Young Women’s Science/Mathematics Career Goals From Seventh Grade to High School Graduation

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ABSTRACT The author examined changes in the educational and career goals of 66 young women who completed surveys in Grades 7 and 12. Participants identified desirable versus undesirable aspects of mathematics- and science-based careers to better understand the characteristics that do or do not attract women from these fields. Over time, participants’ degree aspirations and interest in science, engineering, and mathematics (STEM) careers decreased. Young women liked the learning and discovery and using mathematics, and they reported enjoying STEM careers. Conversely, some of the women disliked doing the mathematics and the hard work required and reported a lack of interest in STEM fields.

Key words: mathematics- and science-based careers, surveys completed in Grades 7 and 12, young women’s educational and career goals

Female and male students have nearly equivalent mathematics and science course completion rates and achievements, with the exception of physics, in which proportionally more male than female students are enrolled (National Center for Education Statistics [NCES], 1997; National Science Foundation, 1996). In spite of their advances and success in high school mathematics and science, women constitute only a small percentage of the science, mathematics, and engineering (STEM) workforce. In 1995, 22% of America’s scientists and engineers were women, compared with half of the social scientists (National Science Board, 1998). Women who do pursue STEM careers most often choose fields in the biological sciences where they represent 40% of the workforce, with smaller percentages found in mathematics or computer science (33%), the physical sciences (22%), and engineering (9%), according to the National Science Board (1998). The preference of female students for the biological sciences and male students for the physical sciences (Rayman & Jackson, 1996) have been documented as early as fourth grade (Kahle, 1996; Kahle & Rennie, 1993).

Girls’ attitudes toward mathematics and sciences and their interest in related careers seem to be independent of and do not necessarily parallel their high school achievements in mathematics and science (Catsambis, 1995). In this article, I compared young women’s attitudes toward and interest in mathematics- and science-based careers over a 4- to 5-year period, from spring of seventh grade to junior or senior year in high school, or the freshman year of college. I examined changes in young women’s educational and career goals and identified aspects of mathematics- and science-based careers that they perceived as desirable versus undesirable to better understand the characteristics and factors that do or do not attract women to STEM fields.

Why Do Few Women Pursue Careers in Mathematics- and Science-Based Fields?

Research that has examined the loss of talented women from mathematics- and science-based fields suggests that there are diverse factors that interact to influence young women’s career choices (Catsambis, 1995; Clewell, Anderson, & Thorpe, 1992; Hanson, 1996; Jacobs, Finken, Griffen, & Wright, 1998; Kahle, Parker, Rennie, & Riley, 1993; NCES, 1997). Hanson (1996) explained that “Gender is not just a direct influence, but rather it might also work indirectly through family experiences that affect school experiences and that ultimately affect individual characteristics and experiences.” For example, in a survey of science-talented rural adolescent girls, Jacobs et al. found that science career preferences were related most directly to girls’ interest in and enjoyment of science, and, to a lesser degree, to their previous science experiences and their parents’ perceptions of women in science and their daughters’ abilities in science. For all ethnic groups, however, boys were twice as likely as were girls to prefer a STEM career by eighth grade and into high school (American Association of University Women [AAUW], 1992; Catsambis, 1995; Linn & Hyde, 1989).

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Beliefs About and Attitudes Toward Mathematics and Science

Some research indicates that girls' beliefs and attitudes contribute most to their mathematics and science interests and experiences (AAUW, 1992; Catsambis, 1995; Hanson, 1996; Kahle, Parker, Rennie & Riley, 1993; Meyer & Koehler, 1990). From a social learning theory perspective, students with less positive attitudes who do not expect success or do not value mathematics and/or science will lack the motivation to persist in these fields (Bandura, 1977). Although there is a decrease in mathematics self-concept for all students in high school, girls' confidence in their mathematics and science abilities declines much earlier and is more pronounced (Byrne & Shavelson, 1987; Marsh, Parker, & Barnes, 1985). The result is that high school girls often underestimate their mathematics and science competence, feel less adequate, and have lower expectations for success in mathematics and science when compared with boys (Guzzetti & Williams, 1996; Kahle & Rennie, 1993; Meece, Parsons, Kaczala, Goff, & Futterman, 1982; Stipek & Gralinski, 1991). High school boys are more likely to feel confident in their mathematics and science abilities (Kahle, 1996; Kahle & Damjanovic, 1994; Marsh et al.; Meece & Jones, 1996; Sax, 1994a) and to believe that they are good in mathematics and science even when their school achievements are the same or lower than those of girls (Adelman, 1991; Sax, 1995).

As girls' feelings of confidence decline, so do their attitudes toward mathematics and science (Jones, Mullis, Raizen, Weiss, & Weston, 1992). Meta-analyses have documented that boys have more positive attitudes than do girls toward mathematics (Hyde, Fennema, Ryan, Frost, & Hopp, 1990) and science (Weiniblings, 1995). Boys also view school mathematics as more useful and interesting than do girls (Fennema, 1981; Hilton & Berglund, 1974); Catsambis (1995) found parallel views for science.

Girls' levels of confidence in and attitudes toward specific disciplines affect their educational and career goals in these fields. Lent, Lopez, and Bieschke (1991, 1993) indicated that students' feelings of competence in science, their self-efficacy, mediated the relationship between their ability and their science-related career aspirations. Other research suggests that girls' preferences for biological sciences contribute to their higher levels of confidence and expectations for success in the health and medical professions and much lower expectations for success in the physical sciences and engineering when compared with boys (Eccles, Barber, & Jozefowicz, 1998). Once women enter the professions, self-efficacy mediates two relationships: (a) between one's ability and desire for advancement to a leadership position in the field and (b) the influence of a role model on such higher level career goals (Nauta, Epperson, & Kahn, 1998).

Stereotypes and Norms

Other research points to stereotypic views of mathematics and science as male domains as a source of girls' negative attitudes (Dix, 1994; Eisenhart, Finkel, & Marion, 1996; Hill, Pettus, & Hedin, 1990; Taber, 1992; Vetter, 1996). Subtle messages that convey the notion that girls are not as capable as boys in mathematics and science may be communicated by significant others, such as parents, teachers, counselors, and friends (Hanson, 1992; Sadker & Sadker, 1986, 1994; Seymour & Hewitt, 1997). Family experiences can affect children's attitudes and achievements, especially in mathematics (Tsai & Walberg, 1983). Parent-child interactions and expectations may promote sex-role stereotypes by encouraging boys to explore, take risks, and develop independence, whereas girls are expected to engage in safe, stationary play. Mathematics and science games and toys that develop spatial reasoning and thinking skills may be given more often to sons versus daughters (Morgan, 1992; Mullis & Jenkins, 1988; Vetter, 1996). Eccles and Jacobs (1986) noted that parents encourage the mathematics achievements of sons more often than daughters, and Casserly (1980) found that parents also have different educational and career expectations for them. Recent work with college students indicated that female science majors were more influenced than were men by parental expectations; fathers' expectations and career choices were reported as most influential, except when mothers had a professional career (Seymour & Hewitt, 1997).

Stereotypes may be reinforced by teachers who have different expectations for boys versus girls as mathematics and science learners. Teachers' beliefs about students' mathematics or science abilities may lead to different learning opportunities for boys versus girls (Gries & Easley, 1984; Hyde & Jaffe, 1998; Jones & Wheatley, 1990; Kahle, 1996; Kahle & Meece, 1994; Sadker & Sadker 1986, 1994; Shakeshaft, 1995; Shepardson & Pizzini, 1992). Sadker and Sadker (1986, 1994) described teachers interacting more frequently with boys, providing critical feedback on the content of their work, and coaching them when they were incorrect or unable to answer a question. Meanwhile, girls were called on less frequently and received minimal feedback, which was related mostly to their cooperation and neatness rather than the content of their work. Grier and Easley found that elementary teachers expected girls to use set rules and algorithms to do mathematics but allowed boys the independence to invent solution strategies. Teachers further thought that boys' invented strategies were indicators of their future success in mathematics.

In the upper grades, school counselors may not encourage girls to enroll in advanced mathematics and science courses because they view these courses as too difficult or unnecessary for girls (Casserly, 1980). Science and mathematics educators drive women away from these fields when they emphasize competition versus more female-friendly, collaborative, or cooperative teaching practices (Tobias, 1990) or when they characterize such careers as solitary and extremely demanding work (Astin & Sax, 1996; Rosser, 1990) requiring "super woman" qualities (Miller & Silver, 1992). Science faculty who discount or fail to recognize
women’s capabilities further discourage women from science (Seymour & Hewitt, 1997). Conversely, college instructors who are viewed as open and caring are more likely to affect students’ persistence in mathematics and science fields (Miller & Silver). Negative impressions and stereotypic beliefs about mathematics and science seriously narrow young women’s choices and career goals.

When mathematics and science are portrayed as inappropriate or not feminine, young women experience conflict between their interest in these subjects and their own personal life and popularity, especially with men (Clewell et al., 1992; Stage & Maple, 1996). Some research has examined women’s perceptions of a role conflict between a STEM career and family responsibilities to understand the loss of women from these fields (Arnold, 1993; Betz, 1994; McCracken & Weitzman, 1997; Nauta et al., 1998; Packard, 2002; Seymour & Hewitt, 1997; Ware & Hill, 1988). From that perspective, women believe that professional and family roles are difficult to combine (Livingston & Burley, 1991) because the demands of a STEM career limit opportunities to fulfill family responsibilities (Nauta et al.).

Some researchers have found that women are less likely to major in science when family responsibilities and personal life are high priorities (Seymour & Hewitt, 1997; Ware & Lee, 1988). Miller and Silver (1992) documented similar findings in their evaluation of Eureka, a college mathematics/science intervention program for women. Eureka participants stated that they “did not want to become ‘super women’,... to sacrifice a part or all of their social life to the demands of a career in the sciences or in mathematics” (p. 25). Their anxiety about balancing career and family responsibilities led women to occupational choices in which they thought that this would be possible, mainly in the medical or health professions (i.e., pharmacist, radiologist, optometrist, nurse, teacher).

Women’s concerns about role conflict are justified and may be accurate because they, more than men, experience societal pressures when blending career and family responsibilities (Lips, 1992; Seymour & Hewitt, 1997). Furthermore, women in STEM careers are more likely than women in other professions to report that family responsibilities interfered with their work (Burlew & Johnson, 1992). Nauta and colleagues (1998) found that perceived role conflict was a predictor of and potential obstruction to women’s leadership aspirations within STEM professions. Contact with role models, however, positively affected women’s beliefs about the compatibility of a career and family life by providing evidence and examples of how dual roles might be possible.

Women are attracted to science when they perceive it as a vehicle for helping others (Astin & Astin, 1993; Vetter, 1996) or as focused on social concerns and issues of interdependence (Davis & Rosser, 1996; Hynes, 1995; Kahle, 1985; Mills, 1993; Rosser, 1993; Sax, 1994b). That finding may help explain why women so often choose careers in the biological and medical sciences. Opportunities to address social problems and provide assistance to others may be more apparent through work in the biological and medical sciences than in other STEM professions. Women may believe that their work in the biological and medical fields is more likely to bring with it the psychological rewards of contributing to society.

Role Models and Career Information

Because women are underrepresented in mathematics-and science-based professions, girls may have few opportunities to meet female role models and obtain information about the many career options available in these fields (Hill, Pettus, & Hedin, 1990; Schuck, 1998). Local occupational norms may affect students’ views and career goals (Ianni, 1989). On one hand, when girls observe that there are few women in engineering and physics-based occupations, they conclude that these fields are more appropriate for men than for women (Taber, 1992). On the other hand, however, exposure to female scientists improves adolescents’ attitudes toward science and women in science (Smith & Erb, 1986). Female role models also counter stereotypes by providing proof of possibilities for women (Byrne, 1993). Female and minority students who do not encounter diverse role models may develop the stereotypic view that mathematics and science are White male domains (Beane, 1985; Eisenhart, Finkel, & Marion, 1996; Malcolm, 1990). Furthermore, interactions with a scientist of one’s own race and gender can greatly affect students’ science-related career goals (Hill, Pettus, & Hedin, 1990).

Once women have entered STEM professions, positive role models seem to increase their self-efficacy expectations and reduce the effects of a perceived role conflict between their career and family responsibilities (Nauta et al., 1998). Role models provide less impact for women in the biological sciences, which are more “gender-balanced,” apparently because they acquire information and develop self-efficacy through other channels as well. Betz (1994) noted that women in the biological sciences receive many types of support and encouragement that help them assess their level of competency and build their confidence. Miller and Silver (1992) also found that anxiety about balancing a career and family responsibilities led many young women in their study to occupational choices in the medical or health professions in which they thought this would be possible. Women may believe that their work in the biological sciences will provide opportunities to address social concerns (Davis & Rosser, 1996; Hynes, 1995; Kahle, 1985; Mills, 1993; Rosser, 1993; Sax, 1994b) and to help others (Astin & Astin, 1993; Vetter, 1996). For many reasons, occupations in the biological sciences may seem more welcoming and appealing to women.

Women in other STEM careers may feel more isolated and receive little feedback or information for judging their performance and developing confidence in their abilities (Nauta et al., 1998; Stage & Maple, 1996). Contact with
female role models provides reassurance and confirmation that women can succeed in one's chosen profession. Nauta and colleagues (1998) suggested that positive role models may demonstrate ways to negotiate the professional environment as well as combine career and family responsibilities. Interaction with other women in the same college major or later on the job also may contribute to a normalization process, whereby young women recognize that they are not alone when they find that a course or situation is challenging or arduous (Nauta et al., 1992, Packard, 2002). Women are then less likely to attribute their difficulties to a lack of ability.

**Participation in Mathematics and Science Extracurricular Activities**

Although the course-taking patterns of males and females are similar, the extent to which they experience out-of-school mathematics and science-related activities is very different (Bunderson & Baird, 1994; Catsambis, 1995; Hanson, 1996; Kimball, 1989; Leder, 1990; NCES, 1997). Participation in extracurricular science activities positively affects students' attitudes toward science so that there is a much smaller decline in attitudes throughout the junior and senior high school years (Hofstein, 1990). By middle school, boys are more likely to have visited mathematics or science museums, participated in mathematics or science fairs or competitions, used a microscope or computer at home, and met a scientist (Hanson, 1996). Motivation to participate in those experiences may arise from boys' interest in mathematics and science, but the experiences also further increase the intrinsic and utility value of mathematics and science for them. In addition, students' exposure to applications of mathematics and science to authentic "real world" situations reinforces the mathematics and science concepts and principles that they learned at school and affects their career expectations (Leder, 1990; Vetter, 1996).

**Method**

The purpose of this longitudinal study was to examine the stability or changes in girls' educational and career aspirations from the junior to senior high school years and to identify factors that either contributed to or decreased their interests in mathematics- or science-based careers. Seventh-grade teachers each selected 5 girls to participate in the 1995 or 1996 career days and to become a part of the study on the basis of the girls' promise in mathematics and science, that is, their above-average achievement and interest in these career fields. Previous work (VanLeuven, 1999, 2001) has described survey findings collected at only one point several years after girls participated in the 1991 and 1992 career days, when they were seniors in high school. This article compares survey results collected at two points—during seventh grade and near graduation from high school—from the 1995 and 1996 career day partici-

pants. The same survey research model is being implement-
ed to trace the educational and career goals of another group of young women who attended week-long summer institutes from 1994 to 1996 (VanLeuven, 2002).

**Research Questions**

The primary goals of this study were to (a) describe and examine changes in girls' degree-level expectations and career aspirations from the junior to senior high school years and (b) identify factors that either contributed to or decreased their interests in mathematics- or science-based careers. Specific research questions included:

1. What are the degree-level expectations of these girls (career day participants) in seventh grade and near graduation from high school? Do their degree-level expectations change significantly from junior to senior high school?
2. How do the participants' degree-level expectations compare with those of other college-bound seniors?
3. Do the participants' indicate different levels of interest in mathematics-based and science-based careers, that is, do they prefer science-based versus mathematics-based careers when they are in junior high school or in senior high school? Do the participants' levels of interest in mathematics-based and science-based careers change significantly from junior to senior high school?
4. What are the career preferences of career day participants in seventh grade and near graduation from high school? Do their career preferences change significantly from junior to senior high school?
5. What characteristics of mathematics-based and science-based careers do participants report as desirable and undesirable as seventh graders and when they are near graduation from high school? Are there significant differences in the desirable and undesirable characteristics identified by young women with mathematics or science career preferences versus those without mathematics or science career preferences? Do the identified characteristics change from junior to senior high school?

This work was initiated to more fully discern why some young women are attracted to STEM careers and others turn away from those occupations. The career day program provided access to a group of young women who indicated interest in mathematics and science-based careers. I hoped to document whether and why those interests were or were not sustained over time.

**Participants**

The participants in this study were 66 young women from two cohorts of seventh graders who had attended the 1995 and 1996 career days at a local university campus. The career day was designed to encourage girls' interest in mathematics- and science-based occupations through workshops and a panel discussion conducted by female role
models. The female presenters provided career information and illustrated applications of mathematics and science to their work by emphasizing the pivotal nature of mathematics and science education for entry into the STEM professions. The career day specifically targets seventh-grade girls because educators want to promote their feelings of competency and expectations of success in mathematics and science at a time when their confidence may start to decline (Byrne & Shavelson, 1987; Marsh et al., 1985). Interactions with female scientists positively affect adolescents' attitudes toward science and women scientists (Smith & Erb, 1986). Seventh grade is also the point at which students make important decisions about future mathematics and science courses that may enhance or limit the options open to them. Exposure to female role models from varied science- and mathematics-based professions may expand girls' visions of what is possible for them.

The career day participants represented many different school districts in Delaware, Chester, and Philadelphia counties, the southeastern region of Pennsylvania. Five students from each school had been selected by their seventh-grade teachers to attend the career day because they had demonstrated potential, that is, above-average achievement and/or interest in mathematics- and science-based fields. Teachers were specifically advised not to select girls who were considered to be the best or highest achieving mathematics or science students because we wanted to support girls who could most benefit from the program.

Although follow-up surveys were mailed to all girls in the 1995 and 1996 cohorts, only a small percentage completed the high school survey. In the 4 to 5 years that had passed from junior to senior high school, many students had relocated, as indicated by "return to sender" written on the survey envelopes. The 66 respondents who returned the follow-up high school survey, participants in the current study, comprised 17% of the 391 girls who attended the career days in 1995 and 1996 and completed the initial survey. The 66 girls were from several different school districts in southeastern Pennsylvania. Like the original cohort of 391 girls, they had been selected as seventh graders to attend the career day because they had demonstrated above-average achievement in mathematics and science, and their teacher wanted to encourage their interests through exposure to role models in these fields. At the time of the follow-up survey, most of the girls were seniors in high school (51 or 77%). In addition, 6 were juniors (9%) and 9 were college freshmen (13.6%).

**Instrumentation and Procedures**

I developed a survey questionnaire by using guidelines for evaluating mathematics and science programs for women established by Davis and Humphreys (1985), with subsequent review and consultation with Dr. Patricia Campbell, an expert in the evaluation of mathematics and science intervention programs for young women. Copies of the junior and senior high school surveys are provided in the Appendix. Students' responses were entered as ordinal ranks or nominal codes when categories of like responses emerged. A test of intrarater agreement of coded responses over the survey yielded 85.3% agreement. Test–retest reliability measures resulted in \( r = .857 \) for the entire survey, with comparable results for specific sections, that is, \( r = 0.828 \) for degree expectations, \( r = .735 \) for level of interest in mathematics- and science-based fields, \( r = .8789 \) for career preferences and influences on career choice.

Seventh-grade girls completed the initial survey before they attended the career day, and the follow-up high school survey was completed when the girls were close to graduation from high school. The surveys were nearly parallel, with three exceptions: (a) the follow-up survey asked participants to report the mathematics and science courses that they had completed versus those projected for completion when the students were in seventh grade; (b) the follow-up survey also included retrospective questions about the nature and effectiveness of the career day events for consideration in improving and revising the program; and (c) on the follow-up survey, students were asked to list the colleges where they had applied or were attending.

This article focuses on responses to the three specific sections of the survey. The first section that was analyzed in this study centers on participants' degree-level goals—associate, baccalaureate, master's, or doctoral degree. The second relevant section addressed the participants' levels of interest in mathematics- and science-based careers and aspects of such careers that they liked most and least. The third section of the survey pertinent to this study was the participants' listings of their three actual career preferences.

**Analysis of degree expectations.** To test for significance of difference in degree goals, I assigned ranks to students' degree expectations on the basis of level of educational goal (0 = no degree, 1 = associate degree, 2 = bachelor's degree, 3 = master's degree, 4 = doctoral degree). I performed the McNemar Test for Significance of Change to compare the number of girls with higher versus lower degree expectations on the follow-up senior survey. Students' degree goals were then collapsed into two categories, undergraduate versus graduate degree expectations. A McNemar Test for Significance of Change in degree expectations from junior to senior high school was completed for students who set higher goals, from undergraduate to graduate degree, versus students with lower goals, from a graduate to an undergraduate degree.

**Level of interest in mathematics- and science-based careers.** Students' expressed levels of interest in mathematics- and science-based careers were assigned rankings (3 = high, 2 = moderate, 1 = low, 0 = no interest). I performed separate \( z \) tests of difference in the proportion of girls with higher versus lower science career interest versus mathematics career interest for seventh-grade responses and senior high school survey responses to determine whether an observed preference for science-based or
mathematics-based careers was significant at either time. I performed McNemar Tests for Significance of Change from seventh grade to senior high school separately for science career interest and then mathematics career interest to determine whether there was a significant difference in girls' level of interest in either of these fields over time.

Analysis of career preferences. From the girls' listed career preferences, types of responses were grouped to form categories, for example, health professions (medicine, occupational or physical therapy, nursing, dietician, etc.), biology, veterinary medicine, chemistry, engineering, computer science and technology, mathematics, nonmathematics, and science. McNemar Tests for Significance of Change in individual career preferences from seventh grade to senior high school were performed for each career category, that is, sciences, health professions, mathematics, and nonmathematics, and science so I could determine whether there were significant differences over time.

Desirable and undesirable characteristics of mathematics and science careers. In the free-response segment of the survey, students described what they would like (desirable characteristics) and would not like (undesirable characteristics) about mathematics- or science-based careers. I grouped and categorized similar responses to determine common features of these careers that were perceived as desirable versus undesirable. The categories have been developed from responses from the three data sets, the current study, the 1991–1992-career day cohort (VanLeuven, 2001), and the summer institute respondents (VanLeuven, 2002). The specific categories and examples are described in the following Research Findings section. A test of intrarater agreement of coded responses in which I used those categories yielded 85.3% agreement.

I conducted McNemar Tests of Significance of Difference from junior to senior high school on the frequencies of each category of desirable and undesirable characteristics to determine whether there was a significant difference over time. Tests of Independence of responses for students with STEM career preferences versus those without STEM career preferences were performed for the 7th-grade and high school data sets. Subsequent Tests of Independence of STEM and non-STEM responses at 7th and 12th grades were performed for each category of characteristic to detect changes over time.

Research Findings

When I tracked girls' aspirations from junior to senior high school, I found significant differences in their educational and career goals. At the junior and senior high school level, the girls had set ambitious degree expectations compared with their college-bound peers, both nationally and in Pennsylvania. There were statistically significant differences in degree expectations over time; more students lowered their goals from a graduate to an undergraduate degree. There also was a statistically significant decrease of interest in science and mathematics careers from 7th to 12th grade. A larger proportion of girls reported a strong interest in science versus mathematics, with differences approaching statistical significance. Over time, the number of students who reported each type of mathematics/science career preference decreased, with statistically significant differences found in the sciences and health/medical professions in particular, and many more students reported nonmathematics/science occupation goals as seniors.

The mathematics required for mathematics and science careers was prominent when students reported what they would and would not like about mathematics/science occupations. When the girls described desirable characteristics of mathematics/science careers, they most often mentioned (a) learning or discovery involved, (b) enjoyment or intrinsic interest, and (c) use of mathematics in their work. Statistically significant differences were found for the desirable characteristics identified by seniors with STEM-based versus those with non-STEM-based career goals. More seniors with STEM occupation goals reported that they would like to use mathematics in their job, whereas more seniors with non-STEM goals offered no response. At seventh grade, more girls with STEM versus non-STEM job preferences reported that they would like the learning and discovery aspects of this work, and the difference approached statistical significance.

As they explained what they would not like about a STEM career, young women most often reported (a) doing the mathematics, (b) the hard work required, and (c) their lack of interest or enjoyment of work in these fields. There were no statistically significant differences in the characteristics identified as undesirable by students with STEM versus without STEM career preferences. Statistically significant differences from 7th to 12th grade were found for (a) death of a patient, reported only in 7th grade and (b) isolation or lack of personal contact, described solely by seniors.

Degree-Level Goals

Study respondents (N = 66) reported their educational and career goals in the spring of seventh grade and 4 to 5 years later when they were juniors or seniors in high school. Table 1 contains the number and percentage of girls who reported specific types of degree-level goals on the junior high versus high school survey. As high school graduation and college approached, many students were ambitious: Of the 66 students, 56% reported that they expected to earn a graduate degree, 47% a master's degree, and 23% a form of doctoral degree (PhD or MD). A much higher percentage of respondents aimed to complete a master's degree compared with college-bound seniors in 1998, 1999, and 2000, nationally (31%) and in Pennsylvania (26% to 27%), according to the Educational Testing Service (ETS, 1999) and The College Board (2002). The percentage of career day students who had set the highest goals of completing a doctoral degree was comparable to the proportion
### TABLE 1. Young Women’s Higher Education Degree-Level Goals

<table>
<thead>
<tr>
<th>Time of survey</th>
<th>No response</th>
<th>None</th>
<th>Associate</th>
<th>Bachelor’s</th>
<th>Master’s</th>
<th>Doctoral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seventh grade</td>
<td>3</td>
<td>4.5</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>High school senior</td>
<td>1</td>
<td>1.5</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1.5</td>
</tr>
</tbody>
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Note. The McNemar Test of Significance of Change indicated a statistically significant difference in the number of students with higher (12 students) versus lower (26 students) degree goals from seventh grade to senior high school: $\chi^2(1, N = 63) = 5.158 > \chi^2(1, N = 63) = 3.841, p < .05$. A z Test of Significance of Differences in proportions corroborated these results: $z = 2.271 > 1.96 (p < .05)$. The McNemar Test for Significance of Change yielded a statistically significant change to higher expectations (graduate to undergraduate degree goals for 4 students) versus lower expectations (graduate to undergraduate degree goals for 15 students) from seventh grade to senior high school: $\chi^2(1, N = 63) = 6.37 > \chi^2(1, N = 63) = 3.84, p < .05$.

of college-bound seniors nationally (22% to 24%), but exceeded that for Pennsylvania (16% to 17%), according to ETS and The College Board (2002; see Table 1).

Individual comparisons from seventh grade to senior high school indicated that 12 students had higher expectations and 26 had lower expectations, whereas the degree goals of 25 students were unchanged. Three girls offered no response as seventh graders, so no comparison was made for them. Students’ degree-level expectations were assigned to ordinal ranks, and the McNemar Test of Significance of Change was performed. A significant difference in the number of girls with higher versus lower degree expectations was found from seventh grade to senior high school, as indicated in Table 1. Because the number of participants exceeded 25, I calculated a z test of differences in proportions as $z = 2.271$, greater than the critical value of $z = 1.96$, corroborating the McNemar test results.

Students’ degree goals were then collapsed into two categories, undergraduate versus graduate-degree expectations. Comparisons yielded 19 students who had changed degree goals from seventh grade to senior high school. A McNemar Test indicated a significant difference in the number of students whose goals were higher, from undergraduate to graduate degree for 4 students, versus those with lower goals, 15 students who changed from graduate- to undergraduate-degree goals.

#### Level of Interest in Mathematics- and Science-Based Careers

In the survey, students indicated their level of interest in mathematics-based and science-based career areas as very strong, moderate, or weak. In the junior high and senior high school, a larger proportion of girls expressed a high level of interest in science (50% at junior high, 35% at senior high school) versus mathematics (29% at junior high, 12% at senior high). Students’ expressed levels of interest were assigned ranks, and z tests of difference in the proportion of girls with very strong science career interests versus those with very strong mathematics career interest were performed separately for the seventh grade and senior high school responses (see Table 2). In seventh grade, the differences in science and mathematics career interest levels approached statistical significance ($z = 1.715 < z = 1.96, p < .05$), as 29 girls expressed the same level of interest, whereas 22 girls reported a higher interest and 12 girls reported a lower interest in science versus mathematics careers. In senior high school, the z test of differences in the proportion of girls with different levels of interest also approached statistical significance ($z = 1.622 < z = 1.96, p < .05$), as 25 girls expressed the same level of interest, whereas 24 girls reported a higher interest, and 14 girls reported a lower interest in science versus mathematics-based careers.

How had girls’ levels of interest changed from seventh grade to senior high school? By using the assigned ranks for level of interest, I examined changes in individual students’ reported interests from seventh grade to senior high school separately for mathematics- and science-based careers. Interest in mathematics careers changed for 41 students; 30 girls expressed lower levels, and 11 girls expressed higher levels of interest. Level of science career interest changed for 41 girls as well; 33 girls reported lower levels, and 8 girls reported higher levels of interest. The McNemar Tests of Significance of Change indicated that there were statistically significant decreases in levels of interest for mathematics-based and science-based careers, with proportionally more students reporting lower interest levels in high school versus seventh grade (see Table 2).

#### Girls’ Specific Career Goals

Students’ career goals were consistent with their educational expectations. Study respondents were asked to list three jobs that they would like to have when they are 25 years old, and to rate their interest as high, moderate, or weak. The most popular career area reported was the sciences and health professions—76 instances in seventh grade and 28 instances in senior high school (see Table 3).
TABLE 2. Young Women’s Higher Level of Interest in Mathematics-Based and Science-Based Careers

<table>
<thead>
<tr>
<th>Time of survey</th>
<th>Mathematics based</th>
<th>Science based</th>
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<tbody>
<tr>
<td></td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Seventh grade</td>
<td>19</td>
<td>38</td>
</tr>
<tr>
<td>High school senior</td>
<td>8</td>
<td>31</td>
</tr>
</tbody>
</table>

Note: The z Tests of Significance of Differences in proportions of girls with higher versus those with lower interest in science careers, when compared with mathematics careers, approached statistical significance in seventh grade (z = 1.715 < 1.96, p < .05) and high school (z = 1.622 < 1.96, p < .05).

McNemar Tests of Significance of Change from seventh grade to high school indicated a statistically significant difference in the number of students with higher versus lower science career interest, $\chi^2(1, N = 63) = 15.244 > \chi^2(1, N = 63) = 3.841$, $p < .05$ and mathematics career interest, $\chi^2(1, N = 63) = 8.805 > \chi^2(1, N = 63) = 3.841$, $p < .05$.

TABLE 3. Categories of Young Women’s Three Career Preferences

<table>
<thead>
<tr>
<th>Career preference</th>
<th>Seventh grade</th>
<th></th>
<th></th>
<th>Senior high school</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Moderate</td>
<td>Total</td>
<td>High</td>
<td>Moderate</td>
<td>Total</td>
</tr>
<tr>
<td>Sciences and medicine</td>
<td>47</td>
<td>29</td>
<td>76</td>
<td>19</td>
<td>9</td>
<td>28</td>
</tr>
<tr>
<td>Health professions</td>
<td>29</td>
<td>13</td>
<td>42</td>
<td>13</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Physician</td>
<td>17</td>
<td>7</td>
<td>24</td>
<td>8</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Sciences</td>
<td>18</td>
<td>16</td>
<td>34</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Veterinarian</td>
<td>6</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Biology</td>
<td>8</td>
<td>9</td>
<td>17</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics and applied mathematics</td>
<td>4</td>
<td>7</td>
<td>11</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Engineering</td>
<td>4</td>
<td>5</td>
<td>9</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Computer science</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>All mathematics/science careers</td>
<td></td>
<td></td>
<td>101</td>
<td></td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>No mathematics/science careers</td>
<td></td>
<td></td>
<td>9</td>
<td></td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Note: McNemar Test of Significance of Change from seventh grade to senior high school in girls’ career goals in science, health professions, and non-science/engineering/mathematics careers yielded statistically significant differences for the sciences, $\chi^2(1, N = 52) = 19.88$, health professions, $\chi^2(1, N = 37) = 12.57$, non-STEM careers, $\chi^2(1, N = 25) = 9.8 > \chi^2(1, N = 25) = 3.84$, $p < .05$.

Within the sciences, the health professions were the largest career category, constituting 55% and 71% of science career listings at junior high and senior high school, respectively. The health professions represented 42% and 41%, respectively, of all mathematics- and science-based preferences in junior and senior high school. Physician was the most frequently listed individual occupation, accounting for 32% and 36% of science career listings in the junior and senior high school surveys. Preferences for jobs in mathematics, engineering, and computer science were consistently much lower, and represented from 5% to 14% of the total combined STEM career preferences. Nine girls in seventh grade and 18 girls in senior high school listed only career preferences that were not mathematics based or science based. In addition, 5 seventh-grade girls and 6 high school girls did not list any career preferences.

When one examines girls’ career preferences listed in Table 3, it is apparent that there was a decline in the number of STEM preferences from seventh grade to senior high school. The exception was computer science, where there was an increase from 5 girls in seventh grade to 7 girls in senior high school. McNemar Tests for Significance of Change in career preferences from junior to senior high school were performed for each career category—sciences, health sciences, mathematics, and non-STEM careers. A statistically significant difference was found for the sciences, health professions, and the collapsed category of non-STEM careers.
### TABLE 4. What Young Women Liked Most About Mathematics-/Science-Based Careers (in Grades 7 and 12)

<table>
<thead>
<tr>
<th>Career preference</th>
<th>Learning/discovery</th>
<th>Enjoy/interest</th>
<th>Using mathematics</th>
<th>Helping people</th>
<th>Salary</th>
<th>Challenge</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
</tr>
<tr>
<td>Mathematics/science</td>
<td>13 10</td>
<td>8 6</td>
<td>6 8</td>
<td>6 4</td>
<td>4 0</td>
<td>5 1</td>
<td>2 1</td>
</tr>
<tr>
<td>Nonmathematics/science</td>
<td>0 3</td>
<td>1 3</td>
<td>1 2</td>
<td>0 0</td>
<td>4 0</td>
<td>0 2</td>
<td>4 1</td>
</tr>
<tr>
<td>Subtotal</td>
<td>13 13</td>
<td>9 9</td>
<td>7 10</td>
<td>6 4</td>
<td>8 0</td>
<td>5 3</td>
<td>6 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Science work</th>
<th>Problem solving</th>
<th>Good grades</th>
<th>Technology</th>
<th>Health science</th>
<th>Apply results</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
</tr>
<tr>
<td>Mathematics/science</td>
<td>3 3</td>
<td>3 3</td>
<td>1 4</td>
<td>2 1</td>
<td>1 3</td>
<td>0 1</td>
<td>10 3</td>
</tr>
<tr>
<td>Nonmathematics/science</td>
<td>0 1</td>
<td>0 1</td>
<td>1 0</td>
<td>1 0</td>
<td>0 0</td>
<td>0 2</td>
<td>3 13</td>
</tr>
<tr>
<td>Subtotal</td>
<td>3 4</td>
<td>3 4</td>
<td>2 4</td>
<td>3 1</td>
<td>1 3</td>
<td>0 3</td>
<td>13 16</td>
</tr>
</tbody>
</table>

Note. McNemar Tests of Significance of Difference from seventh grade to senior high school yielded a statistically significant difference for salary, \( \chi^2(1, N = 66) = 8 > \chi^2(1, N = 66) = 3.84, p < .05 \). Tests of Independence for the constellation of desirable characteristics identified by science/engineering/mathematics and non-STEM students yielded statistically significant results at seventh grade, \( \chi^2(1, N = 67) = 19.76 > \chi^2(1, N = 67) = 14.07, p < .05 \), and 12th grades, \( \chi^2(1, N = 66) = 27.208 > \chi^2(1, N = 66) = 15.51, p < .05 \). Tests of Independence of STEM versus non-STEM students who reported each characteristic at the seventh and 12th grades yielded statistically significant differences in 12th grade for "no response," \( \chi^2(1, N = 66) = 51.423 > \chi^2(1, N = 66) = 3.84, p < .05 \). Nearly significant differences occurred for learning and discovery at seventh grade, \( \chi^2(1, N = 66) = 3.589 < \chi^2(1, N = 66) = 3.841, p < .05 \).

Many more female students listed a science occupation only as seventh graders (20 girls) versus solely when they were in senior high school (3 girls). That finding also was true for the health professions, including 30 solo listings in seventh grade and four listings in senior high school. In senior high school, female students were more likely to no longer list the sciences, and health professions in particular, than they were to add them to their list of career preferences. However, 18 girls listed science occupations in junior and senior high school; 14 girls listed the health professions at both times. Conversely, female students were more likely to list only non-STEM occupational goals in senior high school (18 girls) than to do so in seventh grade (9 girls).

**Desirable Characteristics of Mathematics- and Science-Based Careers**

In the free-response segment of the survey, participants described what they would like (desirable characteristics) and not like (undesirable characteristics) about mathematics-or science-based careers (see Table 4). I categorized similar responses to determine common features of STEM careers that were perceived as desirable versus undesirable. Thirteen categories or types of favorable characteristics emerged; 13 participants offered no response as seventh graders, and 16 participants did so in high school. The most frequent category of response (20%) given by 13 girls in both surveys described the learning or discovery involved in such work. Examples of responses included "discoveries we make" and "learning new things everyday." Intrinsic motives and interests formed the second-largest type of response reported by students who described mathematics/science careers as enjoyable, fun, or interesting; these responses were given by 9 (14%) seventh-grade girls and 8 (12%) high school girls. Nearly the same number of girls (11% of seventh graders and 15% of seniors) reported that they would like doing the mathematics needed for STEM careers. Typical responses included, "Use of logical numbers and equations," "You work with numbers," and "I truly enjoy working with numbers." Six 7th-grade girls (9%) and 4 senior girls (6%) liked the fact that they would be helping their patients. Eight 7th-grade girls (12%) said that they would most like the salary that they would earn, but salary did not appear on any high school surveys. Other positive characteristics reported were (a) the challenge of the work, (b) the many job opportunities and options available in the STEM fields, (c) working in the sciences, (d) problem solving, (e) getting good grades in mathematics and/or science, (f) using computer technology, and (g) seeing the results of work actually applied.
TABLE 5. What Young Women Liked Least About Mathematics-/Science-Based Careers (in Grades 7 and 12)

<table>
<thead>
<tr>
<th>Career preference</th>
<th>Doing mathematics</th>
<th>Hard work</th>
<th>Lack interest</th>
<th>Science</th>
<th>Years of study</th>
<th>Hours of work</th>
<th>No contact/isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics/</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
<td>7 12</td>
</tr>
<tr>
<td>science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonmathematics/</td>
<td>3 8</td>
<td>0 1</td>
<td>1 5</td>
<td>1 3</td>
<td>0 2</td>
<td>1 0</td>
<td>0 1</td>
</tr>
<tr>
<td>science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>10 12</td>
<td>10 6</td>
<td>4 11</td>
<td>3 5</td>
<td>5 4</td>
<td>5 1</td>
<td>0 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lack of knowledge</th>
<th>7 12</th>
<th>7 12</th>
<th>7 12</th>
<th>7 12</th>
<th>7 12</th>
<th>7 12</th>
<th>7 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of creativity</td>
<td>0 1</td>
<td>0 2</td>
<td>1 0</td>
<td>0 0</td>
<td>0 2</td>
<td>4 13</td>
<td></td>
</tr>
<tr>
<td>Nothing</td>
<td>3 1</td>
<td>4 0</td>
<td>5 5</td>
<td>0 0</td>
<td>5 4</td>
<td>5 7</td>
<td>17 22</td>
</tr>
<tr>
<td>Death of patient</td>
<td>4 0</td>
<td>5 5</td>
<td>13 9</td>
<td>4 13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>17 22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. McNemar Tests of Significance of Difference from seventh grade to senior high school yielded statistically significant results for “death of a patient,” \( \chi^2(1, N = 66) = 4 > \chi^2(1, N = 66) = 3.841, p < .05 \), and “no contact/isolation,” \( \chi^2(1, N = 66) = 4 > \chi^2(1, N = 66) = 3.841, p < .05 \). Nearly significant differences occurred for lack of interest/dull, boring, \( \chi^2(1, N = 66) = 3.760 < \chi^2(1, N = 66) = 3.841, p < .05 \).

Tests of Independence for the constellation of negative characteristics identified by science/engineering/mathematics and non-STEM students yielded no statistically significant results at either seventh grade, \( \chi^2(10, N = 69) = 13.008 < \chi^2(10, N = 69) = 18.307, p < .05 \), or high school, \( \chi^2(8, N = 73) = 7.534 < \chi^2(8, N = 73) = 15.507, p < .05 \).

There was a difference in the frequencies of reported desirable characteristics over time. McNemar Tests of Significance of Difference from seventh grade to senior high school were performed for each category of response. A statistically significant difference was found for the category salary, which was reported only by seventh graders. Next, the set of positive characteristics identified by students who had expressed STEM career preferences were compared with those of students without such career goals (non-STEM). Students with STEM career goals listed learning and discovery, using mathematics, and helping people as positive characteristics, whereas these categories were rarely mentioned by non-STEM students. Interest and enjoyment formed a category of responses for both groups, but less often for non-STEM students. There was a noticeable difference on the high school surveys in the number of non-STEM students (13) who offered no response versus STEM students (3) who did respond.

Tests of Independence for the constellation of characteristics identified by STEM versus non-STEM students were performed and yielded statistically significant results at seventh grade and at senior high school. Additional separate Tests of Independence of STEM and non-STEM responses were completed for each characteristic at both seventh grade and senior high school. I found a statistically significant difference in STEM versus non-STEM senior responses for the no-responses category. Nearly significant differences in STEM versus non-STEM seventh-grade responses occurred for learning and discovery.

Participants also reported what they did not like about mathematics- and science-based careers. Table 5 shows that 10 categories of undesirable descriptors emerged, but several participants offered no response as seventh graders (17) and high school students (22). The reported undesirable characteristics represented the views of two thirds of the girls as seniors in high school. Of the one third who did not respond, 9 girls indicated STEM career preferences, whereas 13 girls did not report any STEM career aspirations. It is not apparent why those students offered no response. Perhaps they had not considered, could not articulate, or were unwilling to share their views about the negative aspects of science- and mathematics-based fields.

The largest category of undesirable characteristics involved students’ negative views of the mathematics involved in such occupations—10 girls (15%) in seventh grade and 12 girls (18%) on the senior high school survey. Those responses included “having to work with so many numbers” and “working with all those numbers.” The second-largest category described the hard work thought to be required in STEM careers—10 girls (15%) at 7th grade and 6 girls (9%) at 12th grade. Other students listed the long hours of work that they perceived to be part of STEM
occupations—5 girls (7.5%) at 7th grade and 1 girl (1.5%) at 12th grade.

Another group noted the extensive years of study that they thought would be required for such careers—5 girls at 7th grade (7.6%) and 4 girls at 12th grade (6%). More high school girls (11) versus 7th graders (4) indicated that they were not interested or would not enjoy STEM careers. Some of those responses included descriptors of that work as boring, dull, or monotonous. Three 7th-grade girls and 5 high school girls stated that they would not like doing or using science in particular. Other types of negative descriptions included: (a) perceived lack of creativity, (b) lack of research or knowledge needed for work, (c) dealing with the death of a patient, and (d) lack of contact with people.

McNemar Tests for Significance of Differences from seventh grade to high school were performed for each category of negative characteristics. Statistically significant results were found for death of a patient and lack of personal contact. Tests of Independence were conducted for the constellation of negative characteristics identified by STEM versus non-STEM students at seventh grade and then at senior high school. The results indicated no significant difference in the characteristics reported as undesirable by STEM versus non-STEM students at the time of either survey.

Discussion

Over time, there seemed to be a decrease in girls' degree-level goals and their interest in mathematics-based and science-based careers. The findings of the present study must be considered as speculative, and in need of further corroboration as additional cohorts of career day participants are added to the database. As such, the results will be compared with the work of others as well as my previous research tracking the academic and career aspirations of two other groups of young women. The two groups included 34 participants in a week-long summer institute conducted in 1994 to 1996 (VanLeuven, 2002) and 85 participants in the 1991 and 1992 career days who completed only the high school survey (VanLeuven, 2001). All three data sets represent the views of a group of young women in southeastern Pennsylvania and cannot be generalized to all students in that region or the state.

Degree Expectations

The group of young women in this study had very high degree expectations that exceeded their peers, both nationally and in Pennsylvania. Comparable and even higher degree goals were found for the summer institute (50% indicating MA/MS degree and 35% a PhD; VanLeuven, 2002) and 1991–1992 cohorts of career day respondents (28% indicating MA/MS; 46% PhD or MD; VanLeuven, 2001). However, Holland and Eisenhart (1990) and Miller and Silver (1992) noted that there were indicators that academic goals of the young women had been lowered over time, as significantly more of them changed from graduate to undergraduate degree expectations compared with those who elevated their goals from an undergraduate to a graduate degree. Contrary results were found for summer institute respondents; significantly more seniors reported higher versus lower degree aspirations over time (VanLeuven, 2002). I have planned further communication with those young women, into their college years and beyond, to document whether their degree aspirations are realized. I also will conduct follow-up interviews to better ascertain factors that contributed to or inhibited fulfillment of their goals. For example, Marini's work (1984) indicated that women who marry or become parents before the age of 22 are less likely to complete a bachelor's degree.

Perceptions of STEM Careers

Positive views of mathematics applications to work. Examination of the attributes that the study participants reported as desirable versus undesirable may indicate why some were drawn toward STEM careers and others were not. For this group of participants, the mathematics that they viewed as integral to STEM careers seemed to influence their characterizations of work in these fields as desirable in some cases and undesirable in others. Using mathematics on the job was the second-largest category of desirable characteristics of a STEM career, reported by more seniors with STEM (8 students) versus non-STEM (2 students) occupation goals. The positive view of mathematics applied to work was nearly unique to the young women in the study, as a mere 2% of the 1991–1992 career day cohort (VanLeuven, 2001) and not one of the summer institute respondents (VanLeuven, 2002) offered that perspective.

Of the 10 seniors who described mathematics applications as what they liked most about an STEM career, 5 reported very strong interests in STEM fields. Four students expressed a very strong interest in mathematics-based careers in particular—2 students sustained this level and 2 students reported an increase from a moderate interest in seventh grade. Conversely, 2 young women had a decreased interest from very strong to moderate levels, whereas an additional student sustained a moderate interest in mathematics-based occupations. Hence, 7 of the 10 seniors reported very strong or moderate levels of interest in mathematics-based jobs, whereas interest declined to very weak for 3 students, 2 of whom had reported only non-STEM career goals. Although a 3rd young woman indicated the same decreased interest in mathematics-based occupations, she maintained a high level of interest in the sciences, expressing a very strong desire to teach physics and a moderate interest in engineering. That student's career goals are congruent with an appreciation of mathematics applications to work, as mathematics competence is essential to work in physics and engineering.

When I examined interest in science-based fields for the 10 students, 5 of them indicated very strong (2 seniors) or
moderate (3 seniors) levels, whereas the other 5 seniors reported very weak or no interest. One young woman who had maintained a very strong interest in a mathematics-based career also indicated an increased interest in science-based fields, changing from moderate to very strong interest at the end of high school. As described previously, another student had maintained a very strong interest in science-based occupations over time. Interest in science-based jobs had decreased from very strong to moderate for 2 students, whereas another senior had maintained a moderate level of interest. Of the 5 students who reported a lower level of interest in mathematics-based jobs, 3 of them indicated similar decreased interest and 1 student maintained very weak interest in science-based fields from junior to senior high school. Students' positive characterizations of the mathematics applied to STEM fields was not necessarily accompanied by high levels of or increased interest in STEM career options.

Negative views of mathematics applications to work. Using mathematics on the job also formed the largest category of reported undesirable characteristics of STEM professions, with no significant differences between young women with (4) versus without (8) mathematics- or science-based aspirations. None of the 12 students expressed a higher level of interest in STEM fields from junior to senior high school, but 2 students maintained very strong interest in mathematics-based careers, and 5 students maintained very strong interest in the science-based occupations. Six seniors indicated a lower level of interest in mathematics-based occupations and 5 students had decreased interest in science-based careers. Use of mathematics at work also constituted the largest category of negative descriptors among summer institute respondents (21%; VanLeuven, 2002), but a smaller representation (4%) was found for the 1991–1992 cohort (VanLeuven, 2001).

Four of the 12 students who indicated that they would not like the mathematics aspect of STEM work still reported a preference for such professions. One young woman who hoped to be a physics teacher stated that she was "not good at math"; an aspiring physician saw mathematics as "dull" and "repetitive." However, it seemed that such negative views of the mathematics did not interfere with the students' career goals.

Although the data are informative and help one to understand why some young women turned away from STEM careers, they provide an incomplete picture. One third of the respondents and more than half of the 24 students with non-STEM occupational goals did not report what they would not like about a STEM career. A more complete set of data, supported by interviews across all respondents, would strengthen confidence in formulating the interpretation that a moderate number of young women in this study viewed mathematics as an obstacle to seeking a STEM career.

Through follow-up interviews, one might better understand the aspects of mathematics work applications that young women perceive as undesirable. One also might ascertain whether students have accurate perceptions of the mathematics used in specific STEM professions. Such research might suggest specific intervention strategies, such as shadowing a STEM professional to observe the type of tasks required, with special attention to the mathematics used. Future work might explore specifically how and when girls' interest in STEM careers is affected by their perceptions of the ways that mathematics is used in those careers. Are young women attracted to specific careers because they believe those professions require less or different types of mathematics competency? Examination of those issues was not possible or feasible with the present survey data.

Positive descriptors of STEM careers. Among the young women in this study, those with STEM career goals more often described as desirable (a) learning and discovery involved (20%), (b) interest in and enjoyment of the subjects (12%), and (c) use of mathematics (15%). (Mathematical applications were discussed previously.) Those results are consistent with previous work. Learning and discovering formed the largest category of positive descriptors for the 1991–1992 cohorts (26%; VanLeuven, 2001) and the second largest for summer institute respondents (18%), following the challenge or type of thinking required for STEM occupations (26%; VanLeuven, 2002).

Nine students reported their interest in STEM careers, which formed the third-largest category of positive descriptors in the present study, the second-largest category for the 1991–1992 cohort (21%; VanLeuven, 2001) and a smaller proportion for summer institute respondents (9%; VanLeuven, 2002). Two of the 9 students stated that they would enjoy or find STEM careers interesting. For others, interest or enjoyment was linked to a specific domain. Four students indicated their enjoyment of mathematics, for example, "Math is a subject I've always liked." Three students mentioned their interests in the sciences, for example, "Science is fascinating." Jacobs and colleagues (1998) reported a similar relationship between rural adolescent girls' career goals and their intrinsic interests in science.

Some researchers have suggested that women are more likely to choose STEM careers when they believe that their work will contribute to the solution of societal problems (Davis & Rosser, 1996; Hynes, 1995; Kahle, 1985; Mills, 1993; Rosser, 1993; Sax, 1994b) and/or help people (Astin & Astin, 1993; Vetter, 1996). A few young women (6%) in the present study seemed to share that view because they stated that they would like a STEM career given that they would be helping others. A higher percentage of the 1991–1992 cohort (8%; VanLeuven, 2001) and summer institute respondents (15%; VanLeuven, 2002) reported helping others as a desirable characteristic of STEM professions.

Negative descriptors of STEM careers. When reporting what they would not like about a STEM occupation, students did not describe these careers as male domains, inappropriate for women, or unfeminine. The largest category of undesirable characteristics, using mathematics,
was discussed previously. A lack of interest formed the second-largest category of negative descriptors for STEM fields (15%), following the mathematics used (18%). A nearly comparable percentage of the 1991–1992 cohort (16%) and the summer institute respondents (12%) specifically reported a lack of interest as an undesirable characteristic of STEM careers. Some of those responses included descriptors of STEM careers as boring, dull, or monotonous, reported by 12% of the young women, including 11% of the 1991–1992 cohort and 12% of summer institute respondents. From junior to senior high school, significant differences in interest level were found; many more students reported a lower versus higher interest in STEM occupations. Other researchers have found that students are more likely to report that their interest in another major or peer pressure are reasons for leaving STEM majors (Seymour, 1995; Vetter, 1996).

Very few young women in this study reported the remaining categories of negative descriptors (1.5% to 9%), but some appeared in previous research. A few students (8%) stated that they would not like using science as a STEM career, and similar comments were found for only 4% of the 1991–1992 cohort. That was seemingly not a major concern because there were significantly more seniors with a higher versus lower interest in science-based versus a mathematics-based career.

Seven seniors (11%) who had expressed STEM career goals were concerned about the hard work or long hours that they associated with such occupations. Similar percentages of the 1991–1992 cohort (9%) and summer institute respondents (12%) stated similar concerns when they described what they would not like about a STEM career. Another 6% of seniors in the study stated that they would not like the years of schooling required for STEM occupations; 7% of the 1991–1992 cohort also offered this response, but none of the summer institute respondents did so. Although some young women in this study had a negative view of the challenging work in STEM professions, a few students reported the challenge as a desirable characteristic (4.5%), along with many more students in the 1991–1992 cohort (19%) and summer institute (26%). Five of the 6 students who described STEM professions as hard or difficult work also indicated STEM career preferences in spite of their concerns about the work demands.

Those results offer some corroboration for studies in which researchers have reported women’s perceptions of STEM professions as very demanding (Astin & Sax, 1996; Miller & Silver, 1992; Rosser, 1990). Other researchers have noted that the perceived demands of STEM occupations are viewed as especially burdensome when young women anticipate or have family responsibilities (Seymour & Hewitt, 1997; Ware & Lee, 1988). Young women may then reject STEM goals because they do not perceive ways to combine their career and family roles (Arnold, 1993; Betz, 1994; Burlew & Johnson, 1992; Lips, 1992; Livingston & Burley, 1991; Nauta et al., 1998).

Other researchers have found that women in STEM careers expect a solitary and/or inhospitable work environment (Puckard, 2002; Stage & Maple, 1996; Vetter, 1996). A few students in the current study (6%) described a lack of personal contact as an undesirable characteristic of STEM professions. The same percentage of the 1991–1992 cohorts (6%) reported the isolation or lack of personal contact as a negative descriptor, whereas the summer institute respondents did not.

Exposure to female role models who successfully combine a career, family, and social life might provide evidence and examples that counter young women’s role conflict perceptions. Women in the professions also might offer a more balanced view of the work environment and demands, or, alternatively, a “normalization process by which women may recognize they are not alone . . . thus making it less likely that they will attribute their struggles to a lack of ability” (Nauta et al., 1998, p. 493).

**STEM Career Aspirations**

Very few of the study participants hoped to pursue a career in mathematics, engineering, or computer science at either the junior high or high school level. Girls’ strong preferences for careers in the biological sciences and health and medical professions have been found in all three data sets, representing 28% in the present study, 56% in the 1991–1992 cohort, and 44% of summer institute respondents. Those preferences also are compatible with previous studies. Benbow and Minor (1986) asked mathematically talented junior high school students to rank their preferences for biology, chemistry, and physics and found that girls were more likely to rank biology as the highest, whereas boys gave the highest rank to physics. Eccles, Barber, and Jozefowicz (1998) further explained that girls’ preferences for biological sciences contribute to their higher levels of confidence and expectations for success in the health and medical professions and much lower expectations for success in the physical sciences and engineering when compared with boys’ preferences.

Other research helps one understand why young women are attracted to biological sciences and the health and medical professions in particular. Those professions are more gender balanced and may, therefore, seem more welcoming and supportive to women (Betz, 1994). Miller and Silver (1992) found that young women often chose careers in the health professions because they thought that this work would allow them to blend their career and family responsibilities. Women may be attracted to the biological and health sciences because they perceive this work as a means for helping others (Astin & Astin, 1993; Vetter, 1996) and for contributing to society (Davis & Rosser, 1996; Hynes, 1995; Kahle, 1985; Mills, 1993; Rosser, 1993; Sax, 1994b).

As the young women approached or were entering college, however, more of them were no longer interested in the sciences (30), and health professions (20) in particular, whereas
they had indicated these career preferences as seventh graders. Very few students chose the sciences (4 students) or health professions (3 students) for the first time as seniors when they had not done so in seventh grade. Preferences for the medical profession as a physician or doctor dropped from 24 in seventh grade to 10 for seniors and may have contributed to the decline in graduate-degree expectations.

This study makes a modest contribution to a body of work that aims to identify the many factors that support or lead to the loss of female talent in mathematics and science (Hanson, 1996, Oakes, 1990). The findings represent the views and experiences of a select group of young women in southeastern Pennsylvania, and cannot be generalized to other high school students or high school seniors in Pennsylvania. This work does enable one to better understand the characteristics of mathematics and science careers perceived as desirable versus undesirable to this group of young women whose teachers determined that they had potential to enter such fields. Their responses helped identify factors that influenced their attitudes toward mathematics- and science-based careers.

Continued tracking of the young women and the summer institute participants is planned. Future work will explore other components of the survey data. For example, who or what do participants report as influences on their career preferences? Do reported influences change significantly from junior to senior high school? Are there significant differences in the career influences identified by participants with mathematics and science career preferences versus participants without mathematics and science career preferences?

In addition to the survey, I will use supplemental interviews to provide a more complete account of young women’s views regarding the features or aspects of STEM careers that attract or turn them away from these fields. Will the young women achieve their academic and career aspirations or will their goals change over time (Holland & Eisenhart, 1990). Through this work, I hope to better understand the factors or influences that enhance or inhibit young women’s journeys in pursuit of their goals.

REFERENCES


Packard, B. W. (2002). Women who continue to pursue science: Motivated not only despite but also by concerns about the future. Advancing Women in Leadership, 10(11).


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**APPENDIX**

**Career Day Questionnaire**

**STUDENT INFORMATION FORM**

1. Date: ___________________________ Student Number: ___________________________

2. Full Name ____________________________________________________________ Date of Birth: ___________________________

3. Mailing Address: _________________________________________________________

   City ___________________________ State ___________ Zip ___________

4. Home Telephone: Area Code ( ) __________________________

5. School Name: ___________________________________________________________

   School District: _________________________________________________________

6. Future support for Math Options may depend on service to a diverse representation of young women. The following information is requested solely for affirmative action purposes. This information is voluntary.

Please indicate your predominant ethnic background:

- [ ] African American (not of Hispanic origin)
- [ ] Alaskan Native
- [ ] Asian American or Pacific Islander
- [ ] Hispanic American (not Puerto Rican)
- [ ] Native American
- [ ] Puerto Rican
- [ ] White American (not of Hispanic origin)
- [ ] Other

7. In the list below, check off the math courses you have completed for credit, those in which you are currently enrolled, and those you plan to take in high school. If completed, please circle Grade received. If current, circle Grade expected.

**Math Courses**

- General 7th grade Math
- General 8th grade Math
- Business/Consumer Math
- Pre-Algebra
- Algebra I
- Geometry
- Algebra II
- Trigonometry
- Pre-Calculus
- Calculus
- Advanced Placement in

- Other: __________________________

**Completed Grade**

A, B, C, D, F

Appendix continues
APPENDIX—Continued
Career Day Questionnaire

8. In the list below, check off the science courses you have completed for credit, those in which you are currently enrolled, and those you plan to take in high school. If completed, please circle Grade received. If current, circle Grade expected.

<table>
<thead>
<tr>
<th>Science Courses</th>
<th>Current</th>
<th>Future</th>
<th>Plans</th>
<th>Completed Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>General 7th grade Science</td>
<td></td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
</tr>
<tr>
<td>General 8th grade Science</td>
<td></td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
</tr>
<tr>
<td>General Physical Science</td>
<td></td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
</tr>
<tr>
<td>Earth Science</td>
<td></td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
</tr>
<tr>
<td>Biology</td>
<td></td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
</tr>
<tr>
<td>Chemistry</td>
<td></td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
</tr>
<tr>
<td>Physics</td>
<td></td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
</tr>
<tr>
<td>Advanced Placement in</td>
<td></td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
</tr>
</tbody>
</table>

Other: ____________________________ A, B, C, D, F

9. Computer Experience: __None __Less than 1 year __2 years __3 years or more

10. Do you have a computer at home? __Yes __No Do you use it? __Yes __No

11. Mark any computer courses and/or experience you have had:

___Word Processing ___Testing ___Graphics (posters/cards, etc.)
___Spreadsheets ___Education Programs ___On-Line Services ___Other:
___Database ___Computer Programming ___Games

The following questions relate to your educational and career plans.

12. What areas of math, science, engineering, and/or technology are interesting to you and why?

__________________________________________________________________________

13. Your level of interest in a math-related career (accountant, economist, mathematician) is:

___Very Strong ___Moderate ___Very Weak ___Never Considered

14. Your level of interest in a science-related career (biologist, chemist, geologist, physicist) is:

___Very Strong ___Moderate ___Very Weak ___Never Considered

15. Your level of interest in an engineering or computer science career is:

___Very Strong ___Moderate ___Very Weak ___Never Considered

16. The best aspects of a math or science career are:

__________________________________________________________________________

17. The worse aspects of a math or science career are:

__________________________________________________________________________

18. What are your plans after high school graduation?

___None ___Bachelor's Degree ___Apprentice/Trade School ___Junior College
___Don’t Know ___Master's Degree ___Doctorate ___Other: _____________

19. When you are 25 years old, what kind of job/career would you like to have? Rate how strongly you feel about those jobs/careers.

<table>
<thead>
<tr>
<th>Jobs/Careers</th>
<th>Rating (check one)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Strong</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Weak</td>
</tr>
</tbody>
</table>

(Appendix continues)
APPENDIX—Continued
Career Day Questionnaire

20. What has influenced your career plans mentioned above?
   ___Mother ___Father ___Other Relative ___Teacher ___Counselor ___Friend ___Myself
   ___TV/Radio ___Books ___Magazines ___Movies ___Other

21. Identify the person or thing that has influenced your career choice the most:
   __________________________________________________________________________
   How or why? __________________________________________________________________

Note. The Career Day Questionnaire was completed prior to participation in the present study.

Career Day Follow-Up Questionnaire

1. Date: ___________________ Grade Level: ___________________
2. Full Name ___________________ Date of Birth: ____________
3. Mailing Address:
   City ___________________ State ________ Zip ____________
4. Home Telephone: Area Code (________) ___________________
5. School Name: __________________________________________
   School District: _________________________________________
6. Future support for Math Options may depend on service to a diverse representation of young women. The following information is requested solely for affirmative action purposes. This information is voluntary.

Please indicate your predominant ethnic background:
   ❑ African American (not of Hispanic origin) ❑ Alaskan Native ❑ Native American
   ❑ Asian American or Pacific Islander ❑ Hispanic American (not Puerto Rican)
   ❑ Puerto Rican ❑ White American (not of Hispanic origin)
   ❑ Other ___________________
7. In the list below, check off the math courses you have completed for credit, those in which you are currently enrolled, and those you plan to take in high school. If completed, please circle grade received. If current, circle grade expected.

<table>
<thead>
<tr>
<th>Math Courses</th>
<th>Completed</th>
<th>Current</th>
<th>Grade</th>
<th>Plan to Take</th>
<th>Do Not Plan to Take</th>
<th>Undecided</th>
</tr>
</thead>
<tbody>
<tr>
<td>General 7th grade Math</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>General 8th grade Math</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Business/Consumer Math</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Pre-Algebra</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Algebra I</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Geometry</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Algebra II</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Trigonometry</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Pre-Calculus</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Calculus</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Advanced Placement in</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Other:</td>
<td>❑</td>
<td>❑</td>
<td>A, B, C, D, F</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
</tbody>
</table>

(Appendix continues)
Career Day Follow-Up Questionnaire

8. In the list below, check off the science courses you have completed for credit, those in which you are currently enrolled, and those you plan to take in high school. If completed, please circle grade received. If current, circle grade expected.

<table>
<thead>
<tr>
<th>Science Courses</th>
<th>Completed</th>
<th>Current</th>
<th>Grade</th>
<th>Plan to Take</th>
<th>Do Not Plan to Take</th>
<th>Undecided</th>
</tr>
</thead>
<tbody>
<tr>
<td>General 7th grade Science</td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General 8th grade Science</td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Physical Science</td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Earth Science</td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics</td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced Placement in</td>
<td></td>
<td></td>
<td>A, B, C, D, F</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other: _________________________

9. Year you attended the Math Options Career Day: _________
   and location:  □ Abington-Ogontz  □ Delaware County

10. Your overall opinion regarding activities for Career Day:
    □ Outstanding  □ Good  □ Fair  □ Poor

11. In recalling the Math Options Career Day, what aspects or information were most important or affected you the most?

Why was that so?

12. Computer Experience:  □ None  □ Less than 1 year  □ 2 years  □ 3 years or more

13. Do you have a computer at home?  □ Yes  □ No
    Do you use it?  □ Yes  □ No

14. Mark any computer courses and/or experience you have had:
    □ Word Processing  □ Spreadsheets  □ Database  □ Computer Programming
    □ Testing  □ Education Programs  □ On-Line Services  □ Games
    □ Graphics (posters/cards, etc.)  □ Other: _________________________

The following questions relate to your educational and career plans.

15. What areas of math, science, engineering, and/or technology are interesting to you and why?

16. Your level of interest in a math-related career (accountant, economist, mathematician) is:
    □ Very Strong  □ Moderate  □ Very Weak  □ Never Considered

17. Your level of interest in a science-related career (biologist, chemist, geologist, physicist) is:
    □ Very Strong  □ Moderate  □ Very Weak  □ Never Considered

18. Your level of interest in an engineering or computer science career is:
    □ Very Strong  □ Moderate  □ Very Weak  □ Never Considered

19. What I think I would like about a math or science career is: _________________________

20. What I think I wouldn’t like about a math or science career is: _________________________

21. What are your plans after high school graduation?
    □ None  □ Don’t Know  □ Bachelor’s Degree  □ Master’s Degree  □ Apprentice/Trade School  □ Junior College  □ Doctorate  □ Other: _________________________

(Appendix continues)
Career Day Follow-Up Questionnaire

22. When you are 25 years old, what kind of job/career would you like to have? Rate how strongly you feel about those jobs/careers.

<table>
<thead>
<tr>
<th>Jobs/Careers</th>
<th>Rating (check one)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Strong □</td>
</tr>
<tr>
<td></td>
<td>Moderate □</td>
</tr>
<tr>
<td></td>
<td>Weak □</td>
</tr>
</tbody>
</table>

23. What has influenced your career plans mentioned above?

- [ ] Mother
- [ ] Father
- [ ] Other Relative
- [ ] Teacher
- [ ] Counselor
- [ ] Friend
- [ ] Myself
- [ ] TV/Radio
- [ ] Books
- [ ] Magazines
- [ ] Movies
- [ ] Other

24. Identify the person or thing that has influenced your career choice the most: ______________________________________________________

How or why? ______________________________________________________

25. Did participation in the Career Day in any way affect your education plans for:

High School? [ ] Yes [ ] No Please state how: ______________________________________________________

College? [ ] Yes [ ] No Please state how: ______________________________________________________

26. Were your job or career plans in any way affected by your Career Day experiences? [ ] Yes [ ] No

If Yes, please explain how: ______________________________________________________

27. Have you had other on-the-job or career awareness experiences that have influenced your plans for the future? [ ] Yes [ ] No

If Yes, please identify and describe such activities: ______________________________________________________

28. Please list the college(s) you wish to attend in order of preference:

Note. The Career Day Follow-Up Questionnaire was completed near high school graduation.