

Homeschooling is an Art, not a Science: The Impact of Homeschooling on Choice of College Major

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Editor's Note: *Lynn Phillips was the winner of the 2009 Undergraduate Paper Competition held at the 59th annual meeting of the Pennsylvania Sociological Society at Shippensburg University, Shippensburg, Pennsylvania. Miss Phillips wishes to thank Dr. David Ayers and Dr. Steven Jones for their mentorship and contributions to this project. Dr. Ayers is the Assistant Dean of the Alva J. Calderwood School of Arts and Letters and Chair of the Sociology Department. He was also the instructor of the class "Social Research Methods" for which this paper was written. Dr. Jones is an Associate Professor of Sociology who gave useful comments and editing advice on the paper.*

Abstract

Little research has been done to date on the effects of homeschooling on post-high school students. As homeschoolers are a growing percentage of the population, it was important to begin an investigation of these relationships. This study sought to identify differences between homeschooled and non-homeschooled students' choice of college major. It was hypothesized that students who had been homeschooled in high school would be less likely to major in the natural sciences than their non-homeschooled peers. To test this, a survey was administered to over 800 students at a small, predominantly white, religious, Midwestern college. Though the sample was not randomly drawn, the results should still be generalizable to at least colleges of similar demographics as the one studied. Results of the study were significant and in the predicted direction: homeschooled students were less likely to major in the natural sciences than their public and private schooled peers. This study's results suggest that in the short run, colleges interested in recruiting homeschooled students should build up their liberal arts programs. Looking further ahead, parents, science professionals, and researchers should investigate this difference and determine how to close the science gap between homeschooled and non-homeschooled students.

Introduction and Literature Review

Though much research has been done on the homeschool movement, there is still a great deal to find out. The question of homeschooling has grown in prominence over the past twenty years, even leading to an entire issue of the *Peabody Journal of Education* being devoted to the topic (2000). Most research, however, has only addressed homeschooling's effects on grade-school and high-school aged children. In contrast, this study was designed to investigate an effect of homeschooling after graduation from high school: the choice of a college major.

"Homeschooling" in this study was defined as "the process by which children receive primary and/or secondary education directly from their parents generally in their own home" (Jenkins 1998). Other definitions in the literature have ranged from the very broad to the very specific (Blok 2004; Ray and Eagleson 2008), but Jenkins' definition seemed to distinguish the key aspects of homeschooling. First, it defined the age-category (primary and/or secondary education). Second, it specified that parents were the primary teachers. Third, it stated where the process normally occurred (i.e., in the home). Thus, Jenkins' definition seemed reasonable for the scope of this paper.

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In this study, students who had been homeschooled in high school were compared with their public or private school attending peers. Charter-schooled students were not included in the study. Elementary school education was also not taken into account. Majors were grouped into three categories: natural science, math and engineering, and other majors.

Homeschooling is becoming a more widely accepted form of education with each passing year. Over one million students were being homeschooled in the United States in 2003 (Princiotta and Bielick 2006), and the number is only expected to grow – perhaps even to “three million by the year 2010” (Jones and Gloeckner 2004:17). Of these homeschooled students, nearly half of them are going to college (Barno 2004). As the homeschooling movement continues to expand, this will mean more and more homeschooled students will find their way into the offices of college admissions personnel. Unfortunately, “admissions officers know little about the performance of a home school graduate’s academic performance in college” (Jones and Gloeckner 2004:17).

The little that people do know is that, on average, homeschoolers have historically either outperformed or done no worse than private and public schooled students on a number of standardized tests. (Barno 2004; Gray 1998; Jones and Gloeckner 2004). In 1998, Gray discovered that homeschoolers achieved similar English grades as non-homeschoolers in their freshman year of college. That same year, Jenkins (1998) found that homeschoolers had a higher GPA in community colleges than did their non-homeschooled peers. More recently, Barno (2004) found no differences in GPA by grade level between homeschoolers and non-homeschoolers in Pennsylvania colleges and universities.

Until this study, however, no one had investigated the possible correlation between a homeschool education and a student’s choice of major. For this reason alone, the relationship was important to explore. In addition, colleges around the country have historically valued information on the demographics of their potential students. To help address this deficiency in the literature, this study proposed the hypothesis that, controlling for sex if necessary, *homeschoolers would be significantly less likely to major in the natural sciences (biology, chemistry, and physics) than would non-homeschoolers.*

There were several possible reasons for this hypothesis to be true. First, it was thought that a lack of contact with professional science teachers might influence a student’s choice of major. Many scientists today look back fondly on a wonderful biology or physics teacher who first got them interested in the sciences. But most homeschool parents are not professional science instructors. As homeschooled students are, by definition, generally taught by their parents in their own home, it was assumed that homeschooled students in college today were less likely to have taken classes with a professional science teacher who would have inspired them to pursue science in college. Second, homeschooled students might not have been motivated to go into the sciences due to a lack of contact with professional science labs. This might have led to students not fully experiencing or understanding the concepts of science. Barno’s research (2004) supported this reasoning: though he did not analyze major choice, he found that only 66 percent of homeschooled students thought that science was “emphasized” in their schooling, while 95 percent of them thought that reading was emphasized. In addition, he found that 18 percent of homeschooled students felt “least prepared” for science, second only to mathematics, the subject for which 20 percent of homeschooled students were “least prepared.” Less than 5 percent of students felt “most prepared” for science.

This is not to say that homeschooled students perform poorly on science and mathematics tests; on the contrary, as mentioned earlier, they do no worse on standardized tests than do their non-homeschooled peers. However, a student typically picks a major that he is not merely qualified for, but that he thinks he will enjoy. If, for example, a student performs at the 90th percentile on natural science tests, but at the 99th percentile on tests in every other subject, he still may say he was “least prepared” for science in college and choose a non-science major.

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Both Barno's data and national statistics seemed to support this hypothesis. Though Barno did not report the distribution of non-homeschooled students' choice of majors, he did find that approximately 8.5 percent of the homeschooled students in his sample were science majors. In 2004-2005, however, 11.4 percent of all bachelor's degrees earned in the United States were in the natural sciences (biological and biomedical sciences, health professions and related clinical sciences, and physical sciences and science technologies) (National Center for Educational Statistics 2007). Though this aggregate data obviously could not be directly compared to Barno's work, the difference in the numbers is statistically significant, possibly indicating a discrepancy between homeschoolers' and non-homeschoolers' choices of majors¹.

Methods and Research Design

This study investigated the homeschool-major selection hypothesis by means of a survey administered to 24 purposefully-selected classes at a small, Midwestern, private college. This school was thought to be ideal for answering the research question, as over one tenth of its students had been homeschooled in high school. Additionally, the college has well-established science programs that draw scientifically-minded students. With both a relative abundance of homeschoolers, and quality science departments in which they could choose to study, it was thought that research done at this school on the correlation of homeschooling and choice of major would likely yield significant results.

Class selection in this study was based on ease of access for the researcher, as well as on the type of students in the class. Required general education classes made up a substantial portion of the sample, as they yielded students in a wide range of majors. On average, the survey took 15 minutes to complete, and included 55 items on a broad range of topics. Four of these items were used in this study's analysis; the remaining questions addressed different research issues. Participation in the survey was encouraged but voluntary, and students were guaranteed anonymity. To prevent duplication of respondents, students were asked not to take the survey if they had already done so in a different class.

In total, 878 students participated in the survey. However, only 857 answered all the questions relevant to this study. The surveyed students were between 16 and 24 years of age, with a median age of 19 and a mean age of 19.4. Of the total respondents, 34.6 percent were freshmen, 25.4 percent were sophomores, 22.3 percent were juniors, 16.4 percent were seniors, and 1.4 percent were in their fifth (or higher) year at the college. The sample was predominantly Caucasian (93.5 percent), and also had an approximately even percentage of males (50.5 percent) and females (49.5 percent). A total of 16.3 percent of the students surveyed had a first major in the natural sciences. In addition, 9.2 percent of the respondents had graduated from a homeschool, and 14.1 percent had been homeschooled for some length of time in high school.

While this study is generalizable to a larger population of college students across the United States, there were some limitations that must be taken into account. As mentioned above, students at the college under observation were predominantly white. In addition, they were more politically conservative than at other campuses nationwide, and tended to come from the northeastern United States. They also tended to be more religious than the larger population of American college students. As such, this study may only be generalizable to other small private colleges with similar demographics.

In this study, two of the survey questions were used to distinguish homeschoolers from non-homeschoolers. First, respondents were asked, "Considering where you attended school from the 9th through the 12th grade (high school), what types of schools have you attended at all? PLEASE

¹ The pooled unequal variance t-statistic for the differences in these estimates was 3002.014, which rejects the null hypothesis of equality at most reasonable levels of significance.

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CHECK ALL THAT APPLY: Regular public school, Charter school outside the home, Charter school performed primarily at home, Private school, Home school that is NOT charter school, and Other.” Responses were collapsed into a “Homeschooled?” variable. Those who had listed “Home school that is NOT charter school” as a type of school they attended in high school were included in the “yes” response category, and all others were categorized under “no”. Also on the survey, students were asked, “What type of school did you graduate high school from?” (The same response categories were used.) Those who selected “Home school that is NOT charter school” were defined to be “homeschool graduates” for the variable “SchoolGrad.” Public school, private school, charter school outside the home, and charter school at home graduates were each placed in their own categories. Graduates from “other” kinds of schools were excluded. (It was hypothesized that students in charter schools, even those schooled primarily at home, were more likely to be taught by professional science faculty and have access to science labs. For this reason, charter schooled students of all sorts were purposefully excluded from both “homeschooled” response categories.)

The question of major selection was easier to address. Students were asked to write down their “current first major” on the survey: all majors included in the college’s biology, chemistry, and physics departments were defined as “natural science” in the variable “Major.” Those who selected math, electrical engineering, or mechanical engineering were categorized as “math/engineering.” All other majors were labeled as “other.” Undeclared majors were excluded from analysis.

The sex of the respondents was tested against both the independent and dependent variables to determine whether it was a necessary control variable. Sex was known to influence the selection of major. More males than females are engineers, for example, and more females than males major in elementary education. It was also possible that a lack of traditional sports opportunities for homeschooled students might have led to fewer male homeschoolers. To avoid spurious results, possible relationships between the three variables were tested.

Results

To test the hypothesis that homeschooled students were less likely to major in the natural sciences than non-homeschooled students, the variables “SchoolGrad” and “Homeschooled?” were each cross-tabulated with “Major.” As all the relevant variables were nominal in nature, chi-squared and Fisher’s exact tests were used for this study’s analysis. For the cross-tabulation of “Schoolgrad” with “Major,” a Fisher’s exact test was employed because there were too few observations in each cell for a chi-squared test to be reliable. The results were significant and in the hypothesized direction (Fisher’s exact test (FET) statistic=22.40, $p=.0068$). As shown below, while 17.8 percent of public school graduates and 17 percent of private school graduates chose to major in the natural sciences, only 7.7 percent of homeschool graduates chose these majors.

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Table 1: SchoolGrad by Major

| <i>Major:</i> | <i>School Grad</i> | | | | |
|------------------|--------------------|----------------------|---------------------|---------------------|-------------------|
| | Homeschool | Public | Private | Charter Not at Home | Charter at Home |
| Natural Science | 7.7% | 17.8% | 17.0% | 7.7% | 0.0% |
| Math/Engineering | 5.1% | 15.6% | 14.3% | 0.0% | 0.0% |
| Other | 87.2% | 66.6% | 68.7% | 92.3% | 100.0% |
| | N=78, 1 missing | N=551, 13 missing | N=182, 7 missing | N=13, 0 missing | N=9, 0 missing |

FET=22.40, p=.0068

The results held true for all students who had been homeschooled for any length of time in high school. While 8.1 percent of students who had ever been homeschooled in high school were science majors, 17.7 percent of non-homeschooled students majored in the sciences, as shown below (chi-square=9.534, df=2, p=.009).

Table 2: Homeschooled? by Major

| <i>Major:</i> | <i>Homeschooled?</i> | |
|------------------|----------------------|-------------------|
| | Yes | No |
| Natural Science | 8.1% | 17.7% |
| Math/Engineering | 10.6% | 14.2% |
| Other | 81.3% | 68.1% |
| | N=123, 1 missing | N=734, 20 missing |

$\chi^2=25.289$, df=2, p=.009

Sex was tested against major and type of school attended, and though it was related to major, sex was found not to be significantly correlated with either homeschooling variable. Because this was established, the variable did not need to be held constant in the analysis. As sex could not have caused a spurious relationship, the results completely supported the research hypothesis. In addition, the reliability of these results was strengthened by Barno's findings (2004). Though his number of homeschooled students who became science majors is slightly higher than those found in this study, it

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is similar enough to suggest that these figures might be generalizable to multiple kinds and sizes of schools.

Discussion

Though the hypothesis that fewer homeschooled students major in the natural sciences than non-homeschooled students was supported in this instance, reasons for this significant difference have not been verified. It is still quite possible that this study's results were not typical or representative. Though the sample analyzed was composed of over 850 students, there were relatively few students who were homeschooled, and only six homeschool graduates who were science majors. Thus, though the results of this study's analysis were statistically significant, the small cross-sections of the sample leave room for error. It should be noted, however, that the rate of homeschoolers at the college studied was quite high: as previously mentioned, 9.2 percent of students in the sample were homeschool graduates and 14.1 percent had been homeschooled for some period of time in high school. This might be a larger rate than is typical at most colleges.

There was other room for error in this study. It is possible that the research suffered from inadvertent sampling bias, as classes of students, not individuals, were chosen to be surveyed. More important, the process of choosing classes itself was purposive, not random. It was assumed that students were truthful on the survey and understood the questions being asked. As the study was limited in scope, it is also possible that other uncontrolled factors (for example, parents' income level, education, occupation, religion, or nationality, state laws regulating homeschooling where the respondent was educated, or whether the respondent was raised in a rural, suburban, or urban setting) influenced the results. If this is the case, it would cast into doubt the validity of this study's findings.

Clearly, more research must be done on the topic of homeschooling in general, and on homeschoolers' college experience in particular. Specifically, this study should be repeated at additional colleges and universities in other parts of the country to determine whether this study's (and Barno's) results were typical or unique. Future researchers might also investigate whether homeschooled students who take science classes outside the home (i.e. at a community college or in a co-op) are still less likely to choose a natural science major than non-homeschooled students. In addition, it would be interesting to note whether students who attend large colleges differ from those who attend small colleges, or whether there is a difference between public and private places of higher education. Researchers might also address the question of homeschooling parents' education or religion, and whether that impacts a child's choice of major. Studies should also investigate different types of homeschooling done, and see if there are more subtle variables at work than this primary analysis could detect. Finally, researchers could test whether state regulations on homeschooling make a significant difference in the majors homeschooled students pursue.

If this study's results are found to be generalizable to a larger population, they will be important for the nation, as more homeschooled children go to college and enter the workforce, and more families choose the homeschooling option. Though only 9.2 percent of respondents in this study were homeschool graduates, the number of homeschooled college students is likely to rise in the future. If homeschoolers' major selection remains consistent, there might be a corresponding decrease in science majors nationwide. In these circumstances, schools that specialize in the sciences might do well to focus their attention on non-homeschooled students, and colleges attempting to recruit homeschooled students should focus on expanding and advertising their liberal arts programs.

In addition, if further research supports the hypothesis that the lack of professional lab equipment and trained science teachers is responsible for this discrepancy in major selection, home educators concerned about their children's science education might attempt to find more professional courses for them to attend. This would be an opportunity for science-related firms and organizations to

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expand into the area of education; as homeschooling parents have already opted out of traditional schools, they might be more willing to experiment with non-traditional educational venues. Alternatively, homeschool cooperatives (“co-ops”) might themselves seek out professional scientists and equipment to benefit all the children in their group.

Homeschooled students appear to be different from non-homeschooled students in several different ways, including their choice of college major. Hopefully, these findings will lead to discussion in homeschooling circles about the nature of their children’s education, and how (or whether) to inspire homeschooled students to pursue the sciences beyond high school. Until trends change, though, colleges should be ready for an influx of homeschooled students who prefer language arts to laboratories.

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