of interest and sophistication in science, but unable to attend SSTP in 1960. A total of 227 such individuals returned questionnaires. These were selected to be comparable to those participants in 18 selected SSTP's of 1960* who had just completed their 11th grade and planned to go back to their high schools to complete their 12th grade before going on to collegiate study.

   3.2 Individuals who applied for admission to an SSTP, but due to quotas or other factors did not make it. There were 192 questionnaires returned by this group.

Data for the two sub-samples were very similar. Because of this, the two sub-samples were combined as selected peers.

Two of these classifications appeared to be useful as comparison groups, namely, the Science Talent Search of 1961 (STS) and group of selected peers (SP). The members of the comparison groups had been asked to complete the same questionnaire, Form K, as were the SSTP participants

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* These were the group of peers selected and used on the first study of the 1960 SSTP participants. (Edgerton, Harold A., Impacts of the National Science Foundation's Summer Science Program of High Ability Secondary Students; Richardson, Bellows, Henry & Co., Inc., New York, 1961. (A research conducted under Contract NSF-C-150)

III. THE DATA

Data by which the SSTP program may be evaluated came from the following sources:

1. 1960 SSTP participants:
   - Data drawn from a brief questionnaire filled out by all SSTP participants as part of their application for 1960 SSTP participation.
   - Data from the questionnaire, Form K, filled out by SSTP participants in the spring of 1963.
2. 1961 STS participants:
   - Data from the credentials submitted in December 1960 as their entry to the Search.
   - Data from the questionnaire, Form K, filled out by the STS participants in the spring of 1963.
3. NSF-I participants:
   - Data from the questionnaire, Form K, filled out by the NSF-I participants in the spring of 1963.
4. Selected Peers:
   - Data from the questionnaire, Form K, filled out by the members of this group in the spring of 1963.

The same questionnaire, Form K, was used for all groups. The numbers in each group are shown in Table 1.

Two kinds of evidence of the effect of SSTP are here reported:

- How the participants, after 3 years, saw the effects of their SSTP experience, and
- What evidences, expressed in career development of the participants have appeared within the 3 years immediately subsequent to SSTP.

Table 1.

NUMBERS OF PARTICIPANTS IN EACH PROGRAM IN THE STUDY

Group	No. in Group	No. Completing Form K	%
SSTP: Participants	7028	5815	83
STS: Participants	3603	2922	81
NSF-I: Participants	385	248	64
SP: 1960 Selected Peers	598	419	70

Questionnaire returns were highest for the SSTP and the STS populations.

The Selected Peer and NSF-I sample showed lesser returns, some of the former perhaps because they "were not science". The latter group may have been less responsive because the questionnaire was designed to obtain information primarily from the SSTP group.

The first questionnaire was sent out in April 1963 and failed to produce the expected returns. A follow-up mailing in June, reaching the participants early in the summer at home, was the most effective. Attempts were made with little success to reach the participants whose questionnaires were returned "addressee unknown" through their high schools. In the Washington, D. C. area, telephone follow-ups to such cases were tried but did not produce sufficient results.

A. Effects of SSTP as seen by its Participants

Six questions in Form K were aimed to ascertain how the boys and girls themselves felt about their SSTP participation. These were "open end" questions asking for experiences, opinions and feelings. Some of these subjective opinions were expressed in answer to the specific questions

and some, even more revealing, were added spontaneously in little notes accompanying the questionnaire or in separate letters.

A few were critical of some facet of their particular program, but most were in the vein of the Pennsylvania boy who wrote, "There are many things that a questionnaire cannot discover and the fond memory of a wonderful experience is certainly one of them." He noted further that in his community program, the day for most students ran from 7 AM to midnight, yet not one absence was reported and students regretted only that the course was over in 6 weeks. One added an explanatory note to say that his questionnaire answers might give the impression that SSTP had been of little value, since he could not name specifics in scholarship dollars or grade point increment which had accrued from it. "On the contrary, it was a first class intellectual challenge, perhaps the first such I had received...it gave me a chance to meet many really fine students, many new ideas and new outlooks."

The opportunity to rub elbows with talented faculty and with other bright, science oriented boys and girls was a shining experience for many as reflected in such comments as, "Before SSTP I thought smart people weren't fun", or "I learned humility, saw how much there is to know and how little I knew...I gained respect and admiration for the professors;" "In high school, I never knew I could do difficult problems and advanced type of work as were never given such."

A few of the comments were on the critical side. These included expressions of an uneasy fear that "like sports, the sciences are being abnormally emphasized"; "There is not enough emphasis on morality and the

humanities"; "I wasn't told that I would'nt have a chance to study psychology, economics, sociology, literature or art if I went into engineering." One expressed a deep worry over loss of individuality, "I don't want to be a piece of human utility", and another the anxiety that "people are subordinated to goals, lives to economic systems and men become worshippers of idols made of facts and destroy themselves in the process." Others offered their feelings "too much depersonalization, too many scientists cut themselves off from people"; "as young people we are here on this earth to live, not to make sure that every little thing we do has some practical purpose...in your programs try to break down the idea that material ends are the end"; "students are becoming too mechanical and unfeeling." Without humanities the human race has little chance of survival"; "I want the person who has his finger over the "red" button of science to know what human emotions and feelings are".

Table 2 offers an abbreviated summary of the responses to the six questions. The answers to each of the questions were coded to indicate the content and many verbatim answers were extracted to illustrate the meaning and the feeling of the participants.

The replies to questions 17 and 20 were combined for analysis since the questions were quite similar:

17. Did SSTP cause you to change your career plans?

20. What effects did SSTP have on your career plans?

The summary from Table 2 shows that most of the participants were already settled in their career plans and the SSTP experience either made no change

Table 2.

RESPONSES OF SSTP PARTICIPANTS REGARDING THE EFFECTS OF SSTP PARTICIPATION AS REPORTED BY SSTP PARTICIPANTS. (N = 3948 Boys and 1867 Girls)

		M	F	TOTAL
17, 20	CAREER CHANGE DUE TO SSTP			
	no change, no data	57%	49%	55%
	changed from science/math to other area	5	7	6
	intensified interest in science/math career	26	27	27
	confirmed career plans	11	15	13
18	EFFECTS ON HIGH SCHOOL PERFORMANCE			
	no data, no effect	29%	20%	26%
	negative effects	3	3	3
	positive effects	63	72	67
19	SSTP INTERFERENCE			
	no data, no interference	78%	77%	78%
	later courses seemed dull	13	15	14
	other interfering factors	9	8	9
21	SSTP HELP IN LATER WORK			
	no data, no help	19%	15%	17%
	aided in college admission, etc.	21	20	20
	improved work, background, skill	21	21	21
	refined/increased interest in science/math	15	15	15
	clarified goals	21	21	21
	aided classroom adjustment (confidence, etc.)	9	10	9
22	CONTINUATION OF PROJECT			
	did not continue	86%	87%	87%
	project continued or completed	10	9	10

or refined and intensified their interest in a science or mathematics career.

For over half the participants there was no report of a change in career plans due to SSTP, however, 13% credited the experience with confirming career choices previously made. SSTP very often shocked the young student into a realization that the BS degree he had been thinking about as his college career would be only a beginning in the vast field of knowledge that lay ahead. It also gave him a sense of confidence that he had the ability it would take to go on and thus upgrade his career goals.

For some, the summer's work focused their interest in a specific science-mathematics area. For others, their interest shifted from one area to another though still within the science-math enclave. A few, as a result of SSTP, shifted from other interest fields and decided to go on in science. Some point out that such shifts are not necessarily due entirely to SSTP. The change was coming anyway for many varied reasons, but SSTP clarified their views.

There was a small amount (6%) moving out of science to other interests entirely. However, as one put it, "The summer program was worthwhile, for even if the student rejects science he should know what it is he rejects and the programs do this. For me it was very good." (now intends to teach college music) Frequently the experience showed that true interest did not lie in science. "The origin of my change was SSTP I began to wonder if winning prizes at Science Fairs was enough to carry me through to a vocation in science. I began to realize that I had no

real dedication to the field." "I do not have the ability nor desire for a life in science, my opinion is all these science programs force high school students into fields they may not be suited for, as they did me. Why aren't there such programs in literature, psychology, philosophy, etc., so a high school student can have more choice, or base for choice for a career?" "It took out all the shine and idealized concepts I had held until then." (Now an art major - got into SSTP on urging of teacher - no regrets - SSTP kept her from a mistake). "Concentration of science in SSTP made it so distasteful I decided on Liberal Arts for a broader education."

At the same time there are expressions of anxiety that the program will be deemed wasted because not all remain in science: "SSTP was not lost on me, I still like math and science but my abilities seem to be more in other areas"; or "Do not discount the value of a program because of lack of any drastic effect on the student."

For a few the sojourn in other fields was short and with two years of college completed there has been a return to science; "Changed to liberal arts but only because SSTP convinced me I was intellectually unbalanced. I'm back in science now that I've rebalanced. I discovered that liberal arts is a good past time but no occupation and switched back to science."

There had been some concern on the part of teachers that the SSTP experience might have a negative effect on subsequent performance in high school. Question 18 was included to find out how the participants viewed this matter.

18. What effects did SSTP have on your subsequent high school performance?

Some, 26%, reported no noticeable effect or failed to comment on the question. More interesting is the fact that 67% told about the beneficial effects on their later high school performance. Typical of their remarks were these: "Made me work with more purpose, realized not enough is expected of us in high school." "My work gained a 'professional quality', I felt more a real student." "Gave me competition I'd never had so I worked harder." "After SSTP I chose courses for knowledge, not just grades." "SSTP gave an overall relationship to other courses, deeper understanding." "SSTP came after high school, sorry not before. It would have made my senior year more serious and meaningful."

Some avoided high school science courses feeling they had nothing to offer them after their SSTP experience but later regretted this decision. "It was a mistake not to take high school physics after SSTP - found background inadequate for college physics. SSTP a good course but too fast for complete background."

Very few, only 3%, felt that the summer program had a negative effect on their high school performance. Where this was true it was usually because the challenging SSTP pace made high school seem slow and dull. One wrote, "Last year in HS was awful - a let down from SSTP where I worked for the first time at somewhere near full capacity. Only in college have I become satisfied with myself again." Some, though they would have preferred going on to college immediately, found the return to high school could be made tolerable by doing more reading than required,

entering more activities already available or even organizing extra-curricular math-science groups themselves.

Occasionally there was a reference to physical and mental fatigue at the end of summer which held the student back as he entered his senior year, or a statement of immaturity as "Grades and study habits were worse after SSTP. I was too young and immature to make good use of it." "Took SSTP at end of sophomore year, too immature - junior year suffered."

A closely related question was also asked so as to probe more into any negative feeling about the effects of SSTP.

19. In what ways did SSTP interfere with work done later in high school and in college?

More than three-fourths of the respondents either stated that SSTP offered no interference with later work or did not answer the question, presumably indicating that there was no interference to report.

Less than one quarter of all respondents indicated that SSTP had interfered in any way with later work either in high school or in college. The most common complaint was that later courses seemed dull or repetitious with comments such as, "HS courses seem designed to discourage speculative thought - nothing worth wondering about." Others touched on the same topic more philosophically with such observations as, "repetition can deepen understanding and be worthwhile. A course is as dull as a student makes it;" or said in effect that SSTP helped as a preview, covering ground at a fast pace, much of it over their heads. Repetition later gave time to delve deeper and to find out what the teacher had been talking about all summer.

The "unbored" were those who were recognized by their teachers as having extra background ability and who were allowed extra work, teaching assistantships, or other responsibilities as well as those who had an inner ability to elaborate on the high school course and do extras on their own.

A very common comment was that "I took all the science there was available in my high school", or "The science courses in my high school were almost worthless".

Among the "other" interferences were several comments that, "SSTP gave artificial stimulus to science interest, in college found interest not deep enough or ability lacking." And a smattering who felt, "Both students and teachers expected much of me because of my SSTP, yet they resented same."

As in reports on negative effects on high school, there were several mentions of academic exhaustion. Typical of these comments, "Entered college in summer right after high school graduation. This proved unwise, had no academic vacation for 21 months and the summer showed it, grades declined and academic average suffered."

Answers to question 21 offer a more positive response to the SSTP experience.

21. In what ways did the work done in SSTP help your later work in high school and college?

Both boys and girls felt that their SSTP experience had improved their work, background and skill; had aided in classroom adjustment and in obtaining scholarships and admission to college. Quite a few, 15%, found it had refined or increased their interest in science and mathematics

and some (9%) noted that it aided in personal adjustment by widening horizons and developing self sufficiency. Typical of comments on improved work skills were, "Boy, did I learn to study..and fast"; "Impressed me with the need to get down to work in college."

Even many of those who changed to non-science majors still said SSTP gave them a scientific approach to other studies, a broader view, more objective and searching. Other typical comments on classroom adjustment were, "Teachers knew I had attended SSTP, expected more of me and I worked to live up to expectations;" or "My understanding became reality when I was allowed to give some zoology lectures back in high school."

There are many mentions of SSTP material which was over their heads at the time but which became meaningful as it came up again in later courses. Most college entrance help was indirect in that the SSTP experience gave a background of knowledge that aided in examination.

In the broad field of improved personal adjustment there are references to:

> humility learned as, "Thought I was pretty smart until I got to this program and realized many were smarter. I felt pretty stupid until I got home again."
>
> gains made in self understanding and a broadening vision of what the future could hold as, "SSTP gave me my first real look at the future. It shook me up;" "Met students of greater ability and developed interests and first identified with professional scientists not just teachers;" "Helped my inferiority complex for being poor. I now feel wiser than many richer classmates;" "Your questions reveal only effects on our scientific selves, we have other equally important 'people selves' and SSTP affects this self even more. Meeting students of equal ability, from different backgrounds, starts one on a path to open minded scientific outlook on life."

growth of confidence in own ability as, "The very fact of being accepted in SSTP gave me self confidence in approaching everything." "Gave me confidence to attempt a heavy academic schedule in college and now I can aspire to grad school and research." "This was the first time I realized that I, too, could handle some interesting, even important, problems in math." "SSTP was valuable socially as well as scholastically, helped in math but brought prestige and self confidence and no one can do much of anything without that."

improved skills in developing relationships with other people as, "Have always had trouble getting along with people, but my parents were always there to help. At SSTP I had to make it alone and I tried and almost succeeded"; "SSTP was a turning point in my relationship with other people. Made the first friends I've had for years."

The last of the open end subjective questions relates to continuing work on SSTP project:

22. After leaving your Summer Science Training Program, did you continue work on a project started in that program?

In all, 87% reported "did not continue" and less than 1% failed to answer the question. It is assumed that many of the "non-continuers" had no project to be continued.

Among those who reported that they did not continue their project there were a few comments such as, "Didn't have expensive radiation measuring devices available at SSTP - perhaps a generally frustrating feature of a luxurious program." However, 7% were continued though some were later dropped for lack of equipment, time or money for materials. Many were continued on a now and then basis, the student reporting he is still interested, but busy with too many other things to give it much attention. A few such projects led to jobs and at least one to a patent Those which were continued and used in Science Fairs or STS were less numerous than expected, 2% and 1% respectively

The message comes through "loud and clear" that in its effect on career plans and levels of ambition, subsequent high school and college work and especially in improved self understanding and confidence the participants found the SSTP a really valuable experience.

B. Other Evidences of the Impact of SSTP

We have reviewed the reports of how the SSTP participants subjectively felt that their SSTP experiences had affected them. In this section we are concerned with the kinds of later behavior or performance of these boys and girls which could reflect the extent to which the SSTP has attained its objectives. Some of the questions from Form K used to obtain appropriate data are:

QUESTION 6. What occupation do you now plan to enter?

First choice _____
Second choice _____

. Did the participant choose an occupation which demands training in science or mathematics?

. To what extent did the participants select an occupational field which demands that they perform in research rather than as a practitioner?

QUESTION 7. Has your choice of occupation changed since you were a high school senior?
If YES, what caused the change?

. Of the participants what proportion have decided to change to a non-science career?

QUESTION 3. What colleges or universities have you attended as a regularly enrolled student?

College or University	Dates of Attendance From	To	Course, Major or Curriculum

. What percent of the participants did go to college? To what extent had the participants already selected science, mathematics or engineering as their major fields of specialization?

QUESTION 5. Check the letter which best indicates the average of your college grades.

A A- B+ B B- C+ C D+ or lower

No college

. What proportion of the participants received high marks in their college work?

QUESTION 8. What is the highest academic degree you now plan to earn?

None BA/BS MA/MS Ph.D/Sc.D DDS

DVM MD Other

. What levels of training are envisioned or planned by SSTP participants?

The evidences obtained from answers to the questionnaire, Form K, are summarized in Table 3. To permit comparisons of the later career development of the SSTP participants, data for a "purified" group from the SSTP sample is shown. This consists of the responses of those SSTP responders who were graduated from high school in the spring of 1961 and will be used as the SSTP group for the purposes of these comparisons.

Mathematics and/or science occupations showed up strongly as first choices for the SSTP group, with 68% so indicating. The STS group showed the same overall percent but with a greater difference in the responses of boys and girls. The Selected Peer (SP) group had 57% naming a science or mathematics occupation.

A considerable number not only indicated a mathematics or science occupation but also restricted their choice to research 14% of the SSTP group (about 1 in 7) did so. This was a bit lower than was true in

Table 3

RELATIVE FREQUENCY OF ANSWERS BEARING
DIRECTLY ON THE ACHIEVEMENT OF PURPOSES OF THE 1960 SSTP

	1960 SSTP (1961 HS GRADS)			1961 STS			SELECTED PEERS			1960 SSTP (ALL)		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
NUMBER OF CASES	2608	1160	3768	2205	717	2922	297	122	449	3948	1867	5815
A. % Choosing Math., Science Occupations	71	59	68	75	65	73	61	49	57	75	63	71
A.1 % Choosing Math., Scien., Research Occupations	14	14	14	23	15	19	26	11	22	15	14	15
B. % Choosing Non-Science Occupations	23	35	27	19	29	22	32	43	35	19	30	23
B.1 % Changing to Non-Science Career	5	6	5	4	5	4	5	4	5	4	6	5
C. % Attending College	99	96	98	97	95	97	97	90	95	97	94	95
C.1 % Averaging B or Higher in College	56	58	57	43	54	45	44	48	46	53	57	55
C.2 % Major Field in Sc., Math., Engineering	75	61	71	58	60	59	66	32	56	78	67	74
D. % Seeking Doctoral Degree	58	26	48	64	36	57	44	18	39	69	28	55

the other groups where about 1 in 4 or 5 indicated a research choice. The practicioner science occupations such as engineering, medicine and industrial work are the most prevalent choices.

One can conclude that these programs are unearthing and/or producing interest in research careers. The number reporting "undecided" in occupational choice is smaller than expected; 8% for the SSTP group.

Some had science career plans already in mind and SSTP reinforced their feeling that this was right for them by "bringing a student close to science as in real life"; "made me more certain of my desire to be an M.D., made the role of biology in modern science and society more real." Teaching science or mathematics was a common career plan, especially as second choice of those who hoped to be researchers. Often this was with the idea of bettering the kind of teaching they had known themselves and sometimes indirectly a result of having observed in SSTP the heights to which good teaching could rise.

Science interest has been well sustained with no great shift in occupational choice occurring for any of these groups since they were in high school as seniors. The SSTP group indicate that 5% of their number changed from one area of science or mathematics to another and that another 5% shifted to a non-science area. Girls made this latter change more frequently than boys. For a few, the high science interest faded into disillusionment in college, "I was disgusted with the narrow curriculum." Girls often and boys sometimes noted that they did not "intend to sacrifice my personal life to so demanding a profession" as science Teachers and college professors often influenced positively toward science but

occasionally were also responsible for negative influence, "After Physics and Chemistry under her I decided to avoid all science," "hated my high school physics teacher and science too. He wanted to limit us to science only. This must not be done by anyone." There is a frequent observation that science professors seemed 'narrow-minded," "worshipers of the objective, factual world" "out of touch with fellow human beings". Students lament that they do not wish to become "mere computing machines". Yet the reader is left to wonder a little if these comments were entirely a matter of observation or maybe of expectation colored by the popular concept of the mad, hermit scientist. One girl, now planning to enter a religious order writes, "Contacts with scientists (in SSTP) showed me they are <u>lovely people</u>."

However, the People interest versus the Non-people interests appear to be influencing these young and able students. Those who left the sciences and turned to social work because "I wanted People work"; to the ministry because "I saw less and less meaning to electrical engineering, although I was doing well. I found I had an increasing awareness of people;" to sociology because "math suits my aptitude but not my interest in people" "It has too little to do with the world around me"; to history and philosophy because "I developed an increasing concern with life problems"; to economics and languages because "The verbal sciences seemed more interesting than the physical"; or to Music and Arts because "This is an exciting world with more freedom of thought".

Not a few of these bright students felt that they had been "brain washed" into science by overzealous teachers or the spirit of the times

and discovered only in college that they were not really suited. One, now a language major, wrote, "Science seemed the only choice. I never heard any mention of a non-science major. I think teachers overemphasize science and underemphasize anything else." Others indicate that in their high school the science courses were the only ones offered at a level which challenged the bright student and which carried a kind of prestige and status separating the able from the average.

College attendance was high for all groups. For the SSTP, 98% attended college and 85% had completed 2 or more years of college within 2 years after graduation from high school. For the STS, 97% attended college and 81% had 2 or more years of college. The Selected Peers showed 95% had attended college and 77% completed 2 or more years of work.

Academically the SSTP participants show up strongly. 57% reported a college average of B or higher with the STS and SP groups reporting only 45% and 46% with correspondingly high grades.

There was no clear cut evidence to show when admission to college with advanced standing on a basis of work done in SSTP was a good idea and when it was not. A few who entered with such standing regretted it later, finding that SSTP had not adequately prepared them for advanced classes, "Advanced standing in math gave the impression I was more advanced that I really was." Some, anticipating this, refused advanced standing when offered it and followed the regular freshman program. Still others appear to have made the transition to advanced courses successfully

Experience and the students' own opinions of early admission to college after SSTP were equally varied. Some states, notably Florida and Kentucky, had more reporting such early admissions. A number of students reported that they found high school dull and boring after a foretaste of college in SSTP. "I yearned to go to college" is their common theme. A Louisiana student reports he wished for early entrance to college, but in his state there is no arrangement for early graduation from high school so this was not possible. In some other states students might have taken advantage of such a possibility but couldn't afford it. For a fortunate number, it was a happy escape from an extra semester of marking time in a high school curriculum they had already outgrown. Even so, there were occasional comments as, "I went to college after one semester of senior year in high school, however, my college grades were poor and I have now left." I believe it would have been better if I had finished high school."

The academic ambitions of these students may be reflected in their goals, expressed as the highest degree which they are planning to obtain. About half of the SSTP and STS groups (48% and 57% respectively) are aiming for a doctoral degree. For the SP group 39% are looking forward to a doctoral degree. In each of these groups, more are planning for the Ph.D. than for a professional doctorate degree. The proportions of boys aiming for doctoral degrees is much greater than for girls. The proportion seeking advanced degrees, both Masters and Doctors, for each of the groups is high. (SSTP, 84%; STS, 79% and SP, 71%)

Credit was frequently given to SSTP for upgrading the academic aspirations of the participants. Often they had not realized the need of a higher degree in their field but more often they had not had, until after SSTP, the confidence in their own ability that made a higher degree seem feasible. Sometimes it was a college faculty member who inspired this confidence. In any case, students were uniformly grateful. Equally grateful was one student who found through SSTP that he had no desire to go to college. He is now a happy bookkeeper.

A more objective behavioral evidence of career aim should be the field of specialization being followed in college. From the evidences available at this stage of their training, field of specialization may not be a valid index. Many of the participants, toward the end of their second year in college have not yet entered their major field of study. It is suspected that the answers to "course, major or curriculum" were not consistent, some recording their academic intent and some the kinds of courses they are now taking. For what it may be worth, the response pattern is as follows:

In the SSTP (selected) group, 75% of the boys and 61% of the girls are specializing (major or curriculum) in science, mathematics or engineering. The proportions were lower for the biological sciences and in pre-professional programs, such as pre-medicine and pre-dentistry. The relative numbers may be associated with the relative demand in the various fields. The other groups show fewer in such major fields than does the SSTP group. The percent in each group who have had a part or

full time science or math job may reflect motivation toward a science career.

From these evidences, drawn from the past SSTP performance of the participants, it is clear that SSTP is attaining its objectives. The greater number of its participants are proving themselves academically above average in college, aiming at occupations in the science-mathematics area and anticipating advanced degrees. A fair proportion plan to enter research. Even at this early stage in career development, some have published.

C. Related Background Data

Activity in science as high school students can be reflected in science recognition. 21%, or 1 out of 5 of the entire group of SSTP participants, had received academic honors or awards related to their science achievements. Fewer SSTP participants were members of science organizations in high school (23%) than were the participants in the STS and NSF-I. The fact that the latter programs are sponsored by Science Clubs of America and the Youth Science Program of Science Service, Inc., may be a factor.

On the other hand, the SSTP participants garnered more non-science recognitions in high school than the members of the other programs or the Peer group. The largest differences appear in the proportions making the Honor Roll or being Valedictorian.

Part or full time employment has been common to all of the groups studied. The SSTP group more frequently found jobs in non-science areas

(62% non-science/math versus 16% in science or mathematics). Contrarily, 30% of the NSF-I participants had been employed in some science/mathematics capacity. This group may have been more "visible" to prospective employers by virtue of their public exhibits.

The science jobs available to those boys and girls were often those as laboratory assistants, often in hospitals. Some were employed on research projects with varying degrees of responsibility.

D. Variability Among SSTP's

The extent to which the Summer Science Training Programs have achieved their aims has been approached "extra-murally" comparing the performance of the participants to that of two other groups, the Science Talent Search and Selected Peers. An "intra-mural" view may be had by studying groups who exhibit certain patterns of characteristics within the ranks of the several SSTPs .

The most cogent information for each SSTP may be expressed in terms of percents, e.g., the percent of the participants in any one program completing more than two years of college as of June, 1963; the percent who averaged B or better; the percent who are pursuing programs in mathematics, science or engineering; the percent whose occupational choice lies within the sciences; the percent who anticipate a master's degree or a doctorate, and so on. These data were assembled for 134 SSTP's, all that had 10 or more replies to the questionnaire, Form K.

From such information one can obtain a frequency distribution for each of these "characteristics" of Summer Science Programs. In addition,

the correlations among these "characteristics" were computed indicating the extent to which each characteristic is associated with each of the others.

Practically all of the participants graduated from high school through a period including the years of 1960, 1961 and 1962. Table 4 shows the frequency distribution of percent of participants in 134 SSTP's who graduated from high school in the year 1961 following their SSTP experience.

Table 4.

A FREQUENCY DISTRIBUTION FOR 134 SSTP'S OF PERCENT GRADUATING FROM HIGH SCHOOL IN '61

%	fr	%
90-100	47	35
80-89	17	13
70-79	13	10
60-69	16	12
50-59	17	13
40-49	11	8
30-39	6	4
20-29	3	2
10-19	3	2
0-9	1	1
TOTAL	134	100

For 47 (35% of the SSTP's, 90% or more of their participants graduated in 1961. A few of the SSTP's drew their participants from a younger or older group; 24% of the SSTP's had less than 50% of their participants graduating in 1961.

The 24 SSTP's for which less than 50% of participants graduated from high school in 1961 had for the most part drawn more of the younger and academically less-advanced participants. These SSTP's do not appear to be otherwise different from the remaining 110 SSTP's.

Examination of cross tabulations of percent graduating from high school in 1961 with the other characteristics shows a positive relationship with each of the following:

% attending college

% averaging B or higher in college

% who completed two years of college by June, 1963

% reporting math, science or engineering as field of specialization or major

% who changed their occupational choice within science since high school

% having non-science jobs in the summer of 1961

% having non-science jobs in the summer of 1962

% having received science recognitions in college

Only two of the characteristics showed negative or inverse relationship with the percents who graduated from high school in 1961. These were:

% reporting no employment

% attending two or more SSTP's

This may indicate that there may be some SSTP's whose participants came closer to the stated purposes of SSTP than others. It may suggest a general SSTP "achievement" factor.

Practically all of the participants had attended college prior to the spring of 1963. Table 5 shows that 125 of the programs had 90% or more of their participants attending college. Only 9 SSTP's had fewer than 90% attending college by that time.

Table 5.

FREQUENCY DISTRIBUTION FOR 134 SSTP'S OF PERCENT OF PARTICIPANTS WHO ATTENDED COLLEGE BY MAY 1963

%	fr	%
90-100	125	93
80-89	2	1
70-79	7	5
60-69	0	0
TOTAL	134	100

The percent attending college is related to % selecting a major in science, mathematics or engineering; % changing one's occupation within science; and % having received college science and non-science recognitions. College attendance is also associated with having non-science jobs in the summers of 1961 and 1962. Perhaps any employment to earn money was a necessity for many of these boys and girls in order to attend college. Two characteristics showed an inverse relationship with college attendance:

% reporting no employment or no data regarding employment, and

% attending two or more SSTP's

This is quite similar to the pattern shown for the percent graduating from high school in 1961.

There has been some concern expressed that some schools might use the SSTP as a device for recruiting students. Table 6 shows that this is not a real problem. Few of the SSTP's had any substantial proportion of their participants returning as college students. All but one of the 24 institutions reporting 30% or more of their participants returning as undergraduates are state colleges or universities in the south, mid-west and southwest and would normally attract students from their own areas. Further support of this conclusion is afforded by the lack of significant relationship of other characteristics with this one.

Table 6.

FREQUENCY DISTRIBUTION FOR 134 SSTP'S OF PERCENT WHO ATTENDED COLLEGE AT THEIR SSTP COLLEGE

%	fr	%
90-100	0	0
80-89	0	0
70-79	1	1
60-69	2	1
50-59	3	2
40-49	6	4
30-39	12	9
20-29	30	22
10-19	33	25
0-9	47	35
TOTAL	134	100

The overall influence of the SSTP experience on choice of college was not particularly strong. Five percent reported that one beneficial effect of SSTP was that of helping them choose their college. In those cases where it led to student's choice of the host college it was because he felt he "knew his way around", or "realized what a fine faculty they had", "felt he had friends on the faculty", "would never have realized what a good school it was except for SSTP", etc. Sometimes it steered him to some other campus because he found the SSTP college "too large", or "too small", "too limited", or decided he wanted a co-educational college experience, etc.

Some programs might select students in greater proportion who would not become scientists. Table 7 shows the frequency distribution of the percents of participants for each of the SSTP's who had named a science or mathematics occupation as his first occupational choice. Considering the twenty colleges which had the lowest percent of participants naming science/mathematics occupations, no characteristic seems to stand out. These were about equally distributed among the different types of programs.

Cross tabulations showed that percent who named a science or math occupation as a first choice of vocation is associated with the percent whose second choice was also in science/mathematics, and whose field of specialization is in the physical sciences. This occupational choice is associated with great ambition, the percent anticipating a Ph.D. or D.Sc. or a professional doctorate as their highest degree. These were also related

to percent who attended two or more SSTP's. Two characteristics showed in inverse relation with 1st occupational choice science/mathematics:

% changing their occupational choice within science, and

% changing their occupational choice to non-science since their high school senior year.

These evidences suggest an ambitious, strongly motivated group who are driving toward careers in science.

When we narrow this group down to the percent of those who limited their choice of a science occupation to a research job, we find a number of characteristics related positively with this choice. These are the people who were more likely to have participated in the Annual Science Talent Search and whose second occupational choice was science teaching. Most were anticipating a doctorate, either the Ph.D. or a professional doctorate. They felt that their SSTP had been helpful in getting scholarships. To a greater extent than those choosing the non-research occupations, they had attended more than one SSTP and had received recognition in high school both for science and non-science activities. A greater number had had science jobs. In many ways these are similar to the larger group who selected science/math occupations, but are more sharply defined as the ambitious achievers in the area.

Looking at the other side of the coin, the percent who changed to non-science/math occupations after leaving high school is associated with participating in the Annual Science Talent Search and negatively associated, as one would expect, with choosing a science/math occupation as a 1st or 2nd occupational choice. This particular characteristic does

not seem to be associated with other characteristics which shed any real light on its nature. We can only rely on the statements made by the boys and girls as to why they made this change.

Table 8 shows the frequency distribution of percentages for the SSTP's of participants who decided to change to a non-science/math occupation. The proportions making such change is small. Considering the 11 schools having 12% or more of their participants making such a change, there does not seem to be any particular reason for such change in terms of type of program, location of school or presumed kinds of participants.

Table 8.

FREQUENCY DISTRIBUTION FOR 134 SSTP'S OF PERCENT WHO CHANGED TO A NON-SCIENCE FIELD AS A RESULT OF THEIR SSTP EXPERIENCE

%	fr	%
27-29	0	0
24-26	0	0
21-23	0	0
18-20	2	1
15-17	5	4
12-14	4	3
9-11	13	10
6-8	28	21
3-5	35	26
0-2	47	35
TOTAL	134	100

Table 9 shows the relative frequencies for the different SSTP's according to several different fields of specialization (major field or curriculum) in college. Physical sciences were the most popular with 21%,

followed by Engineering 17% and Mathematics 15%. Altogether 74% indicated a major field of specialty in science, mathematics or engineering.

Table 9

FREQUENCY DISTRIBUTION FOR 134 SSTP'S OF PERCENT OF PARTICIPANTS ACCORDING TO MAJOR FIELDS OF STUDY IN COLLEGE

	Engineering		Mathematics		Phys.Sci.		Biology		Pre-Profes.		All Ma/Sc/Eng	
%	fr	%	fr	%	fr	%	fr	%	fr	%	fr	%
90-100	0	0	0	0	0	0	0	0	0	0	0	0
80-89	0	0	0	0	0	0	0	0	0	0	26	19
70-79	0	0	1	1	0	0	0	0	0	0	32	24
60-69	0	0	1	1	0	0	0	0	0	0	17	13
50-59	0	0	0	0	3	2	0	0	0	0	9	7
40-49	3	2	5	4	4	3	1	1	0	0	5	4
30-39	5	4	5	4	19	14	6	4	0	0	2	1
20-29	30	22	8	6	37	28	14	10	1	1	1	1
10-19	53	40	61	46	44	33	31	23	23	17	1	1
0-9	43	32	53	40	27	20	82	61	110	82	0	0
TOTAL	134	100	134	100	134	100	134	100	134	100	134	100

Having chosen science, mathematics or engineering as a major field or curriculum is correlated significantly with:

- % graduating from high school in 1961
- % attending college
- % B or higher average college marks
- % having completed two years of college
- % having research as 2nd occupational choice
- % having non-science jobs in the summer of 1962

Only two characteristics show negative correlation:

- % no employment
- % rest/travel summer 1962

One measure of anticipation or achievement motivation can be expressed in terms of the highest degree the participants expect to earn. Those who aspire to a Bachelor's degree as the highest degree are not, presumably,

as ambitious or motivated toward being a scientist as those who aspire to a Master's degree; and that these are not as well motivated or ambitious as those who aspire to a Doctoral degree. Table 10 shows the frequency distribution of the percents in each SSTP who reported the Master's degree as their height of ambition, those who reported a Ph.D. or D.Sc. and those who reported any kind of doctorate, both the Ph.D. and professional doctoral degree as M.D. or D.D.S. To find 17% (1 out of 6) of the SSTP's having 50% or more participants aspiring for a Ph.D. or D.Sc. would seem to represent a rather high order of ambition; and 61%, 3 out of 5, of the SSTP's had more than 50% of their participants aiming for some kind of doctoral degree. The 9 SSTP's having the lower proportions (under 20%) of participants aiming for some kind of doctoral degree were, for the most part, schools which did not have a graduate program.

Table 10.

FREQUENCY DISTRIBUTION OF 134 SSTP'S OF PERCENT WHOSE HIGHEST EXPECTED ACADEMIC DEGREE WAS AT THE LEVEL OF THE MASTERS, Ph.D., AND ALL DOCTORATES

	MA/MS		Ph.D.		All Doctorates	
%	fr	%	fr	%	fr	%
90-100	0	0	0	0	1	1
80-89	0	0	1	1	4	3
70-79	0	0	2	1	15	11
60-69	0	0	7	5	26	19
50-59	0	0	14	10	36	27
40-49	15	11	27	20	28	21
30-39	37	28	42	31	15	11
20-29	53	40	25	19	8	6
10-19	24	18	14	10	1	1
0-9	5	4	2	1	0	0
TOTAL	134	100	134	100	134	100

Since this evidence appears to be the best reflection of achievement motivation, one should seek its relationships to other characteristics of the SSTP's. The cross tabulators of both percent anticipating a Ph.D. and percent anticipating a professional doctorate as parallel information were reviewed, since many of the same kinds of factors or characteristics are associated with both. They are an "achieving" group. They had an early first interest in sciences, before junior high school. This group was more likely to have had sciences or math jobs for pay; they had attained high school science recognitions and to some extent non-science recognitions; they participated in greater proportions in the Annual Science Talent Search for the Westinghouse Science Scholarships and Awards; they not only had chosen a science or mathematics occupation but aimed it at research. As a group they are similar to our model of what the budding creative scientist looks like when he is in his middle to late teens.

The percent who averaged B or better in college is associated with the percent majoring in science, mathematics or engineering; with the percent anticipating the Ph.D. degree; and also with a certain breadth of activity and achievement, namely, having attained non-science recognitions in high school and in college. These include making the Honor Roll or Dean's list; being elected to a major elective office, etc. The achieving of high grades is also associated with being a member of non-school science or mathematics organizations. The only negative factor here is that the participants in the Negro programs (see Section E, Kinds of Programs) averaged a little lower in grades than did the other groups.

Table 11 shows the percents in the various SSTP's who reacted in each of three ways to the SSTP experience. For some, career plans were confirmed. The low frequencies shown in the table do not reflect lack of career plans, rather that plans were already fixed and needed no further confirmation. More reported increased interest in their chosen field of science. This, of course, substantiates one of the aims of SSTP. The last two columns indicate that there were a few who felt that SSTP had a negative effect on their post SSTP high school performance. Whether this is good or bad, one cannot say. They reported that they were bored, they had to repeat things taken in SSTP, the pace was slower, and the like.

Table 11.

FREQUENCY DISTRIBUTION FOR 134 SSTP'S OF PERCENT REPORTING CERTAIN EFFECTS OF SSTP ATTENDANCE

	Confirmed Career Plans		Refined & Increased Science Interest		Negative Effect on HS Performance	
%	fr	%	fr	%	fr	%
50-59	2	1	3	2	0	0
40-49	1	1	0	0	0	0
30-39	8	6	9	7	0	0
20-29	14	10	38	28	0	0
10-19	75	56	50	37	7	5
0-9	34	25	34	25	127	95
TOTAL	134	100	134	100	134	100

While the SSTP's tried not to interfere with high school work, some such reaction was to be expected occasionally in this area.

Table 12 shows another evidence that many of the boys and girls are continuing their high level of work in science or mathematics and that their quality is visible to others. For about half of the SSTP's, 10% or more of their participants had received some science or mathematics recognition in college within the first two years of college. This represents a substantial step toward achievement of the aims of the Summer Science Training Programs.

Table 12.

FREQUENCY DISTRIBUTION FOR 134 SSTP'S OF PERCENT WHO RECEIVED SOME SCIENCE OR MATHEMATICS RECOGNITIONS IN COLLEGE

%	fr	%
45-50	1	1
40-44	0	0
35-39	0	0
30-34	4	3
25-29	2	1
20-24	8	6
15-19	27	20
10-14	27	20
5-9	36	27
0-4	29	22
TOTAL	134	100

As these several evidences by which the "success" of the SSTP may presently be judged, there seem to be essentially two major classes of criteria. These, in oversimplified form, are:

A. High level of science achievement motivation, and

B. Superior achievement in training toward being a scientist

E. Kinds of Programs

What characteristics of the programs and characteristics of their participants show significant relationship to such classifications of SSTP's as: Orientation, Commuter versus Residential and Research versus Course?

Orientation Programs: A number of SSTP's were classified as "orientation programs". These were shorter programs, 2 to 4 weeks in length, intended as introduction to a variety of fields and concepts of science rather than for deep exploration in any one. The orientation programs were in those areas in which the opportunities in high schools to obtain a broad base in science or an intensive interest in scientific research would appear to be less than those in the areas having more research programs and more specialized programs. None of the cross tabulating of the Orientation Programs with participant characteristics were significant, suggesting that insofar as the later performance record was concerned, orientation program participants were about the same as non-orientation program participants and not differentiated in terms of the characteristics included in this study. It has been suggested that the orientation programs drew a scientifically less sophisticated group of students than did either the research or course programs.

Research Programs: On the other hand, the participants in the research programs would seem to be the "most sophisticated" or advanced in their outlook. Cross tabulations for research versus other programs showed substantial relationship with participation in the Science Talent Search and an inverse relationship with selection of the master's degree as the highest degree, but there was a positive relationship for this group

in selecting a professional doctorate as their highest degree. More of the research SSTP participants had held science/math jobs than the non-research participants and a substantially higher proportion had held summer math/science jobs in both the summers of 1961 and 1962. Whether this was due to their experience on research programs, or due to a greater science background, drive and motivation, one cannot say.

Here one may feel concern with the question of cause and effect. It is likely that type of program, such as research vs others, was more a "selection by the student" of the appropriate vehicle for his own further training rather than the differential effect, generally, of different sorts of programs. It could have been geographic convenience.

Resident vs Commuter Programs: Another SSTP arrangement which has raised considerable discussion is the resident program as contrasted with the commuter program. In a residential SSTP, the students live in the college residence halls for the program period rather than living at home and attending the program at stated hours during the day, as in the commuter type. Earlier studies indicated a strongly favorable reaction of trainees to the resident program. They felt it gave them greater opportunity to talk through a problem with their faculty members, and particularly with fellow students. The differences, however, between those in the resident and those in the commuter program were very slight and do not support, in terms of the evidences and the techniques used here, any marked difference in the two kinds of program. One might be concerned with the question as to whether the commuter program were less selective than the resident program, since the resident programs could select from high schools within a much wider geo-

graphic area than could the commuter programs.

Negro Programs: Nine of the 1960 SSTP's were in Negro colleges for Negro students. A few others were established in Negro colleges but were open to all students, regardless of race. The discussion here is limited to those programs which were restricted to Negro students in comparison to all other programs.

In comparison with the other programs, more of the students reported that their influence to go into science and mathematics was due to a science math teacher rather than to family background and environment. Their SSTP experience had a slight positive effect on their performance in their remaining high school program. Fewer of the participants in the Negro programs averaged B or better in their college work than among the non-Negro programs; and fewer participated in the Annual Science Talent Search. More of them named a first occupational choice in the practitioner and production careers of science than in other aspects of science. However, their second occupational choice showed up as more interested in science and mathematics generally and also in non-science teaching jobs than the non-Negro programs. The participants in these programs did not set their academic sights quite so high as those in the other programs, showing a greater relative preference for the master's degree as the highest degree sought. A higher proportion of these Negro participants had no employment as compared with the participants in the other programs.

F. Kind of Program and Geographic Location

It was thought that kinds of programs might vary somewhat with the part of the country in which they were located. Examination of the cross

tabulations showed that there were some relationships. Because of the degree of comfounding of kind of program and region of the country, only a very few facts could be identified.

In examining the data describing the participants in kinds of programs, geography did emerge as a factor:

1. Four of the characteristics showed significant differences for geographic areas of the country.

   1.1 Programs in the northeastern states had the highest percents of participants naming science, math or engineering as their field in college. Programs in the Pacific coast and mountain states had the lowest.

   1.2 Programs in the northeastern states had the largest percents of participants making their occupational choice in some field of science or mathematics. Programs in the Pacific coast and mountain states had the least.

   1.3 Programs in the northeastern states had the largest percents of participants who had part or full time science/mathematics jobs while programs in the southern states had the lowest percents.

   1.4 Programs in the Pacific and mountain states had the highest percents of participants who changed their career aims to non-science areas while the programs in the southern states showed the lowest.

2. On the average the resident programs had a larger proportion of their participants going on to college than did the commuter programs. This was the only one of the "criterion" characteristics which showed a difference in the comparison of resident vs commuter programs.

Such findings may be related to the same socio-economic factors that enable schools in New York to produce much more than their pro rata share of Winners and Honorable Mentions in the Annual Science Talent Search. These are the same factors apparently that get communities to invest more per student per year in public schools and to have higher per capita taxes for schools.

3. Two of the "criterion" characteristics showed significant differences for the research vs course dichotomy of programs.

   3.1 Larger percents of participants in research SSTP's had had part or full time jobs in math/science than the participants in course SSTP's.

   3.2 Larger percents of participants in research SSTP's looked toward a doctorate (e.g., M.D., DDS, DVM, etc.) than did the course SSTP's.

Those selected for the research SSTP's seem to have been more advanced in their career plans and perhaps more mature as individuals than the average of those in other types of SSTP's.

G. Patterns of Participation

One purpose of this report is to compare the participants in various programs both at the time of the program and again in the spring of 1963 when most would normally be completing their sophomore year in college.

Three samples, or populations, were available for this purpose. These were:

1. All those who participated in the SSTP in the summer of 1960.
2. All who participated in the Annual Science Talent Search in the academic year 1960-61.
3. All those who participated in the National Science Fair-International in the spring of 1961.

This section is concerned with the questions:

1. Are there any significant differences among those who participate in any one, any two or all three of these programs?
2. Should such overlapped participation be a cause for concern?
3. What differences are apparent at the time of participation?

4. What differences are apparent in later performance?

5. What are the recommendations on the basis of the evidence?

Some data were available for each of the groups as of the time of their participation:

1. Information about the SSTP participants was obtained through a brief questionnaire filled out by these boys and girls as of the time they started their SSTP program early in the summer of 1960. These data are shown in Table 13.

2. All information used in the selection and judging of the Annual Science Talent Search was available for all of the participants in the 1960-61 and 1961-62 Searches. These data are presented in Table 14.

3. Data for the participants in the National Science Fair-International in terms of detailed background records were scarce. Except for name, school, home address, age, field of participation and prizes won, as of the time of participation, there was no "NSF-I Only" pattern of participation available for study which could be compared significantly to any of the other groups.

The SSTP data reflected the SSTP participants and only incidentally those who were in other programs as well, and the STS data represented the STS participants and incidentally those who were also in other programs. These facts suggest that there may be some bias in using these data but its direction or degree is not known. The answers are shown for boys and for girls for those who participated in:

1960 SSTP only

1960 SSTP and 1961 STS

Table 13 shows that those boys and girls who participated in the two programs, SSTP and STS, generally came from larger communities and had taken or were planning to take more work in advanced mathematics,

chemistry, biology and other sciences. This lends credence to the notion that larger high schools with better facilities and more varied science offerings develop in their students a stronger science/math motivation. However, the very fact of availability of more advanced courses and the faculty able to present such may be factors not present in the smaller school. There were frequent notes in the questionnaire from students saying, "I took all the math/science courses my high school offered."

In career planning those who had had the momentum of motivation to participate in both the STS and the SSTP were more likely to aim for science/math careers than those in SSTP only. More of the two program girls plan to major in the physical or biological sciences than do the SSTP only girls. Of the boys participating in one program, rather than two, more plan to go into engineering.

Other information not included in Table 13 shows that those who participated in more than one of these programs are a more select group, a bit younger, more able, better motivated, with stronger backgrounds in science, better academic records, an apparently higher science aptitude and more likely to be planning for careers in science and research. Whether this is so because the additional programs serve as new goals to be achieved and thus aid in producing better performance, or whether only the better talent is attracted to such additional activities is not relevant. In either case participation in these other programs serves many of the same purposes with which the SSTP has been concerned. There is not a great deal of overlapping of participation. Only 7.2% of the 1960 SSTP participants were also in the 1961 STS, and only 1.2% were in the NSF-I. Of the 1961 STS participants 15% also participated in the SSTP and 2% in the NSF-I.

Table 13

PERCENTS OF 1960 PARTICIPANTS IN SSTP ONLY AND SSTP & STS ACCORDING TO CHARACTERISTICS AT THE TIME OF SSTP PARTICIPATION

Characteristics	Males			Females		
	SSTP Only	SSTP STS	TOTAL	SSTP Only	SSTP STS	TOTAL
1 Number of Cases	4417	393	4810	2107	111	2218
2 Grade Completed as of Summer 1960						
Tenth grade or less	19	1	17	20	1	20
Eleventh Grade	72	98	74	71	98	72
Twelfth Grade	8	1	8	9	0	9
3 Size of Community						
100,000 or more	25	37	25	26	39	26
10,000 to 99,999	37	42	37	32	32	32
Less than 10,000	38	21	36	41	25	40
4 HS Courses Taken or Intend to Take						
Solid Geometry	73	76	73	59	63	59
Trigonometry	89	92	89	74	90	75
College Algebra	30	40	31	21	39	22
Analytical Geometry	20	32	20	10	23	12
Mathematical Analysis	9	13	9	5	9	6
Introduction to Calculus	22	37	23	13	25	14
Other Mathematics	10	18	11	9	14	9
General Science	66	70	66	65	62	65
Biology	87	91	87	98	99	98
Chemistry	93	92	92	92	97	92
Physics	90	91	89	87	87	86
Advanced General Science	3	5	3	2	2	2
Advanced Biology	7	15	8	10	19	10
Advanced Chemistry	12	24	13	7	18	8
Advanced Physics	8	18	9	4	11	4
Earth Sciences	4	5	4	3	4	3
5 Intend to Go to College Yes	98	99	98	97	100	98
6 Type of High School Attending						
Public	88	91	88	89	87	89
Private	4	3	4	2	2	2
Parochial	7	7	7	8	10	8
7 Field of Specialization						
Science-Mathematics-Engineering	67	81	68	49	62	50
Mathematics	15	18	15	18	14	18
Engineering	22	13	21	1	0	1
Physical Science	22	32	23	12	21	12
Biology	6	12	6	14	22	15
Pre-Professional	1	3	2	2	5	2

In examining the question of the benefits of participation in only one of the programs vs participating in more than one, more evidence may be drawn from the records of the Science Talent Search. Records of the 2753 boys and 850 girls who participated in the 1960-61 STS were made available. On entering STS, each contestant submits a considerable amount of information in regard to his background and achievement. These data for the contestants of the 1961 STS have been coded and tabulated for the various patterns of participation and for boys and girls. These data are shown in Table 14.

The records for the boys and for the girls were divided into those whose patterns of participation were:

1961 only STS
1961 STS and 1960 SSTP
1961 STS and 1961 NSF-I
1961 STS, 1960 SSTP and 1961 NSF-I

Of the boys, 2306 participated in the STS only, 396 in both STS and SSTP, 37 in the STS and NSF-I and only 14 were in all three programs. The numbers of girls for these program patterns are 726, 102, 12 and 10 respectively. Similar data for the STS participants of 1961 and 1962 are shown as corroborative evidence.

Comparisons will be made, however, only between those participating in the Search and in the SSTP (STS + SSTP); or in the Search only (STS). The numbers of cases in the other two categories for boys and for girls are too few on which to base dependable generalizations. Highlights of the data are as follows:

A larger proportion of those in both programs won honors in STS than those in STS only. One can assume that participation in the SSTP between their junior and senior years added substantial evidence of

Table 14.

DESCRIPTIONS OF 1961 AND 1962 STS

PARTICIPANTS AS OF TIME OF THE STS

EVIDENCES	1961 - STS								1962 - STS							
	MALES				FEMALES				MALES				FEMALES			
	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I
1. NO. OF CASES	2306	396	37	14	726	112	12	10	2270	429	31	13	732	118	13	2
2. % IN HONORS GROUP	8	25	32	50	7	31	25	40	7	22	19	54	7	24	46	0
3. YEAR OF BIRTH: %1944 or later	15	30	3	7	17	24	8	10	16	30	0	23	17	19	15	50
%1943	76	65	95	78	78	74	92	90	74	64	87	69	76	74	69	50
%1942 or earlier	9	4	3	7	5	2	0	0	10	6	13	8	6	7	15	0
4. SIZE OF GRADUATING CLASS																
376 or more	34	45	35	50	26	32	33	40	22	46	23	46	28	37	0	0
150 - 375	31	32	46	29	32	30	33	20	31	29	48	23	27	32	31	50
1 - 149	31	22	19	21	39	29	33	40	32	24	22	30	45	29	23	50
5. RELATIVE CLASS STANDING																
70 or above	37	65	49	57	50	79	67	70	35	63	39	77	48	65	69	100
60 - 69	42	28	38	43	38	13	17	10	46	32	35	15	39	27	15	0
59 or less	14	5	14	0	6	3	17	20	14	15	16	0	7	2	15	0
6. SCIENCE APTITUDE SCORE M	65	79	74	88	55	70	75	75	138	167	160	169	117	141	138	120
σ	7	9	14	16	15	4	12	6	36	28	25	14	32	27	40	10
7. EXTRA CURRICULAR ACTIVITIES																
Science Clubs of America	21	23	38	36	20	25	50	20	26	28	58	38	32	38	54	100
A Science Club	57	64	78	76	46	58	75	60	58	67	68	69	53	59	62	100
A Mathematics Club	21	34	19	43	17	25	17	20	27	39	29	31	19	35	38	0
Junior Academy of Science	12	18	24	57	12	17	42	30	16	20	58	15	20	24	62	0
A Science Fair	39	40	75	64	38	34	67	90	54	49	87	92	52	60	46	100
Summer Science Institute	-	5	0	7	1	8	0	0	5	40	16	38	6	47	8	0
Future Scientists of America	3	4	-	14	2	3	17	0	9	14	22	8	12	15	0	0
Other	25	6	-	0	5	6	0	0	7	5	16	8	8	7	0	0
8. RECOGNITIONS																
Academic Recognitions Sci/Math	32	52	40	50	32	46	58	60	53	74	68	69	50	72	35	100
SSTP	4	52	22	64	5	64	0	60	9	72	29	77	9	65	15	100
Other Summer Programs (not SSTP)	3	17	11	21	2	11	25	20	3	10	3	23	2	11	23	0
Other Science Participation Programs	14	20	24	14	13	21	33	20	20	17	22	31	21	17	15	0
Local Science Fairs	36	42	76	100	36	35	75	70	42	48	71	85	40	53	69	100
Regional-State Science Fairs	18	23	49	57	17	17	50	40	26	30	71	46	25	30	69	100
Natl. Science Fair International	2	3	11	14	2	4	8	10	1	2	13	15	1	4	15	0
Other	1	2	0	0	-	0	0	0	2	1	0	0	1	0	0	0
9. RECOGNITIONS																
National Honor Society	33	52	46	43	44	65	25	70	35	60	32	62	49	61	38	50
Honor Roll	7	10	-	7	11	12	0	20	14	19	29	31	17	21	15	100
Academic Recognition: Non Sci/Math	28	39	35	43	40	41	33	30	37	49	45	38	46	55	54	50
Natl. Merit: Commendation, Sr. Final	23	41	24	36	22	42	25	30	23	42	29	46	21	36	31	0
Major Elective Office (Class Pres.)	26	30	38	36	24	23	33	40	49	52	48	46	50	53	69	100
Civic Recognition-In School	22	26	16	7	22	28	8	40	30	34	29	23	38	45	31	100
Civic Recognition-Out of School	11	13	19	7	13	16	17	20	24	23	32	31	26	31	23	100
Athletic Awards	25	20	16	-	14	11	33	10	26	19	10	8	17	16	15	50
Music Awards	6	5	11	21	7	16	17	0	8	6	3	0	12	7	8	50
Other	2	1	-	-	1	21	0	0	1	0	0	0	0	0	0	0
10. HOBBIES (SCIENCE)																
Collections, Scientific	7	10	-	14	11	7	0	10	13	12	6	15	15	14	23	0
Mathematical	12	17	11	14	11	11	8	0	53	50	42	38	46	50	15	50
Electronics	30	26	35	29	2	6	8	20	35	30	39	31	4	4	8	0
Physical Sciences	31	34	24	50	20	28	33	10	71	62	71	62	65	68	54	100
Biological Sciences	15	16	16	29	26	24	33	10	30	25	45	38	53	43	31	50
Other Science Hobbies	30	29	35	14	24	24	8	10	70	54	74	38	67	58	46	100
11. HOBBIES (NON-SCIENCE)																
Collections Non-Science	26	32	14	36	17	19	8	20	26	33	10	62	14	19	23	0
Music	18	25	22	29	32	34	25	10	37	40	35	23	53	49	54	100
Fine Arts	10	14	5	7	27	27	33	20	45	38	46	23	58	52	23	100
Crafts	14	10	14	14	14	12	17	0	40	32	35	31	28	22	31	0
Photography	30	32	35	36	18	20	25	20	28	28	55	15	18	17	23	0
Team Sports	14	16	5	7	16	21	8	10	46	32	42	23	35	27	23	50
Individual Sports	29	35	32	28	27	29	67	40	52	47	58	46	43	38	38	50
Other Non-Science Hobbies	33	33	22	43	40	41	33	30	70	57	71	38	73	67	62	100

Table 14. (Continued)

	1961 - STS								1962 - STS							
	MALES				FEMALES				MALES				FEMALES			
	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I
12. HOW SUMMER 1960 SPENT																
SSTP (NSF)	4	64	5	71	4	71	0	70	7	76	19	69	7	72	0	100
Taking Non-SSTP Courses	11	20	14	29	15	17	17	20	12	17	10	31	15	15	31	0
Studied by Himself	5	2	5	0	4	0	8	0	2	1	0	0	2	1	8	0
Worked in own Laboratory	2	1	3	0	2	0	8	0	3	1	16	0	2	1	8	0
Science Job(s)	12	5	22	0	13	5	33	10	37	3	42	0	27	10	31	0
Summer Camp	6	1	3	0	9	0	0	0	5	0	0	0	8	0	8	0
Non-Science Job(s)	46	3	40	0	29	3	8	0	24	2	10	0	20	1	0	0
Vacation-Travel-Visit	7	1	5	0	15	1	25	0	7	1	3	0	13	0	8	0
Other	3	4	0	0	3	2	0	0	1	0	0	0	1	0	0	0
13. HOW SUMMER 1959 SPENT																
SSTP (NSF)	10	7	11	14	1	4	0	0	3	10	10	31	2	11	15	0
Taking Non-SSTP Courses	6	18	16	0	10	20	16	0	11	20	6	8	16	19	31	50
Studied by Himself	3	7	0	7	4	3	0	0	3	3	-	8	4	2	8	0
Worked in own Laboratory	8	3	5	14	1	1	8	10	2	2	10	8	1	1	0	0
Science Job(s)	8	7	16	7	8	12	17	0	28	19	42	15	19	19	8	0
Summer Camp	44	12	3	14	12	12	0	30	4	11	6	8	9	12	15	0
Non-Science Job(s)	12	28	35	28	23	18	0	10	27	6	19	15	20	16	15	50
Vacation-Travel-Visit	0	15	11	14	30	23	50	30	12	15	6	8	22	16	8	0
Other	2	1	0	0	4	4	0	10	1	2	0	0	1	0	0	0
14. HOW SUMMER 1958 SPENT																
SSTP (NSF)	1	1	-	0	-	0	0	0	1	2	0	0	1	0	0	0
Taking Non-SSTP Courses	6	12	5	0	8	14	8	10	9	11	10	15	12	23	31	50
Studied by Himself	6	8	5	7	3	4	0	0	3	6	6	8	5	4	0	0
Worked in own Laboratory	2	1	8	14	6	4	0	0	2	2	13	0	1	2	0	0
Science Job(s)	4	3	8	7	4	6	0	0	17	13	22	15	11	11	15	0
Summer Camp	10	16	5	21	12	13	17	30	11	19	10	15	13	16	15	0
Non-Science Job(s)	38	24	35	29	23	10	33	20	27	18	22	15	18	16	8	0
Vacation-Travel-Visit	18	23	27	14	30	38	42	10	19	22	10	23	28	24	23	50
Other	4	2	0	0	4	4	0	10	1	3	0	0	1	1	0	0
15. MOST INFLUENTIAL PERSON																
Parent	8	8	11	0	7	5	8	0	9	8	19	23	6	5	15	0
Relative (not sibling)	1	1	0	0	1	0	0	0	1	1	0	0	1	0	0	0
Teacher (Sci/Math)	61	60	54	71	72	70	58	70	61	55	58	15	71	57	85	100
Teacher (Non Sci/Math)	1	0	0	0	-	1	8	0	1	0	0	0	1	0	0	0
No One Person	2	1	3	0	2	3	0	0	2	2	10	8	1	1	0	0
Other	23	24	30	29	12	19	17	30	14	12	3	31	10	9	0	0
16. FATHER'S HIGHEST DEGREE																
No Degree or Certificate	65	54	60	29	65	53	42	80	60	50	45	77	61	52	46	0
BA or BS	16	18	24	50	15	25	42	10	15	29	19	23	19	19	0	0
MA or MS	6	9	5	14	5	6	0	10	6	7	6	0	3	5	15	0
Professional Degree Below Doctorate	3	4	0	0	4	3	8	0	2	5	0	0	2	4	0	0
Ph D or Sc D	3	5	8	0	2	3	8	0	3	5	5	0	3	2	0	0
MD	2	3	0	0	3	4	0	0	3	2	6	0	2	4	0	0
Certificate (above High School)	3	2	0	7	2	5	0	0	1	1	3	0	1	2	8	0
17. MOTHER'S HIGHEST DEGREE																
No Degree or Certificate	73	65	60	57	70	61	42	50	68	61	71	77	72	56	62	50
BA or BS	15	20	30	21	15	24	17	30	16	22	16	23	14	20	23	50
MA or MS	3	4	5	14	2	6	17	0	3	6	0	0	3	7	8	0
Professional Degree Below Doctorate	-	1	0	0	-	0	0	0	1	1	3	0	1	0	0	0
Ph D or Sc D	-	-	0	0	-	1	0	0	1	1	0	0	0	1	0	0
MD	-	-	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Certificate (above High School)	6	8	0	7	10	6	25	20	6	6	10	0	5	7	8	0
18. FIELD OF SPECIALIZATION																
% All Sci/Math/Engineering	82	84	81	86	88	92	67	100	87	90	93	92	60	86	85	100
% Math	8	17	5	7	10	13	8	0	9	15	16	8	13	19	15	0
% Engineering	34	15	27	7	7	0	0	0	33	17	15	15	12	3	0	0
% Physical Science	27	33	27	36	14	33	33	50	24	38	20	46	13	14	23	50
% Biology	6	5	14	14	17	14	8	20	6	8	13	8	17	28	8	50
% Pre-Professional	5	8	3	7	8	12	8	10	13	9	16	15	13	16	31	0

Table 14. (Continued)

	1961 - STS								1962 - STS							
	MALES				FEMALES				MALES				FEMALES			
	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I	STS ONLY	STS SSTP	STS NSF-I	STS SSTP NSF-I
19. FIRST OCCUPATIONAL CHOICE																
% No Data or No Answer	3	6	5	14	18	8	0	10	0	0	0	0	0	0	0	0
% Science Occupations	91	92	95	86	66	87	100	90	95	97	96	100	93	96	91	100
% Non-Science Occupations	6	2	0	0	16	5	0	0	4	3	3	0	6	3	8	0
% Research	25	41	19	36	27	39	42	50	25	39	45	31	25	43	38	0
% Practitioner	61	46	68	36	26	36	42	40	63	48	45	54	49	35	38	100
% College Science Teacher	2	8	5	14	6	3	8	0	6	10	6	15	14	13	15	0
% Science Teacher	1	1	3	0	7	9	8	0	1	-	0	0	5	5	0	0
% Non-Science Teacher	1	1	0	0	9	2	0	0	-	1	0	0	4	1	0	0
% Professional (law, etc.)	3	1	0	0	2	0	0	0	2	1	3	0	1	0	0	0
20. SECOND OCCUPATIONAL CHOICE																
% No Data or No Answer	20	13	16	7	20	16	17	40	8	5	16	8	7	7	8	0
% Science Occupations	69	82	78	93	72	72	75	60	86	90	84	92	84	89	85	100
% Non-Science Occupations	11	5	5	0	14	12	8	0	5	3	0	0	9	4	8	0
% Research	15	22	8	29	15	20	8	20	29	24	23	46	28	25	31	0
% Practitioner	45	42	54	57	34	33	42	30	46	50	45	23	32	36	23	50
% College Science Teacher	6	15	8	7	9	15	8	10	10	16	16	23	19	23	31	50
% Science Teacher	3	2	8	0	7	5	17	0	1	1	0	0	5	5	0	0
% Non-Science Teacher	2	1	0	0	6	3	0	0	-	-	0	0	4	2	8	0
% Professional (law, etc.)	4	3	5	0	3	6	0	0	2	2	0	0	1	0	0	0
21. FATHER'S OCCUPATION																
% No Data or No Answer	3	2	5	0	4	2	14	0	2	1	0	0	2	3	8	0
% Science Occupation	18	21	33	21	19	30	36	10	24	27	28	23	24	28	16	50
% Non-Science Occupation	79	77	62	79	77	69	50	90	72	72	71	77	75	68	77	50
% Research	2	2	3	0	1	2	14	0	2	2	3	0	2	0	0	0
% Practitioner	14	17	25	21	17	25	14	10	21	21	16	23	19	22	8	50
% College Science Teacher	1	2	0	0	1	2	7	0	2	4	6	0	3	3	8	0
% Science Teacher	1	1	5	0	1	1	0	0	-	-	3	0	-	3	0	0
% Non-Science Teacher	3	5	3	0	3	2	7	0	3	5	0	0	3	3	0	0
% Professional (law, etc.)	8	10	8	36	7	3	7	0	6	11	16	15	4	8	23	0
22. MOTHER'S OCCUPATION																
% No data or No Answer	4	36	5	0	4	4	0	0	5	4	3	0	5	0	8	0
% Science Occupation	4	5	5	21	5	6	16	10	7	9	16	0	7	12	8	0
% Non-Science Occupation	92	59	89	78	90	90	84	90	87	88	80	100	87	85	85	100
% Research	-	1	0	0	-	0	0	0	1	-	0	0	1	0	0	0
% Practitioner	4	3	5	21	5	2	8	10	6	8	13	0	5	5	0	0
% College Science Teacher	-	-	0	0	-	0	0	0	-	-	3	0	1	3	8	0
% Science Teacher	-	1	0	0	-	4	8	0	-	1	0	0	0	4	0	0
% Non-Science Teacher	9	30	16	14	10	13	17	0	8	14	6	0	9	15	8	50
% Professional (law, etc.)	2	3	0		3	4		0	2	3	3	8	2	6	8	0

the kinds of activities by which such boys and girls might be judged to have promise as creative scientists. It is also possible that the research experience, the guidance in their science learning and in their science projects reflected favorably and advantageously in comparison to those who did not have this background. In addition, it is possible that those who participated in both programs had a greater drive with more intense interest and motivation toward being a scientist.

On the average, the youngest group are those who participated in STS and SSTP followed by those in STS only, while groups involving the Science Fair participants were the oldest at the time of the beginning of their high school senior year.

Size of graduating class is also a distinct differential: Those who participated in both programs came from larger senior classes, on the average, than did those in the Search alone. There is clearly something in the climate of the larger high school be it science sophistication, better teachers and facilities, greater competition among students, deeper interest or any combination of all these that results in action in more than one science program.

These differential still persist through their relative class standing in high school. Those who participated in both programs stood relatively higher in their senior classes than those who participated in only one program.

Perhaps the most telling evidence is the difference in the average score on the Science Aptitude Examination. This examination is essentially a college entrance type of test using science materials as its vehicle. Those particpating in the STS only scored on the average

distinctly lower than those who were in two or more programs.

Differences in participation in extra curricular activities show up among the groups. A larger portion of thoseparticipating in the Fairs reported science extra curricular activities, such as Science Clubs of America, a math or science club. For both boys and girls, fewer in the STS only group earned membership in the National Honor Society than those participating in two or more of the programs. Those participating in the Fairs were more likely to have been elected to major office, such as class president.

Those participating in the two programs and those participating only in the STS are equal in terms of the relative frequency of their non-science hobbies. In terms of their scientifically oriented hobbies, there are small differences, generally in favor of thosewho participated in both programs as compared withthose who participated in only one.

Comparing the ways in which the groups spent the two earlier summers, 1959 and 1958, could be of interest here. The pattern of activities for both summers was essentially the same. Those in STS-only took fewer courses, were more likely to attend summer camp, and less likely to hold a summer job than those in the STS plus either the SSTP or NSF-1.

Only one difference shows up in terms of the parents' academic background for the different patterns of participation. The parents of both boys and girls who participated in the STS plus another program were a little more likely to hold a college degree than those who participated in STS only.

As of the time that they were high school seniors, more than 90% of the boys indicated their first choice of occupation was in the realm of

science. The proportion, however, of those in both STS and SSTP who wanted to go into research jobs was distinctly greater than those in STS alone. More of those in STS-only as compared with those in both STS and SSTP wanted to go into a science "practioner" job such as medical practice or engineering. The boys who were in both programs had larger proportions in such occupational groups as biological sciences, mathematics and physical sciences. The pattern of difference is the same for girls, except that the percents are smaller. Those in two programs showed a greater proportion interested in careers in biology, distinctly more in the physical sciences or physics and chemistry and medicine. The STS-only group did show a higher frequency of those who planned to get into a non-Science teaching field.

Not many of the fathers had specific science occupations. Fathers of those who participated in both programs came from science in slightly greater numbers than those in only one program.

There seems to be no differential in terms of the kind of person who was most influential in their development of an intense interest in science. These centered around parents and their science and mathematics teachers.

Although there are small variations on percentages, the 1961 and 1962 STS data are essentially the same.

At the time the participants entered the SSTP in 1960 or the STS in 1960-'61 those who participated in both programs were a more select group than those who participated in only one, a superiority which could not arise purely on the basis of having participated.

The answers to the questionnaire, Form K, in the spring of 1963

also show some differences for different patterns of participation. These are shown in Table 15. The data were reviewed for boys and girls for five patterns of participation:

SSTP only
STS only
SSTP and STS
NSF-1 only
SSTP & STS & NSF-1

There were too few cases in other participation patterns to make inclusion in this table meaningful. The following differences among the patterns of participation were noted:

1. The participants in both SSTP and STS report a higher percent of B or higher average college grades than do those of any other pattern shown. The SSTP & STS & NSF-1 pattern for girls (N=16), however, shows an even higher proportion.

   - Girls, pattern for pattern, seek lesser academic goals than do boys.
   - As a generalization, the more programs participated in, the higher the proportion of participants aiming for doctoral degree.
   - A larger proportion of girls than boys report "undecided" or give no answer to the question, "What is your occupational choice?"
   - For girls, the greater number of programs participated in, the higher the proportion planning to go into science/mathematics occupations.
   - For boys, the relationship between selection of math or science occupations and the number of programs participated in is not so distinct, but the inverse relationship of participation and selection of non-science occupations is noticeable.
   - Percents of participants who received recognitions for performance and achievement in science in high school reflects differences between the one program participants and the multi-program participants.
   - Of the patterns of participation involving the STS, those who were STS and also SSTP and/or NSF-1 won a much larger proportion of honors in the Search.
   - High school non-science honors and recognition such as Honor Roll, Valedictorian, or National Honor Society, were won in

Table 15.

RESPONSES TO QUESTIONNAIRE ACCORDING TO PATTERNS OF PARTICIPATION

MALE AND FEMALE COMPARISON - SSTP, STS, NSF-I AND COMBINATION

	MALES					FEMALES				
	SSTP ONLY	STS ONLY	NSF-I ONLY	SSTP STS	SSTP STS NSF-I	SSTP ONLY	STS ONLY	NSF-I ONLY	SSTP STS	SSTP STS NSF-I
1 Number of cases	3490	1747	119	426	21	716	538	59	126	16
2 % Graduated from high school in 1961	71	99	32	100	100	70	99	42	100	100
3 % Early entrance into college before graduation from high school	2	-	1	0	0	2	-	0	0	0
4 % Received advanced standing with college credit	19	20	16	34	34	15	14	12	32	18
5 % Received advanced standing but without college credit	16	14	9	16	10	17	14	14	15	12
6 % Have attended college	97	97	73	99	100	94	95	75	100	100
7 % Have 2 yrs college credit (Spring 1963)	55	71	25	78	86	51	64	37	73	81
8 % Have over 2 yrs college credit (Spring 1963)	15	10	2	16	14	18	12	3	19	12
9 % B or higher grade average (College)	54	39	41	75	57	55	68	43	73	82
FIELD OF SPECIALIZATION IN COLLEGE										
10 % In area of science-math-engineering	77	52	63	79	90	66	57	49	73	87
11 % Mathematics	12	11	6	17	10	15	13	8	10	12
12 % Engineering	24	23	21	15	5	3	2	2	3	0
13 % Physical Science	21	27	19	36	52	11	27	8	27	38
WHAT IS THE HIGHEST ACADEMIC DEGREE YOU NOW PLAN TO EARN?										
14 % M.A. or M.S. degree	25	24	20	4	0	38	18	34	23	25
15 % Ph D or Sc D degree	40	42	46	76	71	18	21	29	35	62
16 % Professional doctoral degree (MD, DDS, DVM)	18	17	19	17	29	9	12	8	23	12
FIRST CHOICE OF OCCUPATION										
17 % No answer or undecided	4	6	.	6	10	6	23	8	8	18
18 % Science or mathematics occupations	74	75	[illegible]	81	81	62	49	59	73	74
19 % Non-science occupations	20	20	17	14	10	31	27	32	21	6
20 % Research-science occupations	13	16	17	29	29	13	11	8	29	44
21 % Practitioner-science occupations	53	54	60	42	38	36	24	27	38	12
22 % Teach college science	5	4	2	7	14	3	4	3	5	6
23 % Teach non-college science	3	3	2	3	0	10	10	7	1	12
24 % Agricultural Sciences	1	1	0	1	0	0	0	0	0	0
25 % Biological Sciences	4	4	12	5	15	10	11	22	13	50
26 % Engineering	20	23	25	15	0	1	2	2	2	0
27 % Mathematics	10	8	4	11	24	13	12	7	7	0
28 % Physical Sciences	18	23	21	30	10	8	12	3	15	25
29 % Medicine (M.D.)	13	12	13	15	33	6	9	8	15	12
30 % Medical Services (not M.D.)	2	1	2	0	0	4	14	15	9	0
31 % Dentistry	1	1	0	0	0	0	0	0	0	0
32 % Veterinary Medicine	-	-	1	0	0	0	1	0	1	0
33 % Psychology	1	2	1	1	0	3	2	2	4	0
34 % Other Science areas	1	-	1	0	0	-	1	0	1	0
35 % Social Science occupations	2	2	0	2	0	4	3	0	2	0
36 % Teacher non-science	5	5	2	7	2	18	16	29	16	0
37 % Non-science Professional (law, etc.)	8	6	3	5	0	6	3	0	2	0
SECOND CHOICE OF OCCUPATION										
38 % No answer or undecided	29	28	31	26	34	30	29	41	29	44
39 % Science or mathematics occupations	19	50	48	58	58	44	49	39	51	49
40 % Non-science occupations	52	22	19	15	10	25	23	20	21	6
41 % Research-science occupations	8	9	13	15	29	6	10	8	19	0
42 % Practitioner-science occupations	34	29	29	32	29	25	25	27	24	12
43 % Teach College science	5	5	3	6	0	4	4	3	2	12
44 % Teach non-college science	5	6	3	5	0	9	10	7	6	25
45 % Agricultural Sciences	1	1	0	0	0	-	-	0	0	0
46 % Biological Sciences	4	5	6	7	0	9	12	17	17	12
47 % Engineering	11	12	11	10	0	1	1	0	1	0
48 % Mathematics	10	8	2	11	10	9	7	3	2	0
49 % Physical Sciences	15	17	16	18	38	7	10	2	9	25
50 % Medicine (M.D.)	3	3	6	14	5	2	3	2	9	6
51 % Medical Services (not M.D.)	2	1	3	0	0	8	9	12	5	0
52 % Dentistry	-	1	-	-	0	-	-	0	0	0
53 % Veterinary Medicine	-	-	1	-	0	-	-	2	0	0
54 % Psychology	-	2	2	2	0	3	3	0	4	0
55 % Other Science areas	2	-	1	1	14	-	-	2	0	0
56 % Social Science occupations	3	3	3	3	0	5	4	7	6	0
57 % Teacher non-science	4	4	8	6	0	12	9	10	6	6
58 % Non-science Professional (law, etc.)	7	7	4	5	10	6	4	2	6	0

Table 15. (Continued)

	MALES					FEMALES				
	SSTP ONLY	STS ONLY	NSF-I ONLY	SSTP STS	SSTP STS NSF-I	SSTP ONLY	STS ONLY	NSF-I ONLY	SSTP STS	SSTP STS NSF-I
HAS YOUR CHOICE OF OCCUPATION CHANGED SINCE YOU WERE A HIGH SCHOOL SENIOR?										
59 % Changed within science-math area	4	5	1	6	5	6	4	2	8	0
60 % Changed to non-science occupation	4	4	0	6	0	6	5	0	4	0
IN WHAT OTHER SCIENCE-MATHEMATICS PROGRAMS HAVE YOU PARTICIPATED IN 1960, 1962 or 1963?										
61 % Local science fairs	27	57	84	47	86	23	58	83	38	100
62 % Regional/State fairs	12	36	78	83	71	10	36	78	35	75
63 % Science Congresses	1	3	3	10	33	2	4	5	4	0
64 % Jr. Academy of Science	4	12	21	22	43	4	13	20	12	69
65 % Receiving special coaching	5	8	4	11	10	4	9	5	31	25
66 % Carried on undergraduate research	3	4	2	16	24	3	4	3	12	6
67 % Science-math seminar	11	20	15	19	5	10	23	15	19	44
68 % SSTP other than in 1960	8	3	7	17	19	7	3	3	12	12
69 % Other programs, not NSF supported	6	9	15	12	29	5	10	10	35	12
SINCE JUNE 1960, IN WHAT ORGANIZATIONS HAVE YOU HAD MEMBERSHIP?										
70 % Science-math organizations in H.S.	21	28	34	42	38	25	34	54	50	62
71 % Honorary organizations in H.S.	23	20	13	19	24	31	32	30	38	38
72 % Other organizations in H.S.	33	26	10	33	24	49	44	25	46	38
73 % Science-math organizations in college	12	12	15	18	14	12	16	17	4	44
74 % Honorary organizations in college	6	4	4	6	19	7	6	7	8	19
75 % Other organizations in college	33	31	12	35	24	35	39	17	69	38
76 % Science-math organizations out of school	10	18	26	25	33	5	7	7	4	31
77 % Honorary organizations out of school	-	-	58	-	-	0	0	2	0	-
78 % Other organizations out of school	25	23	0	29	33	29	30	81	23	44
79 % Have 1 or more scientific or mathematical publications accepted and/or printed	3	5	15	10	33	2	4	22	11	6
HIGH SCHOOL SCIENCE RECOGNITIONS										
80 % No recognitions or no answer	57	37	10	7	0	64	41	5	0	0
81 % Academic honors or awards	22	25	18	42	33	18	24	15	54	38
82 % Recognition at a State Science Fair	9	27	63	35	76	7	30	64	15	100
83 % National Science Fair award	1	2	45	2	52	1	1	46	0	50
84 % Science Talent Search honors	1	6	5	43	24	1	5	3	73	38
85 % Science Scholarship/Fellowship	5	5	3	10	0	5	5	7	23	12
86 % Other science awards	18	25	44	41	57	14	22	64	62	62
HIGH SCHOOL NON-SCIENCE RECOGNITIONS										
87 % No recognitions or no answer	12	19	25	7	5	9	13	14	4	0
88 % Honor roll, CSF, Valedictorian	41	21	14	34	14	52	33	36	46	25
89 % National Honor Society	44	45	34	65	71	51	58	47	77	69
90 % Held major elective office	12	8	10	18	10	7	5	17	4	25
91 % Civic organizations	10	9	12	4	0	15	11	20	12	12
92 % National Merit award	27	24	14	55	52	25	25	19	65	44
93 % Athletic award	27	22	16	13	0	7	11	10	12	6
94 % Music/drama award	10	10	6	18	10	18	18	5	23	25
95 % Non-science Fellowship/award	20	23	21	47	43	27	31	15	38	31
96 % Other awards	5	55	24	19	33	7	10	36	27	12
COLLEGE SCIENCE RECOGNITIONS										
97 % No science recognition or no answer	89	90	95	83	67	91	91	89	81	81
98 % Received some type of Science recognition	12	11	6	19	34	9	9	10	20	19
COLLEGE NON-SCIENCE RECOGNITIONS										
99 % No non-science recognitions	49	51	70	33	43	45	45	53	19	44
100 % Honor roll, CSF, etc.	21	20	15	33	24	25	26	24	42	25
101 % National Honor Society	4	6	0	5	5	6	8	0	8	25
102 % Major elective office	2	2	1	6	5	3	5	0	12	12
103 % Civic recognition	3	2	0	4	0	4	4	0	8	6
104 % National Merit award	1	-	1	2	0	1	1	0	0	0
105 % Athletic award	10	11	4	13	0	2	4	2	8	0
106 % Music/drama award	2	3	0	2	14	3	3	0	0	0
107 % Non-science Fellowship/award	21	17	8	29	24	24	21	17	35	19
108 % Other non-science recognitions	3	3	9	2	0	3	5	17	15	0
OTHER SCIENCE RECOGNITIONS										
109 % No science recognition outside of school or no answer	98	99	93	95	76	99	98	84	96	100
110 % Received science recognitions outside of school	1	1	8	5	24	1	2	16	4	0
OTHER NON-SCIENCE RECOGNITIONS										
111 % Did not receive non-science recognition outside school or did not answer	93	93	87	94	100	93	91	88	100	81
112 % Received non-science recognition outside of school	7	7	13	6	0	7	8	11	0	19

Table 15. (Continued)

	MALES					FEMALES				
	SSTP ONLY	STS ONLY	NSF-I ONLY	SSTP STS	SSTP STS NSF-I	SSTP ONLY	STS ONLY	NSF-I ONLY	SSTP STS	SSTP STS NSF-I
WHO (OR WHAT) STARTED YOUR FIRST INTEREST IN SCIENCE?										
113 % Don't know, i.e.,always interested	16	13	6	16	19	10	7	3	8	0
114 % Own ability, curiousity, God, etc.	16	16	13	10	10	11	10	5	4	0
115 % SSTP	1	-	0	0	0	1	0	-	4	0
116 % Science Fairs	1	1	2	1	0	1	1	5	0	0
117 % Family environment	20	21	28	27	29	21	23	36	23	25
118 % Science-math courses and/or teachers	29	29	4	28	24	46	49	42	35	69
119 % Non-science-math courses and/or teachers	1	-	1	0	0	-	1	-	0	0
120 % Reading	6	7	5	8	0	3	3	5	8	0
121 % Scientific toys and hobbies	4	6	8	7	5	1	2	-	12	6
122 % Sputnik, TV, etc.	3	4	5	2	14	3	2	2	4	0
HOW OLD WERE YOU AT THAT TIME OF YOUR FIRST SCIENCE INTEREST?										
123 % Who were 11 or younger	95	36	49	40	24	94	22	37	35	19
124 % Who were 12 to 14	2	26	31	28	19	3	32	30	27	44
125 % Who were 15 or older	2	17	8	12	20	2	34	27	24	38
WHAT PERSON DO YOU NOW CONSIDER TO HAVE BEEN MOST IMPORTANT IN FORMING YOUR PLANS FOR YOUR CAREER?										
126 % No answer	14	11	6	10	10	12	7	10	8	0
127 % Parent	23	20	32	25	10	17	17	24	12	31
128 % Brother or sister	1	1	0	2	0	2	2	2	4	0
129 % Other relatives	2	3	1	0	0	3	1	2	4	0
130 % No one person	6	6	4	5	10	7	6	0	4	0
131 % Self	8	9	5	6	0	5	5	2	0	0
132 % Science-math teacher	27	9	26	37	52	31	41	44	62	56
133 % Non/science-math teacher	5	3	2	2	10	10	6	10	0	0
134 % Other school personnel	3	3	5	0	0	4	4	2	8	0
135 % Others	7	10	13	7	10	7	11	3	0	12
136 % SSTP personnel	3	1	1	5	0	4	1	0	0	0
SINCE JUNE 1960, WHAT JOBS HAVE YOU HELD?										
137 % No job or no answer	10	9	11	8	0	20	32	17	9	25
138 % Held 1 or more full time science-math jobs	16	18	33	29	67	10	14	17	25	50
139 % Held part-time (not full time) science-math job, among others	7	8	7	10	5	10	8	17	8	0
140 % Held only non-science jobs (full or part-time)	66	64	50	50	29	61	45	49	58	25
WHAT DID YOU DO DURING THE SUMMER OF 1960?										
141 % No answer	1	2	15	1	0	1	9	20	0	0
142 % Attended SSTP	96	16	1	99	95	98	14	3	96	100
143 % Took non-SSTP courses	-	8	8	0	0	-	12	12	0	0
144 % Studied alone	-	2	1	0	0	-	1	2	0	0
145 % Worked in own laboratory	0	0	2	0	0	0	-	2	0	0
146 % Had science job(s)	-	6	10	0	0	-	5	3	4	0
147 % Went to camp or were camp counselors	-	4	8	0	0	-	5	19	0	0
148 % Had non-science job(s)	2	45	42	0	5	1	38	24	0	0
149 % Rested, traveled, or visited	-	11	6	0	0	-	15	15	0	0
150 % In the military	-	-	0	0	0	0	0	0	0	0
151 % Other	0	0	1	0	0	-	0	0	0	0
WHAT DID YOU DO DURING THE SUMMER OF 1961?										
152 % No answer	4	6	9	1	10	8	7	14	0	0
153 % Attended SSTP	7	2	5	11	14	6	2	2	12	12
154 % Took non-SSTP courses	11	8	14	11	10	16	11	14	19	12
155 % Studied alone	1	1	2	0	0	1	1	2	0	6
156 % Worked in own laboratory	-	0	3	0	0	0	0	3	0	0
157 % Had science job(s)	8	10	15	25	48	6	8	14	19	31
158 % Went to camp or were camp counselors	3	3	4	2	0	5	6	17	0	0
159 % Had non-science job(s)	52	60	40	40	19	40	50	32	38	38
160 % Rested, traveled, or visited	10	8	3	8	0	17	17	3	12	0
161 % In the military	1	2	1	0	0	-	0	0	0	0
162 % Other	-	-	1	1	0	1	-	0	0	0
WHAT DID YOU DO DURING THE SUMMER OF 1962?										
163 % No answer	3	3	6	2	5	5	4	7	0	0
164 % Attended SSTP	1	1	4	4	14	1	1	3	0	0
165 % Took non-SSTP courses	14	13	10	11	10	23	23	15	19	31
166 % Studied alone	1	1	1	0	0	1	1	0	0	0
167 % Worked in own laboratory	-	-	1	0	0	0	0	2	0	0
168 % Had science job(s)	13	14	26	34	38	10	11	8	19	38
169 % Went to camp or were camp counselors	2	3	5	7	14	4	5	15	8	0
170 % Had non-science job(s)	55	58	34	35	19	46	46	44	46	25
171 % Rested, traveled, or visited	6	4	4	2	0	11	10	5	4	0
172 % In the military	3	3	1	0	0	-	-	0	0	0
173 % Other	0	-	2	2	0	1	-	0	0	6

the largest proportion by those who were SSTP only or in combination with other programs in addition to SSTP.

- A lesser proportion of girls than boys reported having held jobs between June 1960 and June 1963.
- A larger percent of participants in NSF-1 and those in both SSTP & STS had held science jobs than did the SSTP only and STS only groups.

Both at the time of participation and again almost three years later those students who participated in more than one program show up more strongly in most of the evidences of achievement motivation, ability and performance and dedication to the areas of science/mathematics/engineering than those who participated in only one program. This is an oversimplified statement of a general trend. There are individuals in each pattern of participation who did achieve outstandingly for their age and academic advancement.

Several recommendations might be derived from the review of the evidence:

1. Participation in all of these programs should be encouraged and abetted.
2. Whenever individually feasible, multiple participation should be encouraged.
3. Whatever the differences in the kind of motivation pushing the participants in each of these programs, whether to learn more. to win prizes or to win recognition, all such motivations are useful and legitimate in promoting the goals of the SSTP.