Illinois Education Research Council
Bringing Research to Policy and Practice
POLICY RESEARCH: IERC 2012-2

College Confidence: How Sure High School Students Are of Their Future Majors

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Executive Summary

This study examines high school students' confidence in their planned college major with an emphasis on students planning to study one of the Science, Technology, Engineering, and Mathematics (STEM) fields. The study draws on responses from the ACT Student Interest Inventory of the Illinois High School Class of 2003, which asks students about their educational and occupational plans. Analysis of 75,698 responses revealed important differences by gender, race/ethnicity, and type of planned major.

When examining high school juniors' confidence in their planned college major, distinct differences were found between different groups of students and majors. Namely:

- **Women** were more confident in their planned college major than men.
- **African American students** were more confident in their planned college major than students from other racial and ethnic backgrounds.
- **Low-income students**, from families that made less than $30,000 per year, were more confident in their planned major than students from higher income backgrounds.
- Students indicating they planned to pursue a major in the **Health Sciences** and **STEM Teacher Education** were more confident in their major than students intending to pursue other STEM majors.
- Students who expected to complete a **vocational/technical degree** or a **professional degree** were more confident of their planned college major, compared to students who expected to complete an associate's degree, a bachelor's degree, or some graduate school.

Although women, students of color, and low-income students are underrepresented in many STEM fields, a high proportion of underrepresented students who plan to major in STEM were very sure of their educational plans. In addition, the level of education required for certain jobs appeared to increase all students' confidence in certain types of majors. These findings, and others, shed light on how a student's confidence in a planned major may be related to characteristics of particular STEM fields, such as the opportunity for exposure to incumbents and high school course work within the given field. Strategies to increase students' knowledge and understanding of potential majors during their secondary education experiences may help to increase students' confidence in their future college majors.

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Acknowledgements

We would like to acknowledge Blanca Rincon of the University of Illinois at Urbana-Champaign and Sharon Locke of the Center for Science, Technology, Engineering and Mathematics (STEM) Research, Education, and Outreach at Southern Illinois University Edwardsville for their thoughtful feedback on an earlier version of this report. We also thank Jennifer Barnhart for her skillful preparation of this report and Brenda Klostermann for her editorial assistance during the development of this report.

Suggested citation:

George-Jackson, Casey E. & Lichtenberger, Eric J. (2012). *College confidence: How sure high school students are of their future majors* (IERC 2012-2). Edwardsville, IL: Illinois Education Research Council at Southern Illinois University, Edwardsville.

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Background

Strengthening the scientific workforce has been and continues to be of importance for every state in America, including the state of Illinois. Preparing an educated workforce to enter Science, Technology, Engineering, and Mathematics (STEM) occupations is important for economic development and competitiveness, as "without a robust STEM workforce, we [the United States] will become less competitive in a global economy" (Carenvale, Smith, and Melton, 2011, p. 6). The STEM workforce contributes to the nation's capacity in research and design, scientific innovations, and technological advancements. Expanding STEM participation at all education levels, in addition to successful postsecondary STEM outcomes, is also important for reasons of equity given that certain groups are underrepresented in the STEM fields, including women, students of color, first-generation students, and low-income students.

An individual's ability to participate in the STEM workforce begins with adequate training and knowledge building garnered from K-12 and postsecondary schooling. The development of skills and knowledge necessary to succeed in math and science in school, in college, and in the workforce is largely a linear process, with little room for diversions or alternative pathways. Students who plan to pursue a STEM major in college often begin preparing in high school by taking certain courses, including Advanced Placement (AP) courses in math and science subjects, if available. Given the sequencing necessary to culminate in a STEM postsecondary degree or STEM occupation, it is necessary to examine high school students' attitudes, thoughts, and actions towards math and science fields. Included in this line of research is the need to link high school students' planned college majors and how sure or confident they are in their plans to pursue those majors. This study investigates high school students' confidence in pursuing a STEM major in college, which will give insight into which groups of students are most likely to study and potentially work in the STEM fields.

A review of the factors that impact high school students' interest in STEM fields led to the identification of four main themes: students' interests and motivations, high school contexts, academic preparation, and academic performance. While other factors also relate to high school students' interests in and ability to enroll in STEM majors in college, these three themes appear to be very influential on students' participation and success in STEM fields as they plan to transition from high school to college.

Students' Interests and Motivations

High school and college present an opportunity for students to explore academic interests and plan their pathway for further education or a specific occupation. Students' own interests and motivations in STEM fields and jobs shape their pursuit of math and science courses, their performance in these courses, and their entry into STEM majors in college. Although White and Asian males are traditionally well-represented in the STEM fields, White students have the lowest levels of interest in science, in comparison to other racial and ethnic groups, while Asian students have the highest levels of interest (Elliott, Strenta, Adair, Matier, & Scott, 1996). Despite Latino/a and African American students exhibiting similar and sometimes higher levels of interest in STEM fields than White students, fewer enter into and persist in STEM majors in college (Hurtado, Pryor, Tran, Blake, DeAngelo, & Aragon, 2010). By gender, White women have lower rates of interest in science than White men (Seymour & Hewitt, 1997), but with "commitment, as attested by their graduate or professional school goals, will achieve in science and engineering at relatively high rates" (Leslie, McClure & Oaxaca, 1998, p. 268).

Students' interests in STEM fields may be shaped, in part, by their orientation to future occupations and potential career earnings. Potential earnings influence Asian women's choice of a STEM major more than White women, particularly for Chinese, Filipino, and Southeast Asian women (Song & Glick, 2004). White women historically view familial obligations and occupational pursuits as exclusive endeavors, which results in their favoring jobs that offer more flexibility than those in the STEM sector so that temporary leaves from the workforce will allow them time to raise a family (Hanson, 2004). In addition to social expectations and life factors,

women tend to select majors based on different reasons and values as compared to men, with women placing less importance on potential career earnings and more importance on jobs that allow them to nurture others (Turner & Bowen, 1999; Wiswall & Zafar, 2012). Students of color also tend to choose majors that will enable them to give back to others and serve their community rather than choosing majors based on personal financial gain (Bowen, Kurzweil, & Tobin, 2005). Unfortunately, high school students—particularly women and students of color—do not view STEM fields as a means by which to achieve the altruistic goals of serving and caring for others, thereby contributing to their decisions not to choose a college major in STEM (Bonous-Hammarth, 2000).

High School Contexts

High schools shape students' educational opportunities through their course offerings, tracking policies, and—most important for STEM fields—access to science and math courses. The context of the high school and the math/science curriculum offered to students can vary greatly, with schools serving low-socioeconomic families providing fewer STEM educational opportunities to students (Oakes, 1990). In addition, schools that serve a high percentage of racial and ethnic minority students do not offer as many AP courses as other high schools due to disparities in school funding and access to resources, including quality teachers (May & Chubin, 2003). This results in fewer AP math and science courses taken by African Americans, Latinos, and Native Americans, which contributes to the underrepresentation of students of color in the STEM fields in postsecondary education.

Although women are underrepresented in certain STEM fields, their rate of completion of AP math and science courses in high school does not vary significantly from those of men (Clewell & Campbell, 2002). Despite their rate of completion in AP math and science courses and despite often earning higher grades in math and science courses than men (Leslie & Oaxaca, 1998), academically qualified women are still less likely to enter into a STEM major or occupation in comparison to men. In other words, "in spite of their strong preparation, girls still end up leaving science" (Blickenstaff, 2005, p. 374).

Academic Preparation

Academic preparation in STEM relates to the math and science courses students take, as well as the grades they receive in those courses. Academic preparation can also be measured by students' performance on standardized tests such as state-based proficiency exams, the SAT, and the ACT. Preparation levels impact not only students' entry into a STEM major, but also their persistence in that major to degree completion (Elliott et al., 1996). Exhibiting a high-level of academic preparation is a common characteristic of students who enter STEM majors in college (Levine & Wycokoff, 1991). White and African American students who took more math and science courses in high school were more likely to enroll in STEM majors in college (Maple & Stage, 1991). In addition, taking more high school science courses increases students' declaration of Engineering and Physical Science majors in college (Ethington, 2001, p. 359). Increasing academic preparation by encouraging students to take "the most academically intensive math courses—trigonometry, pre-calculus, calculus" (Trusty, 2002, p. 471) improves the likelihood of women choosing a STEM major in college.

Academic Performance

Academic performance can vary by levels of self-esteem and confidence, particularly in terms of students' self-assessment of their math and science skills. Stereotype threat has been offered as a possible explanation of lower levels of perceived academic self-concept; thus, underperformance on specific academic measures, such as college entrance exams, may occur for women and students of color (see Steele, 1997). Steele (1997) suggests that the theory of stereotype threat is a way to explain "how societal stereotypes about groups can influence the intellectual functioning and identity development of individual group members" (p. 613). It is important to note that stereotype threat is not an unchallenged theory of underrepresented students' academic underperformance (see Cohen, Garcia, Apfel & Master, 2006).

Methods

Data Source

In the state of Illinois, all high school juniors are required to take the ACT as part of the Prairie State Achievement Examination. The resulting dataset is a census of the Illinois High School Class, focusing on the Class of 2003. The data were made available to IERC researchers under shared data agreements with the Illinois Board of Higher Education and ACT. Obtaining this information for all students in the Class of 2003 increases the generalizability of the findings, and reduces a number of issues related to selection bias that exist in many education studies, particularly studies focusing on students' college choice process and their college experiences. Therefore, students who have a variety of postsecondary aspirations and expectations, including those who did not plan to enroll in college and who did not complete a postsecondary certificate or degree within seven years of graduating from high school, are included in the overall dataset.

Immediately prior to the ACT test administration, students complete a survey called the ACT Student Interest Inventory. Students are asked to answer a series of questions related to their interest in various activities and subjects, which sheds light on the students' academic and occupational interests and goals. This study is centered on students' responses to two items on the survey, namely their planned major along with how sure they are of that major, with a particular emphasis on students who planned to major in a STEM field. Students could provide the following answers to how sure they were about their current choice of college major: Very Sure, Fairly Sure, and Not Sure. For a list of the possible majors students were asked to choose from, see Appendix 1. The analysis presented here focuses on differences in students' responses by their demographic characteristics, as well as the type of major they planned to pursue in college, the highest degree they expected to earn, and the highest degree that was earned. The analysis is limited to students who indicated the type of college major or program of study they would like to enter. Students who indicated that their college major was "undeclared" were removed from the dataset prior to analysis.

Analysis

The current study included descriptive analyses of the Illinois High School Class of 2003, discounting the individuals with missing data for those key survey items.

It should be noted that in all tables and graphs, cell size restrictions were employed, so that data in cells with fewer than 10 individuals was omitted and marked accordingly.

Profile of Students

Table 1 provides background characteristics of the students featured in this study. Of the 75,698 students who are included in the dataset, 53.0% were female and 46.6% were male. In regards to students' racial and ethnic backgrounds: 11.1% were African American, 0.5% were American Indian/Alaskan Native, 64.7% were White, 8.8% were Latino/a, 4.3% were Asian/Pacific Islander, 3.9% were multiracial, and 6.7% preferred not to respond or their response was missing. In terms of family income, slightly higher proportions of the students in the study were in the low (23.3%) and mid-low (24.1%) income categories, as opposed to the mid-high (20.6%) and high income categories (19.5%).

Although roughly four out of every five students in the study expected to earn at least a bachelor's degree, the majority (61.3%) of students did not complete a postsecondary degree within seven years of graduating high school; 2.1% completed a certificate, 5.8% completed an associate's degree, and 30.8% completed a bachelor's degree or higher.

Over forty percent of students planned to major in a STEM field in college. Of these students, their planned majors were as follows: 6.0% in Agricultural Science, 10.1% in the Biological, Physical, and Food Sciences, 13.4% in Computer Science, 23.8% in Engineering, 36.9% in Health Science, 1.3% in Math, 7.6% in Psychology, and 0.9% in STEM Teacher Education. Forty-two percent of students were very sure of their planned college major, 45.7% were fairly sure, and 12.3% were not sure.

Table 1.
Demographic and Background Information (N=75,698)

Variables	N	%
Gender		
Male	35,258	46.6%
Female	40,153	53.0%
Missing	287	0.4%
Race and Ethnicity		
African American	8,378	11.1%
American Indian/Alaskan Native	374	0.5%
White	49,012	64.7%
Latino/a	6,637	8.8%
Asian/Pacific Islander	3,290	4.3%
Other/Multiracial	2,971	3.9%
Preferred not to respond/missing	5,036	6.7%
Family Income		
High Quartile $80K+	14,724	19.5%
Mid-high $50K–<$80K	15,605	20.6%
Mid-low $30K–<$50K	18,251	24.1%
Low <$30K	17,658	23.3%
Missing	9,460	12.5%
Highest Expected Degree		
Vocational/Technical Degree	2,782	3.7%
Two-Year College Degree	6,574	8.7%
Bachelor's Degree	24,992	33.0%
One or 2 Years of Graduate Study	14,920	19.7%
Professional Degree	21,831	28.8%
Other	3,747	4.9%
Missing	852	1.1%
Highest Postsecondary Degree Earned		
No Postsecondary Degree	46,406	61.3%
Certificate	1,565	2.1%
Associate's Degree	4,386	5.8%
Bachelors' Degree	23,341	30.8%
Planned College Major		
Non-STEM Field	44,413	58.7%
STEM	31,285	41.3%
Planned STEM Major (n=31,671)		
Agricultural Science	1,888	6.0%
Biological, Physical, and Food Sciences	3,171	10.1%
Computer and Information Sciences	4,197	13.4%
Engineering	7,439	23.8%
Health Sciences	11,549	36.9%
Mathematics	399	1.3%
Psychology	2,371	7.6%
STEM Teacher Education	271	0.9%
Confidence in College Major		
Very sure	31,783	42.0%
Fairly sure	34,608	45.7%
Not sure	9,307	12.3%

Gender and Planned Major

Planned Major by Gender

As shown in Table 2, the results revealed large gender differences both in terms of the proportion of students planning to major in any STEM field as well as within five of the eight specific STEM areas examined. Comparatively, a higher proportion of male students planned to major in a STEM field overall (44.6% to 38.5%). More specifically, significantly higher proportions of male students planned to major in Engineering (18.5% to 2.2%), Computer and Information Sciences (9.6% to 2.0%), and to a lesser extent Agricultural Science (3.7% to 1.4%), while higher proportions of female students planned to major in Health Sciences (22.8% to 6.7%) and to a lesser extent Psychology (4.8% to 1.3%). It should be noted that there were fairly equal proportions of male and female students planning to major in STEM Teacher Education (0.4% male to 0.4% female), Biological, Physical, and Food Sciences (3.9% male to 4.5% female), and Mathematics (0.6% male to 0.4% female).

Table 2.
Planned Major by Gender (N=75,698)

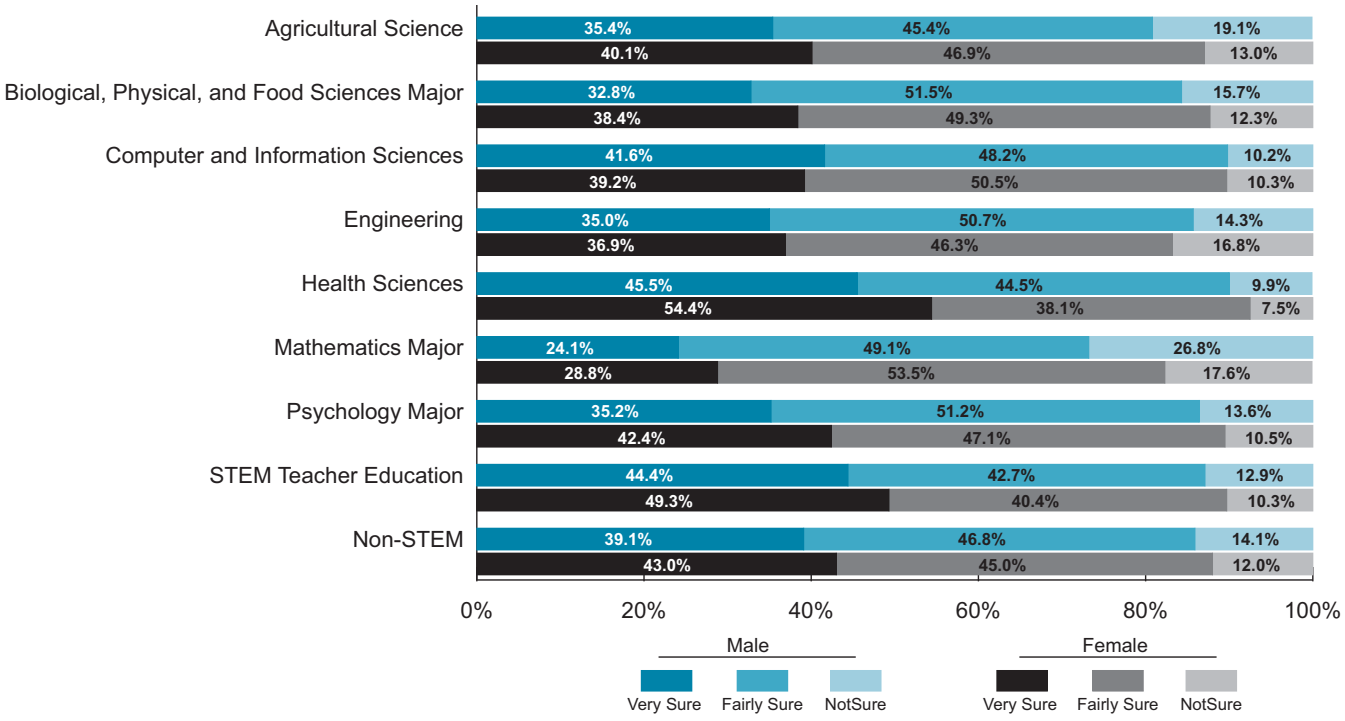
	Male	Female
Agricultural Science	3.7%	1.4%
Computer and Information Sciences	9.6%	2.0%
STEM Teacher Education	0.4%	0.4%
Engineering	18.5%	2.2%
Health Sciences	6.7%	22.8%
Biological, Physical, and Food Sciences	3.9%	4.5%
Psychology	1.3%	4.8%
Mathematics	0.6%	0.4%
Non-STEM	55.4%	61.5%

Gender and Confidence in Planned Major

Given persistent gender differences in STEM participation, examining students' confidence in different types of STEM majors by gender was also of interest. Figure 1 summarizes students' confidence in their planned major by gender and type of intended STEM major. The results revealed that a greater percentage of female high school students were very sure of their future STEM major, as compared to male students (40.4% versus 33.9%, respectively). Female students were more confident than males in their planned college major in every type of STEM field except for Computer and Information Sciences. For instance, 40.1% of females in Agricultural Sciences were very sure of their intended major, as compared to 35.4% of males. Furthermore, a greater percentage of females were very confident in traditionally male-dominated fields including Engineering and Math. As a reference point, 39.1% of males and 43.0% of females who planned to major in Non-STEM were very sure of their future college major.

Not only was a higher proportion of female students interested in the Health Sciences (Figure 1), among those with a stated interest in that field, a significantly higher proportion was very sure of that choice of major.

Figure 1.
Confidence in Planned Major by Gender (N=75,698)



* Note: Excludes responses from students with missing gender information

Race and Ethnicity

Planned Major by Race and Ethnicity

As shown in Table 3, there were some key differences in the proportion of students planning to major in a STEM field by race and ethnicity. Most notably was the large overall difference between Asian students and all other racial/ethnic groups, as nearly three out of every five Asian students planned to major in a STEM field. This was more than 14 percentage points greater than the next highest group—African American students (58.9% to 44.6%)—and close to 20 percentage points higher than that of Latino/a and White students. The majority of this overall racial difference can be explained by the high proportion of Asian students who planned to major in the Health Sciences (28.1%). Additional differences can be explained by the comparatively high proportion of Asian students with a stated interest in Engineering (14.6%). White and Latino/a students had similar patterns regarding the proportion planning to major in the various STEM fields with the exception of two of the fields. Relative to Latino/a students, a slightly higher proportion of White students planned to major in one of the Biological, Physical, or Food Sciences, while a slightly lower proportion of White students planned to major in Engineering. Proportionally, a higher number of White students reported one of the Biological, Physical, or Food Sciences as a planned major, and although the differences were minimal, they had the lowest proportion that planned to major in both Engineering and Computer and Information Sciences. African American students had the highest proportion planning to major in Computer and Information Sciences. It should be noted that plans do not equate to actually majoring in one of the STEM fields, as majoring is conditional upon enrollment and acceptance into a program.

Table 3.
Planned Major by Race (N=75,698)

	African American	American Indian/ Alaskan Native	White	Latino/a	Asian/ Pacific Islander	Other/ Multiracial	Prefer not to Respond/ Missing
Agricultural Science	2.2%	~	2.6%	2.2%	1.6%	~	2.7%
Computer and Information Sciences	7.6%	~	4.9%	6.5%	6.3%	~	6.5%
STEM Teacher Education	0.2%	~	0.4%	0.3%	0.3%	~	0.4%
Engineering	10.1%	~	9.1%	11.5%	14.6%	~	11.5%
Health Sciences	18.1%	~	14.6%	13.2%	28.1%	~	11.1%
Biological, Physical, and Food Sciences	2.4%	~	4.7%	2.5%	5.3%	~	3.9%
Psychology	3.5%	~	3.2%	2.7%	2.15	~	3.2%
Mathematics	0.4%	~	0.6%	0.3%	0.6%	~	0.6%
Non-STEM	55.4%	63.3%	59.9%	60.8%	41.1%	58.6%	60.1%

Confidence in Planned Major by Race and Ethnicity

Despite being underrepresented in STEM fields, African American students in the Illinois High School Class of 2003 were most confident of their planned college major across all types of STEM majors (see Table 4). A greater percentage of African American students are very sure of their plans to major in STEM fields than White students, particularly in Computer and Information Sciences (52% versus 40%, respectively) and Engineering (47% to 40%, respectively). As a whole, White students appear to be less sure of their majors, with only 38% of students reporting that they are very sure of majoring in Agricultural Science, 33% in Engineering, and 25% in Mathematics. So while students of color may be underrepresented overall in the STEM fields, many of those who plan to major in STEM are more sure of their future college major than well-represented students. Across all racial and ethnic groups, students appear to be the most sure about majoring in professional-oriented majors, such as Health Sciences. For instance, nearly two-thirds of African Americans and roughly one-half of White students were very sure about majoring in Health Sciences.

Table 4.
Confidence in Planned Major by Race and Major (N=75,698)

		African American	American Indian/ Alaskan Native	White	Latino/a	Asian/ Pacific Islander	Other/ Multiracial	Prefer not to Respond/ Missing
Agricultural Science	Very Sure	41%	~	38%	29%	~	28%	37%
	Fairly Sure	48%	~	45%	50%	~	50%	43%
	Not Sure	11%	~	17%	21%	~	22%	20%
Computer and Information Sciences	Very Sure	52%	~	40%	38%	37%	36%	42%
	Fairly Sure	44%	~	49%	51%	53%	52%	49%
	Not Sure	4%	~	12%	11%	10%	12%	8%
STEM Teacher Education	Very Sure	~	~	46%	~	~	~	~
	Fairly Sure	~	~	42%	~	~	~	~
	Not Sure	~	~	13%	~	~	~	~
Engineering	Very Sure	47%	~	33%	36%	31%	36%	39%
	Fairly Sure	43%	~	51%	50%	56%	53%	47%
	Not Sure	10%	~	16%	15%	13%	11%	14%
Health Sciences	Very Sure	66%	~	49%	53%	54%	56%	55%
	Fairly Sure	30%	~	42%	40%	37%	37%	39%
	Not Sure	4%	~	9%	7%	8%	8%	6%
Biological, Physical, and Food Sciences	Very Sure	51%	~	34%	44%	33%	~	34%
	Fairly Sure	43%	~	51%	44%	53%	~	50%
	Not Sure	6%	~	15%	12%	13%	~	15%
Psychology	Very Sure	~	~	37%	44%	~	38%	40%
	Fairly Sure	~	~	50%	48%	~	49%	47%
	Not Sure	~	~	13%	8%	~	14%	12%
Mathematics	Very Sure	~	~	25%	41%	~	13%	28%
	Fairly Sure	~	~	53%	50%	~	69%	48%
	Not Sure	~	~	22%	9%	~	19%	24%
Non-STEM	Very Sure	53%	44%	39%	42%	33%	43%	43%
	Fairly Sure	40%	41%	47%	47%	53%	45%	44%
	Not Sure	7%	15%	14%	11%	14%	12%	13%

Family Income and Planned Major

Family income was organized by quartiles into the following groups: high income (more than $80,000), middle-high income ($50,000 to $79,999), middle-low income ($30,000 to $49,999), and low- income (less than $30,000). As illustrated in Table 5, the results reveal a slightly higher proportion of low income students anticipated enrolling in any STEM field. Relative to students in higher income brackets, higher proportions of lower income students reported they planned to major in: Agricultural Science, Computer and Information Sciences, and the Health Sciences. On the other hand, higher proportions of students from wealthier families planned on majoring in Engineering and fields within the Biological, Physical, and Food Sciences.

Table 5.
Planned Major by Family Income Level (N=75,698)

	High Quartile $80K+ (N=14,724)	Mid-High Quartile $79,999–$50K (N=14,605)	Mid-Low Quartile $49,999–$30K (N=18,251)	Low Quartile <$30K (N=17,658)	Missing (N=9,460)
Agricultural Science	1.6%	2.3%	2.9%	3.1%	2.3%
Computer and Information Sciences	4.6%	5.3%	5.7%	6.5%	5.4%
STEM Teacher Education	0.4%	0.4%	0.4%	0.3%	0.4%
Engineering	11.4%	10.2%	9.3%	9.4%	8.6%
Health Sciences	14.0%	15.2%	15.4%	16.4%	15.0%
Biological, Physical, and Food Sciences Major	5.3%	4.7%	4.3%	2.9%	3.9%
Psychology Major	3.1%	3.2%	3.0%	3.2%	3.2%
Mathematics Major	0.6%	0.6%	0.5%	0.4%	0.6%
Non-STEM	59.1%	58.3%	58.6%	57.7%	60.6%

Confidence in Planned Major and Family Income

Students from lower income groups were more confident in their planned college major as compared to students in higher income brackets (see Table 6). As family income increased the proportion of students who reported being very sure of their major decreased. This held true for all majors except Agricultural Science, where there was little difference between the income level and the proportion of students very sure of their major. With all majors combined, 37.0% of the highest family income, 40.7% of middle-high income, 42.3% of middle-low income, and 47.4% of the lowest family income were very sure of their college major. These differences suggest that students from lower-income families may have a clearer sense of their future college major, and by extension, the type of career that they plan to pursue (or vice versa). Conversely, students from higher income brackets may view college as a chance to explore different majors and potential occupations, but have less pressure to select a major that would lead to a desired occupation. In other words, lower-income students may be more likely to adhere to a specific plan for education in order to save time and money, and to reduce the opportunity costs of attending college.

Table 6.

Confidence in Planned Major by Family Income Level and Major (N=75,698)

		High Quartile $80K+	Mid-High Quartile $79,999–$50K	Mid-Low Quartile $49,999–$30K	Low Quartile <$30K	Missing
Agricultural Science	Very Sure	36.9%	36.7%	36.0%	36.9%	39.7%
	Fairly Sure	39.8%	47.2%	47.3%	47.8%	41.6%
	Not Sure	23.3%	16.1%	16.8%	15.3%	18.7%
Computer and Information Sciences	Very Sure	38.7%	39.3%	40.7%	45.6%	39.3%
	Fairly Sure	48.9%	49.9%	48.6%	46.5%	50.5%
	Not Sure	12.4%	10.7%	10.7%	7.9%	10.3%
STEM Teacher Education	Very Sure	30.8%	46.6%	47.0%	54.2%	58.3%
	Fairly Sure	57.7%	39.7%	37.9%	35.6%	38.9%
	Not Sure	11.5%	13.8%	15.2%	10.2%	2.8%
Engineering	Very Sure	31.4%	33.6%	36.6%	39.2%	35.1%
	Fairly Sure	52.8%	53.0%	48.5%	45.8%	51.6%
	Not Sure	15.8%	13.4%	14.9%	15.0%	13.3%
Health Sciences	Very Sure	48.6%	51.0%	52.5%	57.3%	51.4%
	Fairly Sure	42.0%	40.5%	39.8%	35.8%	40.6%
	Not Sure	9.3%	8.5%	7.7%	6.9%	7.9%
Biological, Physical, and Food Sciences	Very Sure	31.9%	35.4%	39.4%	41.5%	31.0%
	Fairly Sure	52.6%	51.7%	46.3%	48.1%	53.9%
	Not Sure	15.5%	12.9%	14.3%	10.4%	15.1%
Psychology	Very Sure	31.6%	42.5%	39.9%	51.0%	35.8%
	Fairly Sure	51.3%	46.7%	50.7%	41.7%	51.8%
	Not Sure	17.1%	10.8%	9.4%	7.4%	12.4%
Mathematics	Very Sure	25.8%	22.7%	31.1%	25.7%	24.1%
	Fairly Sure	52.7%	59.1%	48.9%	50.0%	40.7%
	Not Sure	21.5%	18.2%	20.0%	24.3%	35.2%
Non-STEM	Very Sure	36.1%	40.0%	41.5%	46.9%	40.6%
	Fairly Sure	48.6%	46.5%	46.3%	42.3%	46.3%
	Not Sure	15.3%	13.5%	12.3%	10.8%	13.1%

Confidence in Major by Type of Major

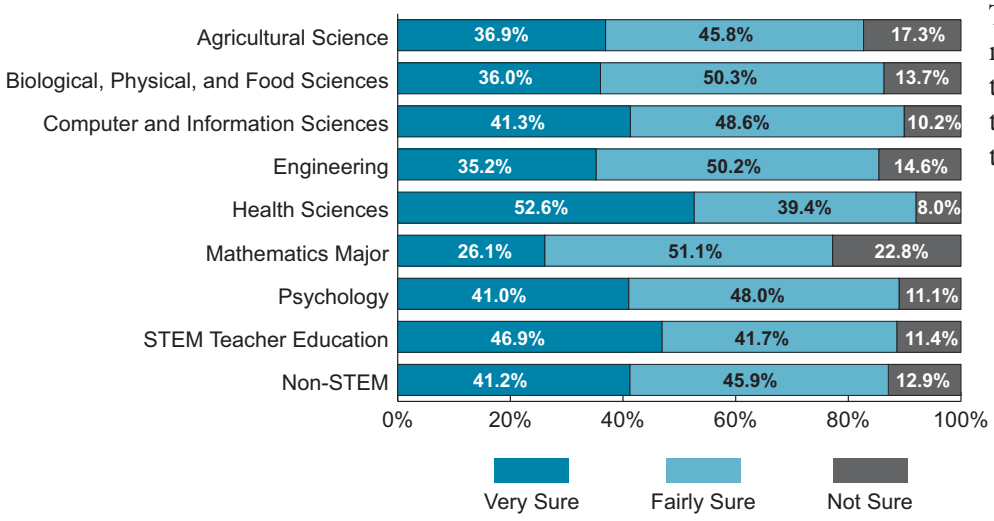
Figure 2 illustrates high school juniors' confidence in their planned major in college, by the type of STEM major. A greater percentage of students who planned to major in the Health Sciences (52.6%), STEM Teacher Education (46.9%), and Computer and Information Sciences (41.3%) were very sure of their college major, in comparison to students who planned to major in other STEM fields. Conversely, a greater percentage of students who planned to major in Math (22.5%), Agricultural Sciences (17.3%), and Engineering (14.6%), as compared to other majors, were not sure of their major. By comparison, nearly half of Non-STEM majors were fairly sure of their major, while 36.9% were very sure and 17.3% were not sure.

It could be argued that the proportion of students confident in their plans to major in each field is reflective of a combination of factors related to the students' motivation as well as characteristics of the particular field itself. One field-related factor is the educational commitment necessary for entry into the occupation. For students planning to major in one of the Health Sciences, this may vary based on the student's desired occupation. For instance, becoming a doctor requires a significant time commitment in addition to strict academic qualifications at each transition point. While becoming a nurse does not require the same time commitment for schooling as becoming a physician (several nursing programs take two years), one must commit to the profession early on to meet the academic prerequisites necessary to enter a nursing program.

The low percentage of prospective Engineering students very sure of their college major is surprising given the likelihood of securing a well-paying job after college and the educational commitment required; however, their confidence level may reflect the perceived difficulty of entering and persisting in an Engineering major in college and perhaps a lack of direct experience in "engineering" coursework in high school as compared with other majors such as Mathematics or Computer and Information Sciences, or biology/anatomy for the Health Sciences. Another factor associated with student confidence in different STEM areas could be related to the opportunity for direct exposure to incumbents within the field. Many high school students may not come into contact with an engineer as they would a nurse or doctor; therefore, engineering may be understood in a less concrete way.

Regarding the relatively high percentage of STEM Teacher Education aspirants who were very sure of their major, students who seek to become teachers may know their desired profession at an early age, due to exposure to incumbents, and make their postsecondary plans accordingly. Also, students who plan to major in one of the Health Sciences and STEM Teacher Education may be motivated by the opportunity to nurture others and/or the flexibility associated with those occupations.

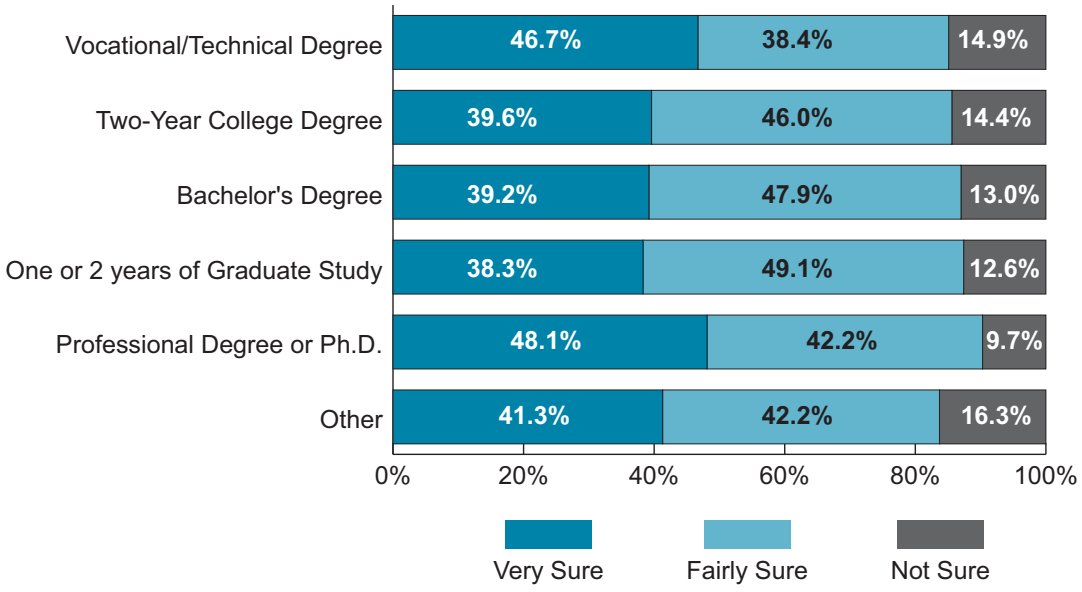
Figure 2.
Confidence in College Major by Type of Planned College Major (N=75,698)



Highest Expected Degree and Confidence in Planned Major

The ACT Student Interest Inventory also asked students to indicate the highest degree they expected to earn. Students who intended to complete a professional degree or a vocational/technical degree were most sure of their planned college major (48.1% and 46.7%, respectively), while students from the other four groups clustered within 1.7 percentage points of 40%. Comparatively, students who indicated their highest expected degree as "other" had the highest percentage (16.3%) indicating a lack of confidence in their planned major. This may be a confluence of students who are unsure of their postsecondary plans or career goals and what degrees and/or fields of study may be necessary to accomplish their goals. In examining the proportion of students who reported being not sure of their planned major across all of the expected degree types, it appeared that as the educational requirements for the expected degree increased, the proportion of students not sure of their major decreased. For example, while 9.7% of the students who expected to earn a professional degree or Ph.D. were not sure of their major (the lowest proportion), 14.9% of the students who expected to earn a vocational or technical degree met that same distinction.

Figure 3.
Confidence in Planned Major by Highest Expected Degree (N=75,698)



Confidence by Major by Highest Degree Earned

Figure 4 illustrates the highest postsecondary degree earned within seven years of high school graduation for students in the study. Approximately 60% of students featured in the study did not complete a postsecondary degree within seven years of high school graduation. Although some students may have expected or planned to attend college and major in a specific field, this did not occur for the majority of the students in the dataset.

The students who earned a certificate as their highest degree had the highest proportion reporting they were very confident in their planned major. Although only a little more than 2% of the Illinois High School Class of 2003 completed a postsecondary certificate within seven years of graduating from high school (Figure 4), as illustrated in Figure 5, roughly half (49.1%) of these students were very sure of their college major, as compared to 41.6% who completed an associate's degree, and 36.8% who completed a bachelor's degree or higher. These differences may be reflective of the range of possible majors available at each level of postsecondary education with fewer possible options available to students pursuing a certificate, as compared to the choices available to students who earned an associate's or bachelor's degree. The majority of students who completed an associate's degree or a bachelor's degree or higher, were fairly sure of their major (45.9% and 49.0% percent, respectively). For the students who failed to earn a postsecondary credential during the study period, there was a roughly equal distribution in the number of students who reported that they were very sure (44.4%) and fairly sure (44.2%) of pursuing their planned major when they were a junior in high school.

Figure 4.
Highest Degree Earned (N=75,698)

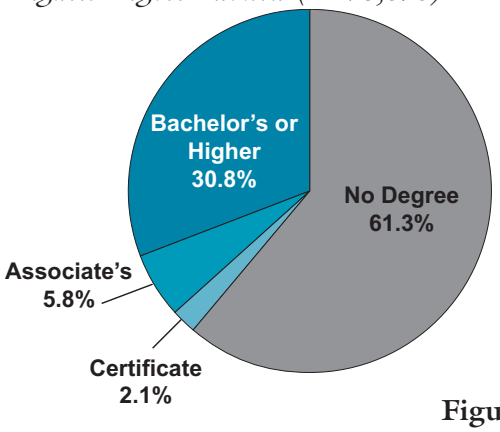
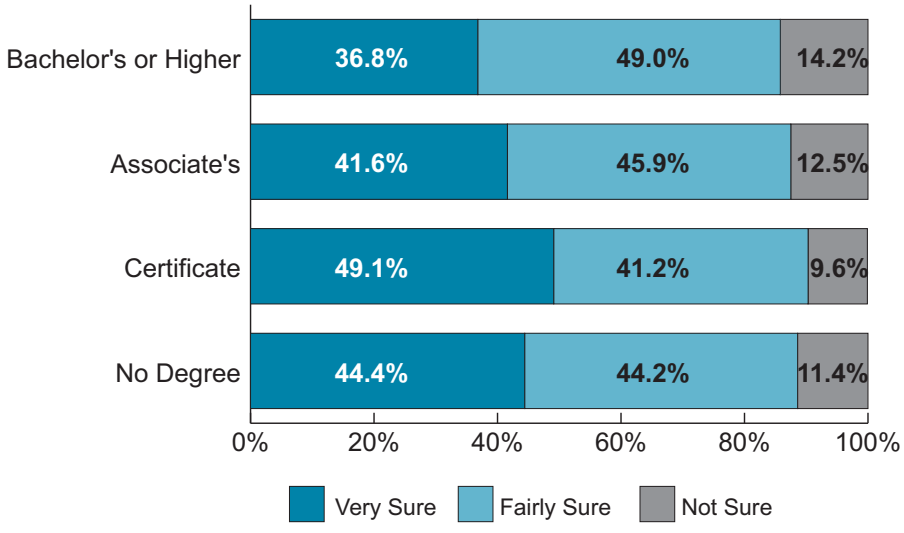


Figure 5.
Highest Degree by Confidence in Planned Major (N=75,698)



Confidence in Planned Major by Highest Degree Earned and Type of STEM Major

Examining students' highest degree earned and type of planned STEM major revealed that students who planned to major in the Health Sciences were most confident of their planned college major, across multiple types of degrees earned. For instance, of the students who completed a postsecondary certificate, 60.7% of those who had planned to major in the Health Sciences were very sure of their future college major in high school, as compared to 40.7% in the Agricultural Sciences and 33.3% in the Biological, Physical, and Food Sciences. Of the students who earned an associate's degree, 51.4% of the students who planned to major in Health Sciences had been very sure of their college major, as compared to 43.3% in Computer and Information Sciences and 37.7% in Engineering.

For students earning a bachelor's degree or higher, only those who planned to major in STEM Teacher Education were more sure of their majors than students planning to major in Health Sciences (47.0% versus 46.3%). The percentage of students very sure of their major in Non-STEM fields is provided in the table for a reference point.

Table 7.

Confidence in Planned Major by Highest Degree by Major (N=75,698)

		Bachelor's or Higher	Associate's	Certificate	No Degree
Agricultural Science	Very Sure	37.9%	39.6%	40.7%	36.2%
	Fairly Sure	47.9%	41.1%	40.7%	46.2%
	Not Sure	14.1%	19.3%	18.5%	17.6%
Computer and Information Sciences	Very Sure	35.6%	43.3%	40.0%	43.0%
	Fairly Sure	53.8%	45.3%	48.4%	47.1%
	Not Sure	10.6%	11.4%	11.6%	9.9%
STEM Teacher Education	Very Sure	47.0%	47.4%	40.0%	47.0%
	Fairly Sure	40.9%	36.8%	40.0%	43.2%
	Not Sure	12.2%	15.8%	20.0%	9.8%
Engineering	Very Sure	30.9%	37.7%	36.5%	37.0%
	Fairly Sure	53.6%	51.0%	47.1%	48.6%
	Not Sure	15.5%	11.3%	16.3%	14.4%
Health Sciences	Very Sure	46.3%	51.4%	60.7%	55.8%
	Fairly Sure	43.2%	40.2%	35.0%	37.5%
	Not Sure	10.5%	8.4%	4.3%	6.7%
Biological, Physical, and Food Sciences	Very Sure	30.8%	37.0%	33.3%	40.5%
	Fairly Sure	54.2%	48.1%	58.8%	46.8%
	Not Sure	15.0%	14.9%	7.8%	12.6%
Psychology	Very Sure	36.5%	34.8%	43.9%	44.6%
	Fairly Sure	49.0%	51.8%	46.3%	46.9%
	Not Sure	14.5%	13.5%	9.8%	8.5%
Mathematics	Very Sure	23.4%	25.0%	50.0%	28.6%
	Fairly Sure	54.2%	50.0%	25.0%	48.6%
	Not Sure	22.4%	25.0%	25.0%	22.9%
Non-STEM	Very Sure	36.0%	39.4%	46.3%	43.8%
	Fairly Sure	49.0%	47.3%	42.3%	44.3%
	Not Sure	15.0%	13.3%	11.4%	11.9%

Implications and Conclusions

The results of the study can be used to inform programs aimed at improving recruitment into the STEM fields. For instance, programs that offer students and their families information about STEM majors and careers may lead to an early awareness of opportunities in STEM fields. The timing of these interventions is crucial given that many students in their junior year of high school already have a notion of what their college major will be, as well as what job they may have in the future. Recruitment programs that inform students and their parents of the many STEM major options, as well as pathways to STEM-related degrees and occupations, may help strengthen students' selection of STEM majors, as well as their confidence in their choice.

In terms of current policy, these results could be useful as the new STEM learning exchange program is implemented in Illinois (Branham, 2012). Learning exchanges are an integral part of Illinois' Race to the Top grant and are designed to support the local development of P-20 STEM programs that connect a student's career and educational interests. The STEM programs heavily emphasize educational and school to workforce transitions, as well as facilitate the development of public-private partnerships between schools and a variety of stakeholders. The learning exchanges are designed to coordinate functions across the P-20 STEM talent pipeline and are designed to improve access and success for underrepresented populations in STEM fields, including women, racial/ethnic minorities, low-income, and disabled students (Tyszko, 2011).

The results also disrupt common perceptions of underrepresented students in STEM fields. Groups that are traditionally underrepresented—women, African Americans, and low-income students— are actually more confident in their plans to major in a STEM field than traditionally well-represented students. This may reflect a notion that students from these groups need to be overly-confident of their major choice to compensate for the perception that they may not succeed in the major due to the level of their group's representation in the STEM fields. Also, comparatively higher proportions of underrepresented groups planned on majoring in select STEM fields, such as African American students in Computer and Information Sciences and Engineering and low-income students in Health Sciences and Agriculture.

This study offers an initial understanding of high school students' levels of confidence in their future college majors; however, being very sure of a STEM (or any) major does not necessarily equate or lead to long-term success in these fields. Further, planning to major in a STEM field does not guarantee that a particular student even enrolls in college upon high school graduation. In addition, the congruency between planned major and students' academic qualifications and preparation levels needs to be explored further to provide additional insight into the process by which students enter and persist in STEM majors. In other words, are educational expectations aligned with academic qualifications and at which point in the talent pipeline are underrepresented students with sufficient academic qualifications exiting the field?

Future Work

A number of limitations are recognized within this study, the most significant of which is related to the use of secondary data. The ACT Student Interest Inventory did not ask students why they felt very sure, fairly sure, or not sure of their current choice of college major. Therefore, it is difficult to assess the reasoning behind the answers that students gave. However, the survey did ask students how sure they were of their intended occupation. Future analysis will aim to better understand the patterns related to students' confidence in pursuing an occupation and planned major.

This analysis has not yet incorporated students' actual college majors. Future analysis will consider how sure students were of their college major according to whether or not they pursued and/or completed a degree in the type of major they initially planned to pursue at the time of taking the ACT. Finally, this paper primarily focused on students who planned to major in a STEM field in college. Future analysis will incorporate students who planned to major in non-STEM fields so that additional comparisons can be made across all college majors.

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Appendix 1 - List of College Majors (ACT, 2001)

400 Undecided

410 AGRICULTURE SCIENCES & TECHNOLOGIES, General
411 Agricultural Business
412 Agricultural Economics
413 Agricultural Mechanics
414 Agricultural Production/Technology
415 Agronomy (e.g., field crop management, soils)
416 Animal Sciences (e.g., animal breeding, dairy, poultry)
417 Farm and Ranch Management
418 Fish, Game, and Wildlife Management
419 Food Sciences/Engineering
420 Forestry (pre-forestry) and Related Sciences
421 Horticulture/Ornamental Horticulture
422 Natural Resources (air, water, soil, etc.) Management

430 ARCHITECTURE & ENVIRONMENTAL DESIGN, General
431 Architectural Drafting/CADD
432 Architecture (pre-architecture)
433 Building Construction/Construction Science
434 City, Community, and Regional Planning
435 Environmental Design
436 Interior Design
437 Landscape Architecture

450 BUSINESS & MANAGEMENT, General
451 Accounting
452 Banking and Finance
453 Business Administration and Management
454 Business Economics
455 Contract Management & Procurement/Purchasing
456 Hotel/Motel/Restaurant Management
457 Human Resources Development/Training
458 Institutional Management
459 Insurance and Risk Management
460 International Business Management
461 Labor/Industrial Relations
462 Management Information Systems
463 Management Science
464 Marketing Management and Research
465 Organizational Behavior
466 Personnel/Human Resources Management
467 Real Estate
468 Small Business/Entrepreneurial Studies
469 Trade and Industrial Supervision and Management
470 Transportation Management

480 BUSINESS & OFFICE, General
481 Bookkeeping/Accounting Technology
482 Business Data Processing/Computer Operation
483 Court Reporting
484 Office Supervision and Management
485 Secretarial (including executive, legal, medical)
486 Typing and General Office
487 Word Processing

510 MARKETING & DISTRIBUTION, General
511 Fashion Merchandising
512 Retailing and Sales
513 Travel Services and Tourism

520 COMMUNICATIONS & COMMUNICATIONS TECH., General
521 Advertising
522 Graphic/Commercial Art and Illustration
523 Graphic and Printing Communications/Technologies
524 Journalism
525 Photography/Film/Video Technology
526 Public Relations
527 Radio/Television Broadcasting
528 Radio/Television Production and Technology

540 COMMUNITY & PERSONAL SERVICES, General
541 Corrections
542 Cosmetology/Hairstyling
543 Criminal Justice/Criminology
544 Fire Protection/Fire Control & Safety Technology
545 Funeral Services/Mortuary Science
546 Law Enforcement and Administration
547 Library Science/Library Assisting
548 Military Science/Technology
549 Parks and Recreation
550 Public Administration
551 Public Affairs
552 Social Work

560 COMPUTER & INFORMATION SCIENCES, General
561 Computer Programming/Software Engineering
562 Computer Science
563 Data Processing
564 Information Sciences and Systems
565 Math/Computer Science

570 CROSS-DISCIPLINARY STUDIES, General
571 Area and Ethnic Studies (e.g., Latin American studies, African-American studies)
572 Liberal Arts/General Studies
573 Multi/Interdisciplinary Studies (e.g., peace studies, women's studies)

580 EDUCATION, General
581 Adult and Continuing Education
582 Education Administration
583 Elementary Education
584 Junior High/Middle School Education
585 Pre-elementary (early childhood) Education
586 Secondary Education
587 Student Counseling/Services
588 Teacher Aide

590 TEACHER EDUCATION, General
591 Agricultural Education
592 Art Education
593 Business Education
594 English Education
595 Foreign Languages Education
596 Health Education
597 Human, Family, and Consumer Science Education
598 Industrial Arts Education
599 Mathematics Education
600 Music Education
601 Physical Education
602 Science Education
603 Social Studies/Social Sciences Education
604 Special Education (e.g., learning disabled, gifted)
605 Speech Correction Education
606 Teaching English as a Second Language
607 Technical/Trade and Industrial Education
608 Education, Other Subject Area

620 ENGINEERING (PRE-ENGINEERING), General
621 Aerospace, Aeronautical & Astronautical Engineering
622 Agricultural Engineering
623 Architectural and Biosystems Engineering
624 Bioengineering and Biomedical Engineering
625 Ceramic Engineering
626 Chemical Engineering
627 Civil Engineering
628 Computer Engineering
629 Construction Engineering/Construction Management
630 Electrical, Electronics & Communications Engineering
631 Engineering Management
632 Engineering Physics
633 Engineering Science
634 Environmental Health Engineering
635 Geological and Geophysical Engineering
636 Industrial Engineering/Technology
637 Materials Engineering
638 Mechanical Engineering
639 Metallurgical Engineering
640 Mining and Mineral Engineering
641 Naval Architecture and Marine Engineering
642 Nuclear Engineering
643 Ocean Engineering
644 Petroleum Engineering
645 Systems Engineering

660 ENGINEERING-RELATED TECHNOLOGIES, General
661 Aeronautical Technology
662 Air Conditioning, Heating & Refrigeration Tech.
663 Architectural Design/Technology
664 Biomedical Equipment Technology
665 Civil Engineering Technology
666 Computer Engineering Technology
667 Construction/Building Technology
668 Drafting and Design Technology/CADD
669 Electrical Engineering Technology
670 Electronic Engineering Technology
671 Electromechanical Instrumentation & Maintenance Tech.
672 Environmental Control Technology
673 Industrial Production Technologies
674 Laser/Fiber Optic Technology
675 Manufacturing Technology
676 Mechanical Engineering Technology
677 Mining and Petroleum Technology
678 Occupational Safety & Health Technology
679 Surveying and Mapping Technology
680 Engineering-Related Technologies, Other

720 FOREIGN LANGUAGES, General
721 Asiatic Languages (e.g., Chinese, Japanese, Korean)
722 Classical Languages (e.g., Greek, Latin)
723 French
724 German
725 Italian
726 Middle Eastern Languages (e.g., Arabic, Hebrew)
727 Russian
728 Spanish
729 Foreign Languages, Other

740 HEALTH SCIENCES & ALLIED HEALTH FIELDS, General
741 Chiropractic (pre-chiropractic)
742 Dental Assisting
743 Dental Hygiene
744 Dental Laboratory/Technology
745 Dentistry (pre-dentistry)
746 Emergency Medical Technology-Ambulance/Paramedic
747 Health Care Administration
748 Medical/Surgical Assisting
749 Medical Laboratory/Technology
750 Medical Records Administration/Technology
751 Medicine (pre-medicine)
752 Mental Health & Human Services/Technology
753 Nuclear Medicine Technology
754 Nursing (practical nursing)
755 Nursing (registered/BSN)
756 Occupational Therapy/Assisting
757 Optometry (pre-optometry)
758 Pharmacy (pre-pharmacy)
759 Physician Assisting
760 Physical Therapy/Assisting
761 Radiology/Radiologic Technology
762 Recreation/Art/Music Therapy
763 Respiratory Therapy/Technology
764 Speech Pathology/Audiology
765 Veterinarian Assisting
766 Veterinary Medicine (pre-veterinary medicine)

780 HUMAN, FAMILY & CONSUMER SCIENCE, General
781 Child Development, Care, and Guidance
782 Child Care Aide/Assisting
783 Culinary Arts/Chef Training
784 Family/Consumer Resource Management
785 Fashion Design and Illustration
786 Food Production, Management, and Services
787 Food Sciences and Human Nutrition/Dietetics
788 Human Environment and Housing
789 Individual and Family Development
790 Textiles and Clothing

800 LETTERS, General
801 Classics
802 Comparative Literature
803 Creative Writing
804 English, General
805 Linguistics
806 Literature, English/American
807 Speech and Rhetorical Studies

810 MATHEMATICS, General
811 Actuarial Sciences
812 Applied Mathematics
813 Statistics

820 PHILOSOPHY, RELIGION & THEOLOGY, General
821 Bible Studies/Languages
822 Philosophy
823 Religion
824 Religious Education
825 Religious Music
826 Theology/Theological Studies

830 SCIENCES (BIOLOGICAL & PHYSICAL), General
831 Astronomy
832 Atmospheric Sciences and Meteorology
833 Biochemistry and Biophysics
834 Biology
835 Botany
836 Chemistry
837 Earth Science
838 Ecology/Environmental Studies
839 Geology
840 Microbiology
841 Oceanography
842 Physics
843 Zoology

850 SOCIAL SCIENCES, General
851 Anthropology
852 Economics
853 Geography
854 History
855 International Relations
856 Law (pre-law)
857 Legal Assisting/Paralegal
858 Political Science/Government
859 Psychology
860 Sociology
861 Urban Studies

870 TRADE & INDUSTRIAL, General
871 Aircraft Technician
872 Airplane Piloting and Navigation
873 Automotive Body Repair
874 Automotive Technology
875 Aviation Management
876 Computer Electronics/Repair
877 Construction Trade and Carpentry
878 Diesel Engine Mechanics and Technology
879 Drafting/CAD
880 Electrical and Electronics Equipment Repair
881 Heating/Air Conditioning/Refrigeration Repair
882 Machine Technology
883 Mechanical Drafting/CAD
884 Welding and Welding Technology

920 VISUAL & PERFORMING ARTS, General
921 Applied Design/Crafts (e.g., ceramics, glass, jewelry, weaving)
922 Art (e.g., painting, drawing, sculpture
923 Art History and Appreciation
924 Cinematography/Film/Video
925 Dance
926 Design, General
927 Drama/Theater Arts
928 Fine Arts, General
929 Graphic Arts Technology
930 Graphic Design
931 Music (liberal arts)
932 Music Performance
933 Music Theory and Composition
934 Photography

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