

# **Identifying Factors That Influence the High School Students' Choices to Pursue Architecture, Construction and Engineering Baccalaureates**

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## **ABSTRACT**

It is a common and widely held belief that the greatest influencing factor for high school students to enter an architecture-, construction-, or engineering-(ACE) education program is because either their parents, relatives or friends work or have worked in the industry. However, there is a little research that supports this belief. This study analyzes characteristics and academic interests of Clark County School District (CCSD) Career and Technical Academies (CATA) students enrolled in ACE curricula. Five hypotheses were formulated for the study: (1) Students enrolled in CATA curricula and their baccalaureate interests are interrelated; (2) a family member's employment in ACE related industry affects a student's decision to select ACE as an area of study in high school; (3) a family member's employment in ACE related industry influences the interest of a student in pursuing a baccalaureate in ACE; (4) desire to pursue a baccalaureate in ACE is independent of the student's belief that employment is readily obtained in this discipline; and (5) interest and academic performance in a subject are correlated. Results positively supported these hypotheses. However, there is a low positive association to prove first hypothesis in the case of students enrolled in CATA construction curricula. Results presented include descriptive statistics and nonparametric tests. The study's findings will benefit educators and educational administrators in understanding what factors influence the choice of academic study in ACE disciplines at the high school level and these students' desires to pursue a baccalaureate.

**Keywords:** Architecture, construction, engineering, high school student, academic interest, employment, influence.

## **1. INTRODUCTION**

In the twenty-first century, high-school students have diverse curricula that may be pursued. Curricula have been developed for very specific areas of study. Science, engineering, business, arts, medicine, and information technology are a few of the present day focused areas of study. The vastness of areas of study further complicates the selection of an area of academic study for today's high school students. It is unlikely that any student at this point in their education will have full understanding of all the different areas, let alone an adequate understanding of the areas that they believe they are interested in to make a truly informed decision. In other words, they may lack the knowledge to select the proper subject in which they can achieve academic success. Myriad curricula make it more difficult for student to choose a particular area of study; it is likely that some students are additionally being influenced in their choice by the present employment market and deceptive education and employment advertisements. The combination of these factors can adversely affect the proper selection of an academic area of study that will provide a stable and satisfying long-term career.

A study conducted on the effect of gender difference on math achievement proposed a theoretical model for studying students' academic choices and decisions [1]. The model linked academic choice to two specific constructs: expectation of success on a task and the subjective value of the task for the individual. And then, achievement expectations and values were hypothesized to be influenced by students' perceptions of their own ability, personal needs, and future goals and by their perceptions of task characteristics [1]. The teachers and parents were the most influencing factor for students to choose their career in engineering or science [2].

## 2. SCOPE AND OBJECTIVES OF THE RESEARCH

This research was conducted to assist educators and educational administrators in understanding student interest in and choice of academic study in architecture, construction and engineering (ACE) disciplines at the high school level. The research was conducted at four Clark County School District (CCSD) Career and Technical Academies (CATA). The CCSD is located in Southern Nevada and is the fifth largest school district in the United States [3].

The objective of this research was to investigate characteristics and academic interests of CCSD CATA students enrolled in ACE related curricula. Various factors that influenced a student to attend a CATA and his or her choices to pursue baccalaureate degrees were investigated.

Other sub-objectives of the research were to:

- Identify significant factors that influence a student's selection of an area of academic interest.
- Develop the relationship between a student interest in a subject and his academic performance in the subject.
- Determine the relationship between academic curricula in which students are enrolled and their post high school graduation academic interests.

## 3. RESEARCH HYPOTHESES

Five research hypotheses were formulated for this study. They are:

Research Hypothesis 1: There is a relationship between the CATA students' choices to pursue baccalaureate degrees and the CATA curriculum in which they are enrolled.

Research Hypothesis 2: A family member's employment in an architecture-, construction-, or engineering-related industry affects a student's decision to select architecture, construction, or engineering as an area of study in high school.

Research Hypothesis 3: A family member's employment in an architecture-, construction-, or engineering-related industry influences the interest of a student in planning to pursue a baccalaureate degree in architecture, construction, or engineering.

Research Hypothesis 4: The interest in pursuing a baccalaureate degree in architecture, construction, or engineering is independent of the student's belief that employment is readily obtained in these disciplines.

Research Hypothesis 5: There is a relationship between the student's academic performance in a subject and his interest in it. As a student's interest in a particular subject increases his academic performance in that subject increases as well.

## 4. RESEARCH METHODOLOGY

This research is based upon data collected in November 2009 by CCSD from 880 students enrolled in four CATAs. The four CATAs were a) Advanced Technologies Academy (ATA), b) East Career and Technical Academy (ECTA), c) Northwest Career and Technical Academy (NWCTA), and d) Southeast Career and Technical Academy (SECTA). Each academy has different curricula. Students enrolled in curricula related to architecture, construction, and engineering were the focus of this research. Questionnaires were distributed by CCSD via the paper survey method. The questionnaire was designed to gather the information using the check-off format, Likert scale format, and write-in format. The questionnaire was administered by CATA teachers to grade 9 to grade 12 students at their school. Students submitted their completed questionnaires to the class teacher and then returned to the researchers for analysis.

Questionnaires that were less than 80 percent complete were eliminated. Some of the questionnaires were 80 - 90 percent complete and those were included in the data analysis because the major questions of the research were answered. Based on the large number of students, the responses were remarkably good. Of the sample of 880 questionnaires, 724 questionnaires were considered acceptable for inclusion in the analysis for this research. Acceptable was defined as questionnaires that were more than 80 percent complete. In order to summarize the information provided by the respondents the data collected was entered into a spreadsheet-based database that was used for descriptive analysis and to generate tables and charts. All the variables were assigned numbers to represent them correctly and to simplify the data entry process. The questionnaire with yes and no responses were entered in database by assigning 1 = yes and 0 = no. The questionnaire related to choice of architecture, construction, and engineering options were entered in database by assigning 1 = architecture, 2 = construction, and 3 = engineering.

## 5. SURVEY RESULTS AND DISCUSSIONS

The distribution of gender showed a strong male dominance as 75 percent were male and 25 percent were female. The distribution of age of the students ranged mostly from 14 years to 17 years old. Table 1 provides a summary of the results obtained in response to the question that was asked to check all of the family members and relatives who have previously worked or presently work in the ACE related areas. The result shows that categories father, grandfather, uncle, and cousin-male were more involved in architecture-, construction-, and engineering-related work. The remainder of the family members was less involved, accounting for less than 6 percent, in these areas.

**Table 1.** CATA Students' Family Members Involved in ACE-Related Work

Family members	Work Experience Related Area		
	Architecture (n=342)	Construction (n=818)	Engineering (n=628)
Father	78 23%	267 33%	181 29%
Mother	22 6%	20 2%	23 4%
Brother	16 5%	38 5%	28 4%
Sister	10 3%	10 1%	11 2%
Grand-father	37 11%	120 15%	106 17%
Grand-mother	7 2%	11 1%	6 1%
Uncle	84 25%	217 27%	140 22%
Aunt	22 6%	20 2%	30 5%
Cousin-male	47 14%	97 12%	81 13%
Cousin-female	19 6%	18 2%	22 4%

The data were analyzed and identified the relationship between CATA student's plans to pursue a baccalaureate and the ACE curricula they were enrolled in. The results are shown in Table 2. The results from Table 2 reveal that there is a positive association between the students enrolled in the CATA architecture curriculum and the student's plan to pursue baccalaureate in architecture. Similarly, there is positive association for engineering. But, there is a less association with the students in a CATA construction curriculum and the CATA students' academic interest in earning and associated baccalaureate.

**Table 2.** Student's Curricula and Intent to Pursue a Baccalaureate

CATA area of study	Students responded (number)	First priority to pursue baccalaureate (%)
Architecture	128	55
Construction	181	28
Engineering	234	83

The reason might be due to the ongoing economic recession when the survey was conducted. During this period construction worker layoffs in Las Vegas were increasing daily and approaching 70 percent of the work force out of work. Additionally, large privately financed capital facility projects and public projects were being canceled or delayed. Swoboda and Cieslik conducted a study on selecting a construction industry career concluded, 'In the high school response to why they would choose the construction industry, the highest response was "not interested". The question should then be asked: why aren't they interested? Is it because of pay, the image, or the work conditions? Part of the solution is to change this poor image [4].' Perhaps the industry's image could also have something to do with CATA students' not desiring to pursue a baccalaureate in construction. During an 18 month time period in 2007-2008 there were 12 highly publicized construction fatalities that occurred on construction projects on the Las Vegas Strip [5] which highlighted the dangerous nature of construction.

Another objective was to find if there is positive association between the high school curriculum that a student is enrolled in and the employment of at least one family member in architecture, construction, and engineering. Table 3 shows that more than 50 percent of the students who chose architecture, construction, or engineering, had at least one family member employed in the area that the student was enrolled.

**Table 3.** Students Enrolled in CATA Curricula and their Family Member's Employment

Curriculum	Students	At least one family member employed in ACE area (%)
Architecture	141	55
Construction	234	51
Engineering	288	59

The analysis of the CATA student's plan to pursue a baccalaureate in architecture, construction, or engineering and the employment of at least one family member in architecture, construction, or engineering is shown in

Table 4. The results show that more than 50 percent of the students had one or more family members who were involved in construction or engineering. Only 37 percent of students who wanted to pursue baccalaureate in architecture had a family member involved in architecture. In other words, even though 63 percent of the family members were not involved in architecture, their children still preferred architecture.

**Table 4.** Relationship Between CATA Student's Plan to Pursue Baccalaureate and Employment of at Least One Family Member in ACE

Area	Interested in earning a baccalaureate	At least one family member involved (%)
Architecture	171	37
Construction	70	64
Engineering	365	53

The CATA students provided information on their beliefs about post-baccalaureate employment in architecture, construction, and engineering. The objective was to find if their beliefs factor influenced them to pursue a baccalaureate in architecture, construction, and engineering respectively. Their responses indicated that they were not going to pursue a baccalaureate in architecture, construction, or engineering based upon the assumption that it will be easy to obtain employment just by earning a baccalaureate. Sixty-nine percent of respondents in architecture, fifty-nine percent of respondents in construction, and sixty-one percent of respondents in engineering supported this conclusion. Table 5 shows the weak association between interest pursuing an architecture, construction or engineering baccalaureate and post-baccalaureate employment in architecture, construction, and engineering.

**Table 5.** Relationship Between Post-baccalaureate Employment and Interest in ACE baccalaureate

Baccalaureate	Students	Students' belief that employment is easily obtained (%)
Architecture	171	31
Construction	70	41
Engineering	365	39

When analyzing the CATA students' interest in subjects such as mathematics, physical science, life science, business, social sciences, liberal arts, fine arts, political science, vocational arts, and computer science, numerical values of 1 to 5 were assigned according to their response whether they strongly disagree or strongly agree on their interest in the subjects. The students were asked to

respond to a question regarding their academic level of performance that they believed they achieved in these subjects. Numerical values of 1.5 to 4 were assigned according to their response whether they earned mostly less than C grade or mostly A grade in the subjects.

The descriptive statistics on interest and their academic performance were analyzed using Predictive Analytics Software (PASW-17), by Statistical Package for the Social Sciences Incorporated (SPSS Inc). Bivariate analysis using Spearman's rank correlation coefficient method was performed to find the relationship between interest and grades. The results shown in Table 6 reflect that there is significant association between the student's academic level of performance achieved in a subject and their interest in it. The results are significant at alpha level 0.01. Similarly, it can be referred from this result that as the students' interests in architecture, construction or engineering goes up, there is more likely to have better academic performance in that area of study.

**Table 6.** Spearman's Rank Correlation Coefficient between Interest and Academic Performance

	Number (n)	Spearman's rho ( $\rho$ )	Significance value
Mathematics	686	0.402	< 0.005
Physical Science	648	0.348	< 0.005
Life Science	631	0.280	< 0.005
Business	585	0.164	< 0.005
Social Science	543	0.237	< 0.005
Liberal Arts	616	0.247	< 0.005
Fine Arts	579	0.283	< 0.005
Political Science	553	0.220	< 0.005

## 6. CONCLUSIONS

The summary of results obtained from the student's curricula and intent to pursue a baccalaureate indicate that there is a strong positive association between the students taking engineering and their plans to pursue an engineering baccalaureate. Similarly, the results for students enrolled in architecture indicate they plan to pursue an architecture baccalaureate. However, there is not sufficient proof to validate a strong positive association for students enrolled in construction pursuing a construction baccalaureate. This result was counterintuitive, as a stronger degree of students planning to pursue baccalaureate study in a construction-related area was expected from students already enrolled in a high school construction curriculum.

The analysis done on whether or not employment of a family member affects a child's enrollment in a high school curriculum revealed that as parents are employed in architecture-, construction-, or engineering-related area their children are more likely to enroll in the corresponding curricula in high school. The results were remarkably supportive to the second research hypothesis that a family member's employment in an architecture-, construction-, or engineering- related industry affects a student's decision to select architecture, construction, or engineering as an area of study in high school.

When family members are employed in architecture-, construction-, or engineering-related area there is a greater likelihood that their children will pursue a baccalaureate similar to the field in which their parents are employed. In this research 37 percent of the students who wanted to pursue baccalaureate in architecture had at least one family member employed in an architecture related area. Similarly, more than 50 percent of the students indicated that they had one or more family members who were involved in construction or engineering. Thus, the third research hypothesis is proved that a family member's employment highly influences the academic choices of a student.

Another research finding is that less than 42 percent of valid responses showed students believed that employment is easy to obtain after earning a baccalaureate in architecture, construction, or engineering. The remaining 58 percent of the valid responses showed students did not believe that employment is easily obtained. This validates the fourth research hypothesis that the interest in pursuing a baccalaureate in architecture, construction, or engineering is independent of the student's belief that employment is easily obtained in these sectors.

The result from Spearman's rank correlation coefficient between interest and academic performance revealed that as the student's interest in a subject increases, academic performance in that subject increases as well. The result was valid at alpha level 0.01. This proves the fifth research hypothesis, and that there is a positive relationship between the student's academic performance in a subject and his interest in the subject. As a student's interest in architecture, construction, and engineering increases his academic performance in that area increases as well and gets motivated to pursue higher degrees.

## 7. RESEARCH LIMITATIONS

The limitations of this research are the following:

- The research is based on the responses from four Clark County School District (CCSD) Career and Technical Academies (CATA) students. The results may not represent other technical academies, comprehensive high schools or

vocational high schools. More definitive results can be obtained if more high schools were surveyed.

- This research assumes that the responses provided are true and unbiased, but, it depends upon how truthful and sincere the respondents were when they provided answers on the questionnaire. For example, when students were asked to check only one box, some students selected more than one. These types of response errors may bias or lead to incorrect conclusions.

## 8. RECOMMENDATIONS

The grades that the students earned should be measured from their transcripts in order to predict the correlation between their academic interests and their grades.

Further research is recommended to improve the determination of the perception of the construction industry by CATA students enrolled in construction curriculum.

Multivariate analysis is recommended to better understand the importance of the various factors driving student interest in enrollment in high school ACE curricula.

## 9. REFERENCES

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