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Student Interest in Engineering and Other STEM Careers: School-Level, Gender, Race/Ethnicity, and Urbanicity

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Student Interest in Engineering and Other STEM Careers: An Examination of School-Level, Gender, Race/Ethnicity, and Urbanicity

Introduction

Researchers and economists predict that in the coming decades there will be accelerating job-growth in science, technology, engineering, and math (STEM) fields.[1, 2] Researchers also predict rising demand for STEM competencies in other occupations.[3] Unfilled STEM job openings and the prospect of increasing baby boomer retirements suggest that the United States is not producing enough individuals who are both interested and qualified in STEM fields to meet this demand. Furthermore, students graduating high school, postsecondary students, and incumbent STEM workers divert from STEM career pathways into other fields adding to the pipeline problem.[4] This critical, growing employment gap is motivating policymakers, kindergarten through twelfth grade (K12) public school districts, institutes of higher education, and employers to find ways to increase graduates with STEM competencies and degrees.

Investigating potential solutions to this problem, business and higher education experts on the United States STEM Education Modeling Project and the President's Committee of Advisors on Science and Technology concluded that improving young students' attitudes toward STEM and interest in STEM careers is as important as increasing their academic proficiency in these subjects.[5, 6] The Business-Higher Education Forum found in its sample of 141 high school students that a full quarter of them had high proficiency in math, but low interest in the actual content. Carnavale, Smith, and Melton found that more than three out of four high school students who test in the top math quartile did not start with a STEM major in college.[4]

As schools and other educational organizations implement programs aimed at improving student interest in STEM careers, more research on how students perceive these careers is needed. Both knowledge about how students understand career pathways in the context of other options, and students' actual interest-levels are important. Findings may be used to design and direct interventions addressing the mechanisms that seem to be disconnecting ability and interest in STEM careers.

Social cognitive career theory suggests that self-efficacy and expectancy-value are critical factors in an individual's career choice and persistence.[7] Self-efficacy is a person's belief in their ability to complete tasks and affect events that impact their lives.[8] Expectancy-value theories complement self-efficacy theories in the investigation of a larger social cognitive model for career aspirations and persistence. Expectancy-value theories posit that individuals regularly assess the likelihood of attaining specific goals and the value they would gain or lose from such attainment.[9, 10] How self-efficacy in traditional academic subjects like math and science translates into interest into career fields like engineering, however, remains relatively unknown. Furthermore, student self-perceptions and the perception of others seem to be important factors in the development of career aspirations as well.[11, 12, 13, 14] A starting place for unraveling these connections entails developing a better understanding of how students perceive careers and how student interest levels in career fields cluster based on demographic factors.

While there has been some research on the impact that regional female labor force participation in STEM fields has on female student interests in STEM subjects,[15, 16] there is very little literature on how student STEM career interests writ large differ between populations exposed to STEM careers differently in their day-to-day lives. It would be particularly important to look at geographic locations that differ in concentration of STEM-oriented employment centers, since this would correspond to the likelihood that members of a student's immediate family (or peers' families) would have a STEM-oriented job. In such places, as students get older, they would have the opportunity to gain more exposure to STEM-related academic topics and activities and to gain more exposure (or not) to adults engaged in STEM-oriented activities.

In an effort to help further answer these important questions about the process by which students develop STEM career interests, this paper explores the particular ways in which students may perceive STEM careers. With so many STEM careers available to students, are there some fields that students perceive to be similar to one another? Are there broad, definable characteristics of STEM fields according to students' perceptions – characteristics which may help educators to better serve career development needs? Additionally, how do students' actual levels of interest in these fields differ? Are there differences associated with broad groups of students, such as groups defined by gender, race/ethnicity, age, or the urban or rural geography of their residence?

Data Sources

Two program evaluations of STEM education initiatives were conducted in the 2012-13 school year. The first evaluation investigated a 43 school-district, 5-9th grade, STEM education initiative in rural counties of a southeastern state. This "Rural Initiative" consisted of 14 grants implementing various hands-on, problem-based STEM education activities, from nationally recognized engineering and technology curricula (e.g. Project Lead the Way) to science-lab kits and STEM festivals. The Rural Initiative was first launched in 2011-12. The second evaluation investigated a STEM initiative implemented across elementary, middle, and high schools in a single, large, urban district in the same southeastern state. This "Urban Initiative" consisted of schools which were in their first year of STEM-focused instructional interventions. The interventions were either school-wide or part of smaller, in-school academies. The 2012-13 school-year was the launch of the Urban Initiative.

As part of a larger research project, a set of surveys were developed to measure student attitudes toward STEM and interest in STEM careers. Two versions of the "Student Attitudes toward STEM (S-STEM) Survey" were created, one for upper elementary students (4th and 5th grade) and another for middle and high school students (6-12th grade). To measure student interest in STEM careers the final section of the S-STEM Survey contained twelve items, each with a definition of a STEM career pathway and titles of related occupations. One item read, for example, "Medical science involves researching human disease and working to find new solutions to human health problems – clinical laboratory technologist, medical scientist, biomedical engineer, epidemiologist, and pharmacologist." This career interest section of the survey used a four-point response scale (1 = *not at all interested* to 4 = *very interested*). A more detailed description of the development of the S-STEM Survey, including validity and reliability results, can be found in Faber (2013).[17] This prior published work provides details on how career areas were derived from U.S. Department of Labor classifications, prior research, expert review, and field testing of the survey instruments.

In 2012-13 the Upper Elementary and Middle/High S-STEM Surveys were administered to students in schools participating in the Rural and Urban Initiatives. This was done to construct baseline measures. Students in the Rural Initiative who completed the survey were in grades four through twelve. Students in the Urban Initiative who completed the survey were in grades five, eight, and eleven. After data cleaning, during which a total of 145 observations were removed, 15,009 observations remained and were used in the analysis (see Table 1). This total represented a combined, approximate response rate of 69.1% (four Rural Initiative school districts did not have any survey respondents). Table 2 shows the demographic characteristics of the respondents.

TABLE 1
Summary of Rural and Urban Initiative Response Counts

Initiative and S-STEM Survey	**Number of Responses**	**Number of Responses after Cleaning**
Rural		
Upper Elementary	3,438	3,413
Middle/High	8,412	8,316
Urban		
Upper Elementary	1,107	1,103
Middle/High	2,198	2,177
Total	15,155	15,009

TABLE 2
Demographic Characteristics of S-STEM Survey Respondents

Demographic Characteristic	**Percentage of Respondents**			
	Upper Elementary (N=4,516)	**Middle** (N=8,125)	**High** (N=2,368)	**All Students** (N=15,009)
Initiative				
Rural	75.5%	86.7%	53.9%	78.2%
Urban	24.5%	13.3%	46.1%	21.8%
Gender				
Male	51.5%	50.5%	50.2%	50.7%
Female	48.5%	49.5%	49.9%	49.3%
Race/Ethnicity				
American Indian/Alaska Native	3.8%	3.3%	1.5%	3.2%
Asian	1.3%	2.3%	3.2%	2.1%
Black/African American	19.6%	13.1%	22.6%	16.6%

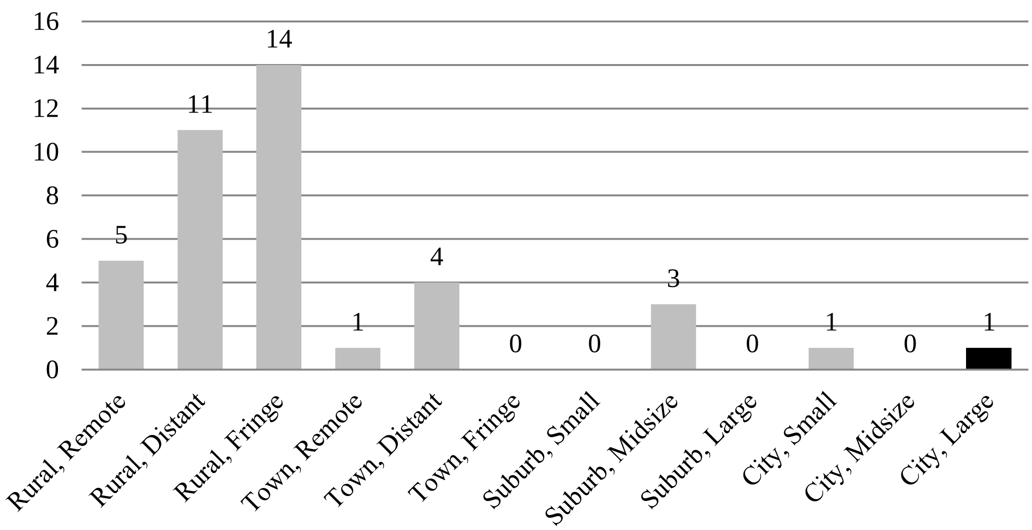
TABLE 2—*Continued*

Demographic Characteristic	Percentage of Respondents			
	Upper Elementary (N=4,516)	**Middle** (N=8,125)	**High** (N=2,368)	**All Students** (N=15,009)
White/Caucasian	50.6%	59.7%	53.7%	56.0%
Hispanic/Latino	12.8%	13.6%	10.7%	12.9%
Multiracial	4.9%	4.2%	5.9%	4.7%
Other	7.1%	3.9%	2.4%	4.6%
Total	30.1%	54.2%	15.8%	100.0%

Note. Upper Elementary = 4-5th grade; Middle = 6-8th grade; and High = 9-12th grade.

Figure 1 shows the distribution of counties participating in the Rural and Urban Initiatives according to the National Center for Education Statistics/Office of Management and Budget Urbanicity scale.[18] According to these classifications, 76.9% of the counties in the Rural Initiative were rural and the remaining 23.1% either had a small town or had suburbs, and one had a small city.

FIGURE 1
Number of Participating Counties by Urban-Centric Locale Type



Note. Gray bars represent counties participating in the Rural Initiative. The black bar represents the large county participating in the Urban Initiative.

An analysis of the 2011 United States Census Bureau's Small Area Income and Poverty (SAIPE) data showed that the county-level poverty rate for young people (individuals under 18 years of age) in the Rural Initiative was notably higher (29.9% average) than the poverty rate for young people in Urban Initiative counties (15.5%). The average county-level poverty rate for young people across the entire state was 25.4% and across the United States was 22.5%.

Methods

The 12 S-STEM Survey items measuring student interest in STEM career pathways were used to identify patterns of career interest or disinterest among nested groups of students: students in the Rural or Urban Initiatives, of different genders, of different races/ethnicities, and in different school-levels (elementary, middle, high). First, cluster analysis was used in multiple iterations to group and re-group the twelve STEM career pathways according to respondent interest-levels. This was done within the nested demographic variables. As a technique, cluster analysis groups variables based on their similarity; this similarity is often defined in terms of correlation. For this analysis clustering of variables was completed using oblique principal component cluster analysis in SAS software.[19] The data were ordinal, therefore Spearman correlations were calculated as inputs into the cluster analysis. Missing values were omitted from the analysis, and variables were iteratively assigned to the clusters to maximize the variance explained by the results. The clusters were created hierarchically until each cluster had only a single eigenvalue greater than one, the criterion used for choosing the number of clusters in a subgroup. Dendograms were created to view the structures of the clusters.

Using these techniques clusters were first created for males and females, within the upper elementary, middle, and high school levels, within the Rural and the Urban Initiatives. Then clusters were created for racial/ethnic groups that have been either historically overrepresented or underrepresented in STEM career pathways, within school-levels, within each initiative. Students who identified themselves as White/Caucasian or Asian comprised the overrepresented group and students that identified as any other race/ethnicity comprised the underrepresented group.[20]

Once the clusters were found for each combination of gender or race/ethnicity, school-level, and initiative, mean cluster scores were calculated to measure student interest-levels. The Likert-type response scale options for the “STEM Career Interest” items were assigned numeric values (1 = *not at all interested*, 2 = *not very interested*, 3 = *somewhat interested*, and 4 = *very interested*) and average interest-level scores were calculated for each student, for each career cluster. Next, within each demographic sub-group, these student-level scores were averaged to create mean cluster scores. A mean cluster score greater than 2.5 indicated that sub-groups’ general interest in a career area and a score less than 2.5 indicated general disinterest. Finally, mean scores for student interest-levels in engineering specifically were analyzed.

Results

STEM career clusters

Cluster analysis results indicated that students in different demographic groups tended to perceive the 12 STEM career areas, including engineering, in similar groupings or “clusters.” The analysis was run on every combination of gender or race/ethnicity, school-level, and initiative, and findings revealed that all student groups perceived the STEM careers in either two or three consistent clusters (see Appendix A-B for dendogram representations of results). Some student demographic sub-groups understood the careers in two, main clusters: a “core STEM” career cluster and a “biological and medical sciences” career cluster. Other demographic sub-groups groups perceived the careers in three clusters: “core STEM,” “biological sciences,” and "medical sciences" career clusters. These clusters did not consist of exactly identical sets of STEM careers across every result, but they were highly similar. The core STEM career cluster most often contained physics, mathematics, computer science, energy, and engineering; occasionally the core STEM cluster contained chemistry and earth science as well. The biological sciences career cluster typically consisted of environmental work, biology and zoology, and veterinary work; sometimes the biological sciences cluster also contained earth science. The medical sciences career cluster most often contained medicine and medical science career pathways; a few times the cluster also included chemistry. The biological and medical sciences career cluster was a combination of the two individual clusters.

Findings revealed that all sub-groups of students perceived engineering similarly to other core STEM careers. In every set of cluster analysis results engineering was grouped with the core STEM career cluster. Regardless of their gender, race/ethnicity, school-level, or whether or not they were in the Rural Initiative or Urban Initiative, students consistently grouped engineering with mathematics, computer science, and energy. This does not mean that all sub-groups of students had similar interest-levels in engineering, but that their interest in engineering was consistently, highly correlated with their interest in other core STEM careers.

Results indicated that female students in particular perceived the 12 STEM career pathways in the three-cluster structure, – with the biological sciences and medical sciences separate – while male students tended to perceive these career pathways in the two-cluster structure. Female students perceived the STEM careers in the three-cluster structure across all demographic combinations of school-level and initiative. Male students, however, perceived the STEM careers in the two-cluster structure across all sub-groups except for high school males in the Urban Initiative. Instead, this group showed a three-cluster structure: (1) core STEM careers included physics, mathematics, computer science, energy, and engineering; (2) medical science careers included medicine, medical science, and chemistry; and (3) biological science careers included environmental work, biology and zoology, veterinary work, and earth science.

Findings suggested that students from underrepresented racial/ethnic groups tended to perceive the STEM career pathways in the two-cluster structure as well (in four out of six combinations), and students from overrepresented groups tended to perceive the careers in the three-cluster structure (in five out of six combinations). Underrepresented students in middle and high school in the Urban Initiative grouped the STEM careers in three clusters, separating the biological sciences and the medical sciences. Students from overrepresented groups in upper elementary school in the Rural Initiative perceived the careers in two clusters, grouping the biological sciences and medical sciences.

Finally, as was previously noted, the core STEM career cluster occasionally varied. For example, high school students from underrepresented racial/ethnical groups in the Urban Initiative perceived a three-cluster structure, in which the core STEM cluster consisted of mathematics, computer science, energy, and engineering. At the same time high school underrepresented students in the Rural Initiative grouped the STEM careers in two clusters, with the core STEM cluster including physics, environmental work, mathematics, earth science, computer science, chemistry, energy, and engineering.

Average interest-levels by career cluster

Analyses of mean cluster scores for demographic subgroups suggested that student interest-levels in STEM careers dropped as school-levels increased (Tables 3 and 4). This trend was consistent in every career cluster, for males and females, in both the Rural and Urban Initiative, with only a few exceptions. Female high school students in the Urban Initiative had higher interest in the biological science cluster and medical science cluster than their middle school counterparts. Also female middle and high school students in the Rural Initiative had higher interest in the medical science cluster than their respective younger counterparts (upper elementary, and upper elementary and middle). Finally, urban overrepresented students showed an increased interest in biological and medical sciences from upper elementary school to middle and high school.

The mean cluster scores also indicated notable differences between the STEM career interest-levels of male and female students broadly (Table 3). Male students expressed higher levels of interest in the core STEM career cluster than female students in every comparison group – female interest-levels were approximately half of a point lower than male averages fairly consistently. Female mean cluster scores were never higher than 2.4 for the core STEM cluster, suggesting that female students may have had an overall ambivalence or disinterest toward core STEM careers, including engineering. At the same time, while the comparisons were not direct, it was notable that female students were more interested in both biological science careers and medical science careers (separately) than males were in the career areas combined. Male cluster scores were never higher than 2.5 for the biological and medical science career cluster, suggesting general ambivalence or disinterest toward those careers.

TABLE 3
Student Interest in Career Clusters by Gender, School-Level, and Initiative

Initiative and Gender by School-Level	**N**	**Mean Cluster Score**			**Proportion Variance Explained**
		Core STEM	**Bio. Sciences/ Bio. & Medical Sciences***	**Medical Sciences**	
Urban Male					
Upper Elementary	556	2.8	2.4 *BM*	--	0.50
Middle	529	2.5	2.1 *BM*	--	0.50
High	525	2.5	2.1 *B*	2.3	0.60
Urban Female					
Upper Elementary	495	2.4	2.8 *B*	2.5	0.54
Middle	529	2.0	2.5 *B*	2.2	0.60
High	532	1.9	2.7 *B*	2.4	0.61
Rural Male					
Upper Elementary	1,640	2.7	2.5 *BM*	--	0.50
Middle	3,364	2.5	2.2 *BM*	--	0.48
High	611	2.4	2.2 *BM*	--	0.51

TABLE 3—*Continued*

Initiative and Gender by School-Level	N	Mean Cluster Score			Proportion Variance Explained
		Core STEM	Bio. Sciences/ Bio. & Medical Sciences*	Medical Sciences	
Rural Female					
Upper Elementary	1,556	2.4	2.9 *B*	2.5	0.56
Middle	3,307	2.0	2.5 *B*	2.6	0.57
High	623	1.9	2.2 *B*	2.7	0.60

* *B* = Biological sciences cluster. *BM* = Biological and medical sciences cluster. Core STEM cluster average standard deviations range from 0.60 to 0.72. Biological sciences cluster average standard deviations range from 0.66 to 1.02. Medical sciences cluster average standard deviations range from 0.71 to 0.96. Biological and medical sciences cluster average standard deviations range from 0.64 to 0.72.

Comparisons of the mean cluster scores of students from historically overrepresented or underrepresented racial/ethnic groups revealed small differences overall, with a few exceptions (Table 4). In general, when analyzed by race/ethnicity, results indicated ambivalence or disinterest towards core STEM careers among sub-groups of students. Upper elementary students, from both overrepresented and underrepresented groups in both initiatives, had the majority of mean cluster scores higher than 2.5. Additionally, students had slightly higher levels of interest in biological and/or medical career clusters than core STEM careers overall.

Some noteworthy differences between racial/ethnic groups were found. Students from groups overrepresented in STEM career pathways in the Urban Initiative expressed slightly higher interest in core STEM careers than their counterparts in the Rural Initiative. Also middle and high school students from overrepresented groups in the Urban Initiative had somewhat higher interest in biological and medical science careers than their counterparts in the Rural Initiative. Within the Rural Initiative, underrepresented students had slightly higher core STEM cluster means than their overrepresented peers in elementary and middle school, and roughly equal scores in high school. This trend was not found in the Urban Initiative.

TABLE 4

Student Interest in Career Clusters by Race/Ethnicity, School-Level, and Initiative

Initiative and Race/Ethnicity by School-Level	**N**	**Mean Cluster Score**			**Proportion Variance Explained**
		Core STEM	**Bio./ Bio. & Medical/ General Sciences***	**Medical Sciences**	
Urban Overrepresented					
Upper Elementary	337	2.6	2.6 *B*	2.3	0.59
Middle	389	2.3	2.9 *B*	2.4	0.59
High	513	2.2	2.7 *B*	2.5	0.63
Urban Underrepresented					
Upper Elementary	713	2.6	2.6 *BM*	--	0.49
Middle	671	2.2	2.1 *B*	2.4	0.59
High	542	2.2	2.1 *G*	2.6	0.61
Rural Overrepresented					
Upper Elementary	1,867	2.5	2.6 *BM*	--	0.49
Middle	4,438	2.2	2.3 *B*	2.4	0.57
High	795	2.1	2.9 *B*	2.4	0.59
Rural Underrepresented					
Upper Elementary	1,336	2.6	2.6 *BM*	--	0.48
Middle	2,234	2.3	2.4 *BM*	--	0.49
High	439	2.1	2.3 *BM*	--	0.55

* *B* = Biological sciences cluster. *BM* = Biological and medical sciences cluster. *G* = General sciences (this cluster only appeared once in the results and consisted of physics, environmental work, biology and zoology, veterinary work, earth sciences, and chemistry). Core STEM cluster average standard deviations range from 0.64 to 0.73; biological sciences cluster from 0.64 to 0.75; medical sciences cluster from 0.89 to 0.99; biological and medical sciences cluster average standard deviations range from 0.71 to 0.77.

The proportion of total variance explained by all the clusters, across all analyses, ranged from 0.48 to 0.63. Three-cluster structures, naturally, explained more of the variance than two-cluster structures. While it was hoped that higher amounts of variance would have been explained, it is also logical that the clusters would not fully explain student career interest.

Separate analyses were done on the engineering career pathway results as well. Comparisons between interest-levels of male and female students indicated that males were consistently, largely more interested in engineering careers than females, regardless of initiative or school-level (Figure 6). Similar to results from the cluster analyses, interest-levels in engineering declined as the school-level of students increased, with the exception of male students in the Rural Initiative. Comparisons of the Rural Initiative to the Urban Initiative suggest that, in general, students in the Rural Initiative had slightly lower interest-levels in engineering than their urban counterparts (except for among high school males).

FIGURE 6

Percent of Male and Female Students "Interested" or "Very Interested" in Engineering Career by Initiative and School-Level

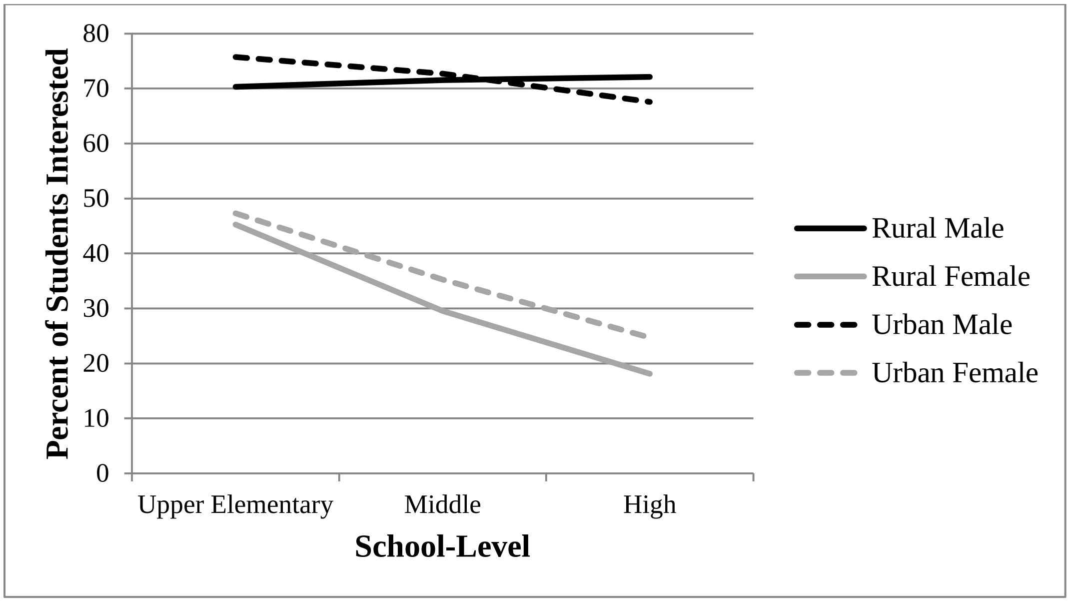
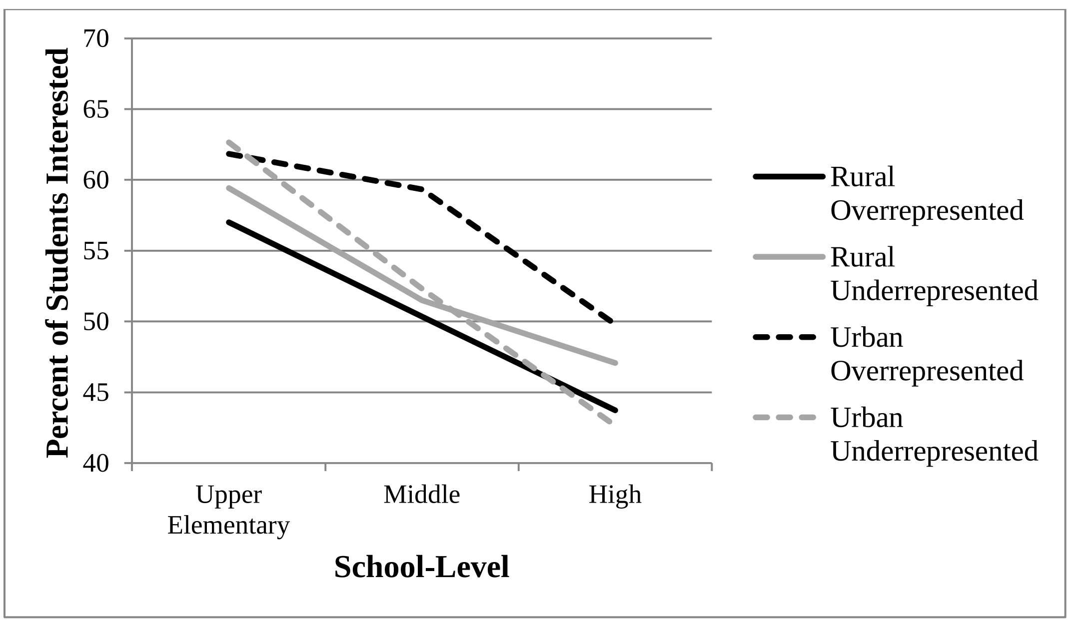


FIGURE 7

Percent of Students from Overrepresented and Underrepresented Racial/Ethnic Groups "Interested" or "Very Interested" in Engineering by Initiative and School-Level



Comparisons between students by racial/ethnic groups revealed much smaller differences in interest-levels in engineering careers than comparisons by gender. Notably, again results indicated a consistent decline in interest-levels as students increased in school-level, regardless of race/ethnicity or initiative. The largest decline was found among underrepresented students in the urban initiative, of which upper elementary students had the highest interest in engineering while high school students had the lowest. Overall, urban students from overrepresented racial/ethnic groups expressed the most interest in engineering careers.

Conclusion

Findings from this research suggest that 4-12th grade students perceive certain STEM careers to be similar to each other. In general, from a comprehensive list of 12 STEM career pathways, students tend to perceive the career fields in two or three clusters, a combination of either: (1) a "core STEM" career cluster consisting mostly of physics, mathematics, computer science, energy, and engineering, occasionally with chemistry and earth science; (2) a "biological sciences" career cluster consisting mostly of environmental work, biology and zoology, and veterinary work, sometimes with earth science; (3) a "medical sciences" cluster including medicine and medical science; and/or (4) a "biological and medical sciences" cluster containing a combination of the previous two clusters. Male students tend to understand the careers in a two-cluster structure and females in a three-cluster. Students from racial/ethnic groups overrepresented in STEM career pathways most often perceive the careers in three clusters and students from underrepresented groups typically perceive them in two. Notably, the engineering career pathway is always grouped with the core STEM careers.

Examinations of actual interest-levels within the career clusters shows that interest generally declines as the school-level of students increases from upper elementary, to middle, to high school. This trend is evident across multiple analyses. Furthermore, noteworthy differences between male and female students appear to exist. Males have largely higher interest in engineering careers and this interest is more stable across school-levels than for females. This is the largest, most consistent gap in interest-levels between all of the sub-group comparisons. Males also have higher interest in core STEM career pathways than females, who instead are mostly ambivalent. At the same time females seem to have higher interest in biological and medical science careers than males, who are mostly ambivalent in this case.

The most important findings from this work is confirmation that not all students – based on age, gender, race/ethnicity, or urbanicity – perceive STEM careers similarly in terms of their relatedness to each other and in terms of the students' personal interest-levels. A student's gender and school-level seem to be the most salient of these factors regarding their perception of STEM careers and expressed interest-levels. Furthermore, students consistently perceive engineering as markedly different from biological and medical sciences. Given the growth of engineering and technological applications in those sciences, this result indicates a potential need for intervention among STEM education programs.[21] Conversely, the engineering and technology applications in biological and medical sciences also may be a leverage point for increasing females' interest in engineering, given this study's findings. In sum, the results suggest that STEM initiatives should carefully consider their target population when designing interventions. Interventions targeted at increasing student interest in STEM careers should not take a "one size fits all" approach. Instead, as much as possible, they should be tailored to unique groups of students based on characteristics like gender, age, race/ethnicity, and urbanicity.

The cluster analyses explained anywhere from approximately 49 – 63% of the variance between sub-groups. While these results do not capture all variation in the data, they represent sizeable amounts given that there are numerous other important factors impacting student interest-levels in STEM careers. Further research should be done to confirm the findings herein and to explore why students perceive certain STEM careers to be similar to one another and others to be different. Of particular interest is how clustering of biological and medical sciences fluctuates based on a number of demographic factors. More work should also be done to uncover why female students compared to males are less interested in core STEM careers and engineering careers and are more interested in biological science and medical science careers. Why do students in higher grades lose interest? Societal demands for a labor force with STEM knowledge, STEM skills, and engineering competencies will continue to grow for the foreseeable future. Programs aimed at closing this labor supply gap can use information about the varying STEM career interests of different types of students, such as students from historically underrepresented groups, to most effectively achieve their goals.

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Appendix A. Cluster Analysis Results by Gender, School-Level, and Initiative

Figure A.1 Upper Elementary School Males in Urban Initiative

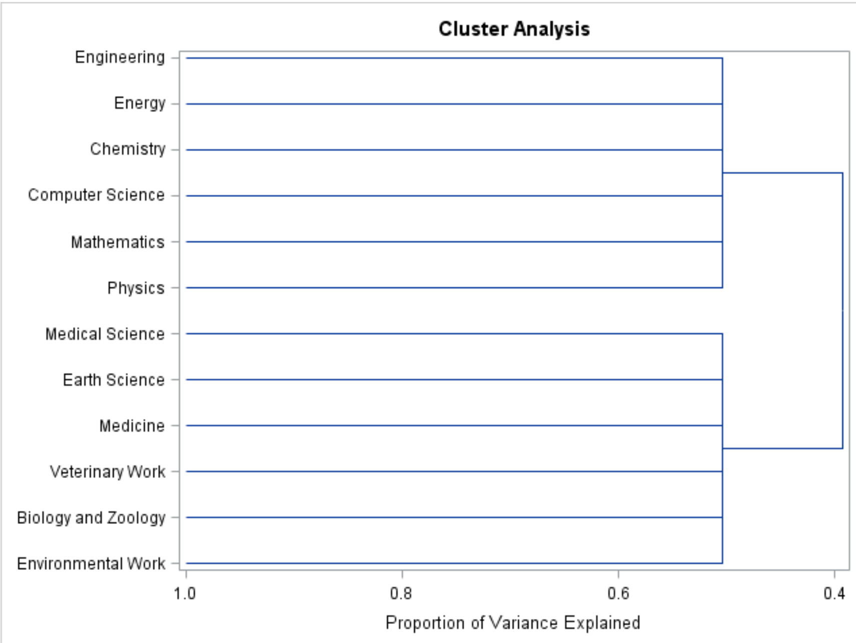


Figure A.2 Upper Elementary School Females in Urban Initiative

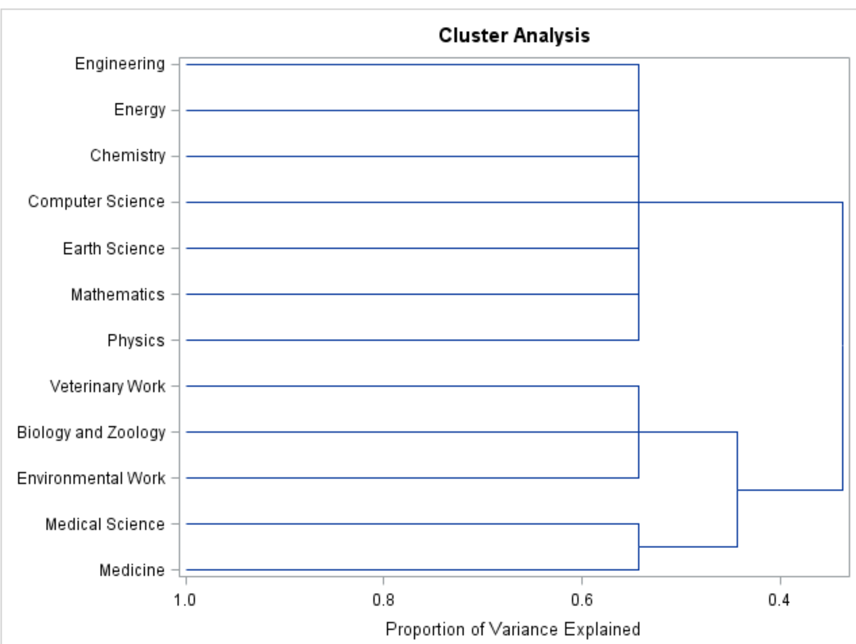


Figure A.3 Middle School Males in Urban Initiative

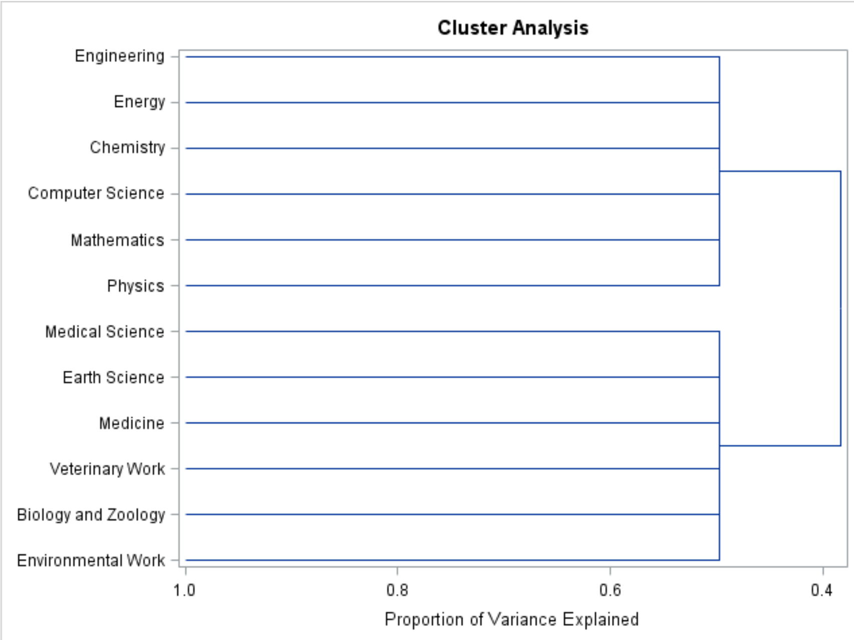


Figure A.4 Middle School Females in Urban Initiative

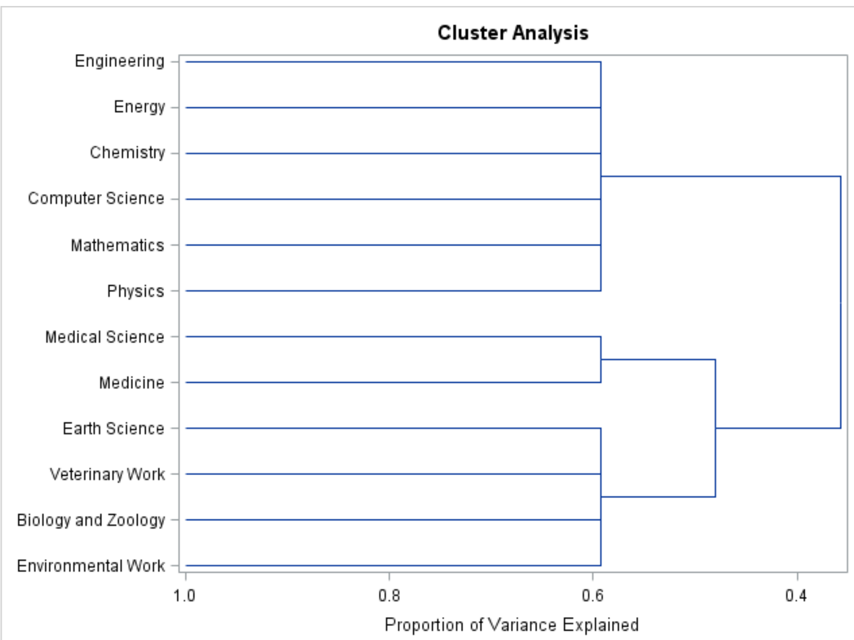


Figure A.5 High School Males in Urban Initiative

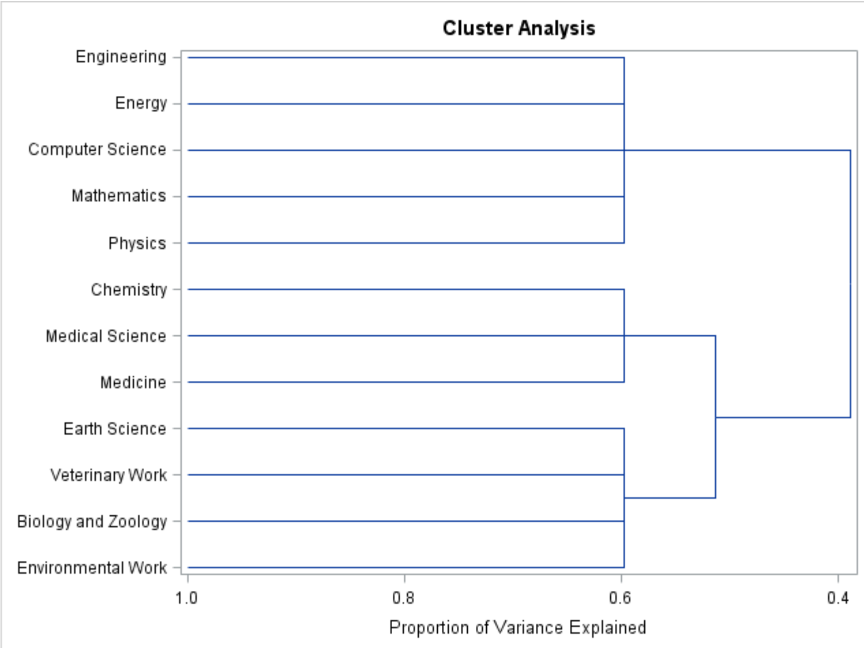


Figure A.6 High School Females in Urban Initiative

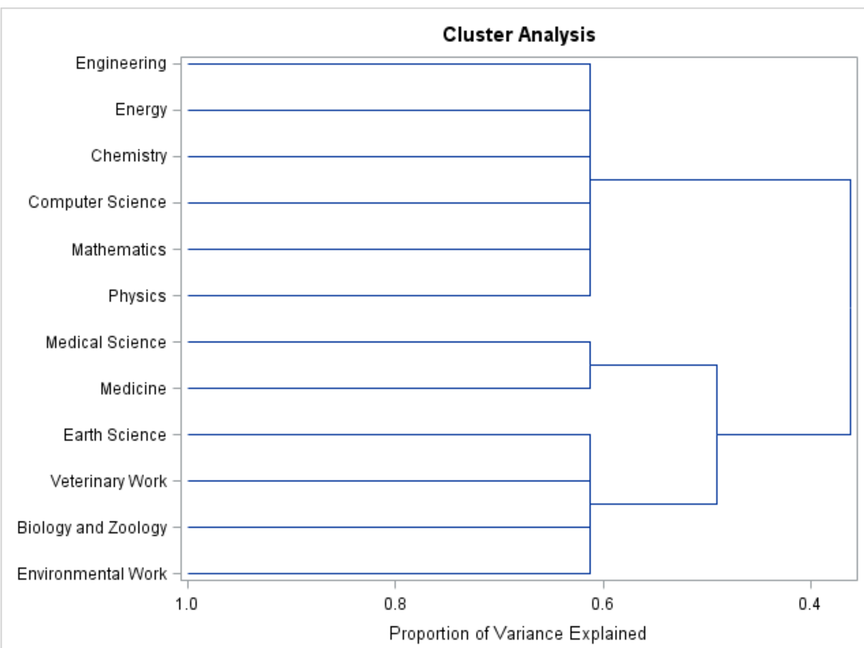


Figure A.7 Upper Elementary School Males in Rural Initiative

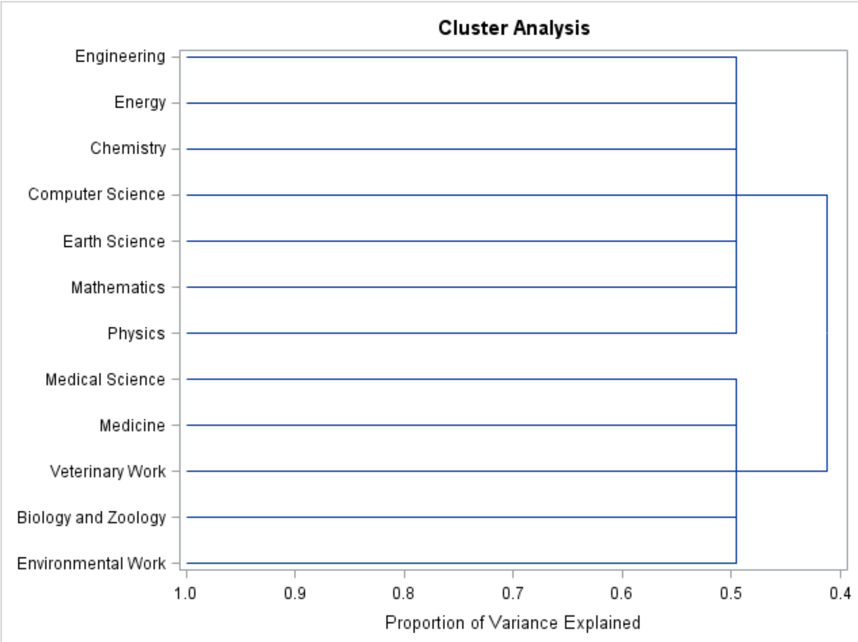


Figure A.8 Upper Elementary School Females in Rural Initiative

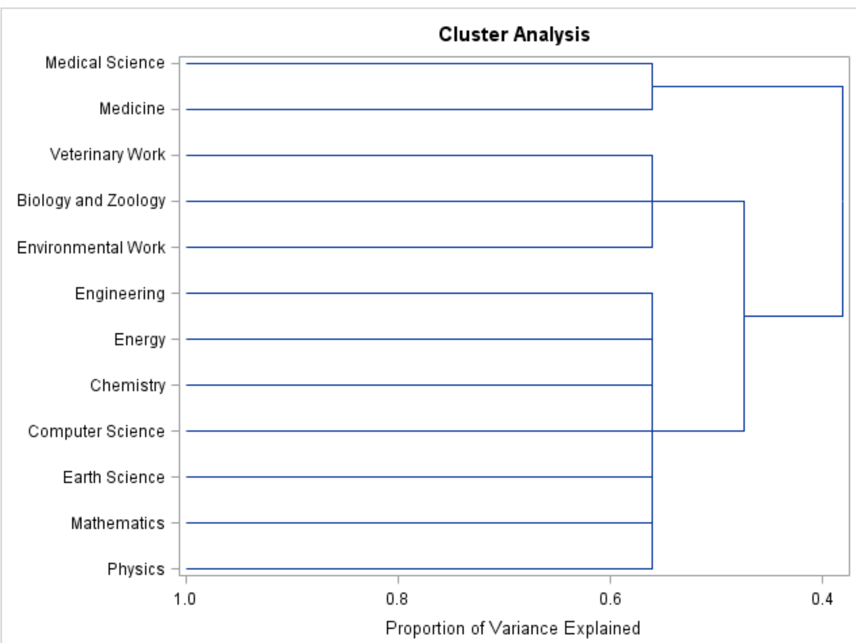


Figure A.9 Middle School Males in Rural Initiative

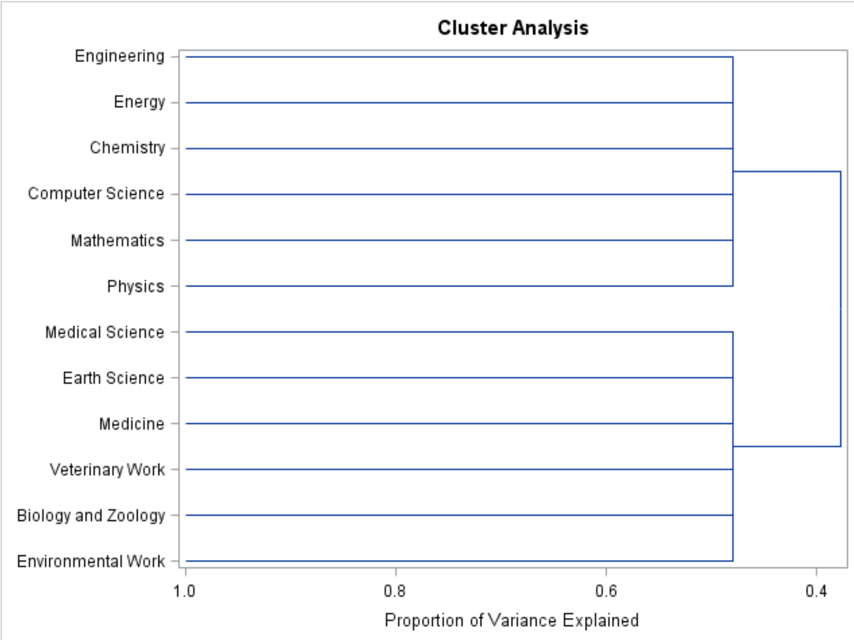


Figure A.10 Middle School Females in Rural Initiative

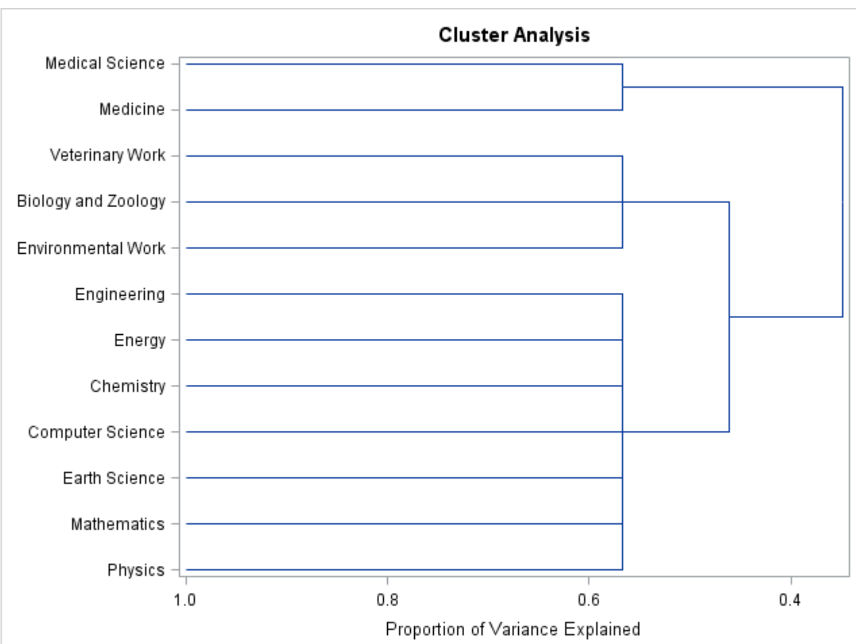


Figure A.11 High School Males in Rural Initiative

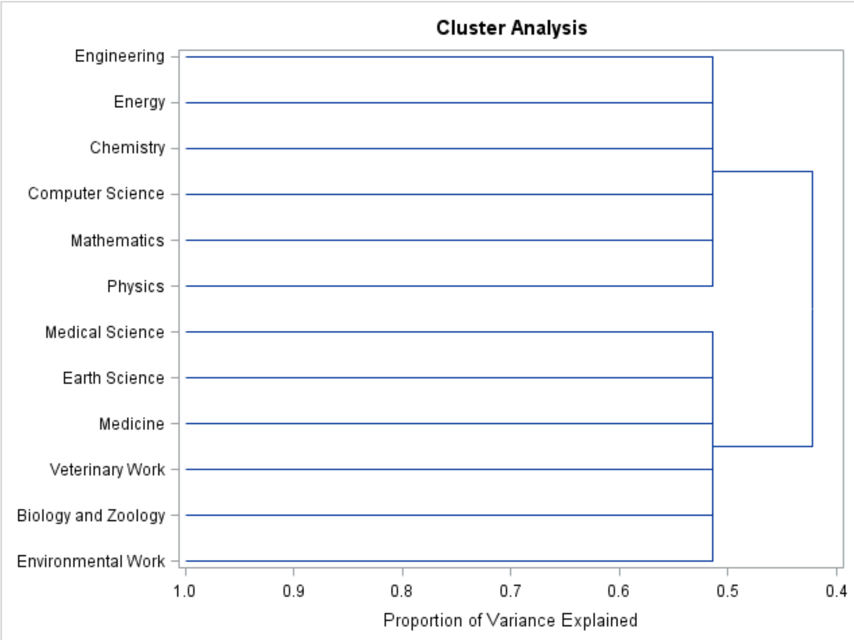
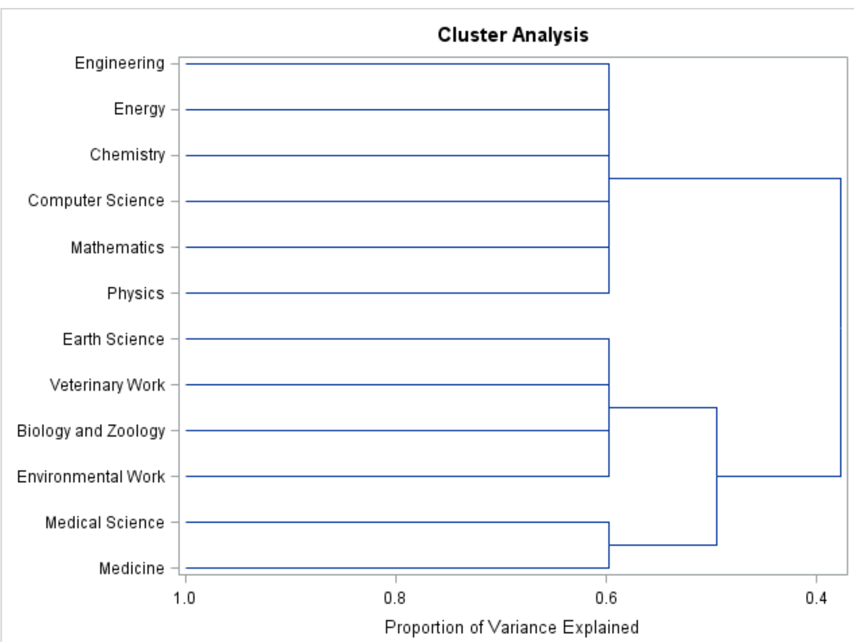


Figure A.12 High School Females in Rural Initiative



Appendix B. Cluster Analysis Results by Race/Ethnicity, School-Level, and Initiative

Figure B.1 Upper Elementary School Students from Overrepresented Racial/Ethnic Groups in Urban Initiative

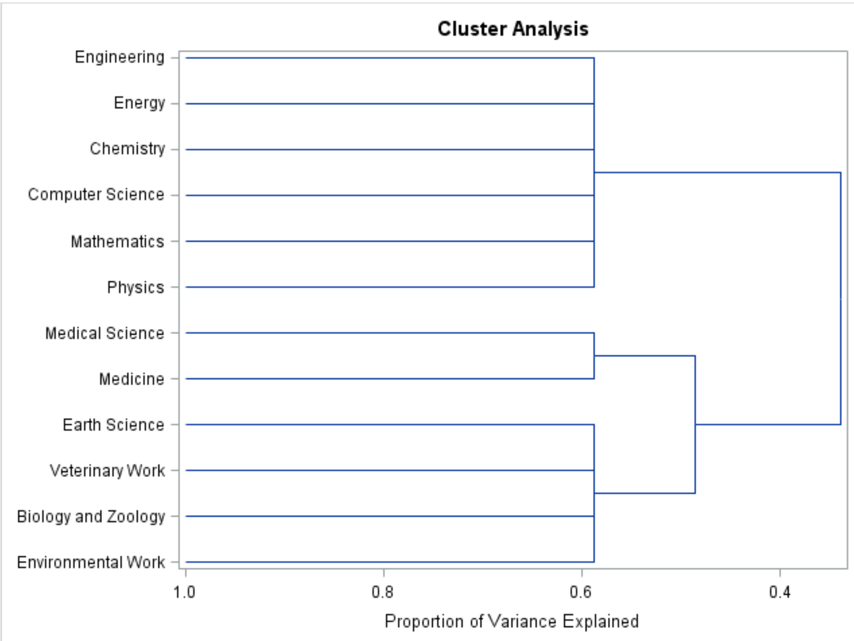


Figure B.2 Upper Elementary School Students from Underrepresented Racial/Ethnic Groups in Urban Initiative

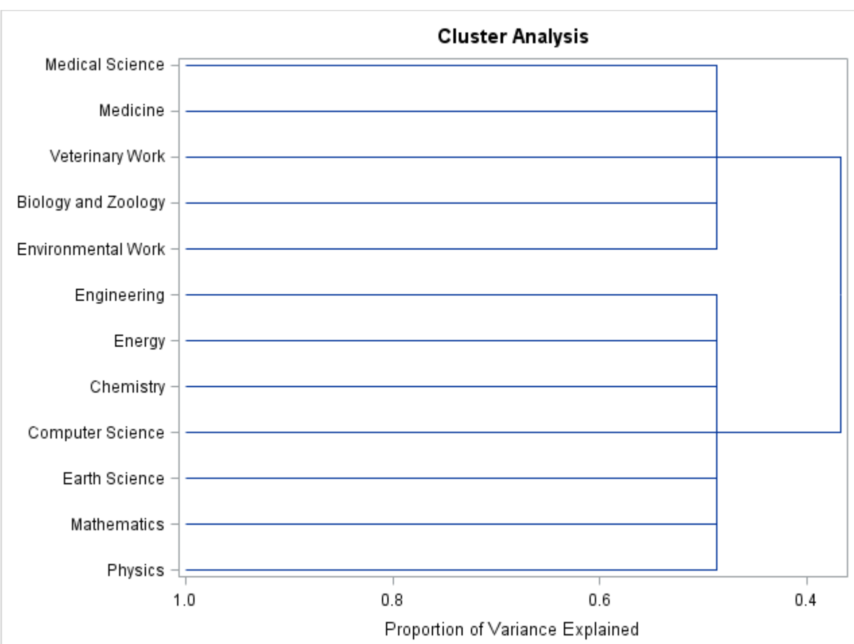


Figure B.3 Middle School Students from Overrepresented Racial/Ethnic Groups in Urban Initiative

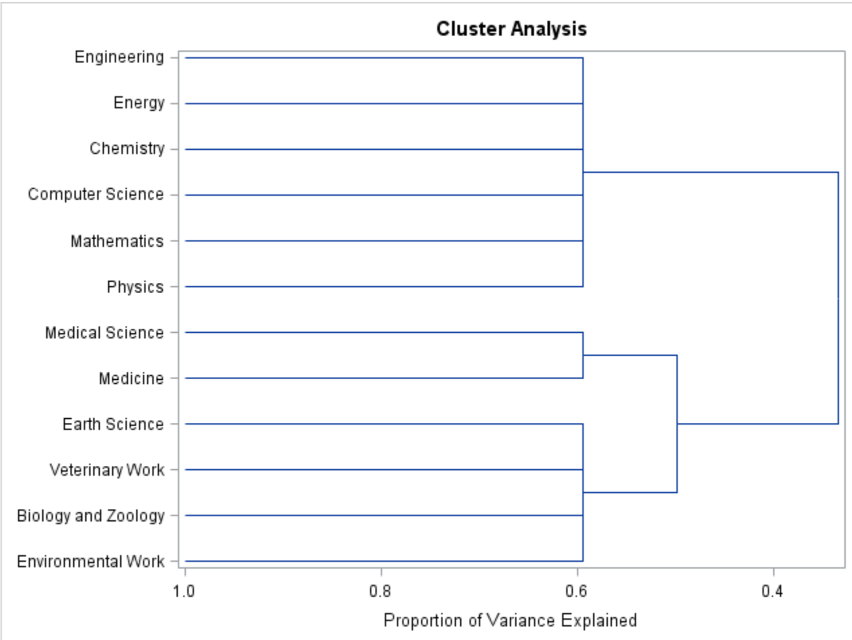


Figure B.4 Middle School Students from Underrepresented Racial/Ethnic Groups in Urban Initiative

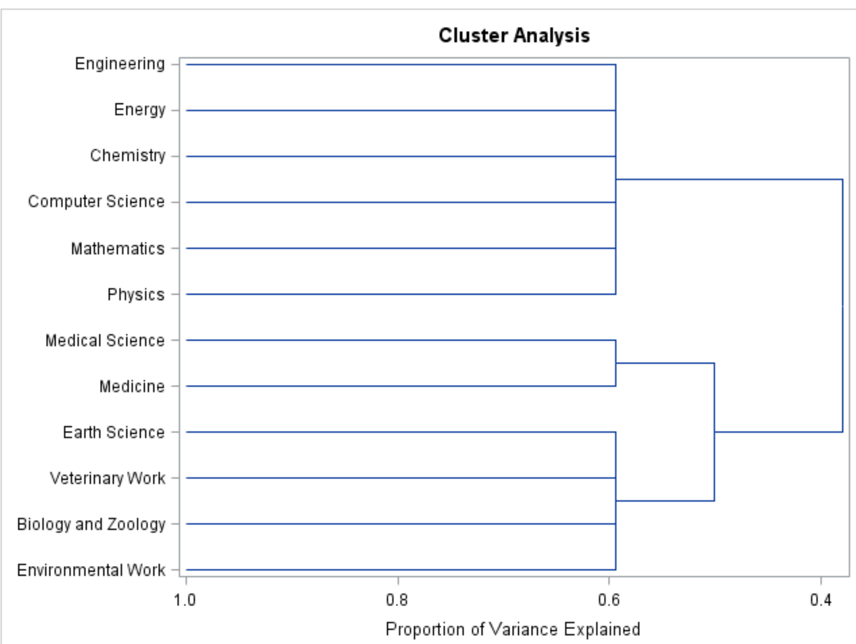


Figure B.5 High School Students from Overrepresented Racial/Ethnic Groups in Urban Initiative

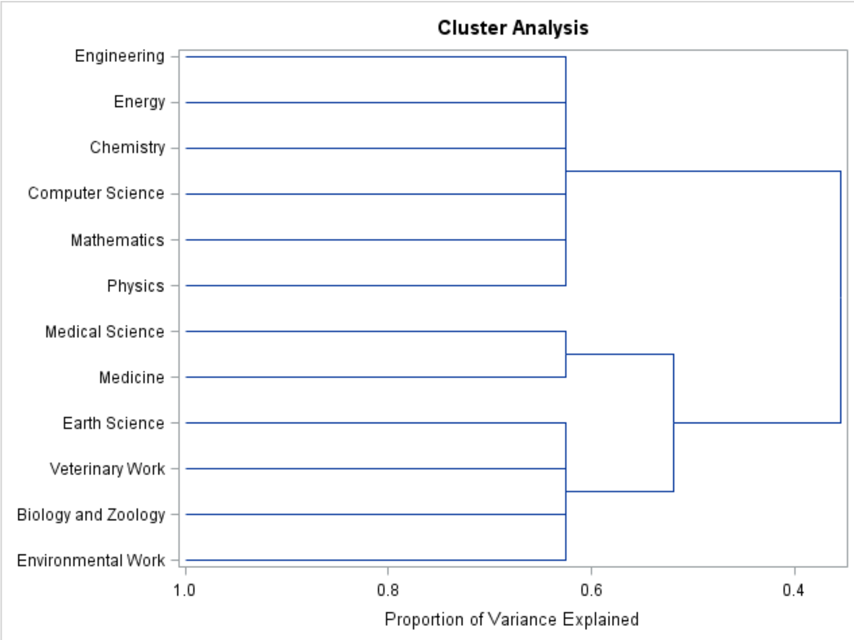


Figure B.6 High School Students from Underrepresented Racial/Ethnic Groups in Urban Initiative

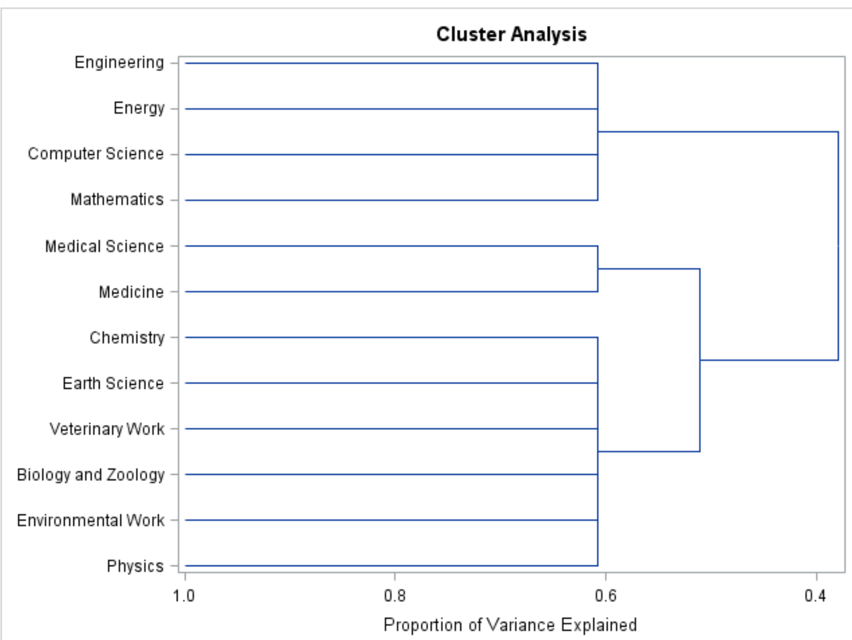


Figure B.7 Upper Elementary School Students from Overrepresented Racial/Ethnic Groups in Rural Initiative

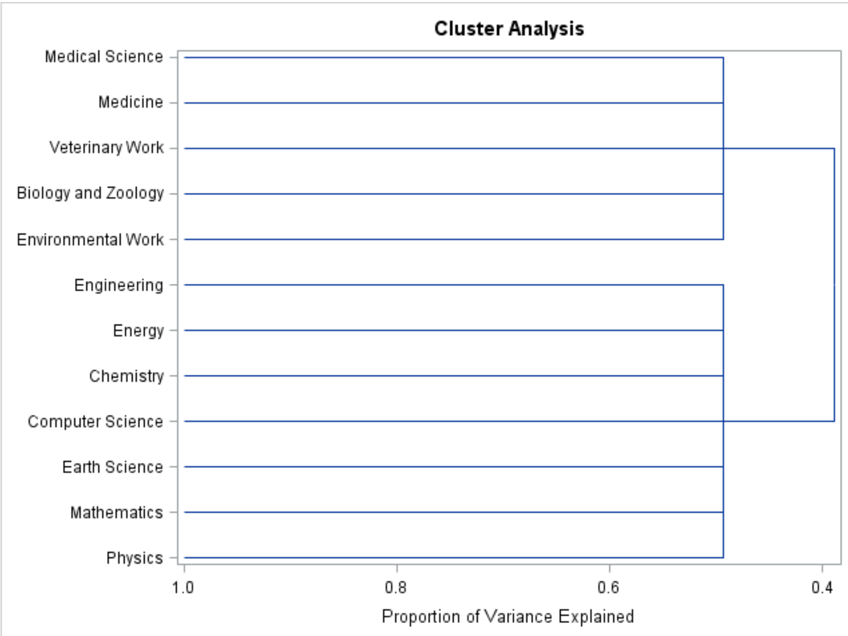


Figure B.8 Upper Elementary School Students from Underrepresented Racial/Ethnic Groups in Rural Initiative

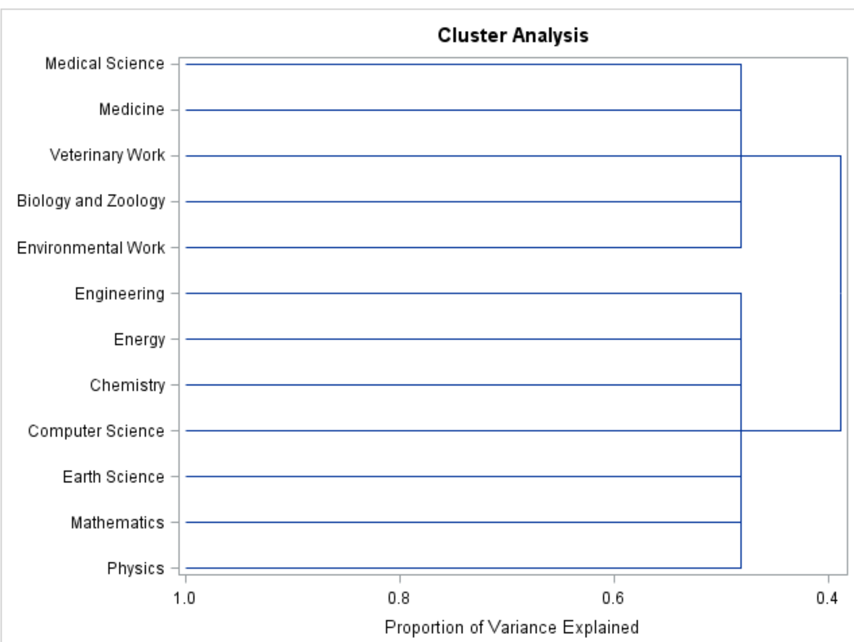


Figure B.9 Middle School Students from Overrepresented Racial/Ethnic Groups in Rural Initiative

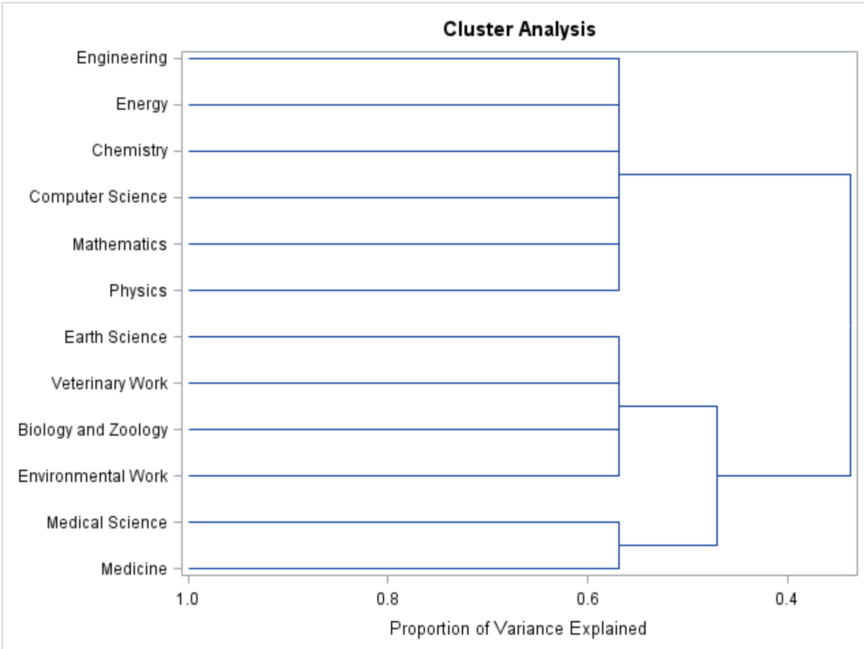


Figure B.10 Middle School Students from Underrepresented Racial/Ethnic Groups in Rural Initiative

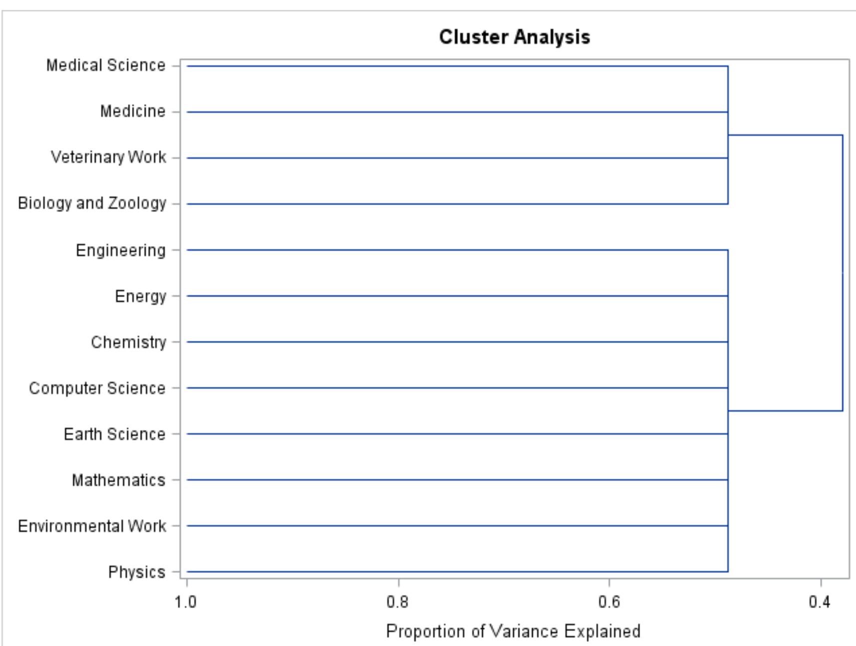


Figure B.11 High School Students from Overrepresented Racial/Ethnic Groups in Rural Initiative

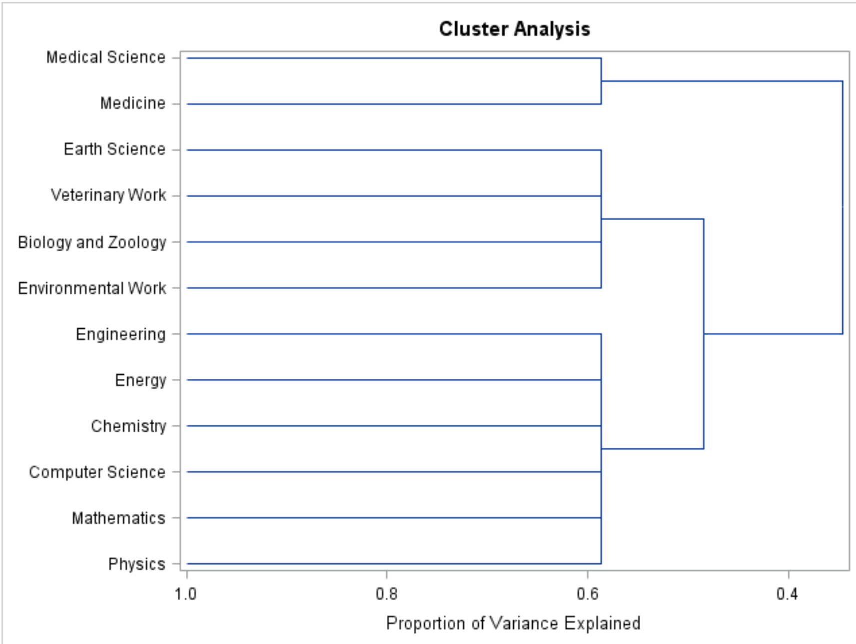


Figure B.12 High School Students from Underrepresented Racial/Ethnic Groups in Rural Initiative