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ABSTRACT

The primary purpose of the study reported was to provide information related to high school students choosing or not choosing to pursue science careers. The survey included high school students in public and private secondary schools throughout the nation. Information was obtained relating to educational levels, school subjects, self-concepts, attitudes toward sex roles and science issues, career inclinations and choices, work preferences and others. The report of results is based on a national sample of 2,000, stratified on the basis of census data for sex, grade in school, region of the country, and rural-urban residence. The reports give the results of the opinion survey. Information is given including prices for subscription and individual copies of reports of the Purdue Opinion Panel, which are conducted three times each year. Report numbers, the dates, and titles are listed. An order form is included. (EB)

REPORT OF POLL NO. 101
OF
THE PURDUE OPINION PANEL

FACTORS INFLUENCING THE SCIENCE CAREER PLANS OF HIGH SCHOOL STUDENTS

June 1975

Measurement and Research Center
Purdue University
West Lafayette, Indiana 47907

FACTORS INFLUENCING THE SCIENCE CAREER PLANS OF HIGH SCHOOL STUDENTS

by

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Report of Poll 101

of

THE PURDUE OPINION PANEL

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This project was jointly conducted by the Measurement & Research Center and Engineering Education Research Studies, Department of Freshman Engineering.

THE PURDUE OPINION PANEL
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In 1941, the late Dr. H. H. Remmers, then Director of Division of Educational Reference at Purdue University, first proposed a program to survey the attitudes, beliefs, and behavior of American youth. The objectives of continuous inventory were stated as follows:

1. to serve as a guide for evaluating the process of education,
2. to serve as a catalytic agent and revitalizing force,
3. to the extent that dependable trends were obtained, to plan effectively for the future with extrapolations of such trends as a basis,
4. to serve as a vantage point from which to explore the origins, the factors that change, make and unmake attitudes, interests, wants, and needs of youth,
5. to serve as at least a starting point for more effective community integration (not just relatively small geographic areas but the nation and ultimately the world community),
6. to make possible positive contributions to social psychology with respect to content, research methodology, and theory.

This project was jointly conducted by the Measurement and Research Center, and Engineering Education Research Studies, part of the Department of Freshman Engineering within the Schools of Engineering at Purdue University, having responsibility for institutional and educational research in engineering education and higher education; W. K. LeBold, Director.

Factors Influencing the Science Career Plans of High School Students

Arline C. Erlick and William K. LeBold *

Abstract

This is a study of the career plans of high school students. The primary purpose of the study is to provide information on the reasons why high school students do, or do not, choose to pursue science careers. The objectives of this survey are: (1) to determine the educational and occupational aspirations of high school students, (2) to relate present school experiences to expectations of varying educational and work contexts, and (3) to relate parental influences to career expectations.

During the spring semester of 1975, the Purdue Opinion Panel surveyed high school students in public and private secondary schools throughout the nation. Poll 101 asked questions about several topics: educational levels, school subjects, self-concepts, attitudes toward sex roles and science issues, career inclinations and choices, work preferences, etc. The report of results is based upon a national sample of 2000, stratified on the basis of Census data for sex, grade in school, region of the country, and rural-urban residence.

The four school subjects taken by three-fourths or more students were: English, social studies, algebra, and biology. Males were more likely to take and to like: mechanical drawing, auto mechanics, physics, chemistry, and plane geometry. Females were more likely to take and to like: typewriting, home economics, and bookkeeping. Non-white respondents were less likely than white respondents to take: English, social studies, algebra, and biology. Non-white respondents were the least likely to take and to like: plane geometry, trigonometry, and chemistry. Black females were the least likely to like trigonometry, plane geometry, and chemistry.

Half or more of the high school teachers were reported to encourage post-high school education and/or training, creative or original work, and the building of basic skills. Few teachers were reported to tell students that science course work is difficult.

Of all respondents to Poll 101, 49% reported having given consideration to a career in science, mathematics, or engineering (57% of the males and 41% of the females). These science-leaning respondents were the most likely to have taken and to like: algebra, plane geometry, trigonometry, chemistry, physics, and mechanical drawing. These characteristics were also shared by science-leaning respondents: (1) parents, especially fathers, had college education, (2) academic achievement was high, (3) self-concepts of skills and abilities were positive, (4) leisure reading level was higher, (5) involvement in career development activities was higher, (6) school climate was reported as more positive, (7) more positive attitudes were held on female career roles and science issues, (8) more interest and parental support was expressed for doing theoretical or research work, and (9) greater preference was reported for the Medical-biological and Engineering, Physical Science, Mathematics, and Architecture job families.

Of all the respondents to Poll 101, 5% reported an interest in becoming a scientist. Preference for employment in the future was reported by 13% for the Medical-biological and Engineering, Physical Science, Mathematics, and Architecture job families. When occupations expected for future employment were indicated, 19% reported a choice in the Medical-biological or Engineering, Physical Science, Mathe Mathematics, and Architecture job families.

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Factors Influencing the Science Career Plans of High School Students

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I. Problem

Not very much is known about the factors instrumental in career decisions for people-in-general. That information presently available focuses primarily on the career decisions of white males. There is need to identify and to remove the barriers to full utilization of talent in science careers.[1] Information that would help to identify and to understand the barriers to science careers could be useful in making decisions about counseling needs, program development, or activities so that not only white males but also females and ethnic minority group members could reach their potential growth in career development.

This is a study of the career plans of high school students. The primary purpose of the study is to provide information on the reasons why high school students do, or do not, choose to pursue science careers. The objectives of this survey are: (1) to determine the educational and occupational aspirations of high school students, (2) to relate present school experiences to expectations of varying educational and work contexts, and (3) to relate parental influences to career expectations. Information was obtained on several topics in Poll 101:

1. Educational levels: parents', students' expectations
2. School subjects: those taken, attitudes toward
3. Self-concepts: skills, abilities, activities and achievements
4. Attitudes toward: sex roles, science issues
5. Science careers: consideration given toward entering, encouragement received to enter, science-non-science career choices
6. Work preferences: parents' for children, students' own
7. Career choices: job family most preferred, occupational choice expected for future.

Several questions were raised in this study:

1. What are the effects of stimuli from school courses on career decisions in science areas?

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[1] The word "science" is used in this study as a general term referring to the following disciplines: the mathematical, physical, biological, medical (but not clinical), engineering, and social sciences, and the history and philosophy of science; also included are interdisciplinary fields which comprise overlapping areas of two or more sciences (e.g., biophysics, geochemistry, meteorology, and oceanography).

2. What are the conditions which produce differential points of view with regard to science careers among various groups, e.g., females and minority group members? Conditions to be examined are those within the school, within the family, and within the student.

3. What is the interaction between attitudes toward science as a career and/or behavior patterns which occur simultaneously?

During the spring semester 1975, more than 9,000 students in public and private high schools in the United States responded to Poll 101. Grades 10, 11, and 12 were surveyed. From the total returns, a sample of 2000 was drawn, with stratification to match the 1970 Census distributions according to sex, grade, residence (rural-urban), and geographic regions. (See Section IV for procedures.)

II. Results

School Subjects

Respondents to Poll 101 were asked to indicate which of several high school subjects they had taken and whether or not they liked the subjects (Item 12)[2]. The four subjects taken most frequently by all respondents were: English, social studies, algebra and biology. (See Table 1.) These subjects were also among the five subjects liked by most respondents to Poll 101. The data obtained indicated that high school females were less likely than high school males to take and to like plane geometry, trigonometry, chemistry, physics, mechanical drawing, and auto mechanics. High school females were, however, more likely than high school males to take and to like home economics, typewriting, and bookkeeping.

Table 1. Attitudes toward School Subjects

	Taken/taking			Like		
Subjects	Total	M	F	Total	M	F
English	95	93	97	65	53	78
Social Studies	88	87	89	63	61	66
Algebra	80	80	80	53	53	54
Biology	78	76	79	62	59	65
Typewriting	63	49	77	55	39	71
Plane geometry	49	52	47	34	38	30
Art	48	47	50	49	44	54
Home Economics	42	14	71	42	20	65
Band, orchestra	28	29	30	28	23	32
Chemistry	27	30	23	28	31	25
Mechanical Drawing	22	38	6	27	39	13
Bookkeeping	17	12	21	24	17	30
Trigonometry	15	17	14	18	21	15
Physics	11	15	8	17	22	12
Auto Mechanics	11	17	4	27	40	13

Note: All data are percentages of responses. Responses may not total 100% in some instances due to rounding errors, omissions or multiple responses.

[2] All items referred to in the text can be found in the APPENDIX.

Non-white respondents to Poll 101 indicated lower rates of access to English, social studies, algebra, and biology than did white respondents. Non-white respondents were also less likely than white respondents to take and to like plane geometry, trigonometry, and chemistry.

Female respondents to Poll 101 tended to like the verbally-oriented subjects (English, social studies, art, and music) while male respondents tended to like mathematics and physical science subjects. These results revealed especially large sex differences for some subjects; females reported liking: (1) English by a ratio of 3:2, (2) typewriting by a ratio of 7:4, (3) bookkeeping (30% to 17%), and art (54% to 44%). On the other hand, male respondents more frequently reported liking physics (22% to 12%), mechanical drawing by a ratio of 3:1, and auto mechanics by a ratio of 3:1.

Attitudes toward school subjects were examined for relationships to grades, college-non-college plans, and consideration given to science careers. The data obtained from Poll 101 revealed that, for nearly every subject, liking was more frequently reported by respondents planning to attend college; those with excellent grades, and those who had considered science careers for themselves.

Differential responses were noted in non-white attitudes toward school subjects. American Indian respondents were the most consistent in reporting dislike for nearly every course. Trigonometry was the only subject that was disliked by about equal proportions of non-white groups and by non-white respondents to a greater extent than by white respondents.

Teacher Behaviors

In Poll 101, students reported several behaviors which are typical of most of their high school teachers. Nearly six out of ten (59%) of the respondents reported that most of their teachers do give encouragement to consider education and/or training beyond high school. Encouragement for post-high school education or training increased in frequency of reports at grade eleven, and was greatest for respondents with above average or higher grades. Half or nearly half of the respondents (especially those with high grades) reported that most of their teachers do give encouragement to be creative and to build basic skills. Very few respondents (9%) reported that most of their teachers tell students that science course work is difficult. About a third of the respondents reported that most teachers do encourage students to explore many choices for post high school plans, do offer frequent opportunity to talk with teachers individually, and do give students advice on what to do after high school. On the other hand, only 20% of the respondents reported that most teachers do encourage students to take mathematics courses; those who did were primarily males (23% to 17%).

Among respondents to Poll 101, females more frequently than males reported that most of their teachers do encourage the building of basic skills, do encourage students to be creative, do encourage the exploration of many choices for post high school plans, including further education and/or training. Respondents planning to go to college compared with those going directly to work reported encouragement to consider post high school education and/or training, to be creative, to build basic skills, to explore many career options, and to take mathematics courses to a greater extent. College-bound respondents also reported to a greater extent than those going directly to work that teachers offer frequent opportunity for individual talks. Encouragement in these areas was reported more frequently by respondents having grades above average or higher compared to those with lower grades. In comparisons by ethnic groups, white respondents reported encouragement more frequently for most of these areas while non-white respondents tended to report more frequently that teachers

(1) give students advice on what to do after high school, (2) tell students which jobs offer the best opportunities for males and for females, (3) tell students in which courses males and females can expect to be most successful, and (4) encourage Spanish American respondents in particular to take mathematics courses.

Innovative Science Programs

In this study, schools were described as high in innovative programs in science curricula if school personnel listed, as part of the school curricula, three or more of the following science programs: (a) School Mathematics Study Group (SMSG), (b) Physical Science Study Committee (PSSC), (c) Harvard Project Physics Course (HPP), (d) Chemical Education Material Study (CHEMS), (e) Chemical Bond Approach Project (CBA), and (f) Biological Science Curriculum Study (BSCS). In the Poll 101 national sample, 15.8% of the respondents were in schools defined as high in innovative science programs. (See Table 2.) Those schools reporting none of these science programs were described as traditional science program schools; 56.8% of the respondents to Poll 101 were in schools defined as traditional science program schools. Another 11.9% of the respondents to Poll 101 were in schools described as having one or two of the innovative science programs. The proportions of respondents to Poll 101 who were in innovative or traditional science schools were similar to the proportions of schools having these programs as reported by Schlessinger, Howe, White, Chin, Baker, and Buckeridge (1973), in a survey of 5,993 U.S. schools (29% had innovative programs, 68% had traditional science programs). The Appendix of Poll 101 offers comparisons by traditional (None) and innovative (3+) science program schools for all questions in Poll 101.

Table 2. Estimates of Secondary School Innovative Science Programs

Science Programs	Poll 101, 1975	
	Schools[3]	Students[4]
School Mathematics Study Group (SMSG)	7.8	7
Physical Science Study Committee (PSSC)	13.2	7
Chemical Education Material Study (CHEMS)	13.9	9
Biological Science Curriculum Study (BSCS)	20.2	31
Harvard Project Physics (HPP)	9.3	2
Engineering Concepts Curriculum (ECCP)	.8	1
Introductory Physical Science (IPS)	2.3	22
Intermediate Science Curriculum Study (ISCS)	1.6	7
	129	2000

3 Data represent percentages of schools in the panel for Poll 101 reporting the use of innovative programs in operation.

4 Data represent percentages of respondents in the Poll 101 national sample reporting the use of innovative science materials in courses.

The results from Poll 101 indicated that schools with high innovative science programs were probably in affluent communities, with greater numbers of parents having one or more years of college education, and with students who were high in academic achievement and high in aspirations for their own post high school education. In traditional science schools, fewer parents had education at the post-secondary level by a ratio of 1:2 when compared with parents in the high innovative schools. For respondents in high innovative schools, reports of each of the following were greater than those in traditional schools: (1) above average grades or higher (59% to 50%), (2) educational aspirations at the junior college level or higher (69% to 58%), and (3) above average self-reports of abilities: academic ability (51% to 38%), scientific ability (26% to 18%), problem solving ability (33% to 26%), and mathematics ability (37% to 31%). The self-assessment reports of abilities are worth noting for the consistency in direction, being higher in each case in schools having innovative rather than traditional science programs.

There was no evidence in the Poll 101 results of differences between respondents in traditional and in high innovative science schools for any of the following: (1) ethnic group, (2) for most courses taken or subjects liked, (3) in participation in a National Science Foundation program or in entering projects in science fairs, (4) in drive to achieve or in athletic, artistic, mechanical, or speaking abilities or in social skills, and (5) in consideration given to, and encouragement given to consider, a career in science, mathematics, or engineering. There was a tendency for respondents in innovative science schools to take and to like plane geometry and biology but not band or orchestra when compared with those in traditional science schools. Respondents from schools having traditional science programs tended to take mechanical drawing and band or orchestra, and to like typing, auto mechanics and band or orchestra to a greater extent than those in schools having innovative science programs.

Student exposure to innovative science materials was assessed in Poll 101 (Item 5). The BSCS and IPS programs were the most frequently reported by respondents to Poll 101. It should be noted that IPS is offered primarily at the junior high school level (Schlessinger et al, 1973). Self-reports of exposure to innovative science materials may be subject to bias due to lack of recognition or recall.

The Poll 101 results showed higher ratios of innovative science materials used in science courses among respondents in innovative rather than traditional science schools: (1) ISCS, 2:1, (2) HPP, 3:1, and (3) CHEMS, 4:3. SMSG, however, was reported more frequently by a ratio of 2:1 by respondents in traditional science schools.

There was little evidence that respondents in traditional and innovative science schools differed in rates of participation in honors or advanced placement programs in mathematics, biology, or physics. Respondents in innovative schools tended, however, to report higher rates of participation in several honors or advanced placement programs than did those in traditional schools: (1) chemistry, 60% higher, (2) English, 21% higher, (3) social studies, 37% higher, and (4) foreign languages, 28% higher. All rate frequencies were low.

Educational Levels

Respondents to Poll 101 gave the present educational levels of their parents and respondents' own educational expectations after leaving high school (Items 8, 9, and 10). A comparison of these can be found in Table 3. Two major conclusions can be drawn from these results. One is that non-white parents are less educated when compared with white parents. Two is that respondents to Poll 101 aspire to more education and/or training than their parents have received.

Table 3. Comparisons of Students' Educational Expectations by Parents' Level of Education

Highest Level of Education	Father						Mother						Self					
	Total		White		Non-white		Total		White		Non-white		Total		White		Non-white	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Less than high school graduate	24	25	23	23	34	45	18	20	16	19	36	36	1	0	1	0	3	0
High school graduate	33	29	33	29	31	24	48	46	50	46	37	43	15	19	14	19	20	23
Vocational, business, or apprentice training, military service	12	17	12	17	15	13	7	10	8	10	6	8	23	16	23	16	21	19
Attend community college, 1 to 3 years of college	10	11	10	11	8	8	11	11	11	11	10	5	13	19	13	19	15	25
Graduate from 4-year college (bachelor's degree)	13	11	14	12	8	2	11	9	11	10	9	2	26	27	26	28	23	19
Advanced college degree (master's or doctor's degree)	8	8	8	8	6	5	4	3	3	3	6	6	20	15	20	15	22	14

Self-concepts

In Poll 101, high school respondents gave self-assessments of several of their attributes (Item 11). The two highest ranked attributes were drive to achieve and academic ability. Lowest in rank for all respondents were self-assessments of scientific and mechanical abilities. A description of the self-assessments of abilities and skills can be found in Table 4. Assessments were ranked in order of reports by respondents.

Table 4. Self Ratings of Abilities and Skills

	Total			White		Black	
	Above Average			Above Average		Above Average	
Characteristics		M	F	M	F	M	F
Drive to achieve	44	43	45	43	46	43	37
Academic ability	39	37	41	39	43	22	19
Athletic ability	33	39	27	39	27	36	25
Mathematical ability	31	35	28	35	29	31	19
Problem solving ability	27	31	23	32	24	27	15
Social skills	27	24	30	24	30	23	31
Speaking ability	26	26	26	25	27	31	25
Artistic ability	20	19	20	19	20	21	12
Mechanical ability	19	31	7	32	7	22	6
Scientific ability	19	24	14	25	14	18	12

An examination of above average assessments for abilities and skills was made to determine which of the respondents held the most positive self-concents. No sex differences were noted for high assessments of drive to achieve, speaking and artistic abilities. Large sex differences with higher ratings for males were noted for the following: (1) mechanical ability, 4:1, (2) athletic ability, 39% to 27%, (3) scientific ability, 24% to 14%, (4) problem solving ability, 31% to 23%, and (5) mathematical ability, 35% to 28%.

Consistency in reporting above average assessments was found for all or nearly all of the ten abilities and skills among respondents who had considered science careers, those with above average or higher grades, and those who planned to go to college rather than to work after high school. There was also a consistent tendency for respondents in innovative science schools to give higher self-assessments for all of the abilities and skills except for drive to achieve, athletic and mechanical abilities.

There were differences between white and non-white respondents in reporting high levels of abilities and skills. Compared with white respondents, non-white respondents were under-represented in above average ratings for academic, mathematical, and scientific abilities. Spanish American respondents were under-represent in above average assessments for nine of the ten abilities and skills listed above. Black females less frequently than black males or white females reported above average assessments for mathematical, problem solving, and artistic abilities as well as for drive to achieve.

Science-leaning vs. Non-science-leaning Students

In this study, science-leaning students were defined as those who responded that they had given consideration to a career in science, mathematics or engineering (Item 34). In the national sample for Poll 101, 59% of the males and 41% of the females were science-leaning by this definition. When compared with non-science-leaning respondents to Poll 101, science-leaning respondents reported (1) well-educated fathers, (2) high academic achievement, and (3) positive self-assessments of their skills and abilities. Both fathers and mothers of science-leaning respondents tended to be better educated than were parents of non-science-leaning respondents (fathers 25% to 15%, mothers 18% to 10%). Reports of above average or higher grades were greater by more than three to two (65% to 40%) in the science-leaning group. Reports of above average self-assessments were greater for science-leaning respondents for each of the following skills or abilities: (a) academic ability, (b) drive to achieve, (c) mathematical ability, (d) scientific ability, (e) problem solving skills, and (f) mechanical ability.

Few differences were found between science-leaning and non-science-leaning high school students in all of the following activities: (1) having a major part in a play, (2) winning a prize or award in an art competition, (3) taking part in a National Science Foundation program, (4) entering a project in a science fair, (5) receiving a high rating in a state or regional speech debate contest, (6) editing a school paper, yearbook or literary magazine, (7) active participation in scouting or (8) being elected to student or public office. Science-leaning students differed from non-science-leaning students, however, in achieving recognition for mathematics (11% to 3%) and in being a member of a scholastic honor society (19% to 10%).

Differences by science inclinations were noted in academic areas. Science-leaning high school students were more likely than non-science-leaning students to report that they had taken, were now taking, or expected to take the following high school courses: (1) algebra, (2) plane geometry, (3) trigonometry, (4) chemistry, (5) physics, and (6) mechanical drawing, but not in taking bookkeeping or home economics. Science-leaning respondents were also the most likely to report that they like the following subjects: (a) algebra, (b) plane geometry, (c) trigonometry, (d) biology, (e) chemistry, (f) physics, and (g) mechanical drawing, but not typing or home economics.

When skills in several activities were reviewed, science-leaning high school students showed greater tendency than did non-science-leaning students to report skills in the activities (Item 15). The twelve activities offered in Poll 101 were adapted from Holland's (1965) personality types and range of competencies. Science-leaning students reported skills at the level of doing "reasonably well" each of the following: (1) realistic activities: (a) using wood shop power tools, (b) making mechanical drawings, and (c) using a voltmeter; and (2) investigative activities: (a) using logarithmic tables, (c) using a slide rule, (c) using a microscope, (d) describing the function of the blood stream, and (e) interpreting simple chemical formulae. No differences were found between science-leaning and non-science-leaning respondents in the artistic activities of making handicrafts and designing things although science-leaning respondents probably have greater skills in playing a musical instrument. Science-leaning respondents showed less tendency, however, to report skill in the conventional activity of typing at the rate of forty words a minute than did non-science-leaning respondents.

Science-leaning high school students apparently are more active leisure readers than are non-science-leaning students. With the exception of the area of health, physical fitness, diet, Yoga, etc., science-leaning respondents

exceeded non-science-leaning respondents to Poll 101 in reports that one or more magazines or books had been read during the past year in each of these groups (Item 36): (1) Popular Mechanics, Mechanics Illustrated, (2) Popular Science, Psychology Today, (3) science fiction (not comic books); (4) other kinds of fiction, and (5) social-political, cultural problems.

For science-leaning high school students, the school instructional climate appears to be favorable, and students themselves appear to be more actively involved in the kinds of activities thought to be facilitating for career development. Science-leaning students to a greater extent reported that most of their teachers do (Item 37): (1) offer frequent opportunity to talk with teachers individually, (2) encourage students to take mathematics courses, (3) encourage students to build basic skills, and (4) encourage students to explore many choices for post high school plans. Career-related behaviors of science-leaning respondents exceeded those of non-science-leaning respondents in the following areas (Items 19, 21, 22): (a) in talking with the guidance counselor three to five or more times during the past year concerning training or education after high school, (2) in talking with one or more teachers about jobs, work, or careers during the past year, and (3) in reading something related to jobs or work at a library during the past year.

In general, the attitudes of science-leaning high school students toward female career roles and science issues appeared more favorable than did the attitudes of non-science-leaning students. To a greater extent, science-leaning respondents to Poll 101 agreed with all of the following: (1) women are as interested in mathematics as are men, (2) respondents would approve the appointment of a woman as chairman of the Atomic Energy Commission, (3) respondents would choose for themselves the best qualified dentist available regardless of sex, and (4) respondents would give tax support for the following programs: (a) science education programs, (b) programs to improve the environment, and (c) programs to continue space research.

In future employment, four times as many science-leaning as non-science-leaning high school students (16% to 4%) expressed interest in doing theoretical or research work (Item 23). Parental support for theoretical or research work, as perceived and reported by students, was nearly three times as great among science-leaning as non-science-leaning respondents (14% to 5%) (Item 24). Science-leaning respondents were less inclined toward the secretarial or clerical job family but more inclined toward the medical and biological sciences and toward engineering, physical science, mathematics and architecture than were non-science-leaning respondents. As job values, science-leaning respondents placed greater emphasis upon (a) the chance to use skills and abilities fully, (b) the chance to increase skills and abilities, to grow, (c) job freedom, independence, and (d) the possibility for rapid advancement than did non-science-leaning respondents.

In the national sample for Poll 101, five percent of the high school students expressed interest in becoming a scientist (Item 27). There was no evidence that schools having three or more of the innovative science programs, e.g., SMSG, BSCS, etc., had impact on science career decisions (6% in innovative science schools, 5% in schools having no innovative science programs). The ratio of males to females interested in becoming a scientist was 2:1 (6% to 3%). Science-leaning respondents showed greater inclination toward becoming a scientist than did non-science-leaning respondents by a ratio of 4:1 (8% to 2%). Some evidence was available on the relationship of innovative schools to consideration given to science careers to suggest a possible impact; in innovative schools (those with three or more programs) fifty-three percent of the respondents had considered science careers as compared

with 49% in schools having no programs, while disinterest in science careers was reported by 42% in innovative science schools and 45% in schools having none of the innovative science programs. These results are weak but the direction of the results suggests that innovative science programs in schools may have impact on the consideration given by high school students to potential science careers.

Work Preferences

Respondents to Poll 101 were asked to indicate their preferences for work or employment activities, e.g., serving others or making things, etc., and the type of work their parents prefer for them (Items 23 and 24). (See Table 5.) Overall, a close similarity was found between students' own work preferences and their perceived parental preferences. Students appear to be fairly certain of their own work type preferences; there were minimal omissions in these reports. Female respondents were less certain of parents' work preferences for them; discrepancies in females' reports were the greatest in the male-female comparisons.

Table 5. Students' Work Preferences by Parents' Preferences

	Total				White				Non-White			
	Students'		Parents'		Students'		Parents'		Students'		Parents'	
Work Preferences	M	F	M	F	M	F	M	F	M	F	M	F
Service, maintain or repair things	21	2	19	2	21	2	18	1	19	1	21	1
Serve others	15	42	15	34	16	42	15	35	13	43	12	27
Make or build things, grow things	23	11	18	7	23	11	18	7	23	11	16	10
Manage or direct people or work	19	13	20	15	20	13	21	15	19	14	17	14
Teach or instruct	10	21	9	22	9	22	9	21	13	15	14	31
Do theoretical or research work	11	9	11	8	11	9	11	8	12	10	16	5
	99	98	92	88	100	99	92	87	99	94	96	88

Those discrepancies found between students' and parents' work preferences occurred among non-white respondents. Non-white females showed a greater interest in serving others than did their parents (43% to 27%). On the other hand, non-white parents appeared to have greater interest for their children in teaching or instructing than did non-white females (31% to 15%).

Male respondents and parents of males respondents showed greater preference than did parents of females and females themselves in servicing, maintaining or repairing things (ratio of 10:1), and in making or building things or growing things (ratio 2:1). Parents of females and females themselves showed greater preference for serving others (ratio of 2:1), and for teaching or instructing (ratio of 2:1).

Interest in doing theoretical or research work was greater among respondents intending to go to college rather than to work after high school (ratio of 5:1), among science-leaning rather than non-science-leaning respondents (ratio of 4:1), and among respondents with high rather than low grades (ratio of 3:1). These respondents reported parental support for theoretical or research work in similar proportions.

Attitudes toward Sex Roles

Several aspects of attitudes toward female career roles were offered to respondents to Poll 101 (Item 38). The results were examined for the current status of these attitudes among high school students and for the nature of individuals most likely to hold biased views. In general, high school students reported favorable attitudes toward female career roles with some contradictions. Females showed the most favorable attitudes while there was clearly a male bias on several issues.

In this study, favorable attitudes toward career roles for women were defined as approval or agreement with all of the following: (1) approval of careers in science fields for females, (2) agreement that science ability is equally distributed among males and females, (3) agreement that the best qualified dentist available would be chosen regardless of sex, (4) agreement that females have as much interest as males in mathematics, (5) approval of marriage and/or family and a career for most women, (6) agreement that women have the ability and endurance to make successful space flights, (7) strong approval of the election of women as governors, and (8) approval of the appointment of a woman as chairman of the Atomic Energy Commission. Unfavorable attitudes were defined as agreement or approval of all of the following: (a) agreement that women should stick to "women's jobs", (b) agreement that a woman's place is in the home, (c) agreement that working women take jobs away from men, (d) agreement that education is wasted on women since they usually get married and raise a family, (e) agreement that men do not like to work for women supervisors, and (f) agreement that according to the latest Census data, equal job opportunities have now been achieved. (Items 18, 33, and 38). Statements (a) through (e) are some of the myths about women workers refuted by the Women's Bureau (U.S. Dept. of Labor, 1971).

Respondents to Poll 101 nearly unanimously rejected (9% approved) the view that education is wasted on women. (See Table 6.) More than two thirds of them (68%) approved of combining marriage and careers for most women. Nearly nine out of ten (89%) of the respondents approved of careers in science fields for females. Less than one out of five (18% to 19%) of the respondents endorsed the myth statements that a woman's place is in the home, that working women take jobs away from men, and that women should stick to "women's jobs". Some high school students appeared misinformed about Census data on equality of job opportunities; nearly one out of four (23%) reported that current Census data show that equality of job opportunities has already been achieved. Three out of four (75%) of the respondents would select a dentist on the basis of qualifications rather than on the basis of sex. The selection criterion differed, however, when decisions were to be made for a governor or a chairman of the Atomic Energy Commission. Only four out of ten (40%) of the respondents gave strong approval for the election of women as governors, and only a third (34%) would approve the appointment of a woman as chairman of the AEC.

Not only did high school respondents to Poll 101 give near concensus on approving science careers for females, but seven out of ten (70%) reported that women have as much science ability as do men. More than six out of ten (63%) reported that women are as interested as men in mathematics.

In this study, biased views toward female career roles were defined as approval of the unfavorable attitudes listed above or failure to approve the favorable attitudes listed above. In twelve of the fourteen statements listed above, female respondents to Poll 101 gave more favorable attitudes toward female career roles while biased views were reported more frequently by male respondents. Responses of males and females were similar on the issues of Census data evidence

and male attitudes toward female supervisors. For the remaining twelve statements, differences of at least ten percentage points were found with females giving the most favorable reports. For six of the statements, a difference ratio of about two to one was found with males giving the most biased reports.

Table 6. Attitudes toward Female Career Roles

Approval or Agreement with Issues	Total	Male	Female
Education is wasted on women since they usually get married and raise a family.	9	12	5
How do you feel about careers in science fields for females? Approve	89	83	94
A woman's place is in the home.	18	23	12
Working women take jobs away from men.	18	25	11
Women should stick to "women's jobs."	19	25	12
According to the latest Census data, equal job opportunities have now been achieved.	23	21	25
I would choose for myself the best qualified dentist available regardless of sex.	75	70	81
Women have as much science ability as men do.	70	63	78
For most women, respondent would approve of marriage and/or family and career.	68	60	77
Women are as interested in mathematics as are men.	63	55	72
Men don't like to work for women supervisors.	51	48	53
Women have the ability and endurance to make successful space flights.	43	32	54
I strongly approve the election of women as governors.	40	27	54
I approve of appointing a woman as chairman of the Atomic Energy Commission.	34	24	45

Female respondents to Poll 101 clearly outranked males (by 11% or more or by ratios of 2:1 in three instances) on all of these issues: (1) approval of wives working full-time before and after having children, (2) combining marriage and careers for most females, (3) approval of careers for females in science fields, (4) agreement that women have as much interest as men in mathematics, (5) agreement that science ability is distributed equally among the sexes, (6) agreement that women have the ability and endurance to make successful space flights, (7) approval of the election of female governors, (8) approval of the appointment of women as chairman of the A.E.C., and (9) selection of a dentist on the basis of qualifications rather than on sex type. All of these issues were reported more frequently by respondents with excellent grades and plans to attend college rather than those with low grades and those planning to go directly to work after high school. Seven of these issues were endorsed more frequently by respondents in innovative rather than traditional science program schools. Five of the issues were endorsed more frequently by science-leaning rather than non-science-leaning respondents.

By large proportions (ratios of 2:1 or greater), male respondents to Poll 101 outranked females on these issues: (1) wife will not work at any time, (2) disapproval of careers for females in science fields, (3) agreement that a woman's place is in the home, (4) agreement that women should stick to "women's jobs", (5) agreement that education is wasted on women, and (6) agreement that working women take jobs away

from men. To a greater extent than females, males also approved of marriage and family but not careers for most women (38% to 18%). Five of the issues listed above were endorsed more frequently by respondents whose grades were low and those who planned to go directly to work compared with those with high grades and those with plans to attend college. Four of these statements were endorsed more frequently by white respondents and those attending traditional rather than innovative science program schools.

Responses to two of the issues differed from those noted above. Nearly one out of four (23%) of the respondents to Poll 101 agreed with the statement that Census data reveal that equal job opportunities have now been achieved, a false statement. Those who did so tended to be in tenth rather than twelfth grade, to be non-white rather than white respondents, and to be those with low rather than high grades. It is possible that responses to this issue were framed from the perspective of ethnic rather than sex equalities.

Second, half of the respondents to Poll 101 agreed with the statement that men do not like to work for women supervisors. Endorsement of this issue was greater among white respondents, those with excellent grades and plans to attend college, science-leaning rather than non-science-leaning respondents, and those in innovative rather than in traditional science program schools.

No evidence was noted for change between tenth and twelfth grades in attitudes toward any of these issues: (1) a woman's place is in the home, (2) women should stick to "women's jobs", (3) education is wasted on women, (4) working women take jobs away from men, and (5) women have ability and endurance for successful space flights. Increases in the same direction were noted between grade in school and endorsement of each of these statements: (a) that women are equally interested in mathematics as men, (b) men do not like to work for women supervisors, (c) women have as much science ability as men do, (d) the election of women as governors is strongly approved, (e) the appointment of a woman as chairman of the A.E.C. is approved, and (f) the best qualified dentist available would be chosen regardless of sex.

Reasons for not Becoming Scientists

Respondents to Poll 101 were asked to indicate the major reason why they felt they could not become a scientist (Item 27). In answer to this question, 5% of the respondents indicated an interest in becoming scientists. Those respondents earlier described as science-leaning indicated intent to become scientists by a ratio of 4:1 compared with non-science-leaning respondents (8% to 2%). Males outranked females in intent to become scientists by a ratio of 2:1 (6% to 3%). Those reporting interest in becoming scientists tended to have excellent rather than low grades (ratio of 12:1), to plan to attend college rather than to go directly to work (ratio of 7:2), and to be white rather than black (ratio of 5:0).

There were two major reasons given for not becoming a scientist: (1) other plans or interest in some other career, and (2) problems related to school courses. Of all the respondents to Poll 101, 47% had some other plans than becoming scientists: 40% were interested in some other career, 4% wanted to get married, and 3% wanted to enter military service. Those respondents with other career plans more frequently reported intent to obtain special training other than college, and they tended to be white or black rather than American Indian or Spanish American. The primary course-related problems reported were poor grades (12%) and lack of prerequisite courses for admission (10%) although reports that required courses are too hard (7%), and long preparation is required (5%) were also given. Those who gave course-related problems as reasons for not becoming scientists tended to be non-white, to report low grades and non-college future

plans to a greater extent than did those interested in becoming scientists. According to reports from respondents to Poll 101, few parents (1%) would be against science careers for their children. It should be noted that 6% of the respondents to Poll 101 reported that they "can't afford it," of which 7% of the science-leaning and 4% of the non-science-leaning respondents reported this, and more were non-white, especially American Indian and Spanish-speaking Americans than white respondents.

Career Choices

In this study, two methods were used to assess movement toward career selection for future employment. One, respondents to Poll 101 were asked to indicate the one job family in a list of twelve job families[5] most preferred for future employment (Item 25). (See Table 7.) Two, respondents were asked to select the one occupation closest to the one in which they expect to be employed in the future. To assist respondents, a group of 138 occupations,[6] arranged in the twelve job families, were provided to review in the occupational decision-making.

Table 7. Job Family Preferences

In which one of these job families would you most prefer to be employed in the future? (Mark only ONE.)	Poll 94 1972		Poll 98 1973		Poll 101 1975	
	M	F	M	F	M	F
General labor, community and public service	12	7	14	6	9	7
Secretarial-clerical, office work	2	21	2	17	2	23
Construction trades	9	1	10	1	10	1
Mechanics, industrial trades	15	1	15	1	18	1
Proprietors, sales	5	3	6	4	4	3
Technical jobs	8	3	8	3	10	2
Fine arts, performing arts	9	14	7	12	8	10
Humanities, law, social and behavorial sciences	7	7	6	6	7	10
General teaching and social service	5	17	3	15	4	14
Business administration	6	6	7	7	8	4
Medical and biological sciences	11	16	13	24	11	16
Engineering, physical science, mathematics and architecture	11	2	9	2	13	5

Employment preferences for engineering, physical science, mathematics, and architecture increased for both high school males and females during the period between Poll 94 in 1972, and Poll 101 in 1975. High school females showed less preference in 1975 for business administration, general teaching and social service, and fine arts, than females did in 1972. Female interest in humanities, law, social and behavioral sciences increased also between the Purdue Opinion Panel studies in 1972 and 1975.

[5] The twelve job families were adapted from the final classification of job families in the Project TALENT data. (Flanagan, et al, 1971)

[6] The titles were taken primarily from the Dictionary of Occupational Titles (3rd ed.), published by the U.S. Dept. of Labor.

While some female interest was found in the three polls for each of the twelve job families, females' preferences were greater than that of males in secretarial-clerical jobs (ratio of 10:1), in teaching and social service (ratio of 3:1), and in medical and biological sciences (ratio of 3:2). Males' preferences outnumbered that of females in mechanics and industrial trades (ratio of 15:1), in construction trades (ratio of 10:1), in technical jobs (ratio of about 3:1), as well as in the physical sciences, engineering, mathematics, and architecture (ratio of 3:1).

College bound respondents to Poll 101 reported greater interest in job families for the humanities, teaching and social service, business administrati , medical and biological sciences, physical science, engineering, mathematics, and architecture, but less interest in labor, secretarial-clerical and office work, construction trades, and mechanical and industrial trades than did those who planned to go directly to work after high school. Interest in medical and biological sciences, physical sciences, engineering, mathematics, and architecture, and humanities, law, social and behavioral sciences was greater for those with high grades while those with average or low grades had greater preference for mechanics and industrial trades and construction trades. There were few differences between white and black respondents as groups in preferences for physical science, engineering, mathematics, and architecture, medical and biological sciences, general teaching and social service, humanities, law, social and behavioral sciences, fine arts, performing arts, technical jobs. As groups, American Indians and Spanish Americans showed the least preference for physical science, engineering, mathematics, and architecture, general teaching and social service, and humanities, law, social and behavioral sciences.

Results similar to those for preferred job families were noted when occupational choices were examined by job families. (See Table 8.) All usable responses to Poll 101 (N = 8,621) were examined for similarities between occupational choices grouped by job families and those job families preferred for future employment. The same general pattern of occupational interests were obtained by the two methods. Those differences which appeared likely developed because the number of occupations offered for selection was limited.

Table 8. Occupational choices in Job Family Groups*

Occupational choices expected in future employment (grouped in job families)	Total	Males	Females
General labor, community and public service	7	9	6
Secretarial-clerical, office work	9	1	16
Construction trades	3	6	0
Mechanics, industrial trades	6	10	2
Proprietors, sales	3	4	2
Technical jobs	5	5	5
Fine arts, performing arts	6	4	7
Humanities, law, social and behavioral sciences	6	5	7
General teaching and social service	9	4	14
Business administration	6	8	4
Medical and biological sciences	13	11	15
Engineering, physical science, mathematics and architecture	6	9	2
No occupational choices given	23	25	20
	102	101	100

* Data was obtained from the total respondents available; total usable responses = 8,621 (4,160 males, 4,461 females), for Poll 101. Responses indicated specific occupations which were then grouped in job families.

Geographical Differences

Although the geographical distribution of frequencies by sex, grade, rural-urban residence, and region are controlled in the selection of Purdue Opinion Panel national samples, there were some important and significant geographic differences in self-reports of high school students to Poll 101, e.g., for school subjects, activities, skills, careers, science, and the role of women in society. Respondents from the East were more college- and science-oriented than were other respondents in their present activities and in future educational interests. To a greater extent than other respondents, those from the East were more likely to have taken and to like mathematics and science courses, to have participated in honors or advanced placement programs in mathematics, chemistry, and foreign languages, and to have confidence in their mathematics and academic abilities. A high proportion of respondents from the East had given consideration to science careers. Attitudes toward the combination of marriage and careers for females and toward career roles for females were more positive among respondents from the East. Eastern respondents also showed the greatest interest in receiving an advanced degree at the masters or doctoral level as well as in intent to delay marriage until after 26 years of age. Eastern respondents were also the most likely to have had counselor contacts to discuss education and/or training after high school, to have had opportunity to talk individually with teachers, to have talked with friends about work, but they were the least likely to report that teachers had encouraged their taking mathematics. Respondents from the East were the least likely to have received recognition for 4-H projects, state or regional music contests, or to have taken field trips to a business or industry. The greatest interest in serving others was reported by Eastern respondents.

Respondents to Poll 101 from the Midwest were equally as likely as those from the East to report high academic and mathematics abilities, that they have taken and like algebra and plane geometry, and that they have considered science careers and that they have been encouraged in this interest. Midwest respondents were equally as likely as Eastern respondents to report the opportunity to talk individually with teachers, and that they had discussed work with friends.

In contrast, respondents from the South were the least likely to report skills in making mechanical drawings, in use of the microscope, and in interpretation of simple chemical formulae, and they attached the least importance to eleven of the twelve job values listed in Item 26. Southern respondents were the least likely to have sought work-related information from a library or from their school.

Western respondents to Poll 101 showed the greatest interest in post-secondary education at the community college level and the least interest in pursuing an advanced degree. Respondents from the West were the most likely to have had, in school, a typing course and a course in occupations or careers, to report liking mechanical drawing, auto mechanics, and band or orchestra, and to report skills in handicrafts and typing. Western and Eastern respondents were equally likely to report having 250 or more books at home, but Western respondents were the most likely to have read science fiction other than comic books and literature concerning health, physical fitness, diet, Yoga, etc. Western and Midwestern respondents were equally likely to report recognition for 4-H projects, but Western respondents were the least likely to have entered a project in a science fair. Western respondents showed the most preference in future employment to make or build or grow things, and they reported the greatest parental support for this preference.

Science Issues

In addition to attitudes about science courses, science careers for females, and consideration given to science careers, reactions to several current science issues were sought in Poll 101. The results, in general, revealed positive attitudes toward the benefits and by-products of scientific research and a willingness on the part of respondents to supply tax support for several science programs. There was, however, an interest in lending support for scientific research on the basis of its practical value. Respondents also showed reluctance to support space research and science education programs.

Three out of four respondents to Poll 101 agreed that the by-products of past scientific efforts taken as a whole have been beneficial to man. More than seven out of ten (71%) respondents agreed that overall science and technology do more good than harm. More than seven out of ten (72%) respondents would willingly pay taxes to support cancer research. Two thirds of the respondents would give tax support to improve the environment while half or more of the respondents would support through taxes the improvement of techniques for food production (54%) and the search for alternate sources of energy (51%).

On the other hand, 69% of the respondents to Poll 101 agreed that money should not be given for scientific research unless it has practical value. This is a complete reversal of positions from that of respondents to Poll 50 in 1957, when only 26% agreed with this position. Fewer than one out of five (18%) respondents to Poll 101 would be willing to pay taxes to support continued space research. Respondents to Poll 101 were nearly equally divided on the issue of continuing or discontinuing high altitude flying which is feared may break the ozone barier. Only about one in five (22%) of the respondents would offer willing tax support for science education programs.

Several sex differences were found in attitudes toward science programs which would be supported by taxes. Female respondents to Poll 101 to a greater extent than males would endorse the support of cancer research (ratio of 5:4) and the improvement of the environment (69% to 63%). Males to a greater extent than females would endorse the seeking of alternate sources of energy (54% to 48%), continued space research (ratio of 2:1), and support for science education programs (ratio of 4:3). To a greater extent than males, females agree that the byproducts of past scientific efforts have been beneficial to man.

Large differences were found in willingness to pay tax support for cientific programs when comparisons were made by course grades, future plans, and science-leaning inclinations. Differences as large as ratios of 2:1 were found in several instances with tax support more willingly being granted by the following: (1) respondents with above average or higher rather than average or low grades, (2) those planning to attend college rather than go to work after high school, (3) science-leaning rather than non-science-leaning respondents, (4) white rather than black respondents, and (5) those in innovative rather than traditional science program schools. Positive attitudes about the overall benefits and by-products of science and technology were also reported by respondents with high grades, college plans, science-leaning inclinations, from innovative schools, and white respondents, in comparison with those having average or low grades, plans to go to work, non-science-leaning inclinations and black respondents. In general, there was also a tendency for attitudes toward science issues and tax support for science programs to increase in a positive direction with grade in school.

III. Discussion

This study of high school students' career plans sought to determine the reasons why science careers are or are not being pursued. Examination was made (a) of behaviors, e.g., regular or honors courses taken, participation in activities, (b) of attitudes, e.g., toward school subjects, career roles for females, science issues, (c) self-concepts of skills and abilities, interests, and (d) career choices or preferences.

On the whole, the results of this study revealed positive attitudes toward the benefits of science and technology and a willingness to give tax support for programs in cancer research, in environmental improvement, in improvement of food production techniques, and in the search for alternate forms of energy.

The results of this study indicated that high school students hold positive attitudes toward science career roles for females with nearly unanimous concensus on this issue. High school students as a whole believed that females are equivalent to males in scientific ability and in interest in mathematics.

More than three out of four high school students in this study have been exposed to science content through courses in algebra and biology. Half of them have taken plane geometry, and a fourth have taken chemistry. Positive attitudes toward science subjects were found: (1) 62% like biology, (2) 53% like algebra, (3) 34% like plane geometry, and (4) 28% like chemistry.

In this study, an attempt was made to examine science career choices by the following methods, by determining the extent: (a) of consideration given to science careers, (b) of support received for entering science careers, (c) of preference for life or physical science job families, (d) of occupational choices made in the life or physical sciences, and (e) of intent declared to become a scientist.

Of particular interest and importance was the finding in this study that half of all the high school students had considered pursuing careers in science, mathematics, or engineering, 57% of the males and 41% of the females, and that nearly as many had been encouraged to pursue science careers. These science-leaning individuals had taken science courses, and they like science subjects. Science-leaning high school students shared these characteristics: (1) college educated parents, especially fathers, (2) high academic achievement, (3) positive self-concepts of skills and abilities, (4) broad range of leisure reading topics, (5) active involvement in career development activities, e.g., seeking career information, discussions about work, (6) positive reports of school climate, e.g., having frequent opportunity to talk individually with teachers, encouraged by teachers to take mathematics, to build basic skills, to explore many post-secondary school options, and (7) positive attitudes toward female career roles and toward science issues. Science-leaning high school students reported interest in doing theoretical or research work and parental support for this interest. Science-leaning high school students reported the greatest preference of all respondents in this study for life or physical science job families.

In this study, there was evidence of the impact on high school students' career plans of parents' education and of parental support for modes of work, both of which were highly related. Ten percent of the high school students in this study reported their own preference and parental support for doing theoretical or research work, 11% of the males and 9% of the females. Little difference was evident in reports between students' and parents' preferences for this type of work.

The results of selections for job families preferred and occupational choices grouped by job families were very similar considering the constraint of limited occupational choices offered. There was little or no difference between the two methods for the medical and biological sciences with female preferences slightly higher. Occupational choices were depressed in the physical science and humanities job families. Males were predominant in the physical sciences, and females were so in the humanities. In this study, 14% of the high school students expressed preference for future employment in the medical and biological sciences, and 13% of them selected a life science occupation as one expected for future employment (males: 11%, 11%; females: 16%, 15%). In the physical science group, 9% of the high school students expressed preference for, while 6% selected an occupation in, the engineering, physical science, mathematics, and architecture job family (males: 13%, 9%; females: 5%, 2%). In the humanities job family, 9% reported preference for, while 6% selected an occupation in, humanities, law, social and behavioral sciences.

Only 5% of the high school students in this study indicated an intent to become a scientist, 6% of the males and 3% of the females. These declared-scientists were males (2:1) with excellent grades, college plans, and science-leaning as described earlier. The declared-scientist group was far smaller in size than the preferred-science groups and the occupational-choice-science groups by about one in four or five. One possible explanation for this discrepancy is the potential confusion over the definition of a scientist. It is possible that high school students do not include engineers and architects as scientists. A second explanation is that the medical and biological sciences include nurses and, therefore, responses to this job family may contribute to the discrepancy. While the indication of a job family preference may represent the ideal (which may or may not be attainable), the selection of an occupation most expected for future employment likely represents the potentially obtainable career. Yet responses to these two tasks were similar, and the depression in career choices

could be explained by the limited number of options presented. In conclusion, the expected proportion of future scientists may be underrepresented by the 5% of all high school students who are declared scientists, but is likely over-represented by the 23% of all high school students who prefer the medical and biological sciences and the physical science, engineering, mathematics, and architecture job families and the 19% who selected an occupation falling into one of these two job families.

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IV. A Word About Technique

The reader may wish to clarify his thinking about the distinction in terminology made in this report between "Poll" and "Panel." The term "Poll" is used to refer to the questions asked of students. The term "Panel" refers to the annual body or sample of students whose schools have subscribed to the polls.

Polls of the PURDUE OPINION PANEL are given by the high schools to approximately 10,000-19,000 students in high schools all over the nation. Students record their answers anonymously on a special Ballot Card. When the cards are returned to Purdue University, these marks are converted into punched holes, making it possible for all the data to be tabulated and analyzed by computer. Each school is sent a report of its own results in addition to this national report.

The first part of each poll asks a number of questions establishing the individual's sex, school grade, and future plans.

Over 9,000 high school students from all sections of the United States replied to this poll. A sample of 2,000 students was drawn so that analyses of results could be made on a group as nearly representative of the nation's high school students as our data would permit. The sample was stratified according to grade, sex, residence, and geographical region but strictly randomized from our total return with respect to all other characteristics. The composition of this sample is shown in the following tables.

TABLE I

States Included in Regional Breakdowns

WEST	MIDWEST	EAST	SOUTH
Alaska	Illinois	Connecticut	Alabama
Arizona	Indiana	Maine	Arkansas
California	Iowa	Massachusetts	Delaware
Colorado	Kansas	New Hampshire	District of Columbia
Hawaii	Michigan	New Jersey	Florida
Idaho	Minnesota	New York	Georgia
Montana	Missouri	Pennsylvania	Kentucky
Nevada	Nebraska	Rhode Island	Louisiana
New Mexico	North Dakota	Vermont	Maryland
Oregon	Ohio		North Carolina
Utah	South Dakota		Oklahoma
Washington	Wisconsin		South Carolina
Wyoming			Tennessee
			Texas
			Virginia
			West Virginia

INTERPRETATION OF POLL RESULTS

In all national surveys, a question inevitably is raised about the extent to which the reported results in the survey accurately reflect the attitudes, opinions, and feelings of the total population of high school students. In part, the accuracy of the results depends upon the size of the sample drawn and the care given to the selection of the sample. With a correctly drawn sample of sufficient size the results will be very similar to those that would be obtained if the entire population were polled. Probability tables based on a sample of 1500 to 2000 cases show that results from the total population probably would fall within a range of one percentage point above or below the response of the sample.

The sample of 2000 high school students in the Purdue Opinion Panel surveys is large enough to reflect the attitudes, opinions, and feelings of the total high school population with a high degree of accuracy. Size alone, however, does not insure accuracy of representation of all relevant characteristics in the total body. How valid the results are depends upon: (1) the extent to which appropriate characteristics were selected to match the population; (2) the care in selection of the schools to participate; and (3) the extent to which the schools and students cooperate.

The tables in the Appendix of this report give the percentages choosing each response, by total sample and the various sub-samples or categories of the total. The percentages in these tables may not total 100% for all questions. Rounding error will cause the total to be a percentage point high or low in some cases. Many percentages total less than 100% because of omissions by some students.

Sample for Poll 101

Some restraints were exercised in the selection of participants in schools and the selection of respondents in the national sample for Poll 101. These are described below.

Schools were requested to administer Poll 101 to 100 to 125 students. The following methods of selection were provided:

A. In those schools having a total enrollment in grades 10, 11, and 12, of less than 160, all students would participate.

B. In those schools having a total enrollment of more than 160 in grades 10, 11, and 12, a random sample of from 34 to 43 students would be selected from each of grades 10, 11, and 12. The total number of participants in the school would fall between 100 and 125. Either of these alternatives could be chosen:

1. An alphabetical list of students either of the entire school or separately by grades would be used.
   a. The proportion needed to meet the survey requirements was selected from examples provided.
   b. Then every nth individual was selected starting with some other than the first individual in the list.
2. Or a table of random numbers would be used to make selections from alphabetical lists of students in the school.

Schools reported the selection method used. The results showed an average of 94.4 respondents per school.

In drawing the national sample, the decision was made to accept only those respondents who indicated an occupational choice. It was possible in every instance to use this method and to make random selections without using all available cards from cells. Some bias may have been introduced into the national sample by discarding respondents without occupational choices. A preliminary run of data from over 8,000 respondents indicated a ratio of white to non-white respondents of 85%:13% compared with a ratio of 89%:10% in the national sample. Non-white respondents, especially the black, appear to be underrepresented in the national sample because of failure to indicate an occupational choice.

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Measurement and Research Center
Purdue University
Lafayette, Indiana 47907

The reports of the Purdue Opinion Panel give the results of the opinion surveys which are conducted three times each year among high school students throughout the nation. The sample on which results are based is classified according to grade in school, sex, socio-economic status, geographical region, and other pertinent variables. These reports are copyrighted by Purdue Research Foundation; material from these reports may not be used without the permission of Purdue Research Foundation.

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