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High school student interests in architecture, construction, and engineering education

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HIGH SCHOOL STUDENT INTERESTS IN ARCHITECTURE, CONSTRUCTION, AND ENGINEERING EDUCATION

by

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ABSTRACT

High School Student Interests in Architecture, Construction, and Engineering Education

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It is a common and widely held belief that the greatest influencing factor for high school students to enter an architecture-, construction-, or engineering-education program is because either their parents, relatives or friends work or have worked in the industry. However, there is little research that supports this belief. The focus of this research was to analyze characteristics and academic interests of Clark County School District (CCSD) Career and Technical Academies (CATA) students enrolled in architecture, construction and engineering (ACE) curricula.

This research analyzed data collected from a survey conducted by CCSD of their students enrolled in ACE courses. Comprehensive descriptive statistics of the survey population were developed. The research analyzed the relationship between CATA students with their academic interest, academic performance, family member's employment, and post-baccalaureate pay. Also, the students' future plans regarding further community college or university ACE education or direct entry into the workforce were analyzed.

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CHAPTER 1

INTRODUCTION

1.1 Background

Every high school student has his or her own academic area of interest. They frequently choose a field of interest related to what they think their long-term career will be, but it is extremely challenging to select the right career path.

Prior to high school, students have few electives in the prescribed K-8 curriculum. They are required to take courses in the prescribed basics and fulfill all minimum requirements of grade and middle schools. As students enter high school they are afforded more choices from which they can begin to tailor their education towards the future career they envision for themselves. At this point there are many influencing factors that affect the choice of the academic area that they pursue. It is a common belief that some of the major influencing factors are related to their parent's profession and their influence in recommending an area of study. Additionally, the students' own interest and confidence in their abilities play a role in the decision making. Friends and associates may play a significant role in selecting career related academic studies.

Prior to 1890, the American high school was not widely attended and had only one "classical" curriculum that was designed for children of the elite (Kenneth, 2002). At the beginning of the twentieth century, children of working class parents began to attend high school in increasing numbers and the traditional "classical" curriculum was fundamentally extraneous to most of these students. It was at this point that the

curriculum was then differentiated into traditional academic programs of study and vocational programs of study.

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.

According to Greene (2002) the national high school graduation rate in 1998 was 71 percent. Data from the National Center for Education Statistics (NCES, 2009) showed that nationally, of the entering freshman the average graduation rate for the 2007-08 academic year was 74.9 percent. Nationally there is an improvement in the high school graduation rate. The statistics for Nevada showed that the graduation rate for public high schools from academic years 2002-2003 to 2007-2008 has declined from a rate of 72.3

percent to 51.3 percent. Nevada's dropout rate for the 2005-06 academic year for grade 9 through grade 12 public high school students was 7.7 percent and decreased to 5.1percent in the academic year 2007-08 (NCES, 2009). The Nevada K-12 education system is producing significantly fewer graduates than most of the nation.

Student characteristics, home environment, parent's income and affluence, location of schools and the quality of schools are some of the major factors that affect decision making concerning the academic study area selected in high school. Similarly, motivational factors such as achievement and recognition, a student's particular interest in subject matter, and the ability to grasp ideas all contribute to making academic career choices. It is important to understand how students go about making high school specialty study area choices, and how differences across gender, ethnicity, academic curriculum, and academic interest are related with student perceptions.

1.2 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 (CCSD Fast Facts 2009-10). The CCSD schools are located in Henderson, Las Vegas, North Las Vegas, Laughlin, Boulder City, Searchlight, Good Springs, Indian Springs, Overton, Sandy Valley, Mesquite and unincorporated

Clark County. The four CATA's were: a) Advanced Technologies Academy, Las Vegas, Nevada, b) East Career and Technical Academy, Las Vegas, Nevada, c) Northwest Career and Technical Academy, Las Vegas, Nevada, and d) Southeast Career Technical Academy, Las Vegas, Nevada. A brief description of these CATAs is provided in section 3.3.1 CCSD CATA Sample. Data was collected from the students enrolled in the ACE related curricula at those four schools.

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 were investigated. The questionnaire was designed to collect the information about possible influencing factors. Some of the questions were related to family and personal background. Other questions were related to subject interest, academic achievement, post-baccalaureate pay, location of schools, and so on.

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.
- Develop descriptive statistics of CATA students' plans to pursue baccalaureate degrees.

- Develop descriptive statistics of CATA students regarding their plans to pursue ACE degrees at UNLV.
- Develop descriptive statistics of CATA students' planning to directly enter the work force following high school graduation.
- Develop recommendations for further research.

1.3 Limitations

The research was limited to four CCSD CATAs in southern Nevada. Only address students who were enrolled in ACE fields only participated in the research.

1.4 Research Hypothesis

This research has five research hypotheses which 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.

CHAPTER 2

LITERATURE REVIEW

An investigation of the factors that lead elementary school students to general or vocational schools was performed both in general and vocational high schools in Canakkale, Turkey in 2001(Aypay 2003). The research question in the study was "What factors affect school choice for high school students?" In this study the sample size was 866 students. In the sample 55.5 percent were enrolled in vocational schools and 44.5 percent in general high schools. The survey instrument used closed-ended questions regarding student background characteristics, academic achievement, parental involvement, guidance in the elementary school, and future aspirations. Background variables, academic and personal variables, and parental involvement variables were used as three types of variables during data analysis.

The results of t-tests indicated there were differences between general high school students and vocational high school students regarding background, family involvement, family income, academic variables, preparation for high school, and ideal occupational preferences with a significant value ($p < 0.01$). Compared to vocational high school students the general high school students were more likely to achieve higher levels of academic performance, receive better guidance, grow up in an urban environment, and their family incomes were higher. The status attainment factors (living in an urban environment, academic achievement, and how likely they will reach their ideal occupational preference) were found more significant than the parental involvement variables (parent-school relationship, parent monitoring of student) on a student's choice

of a high school. Additional research using macro-level data was recommended to further investigate effects of parental involvement on student achievement and school choice.

A study conducted in six rural high schools in Arizona identified factors that were associated with perceived career options in different ethnicities (Lauver and Jones 1991). The three largest ethnic groups used for the study purposes, as classified by Lauver and Jones (1991), were American Indian (86 students) , White (587 students), and Hispanic (220 students) . The survey instrument was a questionnaire used to collect data from students in business classes. Respondents were asked about their gender, grade, ethnicity, and occupation of parents. The responses were measured to estimate career related self-efficacy for training and job performance for male and female occupations. The study found either job training or job performance could be used to estimate self-efficacy.

For all ethnic groups, perceived options for females were positively related to predominantly female occupations, and perceived options for males were positively related to predominantly male occupations. The study developed a bivariate correlation matrix showing the relationships among dependent and independent variables for Americans Indians, Hispanic, and the White students. The dependent variables were perceived career and self-efficacy, and the independent variables were ethnicity, socioeconomic status, and gender. The investigators concluded that self-efficacy and perceived career options were different among ethnicities and across gender.

Germeijs and Verschueren (2007) conducted research among adolescents in Belgium with the objective to investigate consequences of high school students' career decision-

making process for choice implementation in higher education. The degree of commitment to the chosen academic discipline, academic adjustment, and choice actualization were described as choice implementation. The study revealed six core aspects of the career decision-making process. The researchers classified the six core aspects as: (1) orientation to choice, (2) self-exploration, (3) broad exploration of the environment, (4) in-depth exploration of the environment, (5) decisional status, and (6) commitment.

The research sample size was 748 students. Students were investigated for three consecutive semesters before the end of grade12. Following the end of a semester, a questionnaire was administered to find out early choice implementation. The research collected data and investigated whether early commitment and academic adjustment in turn predicted the achievement during the first year in higher education. The study used linear and logistic regression analyses which analyzed the consequences for choice implementation in higher education.

The analysis revealed the outcomes of student career decisional tasks at the end of grade 12 significantly contribute to several aspects of early choice implementation during the first trimester in higher education. Firstly, the analysis found that higher levels of decisional status and commitment at the end of grade 12 enhanced the likelihood of actualizing the choice intention. Secondly, the analysis revealed that students who were less confident in their choice before choice implementation were at risk for being less committed to their study during higher education. Thirdly, the result showed that orientation, environmental exploration, decisional status and commitment at the end of

grade 12 were all associated with future academic adjustment in higher education. This research examined in detail the consequences of the career decision-making process for choice implementation within the context of high school students' choice of a major in higher education.

In another study, the researchers conducted research on the effect of gender difference on math achievement and proposed a theoretical model for studying students' academic choices and decisions (Parsons et al. 1982). Their assumption was that fewer females, compared with males, elect to take advanced level mathematics courses and enter mathematically oriented careers. The study showed that males and females were pursuing careers in the scientific, mathematical, and technical fields in disproportionate numbers. This imbalance between males and females existed even though efforts were made through affirmative action and scholarship programs. The research indicated that more males interacted with teachers in mathematics and science classes than females did with teachers. Also they found that teachers worked together with males in mathematics and science classes more than with the females. In fact, the student-teacher interaction patterns in academic choices were significant. The study developed a psychological model, shown in Fig.1, to increase our understanding of course enrollment patterns and career decisions.

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. The psychological model developed is shown in Fig. 1.

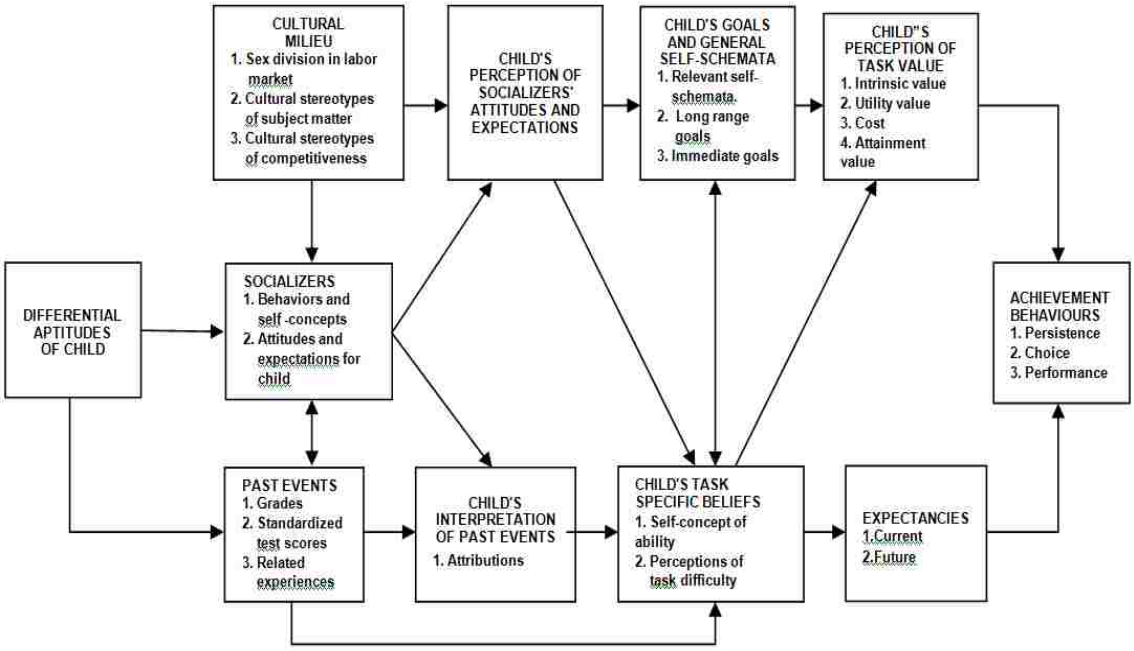

Fig. 1. General model of academic choice (Parsons et al. 1982)

Dick and Rallis (1991) conducted a study of public high schools in Rhode Island to identify factors and influences on high school students' career choices. The study used a large sample size for the research analysis. The survey collected a stratified random sample of 2,213 seniors (1,089 males and 1,124 females) from nine public high schools. The sample included large and small communities with a variety of socioeconomic levels. The objective of the research was to find the difference between the students

choosing careers in engineering and science from students choosing other careers in their perceptions of the factors in, and influences on, their academic and career choices. The result indicated that students at the high schools in the two upper-middle-class suburbs and a university town tended to be more prepared in the number and level of mathematics and science courses taken than students in the high schools located in the cities or at a vocational-technical high school.

Using the comprehensive general model of academic achievement behaviors proposed by Parsons et al. (1982), a sub model was developed to serve as a useful model for guiding inquiry into gender differences in career choice. The model used both intrinsic factors such as intellectual interest and extrinsic factors such as salary expectation which were determined as a career's perceived value, as demonstrated in Fig. 2. It was shown in the model that students make their career choices on the basis of their beliefs about themselves, their own abilities, and their beliefs about the relative values of different careers.

The analysis revealed that parents and teachers were perceived to have effective control on career choice more often for students choosing careers in engineering and science than for those choosing other careers. Results of the analyses found less than 50 percent of females chose careers in engineering compared to 64 percent of males. The survey results indicated that both males and females who chose engineering or science careers had some specific encouragement to do so. The teachers and parents were the most influencing factor for students to choose their career in engineering or science.

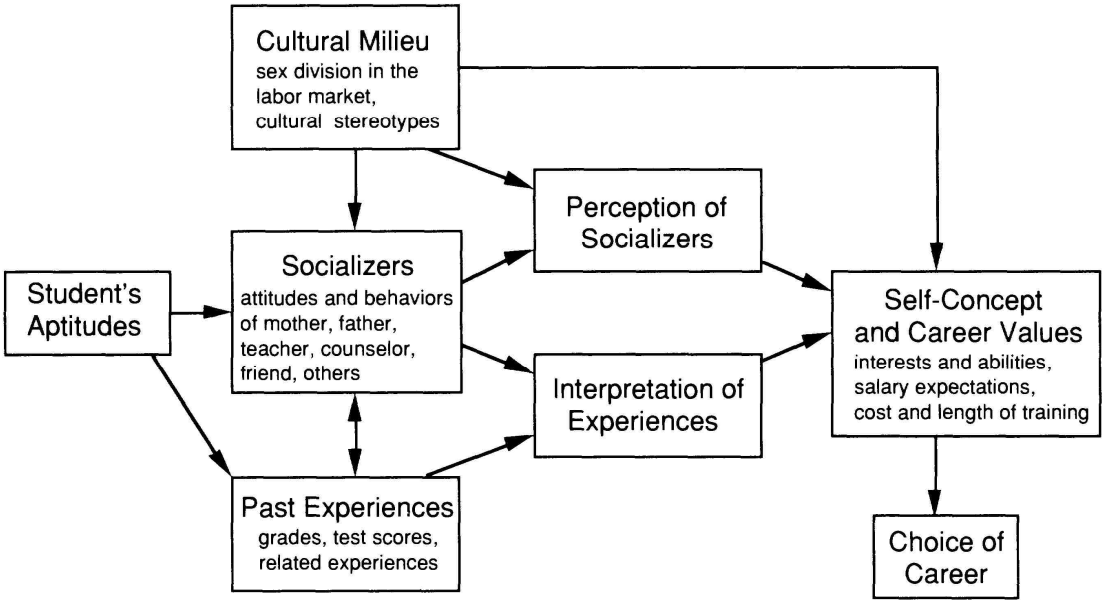

Fig. 2. Model of career choice (Dick and Rallis 1991)

Paa and McWhirter (2000) conducted a study in a small midwestern city to investigate the influences on high school students' career expectations. The primary goal of the study was to understand aspects of the ecological contexts in which adolescents make career decisions. A questionnaire was used to collect data. There were 464 high school students (226 males and 238 females). Students were surveyed at two high schools where more than 95 percent completed the survey. Their perceptions of influences on their career expectations were examined since such perceptions were likely to influence behavior.

The analysis revealed three main influencing factors in the career expectations of adolescents. The researchers classified the three factors as background, personal, and

environmental. These factors were broken down into ten background, six personal, and seven environmental sub-factors in the survey. Each sub-factor was ranked in order for the strength of its influence on their career expectation. Also, the participants were asked to rank according to the overall set of factors with the strongest influence on their own career expectations.

The results suggested that high school students were aware of a variety of internal and external influences on their current career expectations. The study showed the top three background sub-factors that influenced both female and male students were ability, role models and media, whereas, ethnicity, gender and family income were the three least influential factors. Similarly, the study investigated whether the mother and father influenced both boys and girls. The result was found that female friends influenced females only, and male friends influenced males only. This study also showed that male teachers and counselors were the least influencing factor for females. Similarly, interests, personality, and values were determined to be the three strongest personal influencing sub-factors.

Swoboda and Cieslik (1997) investigated why different individuals were interested in a career in the construction industry and recommended ways to promote construction as a career choice. The survey population included junior and senior high school students, students in associate degree programs in construction, and skilled workers employed in the construction industry. The questions were intended to infer the students' perception of the construction industry and whether or not they had an interest in construction as a career.

The high school survey questionnaire was categorized into three parts: (1) general awareness of the industry, (2) training, and (3) perception of the industry's image (Swoboda and Cieslik 1997). The result indicated that 61 percent of the high school students out of 520 respondents were unwilling to pursue a career in construction for the following reasons: not interested, work conditions, low pay and little knowledge of the construction industry. As a result, the study concluded that the construction industry had a poor image which needed to be changed in order to interest students in pursuing a career in the industry.

The associate degree survey questionnaire was categorized into four parts: (1) programs that their school offered, (2) who or what influenced their decision to attend the school, (3) pay/job market, and (4) their opinion of the industry's image (Swoboda and Cieslik 1997).

Similarly, the skilled labor survey was categorized into three parts: (1) questions related to the company they are employed with, (2) training, and (3) their opinion of the industry's image (Swoboda and Cieslik 1997).

For both the associate degree students and skilled labors the research concluded that self, family, and friends influence were the top reason given for selecting construction as their career choice.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The literature review provided a background of possible factors that can influence a student's academic interests and career choices, and explored related research studies. The objective of this research was to find the relationship between the CATA students enrolled in ACE curricula and their academic interests.

A brief description of the sampling method is provided and followed with the details of CCSD CATA sample; this chapter outlines the process of the development of this research, including data collection, survey results, discussion and findings.

3.2 Sampling Method

The sampling method is a method of selecting a good sample from a population so that by studying the sample it can be generalized to represent the entire population. There are various methods for selecting a sample. Probability sampling and non-probability sampling are commonly used sampling methods.

In this research, non-probability sampling method was used to select four CCSD CATAs as a sample.

3.2.1 Non-probability Sampling

Non-probability sampling is a type of sampling in which not everyone has an equal chance of being selected from the population. In other words, it does not involve random selection. It is often used in psychological research in schools or colleges because it is

convenient and less expensive than probability sampling. One method of non-probability sampling is convenience sampling.

3.2.1.1 Convenience Sampling

Convenience sampling is used when the researcher wants to use any available group of participants to represent the population. This sampling technique is widely used in research where subjects are selected because of their convenient accessibility and proximity to the researcher (McIntire and Miller 2007).

In this research, convenience sampling was used to collect the data from the CATA students.

3.3 Sample

McIntire and Miller (2007) states "although the survey might be administered to the entire population-all members of the target audience-it is more typical to administer the survey to a representative subset of the population, known as a sample."

The sample for this research included students from the four CCSD CATAs. Each academy has different curricula. Students in curricula related to architecture, construction, and engineering were the focus of this research.

3.3.1 CCSD CATA Sample.

The CATA's and the curricula offered are discussed below.

a) Advanced Technologies Academy (ATA)

ATA is a magnet high school in Las Vegas, Nevada, which was established in 1994. The program areas of study at ATA are: law related careers, information technology,

network technology, business and finance, computer graphic design, architectural design, computer science, and engineering technology.

b) East Career and Technical Academy (ECTA)

ECTA is a comprehensive magnet high school in Las Vegas, Nevada, which was established in 2008. The program areas of study at ECTA are: construction technologies, culinary arts, teacher education/early childhood, entertainment business and marketing, integrated technologies, medical professions, and transportation technology.

c) Northwest Career and Technical Academy (NWCTA)

NWCTA is a magnet high school located in the northwest area of Las Vegas, Nevada, which was established in 2007. The program areas of study offered at NWCTA are: engineering and design, construction management, hospitality, medical professions, transportation technology, teacher education/early childhood, culinary arts, and media communications.

d) Southeast Career and Technical Academy (SECTA)

SECTA is a four-year comprehensive career and technical high school in Las Vegas, Nevada, which is established in 1966. The program areas of study at SECTA are: 3D-animation for film and games, architectural engineering, automotive technology, business technology, collision repair technology, computer networking, computer science, computerized accounting, cosmetology, culinary arts, CADD/drafting, engineering and commercial, film studies and video production, graphic communications, graphic design and illustration, health sciences, and welding.

3.4 Overview of Research Methodology

This research is focused on developing descriptive statistics of influencing parameters in the student academic interests related to the architecture, construction and engineering. This research, also investigates the correlations between the subjects that students find interesting and their academic performance in those subjects. Fig. 3 provides a flowchart that schematically represents the process utilized to conduct this research.

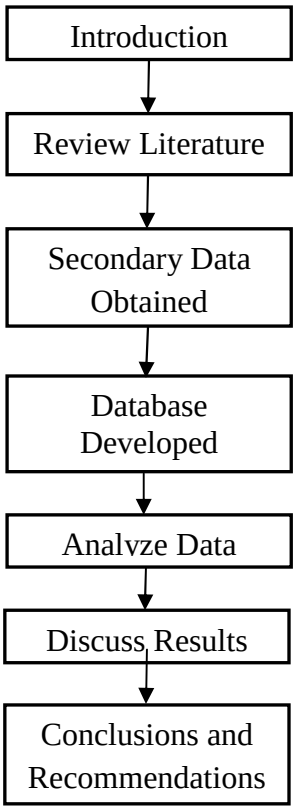

Fig. 3. Research methodology flowchart

Each step of the research methodology is briefly explained in the following sections.

3.4.1 Introduction

Chapter 1-Introduction provided the introduction part of the research methodology covering the background, scope and objectives, limitations, and research hypotheses. It also provides an overview of the research and highlights the need for the research

3.4.2 Literature Review

Chapter 2-Literature Review provided the literature review part of the research methodology. The literature review brings the reader up to date with current literature and findings related to this research topic. For this research, various journals, articles, conference proceedings, websites, and books were reviewed.

3.4.3 Data

CCSD developed a questionnaire and administered the questionnaire to students enrolled in ACE curricula at the CATA's. The detailed description of the contents included in the survey instrument is discussed in Chapter 4-Survey Instrument and Data Collection.

3.4.4 Data Collection

The conclusions reached through quantitative and qualitative research are stonger if they are supported by adequate data. The purpose of data collection is to obtain information and record the data. Ultimately the data collected will be analyzed and the results will be used to make informed decisions about important issues. There are various ways to collect data: by questionnaire survey, by telephone survey, by interview, by email or mail, and internet survey. The data used in this research were collected by the

CCSD questionnaire that was distributed via the paper survey method. The detailed description of how the data was collected is presented in Chapter 4-Survey Instrument and Data Collection.

3.4.5 Data Analysis

Data analysis begins with inspecting the data, it is then screened, transformed, analyzed and results are produced. Figures and tables were developed based on the results of the data analyses in order to either refute or support this research's hypotheses. The detailed analysis of the data is described in Chapter 5-Data Analysis.

3.4.6 Discussion of Results

This section provides the discussion of the data analysis results and the interpretations of the results. The results and findings were summarized to assess whether the research hypotheses were valid or invalid, and to determine the factors that influenced academic interests of CATA students. The results are discussed in detail in Chapter 6-Discussion of Results.

3.4.7 Conclusions and Recommendations

The information that was obtained during all of the process discussed in the previous sections of the research methodology was used to draw conclusions based upon the proposed research hypotheses. Some conclusions lead to recommendations of additional research in this area. These conclusions and further research recommendations are presented in chapter 7-Conclusions and Recommendations.

3.5 Statistical Background

The questionnaire, for this research, collected data using the check-off format, Likert scale and write-in format. Since different data collection formats were used different numbers and scales were assigned to measure attributes, traits, or characteristics of the students. Validity tests and non-parametric tests were performed to test the hypothesis. Grade earned versus interest in a subject was analyzed using Spearman's rank correlation coefficient analysis. The basic terminologies and assumptions used in this analysis are explained in the following section.

3.5.1 Levels of Measurement

Four levels of measurement that are commonly used in research similar to the present research are nominal, ordinal, interval, and ratio scales. Only nominal and interval scales were used in the present research and they are described below.

3.5.1.1 Nominal Scales

In nominal scaling, numbers are assigned to groups or categories of information. The numbers do not represent quantitative values; numbers simply give the categories a numerical label. Nominal scales are widely used in demographic data such as grouping people based on gender, ethnicity, etc. For example, we can assign 1= male, 0 = female.

3.5.1.2 Interval Scales

The scale in which the position of each point measured is equal distance from one another is known as interval scale (Dizney 1971). The interval scale is measured between two extremes, for example, student's interest in a subject may be rated from 1 to 5, with the value 1 being assigned a meaning of strongly disagree and 5 being strongly agree.

The advantage of an interval scale is that means and standard deviations can be calculated for these scores.

3.5.2 Variables

Variables refer to measurable attributes which may be discrete or continuous. In this research some variables are relatively complex and they are frequently interrelated. For example, we might say that academic achievement is a function of interest, but to be more precise, we might wish to add other variables such as age, motivation, past experience, and so on. In this research, “interest in subject” and “grades earned” are used as variables to find correlation through Spearman’s rank correlation test, which is a non-parametric correlation test.

3.5.3 Correlation

Correlations are important indices of relationships between variables. One of their fundamental uses is to discover not only how one variable accounts for another variable, but also the degree to which they do not account for each other. In the measurement in this research, the use of correlation coefficients is important at a fundamental level in two crucial concepts, namely, validity and reliability.

3.5.4 Non-parametric Statistic

A non-parametric statistic is the statistic based on the interval scale of observations. Variables are ranked in order unless they are continuous. For this research, Spearman’s rank correlation coefficient is used for correlation test.

3.5.5 Spearman's Rank Correlation Coefficient

Spearman's rank correlation coefficient is generally represented by Greek letter "ρ" (rho) which measures statistical association between variables that are ranked. The Spearman correlation coefficient ranges from +1 to -1. The positive Spearman correlation coefficient defines that variable Y (dependent variable) has positive association with variable X (independent variable). This means, when X increases, Y tends to increase. Similarly the negative correlation coefficient explains that there is reverse association between X and Y variables. The Spearman correlation coefficient is zero if the rankings are completely independent.

Spearman's rank correlation coefficient is a non parametric test which means it is distribution free. While testing a hypothesis, the possible association in the underlying variables can be investigated.

3.5.6 Measurement of Validity

Walonick (1997) states that, "Validity refers to the accuracy or truthfulness of a measurement. Are we measuring what we think we are? This is a simple concept, but in reality, it is extremely difficult to determine if a measure is valid. Generally, validity is based solely on the judgment of the researcher. When an instrument is developed, each question is scrutinized and modified until the researcher is satisfied that it is an accurate measure of the desired construct and that there is adequate coverage of each area to be investigated".

Validity focuses on answering this question: "is this instrument measuring what it is supposed to measure?" (Thorndike and Thorndike-Christ 2009). Score interpretation

validity for a particular use often is not useful for another purpose. In this research, measurements of validity are discussed below.

3.5.6.1 Face Validity

Face validity focuses on whether a test appears or "looks like" it measures what it is intended to measure. Face validity judgments are made primarily on the basis of inspection only with little or no other information. It is often important when selecting survey instruments. When all else is equal, an instrument with better face validity should be used (Meyer et al, 2001).

Typically, many possible tests are relevant for a particular area, and picking the one with the greatest face validity may be appropriate.

3.5.6.2 Content Validity

Pearson (2010) states that "content validity is achieved when a set of questions captures the full range of attributes thought to constitute what is being measured."

3.5.6.3 Criterion Validity

Pearson (2010) states that "criterion validity is assessed through a measure's association or correlation with other things we know or believe it to be related to." There are two types of methods for obtaining criterion validity: concurrent and predictive. In this research, concurrent validity is applicable.

3.5.6.4 Concurrent Validity

Pearson (2010) states that "concurrent validity is a measure of the extent to which your measure is correlated with, say, other items in the survey or questionnaire that you know or believe that it should be highly related to." This method does not involve

prediction. Instead, it provides information about the present and the status quo (Cascio1991). The concurrent method involves administering two measures to the same group of individuals at approximately the same point in time.

3.5.6.5 Statistical Conclusion Validity

The conclusion reached or inference drawn about the extent of the relationship between the two variables is said to be statistical conclusion validity when we reach the correct conclusion. Cook and Campbell (1976) state that, “statistical conclusion validity refers to the validity of conclusions we draw on the basis of statistical evidence about whether a presumed cause and effect co-vary.”

3.5.7 Bivariate Analysis

Bivariate analysis is the simultaneous analysis of two variables or groups, and it provides the concept of association between those variables. The analysis may include calculating correlation coefficients, cross-tabulations, t tests, chi-square comparisons, or analysis of variance.

For this research, Spearman’s rank correlation coefficients and cross-tabulations are used as bivariate analysis to test the hypothesis of “association” and causality.

CHAPTER 4

SURVEY INSTRUMENT AND DATA COLLECTION

4.1 Survey Instrument

As previously described a questionnaire was developed as a survey instrument by CCSD. The questionnaire is provided in Appendix C. The questionnaire was designed to gather the following information using the check-off format, Likert scale format and write-in format. The survey instrument deals with the following seven main areas:

a. General student information
b. Family work experience and education
c. Student subject interests and grades
d. Post-high school plans
e. Baccalaureate academic interests and majors
f. Internship and post-baccalaureate pay
g. UNLV specific

Questions 1 through 6 were designed to gather general information from the students, such as gender, age, race, high school grade, family members, and number of brothers and sisters. Question 7 was designed to identify the highest level of education that their family members had obtained. Questions 8, 9 and 10 dealt with their school, curriculum that the student was enrolled in, and they identified if they knew other individuals that attended any of the CATA's. Questions 11 through 18 and questions 25 through 31 were related to students' perceptions about CATA and high school programs. Questions 19 and 20 were related to the awareness of events that may have had an impact upon

curriculum selection. Questions 21 through 23 were concerned with work experience of students, family members, and relatives. Question 24 was designed to identify factors that influenced students' decisions to choose technical areas of study at the high school level. Question 32 pertained to post-high school plans. Similarly, questions 33 and 34 dealt with the university they planned to attend and their academic major. Questions 35 and 36 were intended to collect information about subject interest and associated academic performance. Questions 37 through 40 were specifically related to UNLV. Questions 41 through 46 addressed internship, job market, and post-baccalaureate salaries in architecture, construction and engineering. Questions 47 and 48 were designed to assess students' awareness about the construction industry. Finally, questions 49 through 51 were to identify the type of associate degrees CATA students wanted to pursue if they were not going to pursue a baccalaureate degree.

4.2 Questionnaire Distribution

CCSD printed and distributed paper copies to teachers at the four CATA's. The questionnaire was administered by CATA teachers to grade 9 to grade12 students at their school. Only the NWCTA and SECTA had a complete compliment of grade 9 tograde 12 students. The other CATA's had only through the 11^{th}, 10^{th} or 9^{th} grade students because the CATA's have been opened on a year-by-year staggered schedule. The questionnaires were distributed by CATA teachers to their classes. By using a paper medium for the questionnaire maximum flexibility was afforded to teachers in how the questionnaire was administered. Some teachers had students complete the questionnaire in their classroom

and other teachers assigned it to students as a homework assignment. The downside to using a paper medium in such a complex questionnaire leads to intensive transcribing and entry of data into a format that may be analyzed using spreadsheet and statistical software.

4.3 Data Collection

The data were collected from four CCSD CATAs. Students submitted their completed questionnaires to the class teacher. Then, the surveys were compiled in a large envelop and was returned to the CCSD office. CCSD supplied the completed questionnaires to UNLV for analysis.

4.3.1 Data Processing

Questionnaires that were less that 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. However, based on the large number of students, the responses were remarkably good.

The questionnaire collected from the four schools was entered according to the name of the school that students presently attended so that correlation could be made easier.

4.3.2 Distribution of the Survey

This survey was conducted during the later part of October, 2009 and the questionnaires were given to UNLV in late November 2009. The total sample size was 880 students. The distribution of students surveyed by institution is shown in Table 1.

4.3.3 Survey Response Rate

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. There were 156 questionnaires which were less than 80 percent complete, and these were eliminated. Thus, the response rate was 82 percent which is a very good response for this type of research. Table 1 shows the number of questionnaires distributed, and the number of questionnaires eliminated and included in the research by school.

Table 1 Distribution by School

Name of school	Number of questionnaires distributed	Questionnaires $\leq$ 80% complete	Questionnaires include in analysis
Advanced Technologies Academy	175	26	149
East Career and Technical Academy	190	30	160
Northwest Career and Technical Academy	400	87	313
Southeast Career and Technical Academy	115	13	102
Total	880	156	724

4.3.4 Data Entry Process

The students were provided with an eight page questionnaire, and they had to either select the right options provided or had to write in an answer. The questionnaire in Appendix C is 13 pages long but contains the same questions that the eight page questionnaire contained. The length difference is due to formatting differences required for thesis margins.

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.

CHAPTER 5

SURVEY RESULTS

This section presents the results for the 724 questionnaires that were entered in database. From the database the information provided by the survey respondents was summarized to present the output of the survey. The following sections provide the detailed results.

5.1 CCSD CATA Survey Results

The first six survey questions were used to record the gender, age, race, high school grade, family members living with, and number of brother and sisters of the student respectively.

The pie charts as shown in Fig.4 to Fig.9 show the responses that were received from questions 1 to questions 6 of the questionnaire representing the demographics of the students. The distribution of gender is shown in Fig.4. showing a strong male dominance as 75 percent were male and 25 percent were female. .

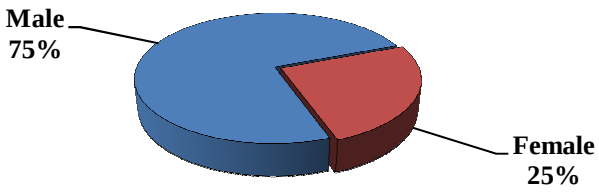

Fig. 4. Gender distribution of students

The distribution of age of the participants is shown in Fig.5. it appears from the age distribution that most grade 9 through grade 11 comprise the survey. This agrees with Fig.7.

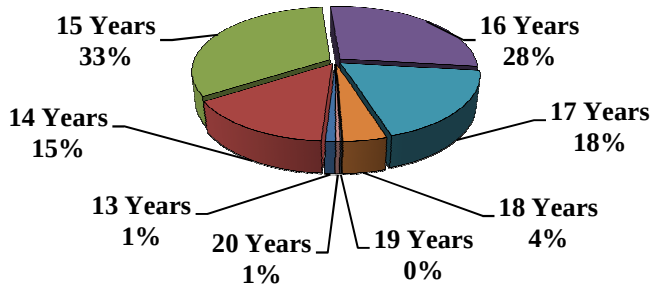

Fig. 5. Age distribution of students

Similarly, Fig. 6 presents the distribution by race of the respondents. The sample is ethnically diverse.

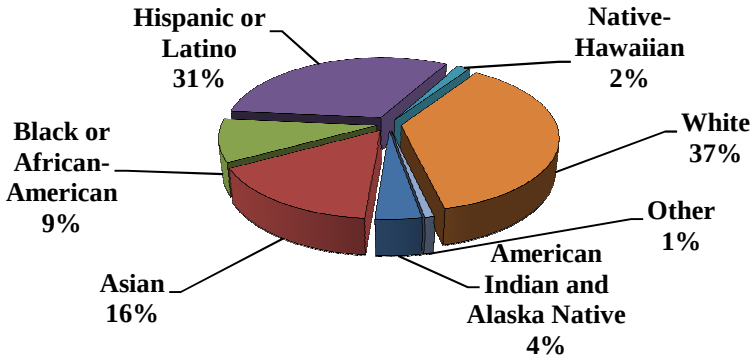

Fig. 6. Distribution of students by race

The result shown in Fig. 7 shows the distribution of respondents by high school grade level. The response to the question 5 is presented in Fig.8 showing that 69 percent of the students live with both parents and the next highest number is 18 percent of the students live with only their mother.

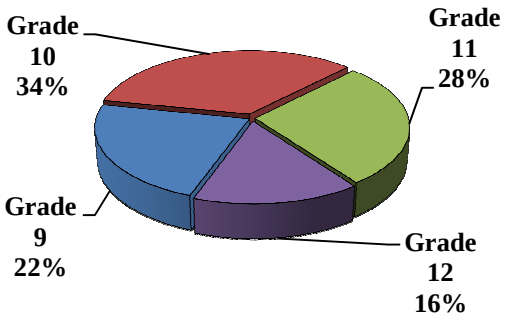

Fig. 7. Students' present high school grade level

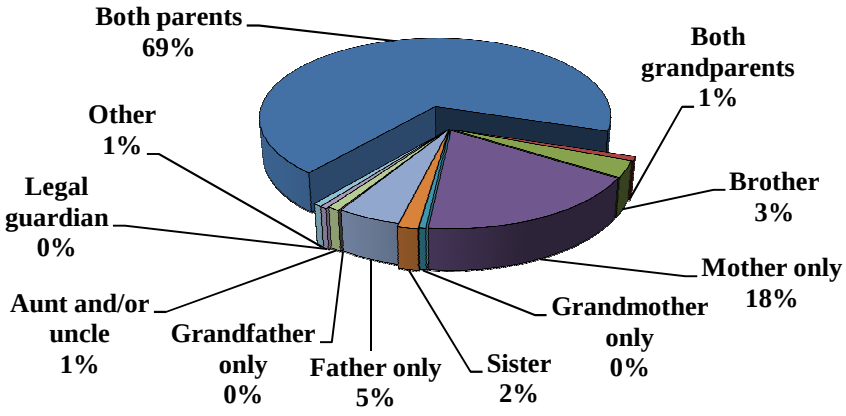

Fig. 8. Distribution of whom students live with

Fig. 9 shows the distribution of CATA students who have brothers and sisters

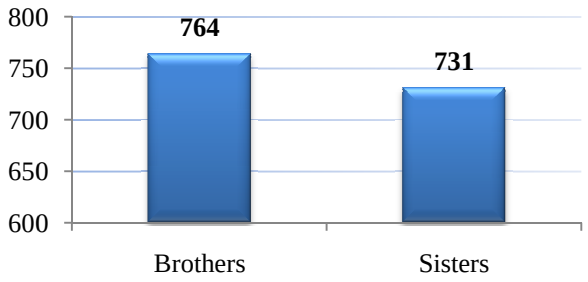

Fig. 9. Students with brothers and/or sisters

Question 7 was designed to determine the highest level of education that the student's family members had obtained. Only 11 percent of the students were from families where the highest level of education obtained was below the high school diploma level. Regardless of the K-12 education level obtained if it was below high school diploma level it was categorized as such. So, whatever the education level that student checked in below the high school diploma they all were grouped under one category named as "Below High School." Also, as listed in question 7 of the questionnaire, the level of education asked "Some College but did not obtained degree" was grouped under the "High School Diploma" category.

In addition to this, the overall highest level of education among family members was calculated by taking only the one highest level of education from any one of the family members. For example, if both father and mother had doctorate degree then it is counted

only once to get overall highest level of education. The result is tabulated with their number and corresponding percentage as shown in Table 2 below.

Table 2. Highest Level of Education of Student's Family Members

Education	Family Members				Overall Highest level of education among family members (n= 602)
	Father (n=496)	Mother (n=535)	Brother (n=213)	Sister (n=190)	
Doctorate Degree (Ph.D.)	25 5%	16 3%	10 5%	4 2%	34 6%
Master's of Science (M.S)	63 13%	64 12%	3 1%	5 3%	102 17%
Bachelor's Degree (B.S.)	73 15%	96 18%	26 12%	21 11%	113 19%
Associates Degree (A.S., A.A.S)	31 6%	46 9%	4 2%	20 1%	49 8%
High School Diploma	211 43%	223 42%	101 47%	98 52%	237 39%
Below High School	93 19%	90 17%	69 32%	42 22%	67 11%

Questions 8, 9 and 10 were designed to collect information about the student's current school, curriculum that they are enrolled in, and whether brothers, sisters or friends attended these schools. Fig. 10 shows the responses by school, and Fig. 11 shows the curriculum that the students are enrolled in.

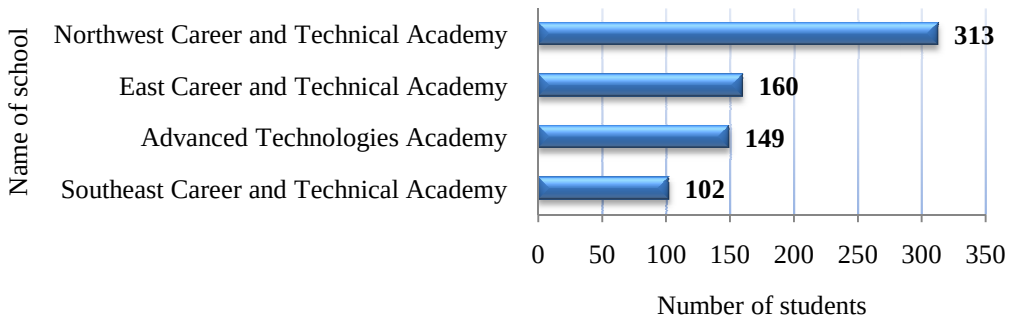

Fig. 10. Responses by school (n=724)

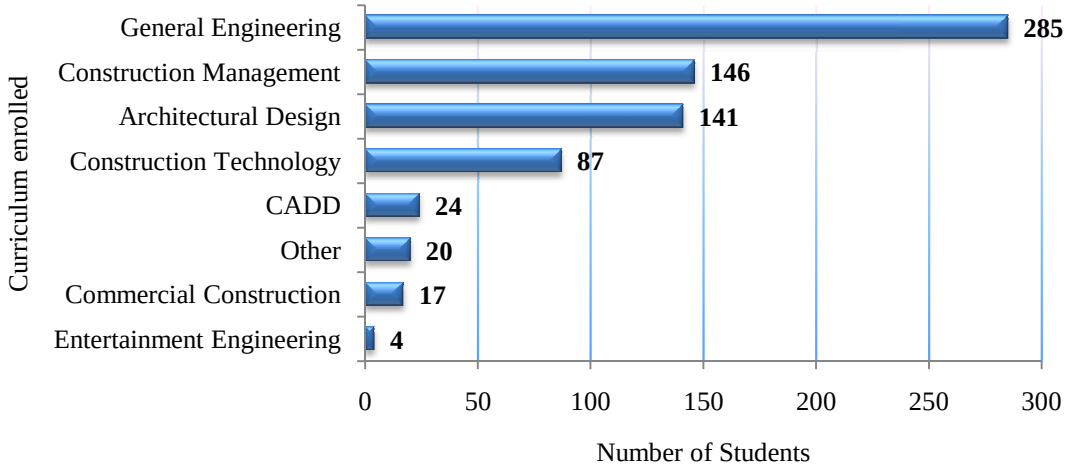

Fig. 11. Curriculum enrollment (n=724)

In response to Question 10, the distribution of brothers, sisters, and friends that have attended the schools mentioned in the list is presented in Fig. 12.

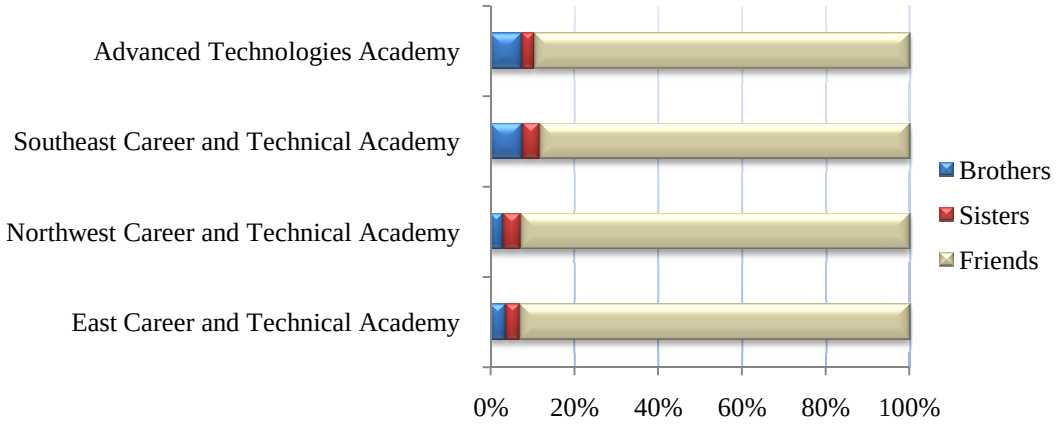

Fig. 12. Distribution of brothers, sisters and friends who attended CATA's

Fig. 13 shows the percentage of students that intend to change to another curriculum. There were 708 students that responded to this question. One quarter of the students intend to change to another program.

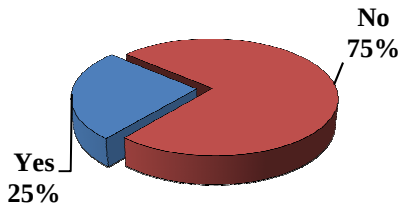

Fig. 13. Student intentions to change programs

Fig. 14 presents the programs that the students who want to change programs want to enter.

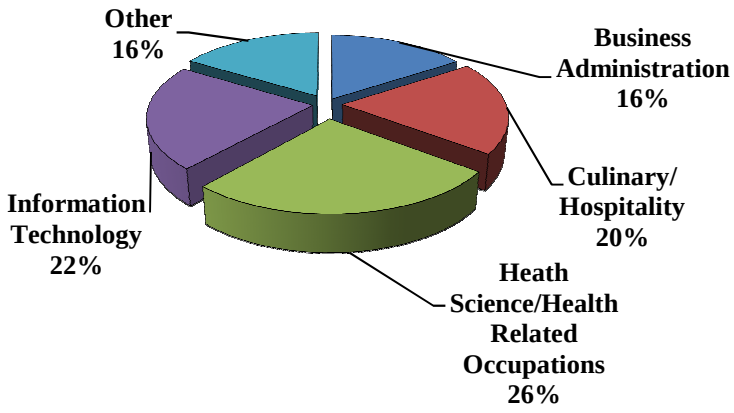

Fig. 14. Programs that students want to change to

Fig. 15 shows the percentage of students preferring to attend a different CATA. The result shows that only 11 percent of the students preferred to attend a different CATA.

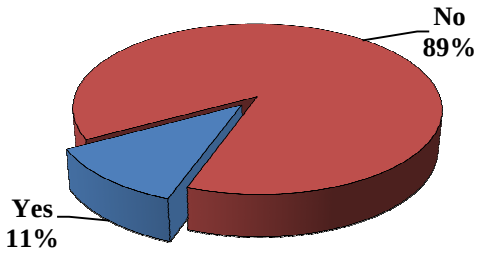

Fig. 15. Students preferring to attend a different CATA

When students were asked if they would attend a different CATA if transportation were provided, 17 percent indicated that they would. It is shown in Fig. 16.

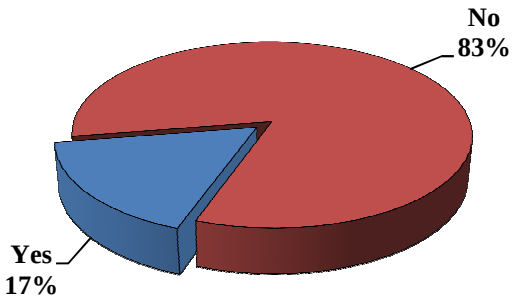

Fig. 16. Students who would attend a different CATA if transportation were provided

In addition to the courses that are already offered in CATA's, students desired additional courses be offered in their school. Students gave high priority to the addition of robotics course(s). Computer networking/computer science, cosmetology, and design (fashion and interior) were equally emphasized as their second priority. The results are presented in Table 3.

Table 3. Student's Priority on Other CATA Courses

Priority	Courses				
	Computer Networking /Computer Science (n=431)	Cosmetology (n=176)	Design (Fashion and Interior) (n=295)	Robotics (n=458)	Veterinary Science (n=229)
1	153 35%	51 29%	105 36%	213 47%	45 20%
2	154 36%	64 36%	107 36%	161 35%	69 30%
3	124 29%	61 35%	83 28%	84 18%	115 50%

Advertisement is the best way to deliver information to people in any sector. It can be delivered through different means and media. Students selected "Middle School Counselors and Recruiters" and "Television" as the best way to advertise the CATA's and their programs. Since, the question allowed students to select five responses to the multiple choices given; the total number of responses was 3186. The result shows "MySpace" as the second highest source to advertise. Youtube, Facebook, and Web Sites ranked in third position. The detailed description of advertizing selections is presented in Fig.17.

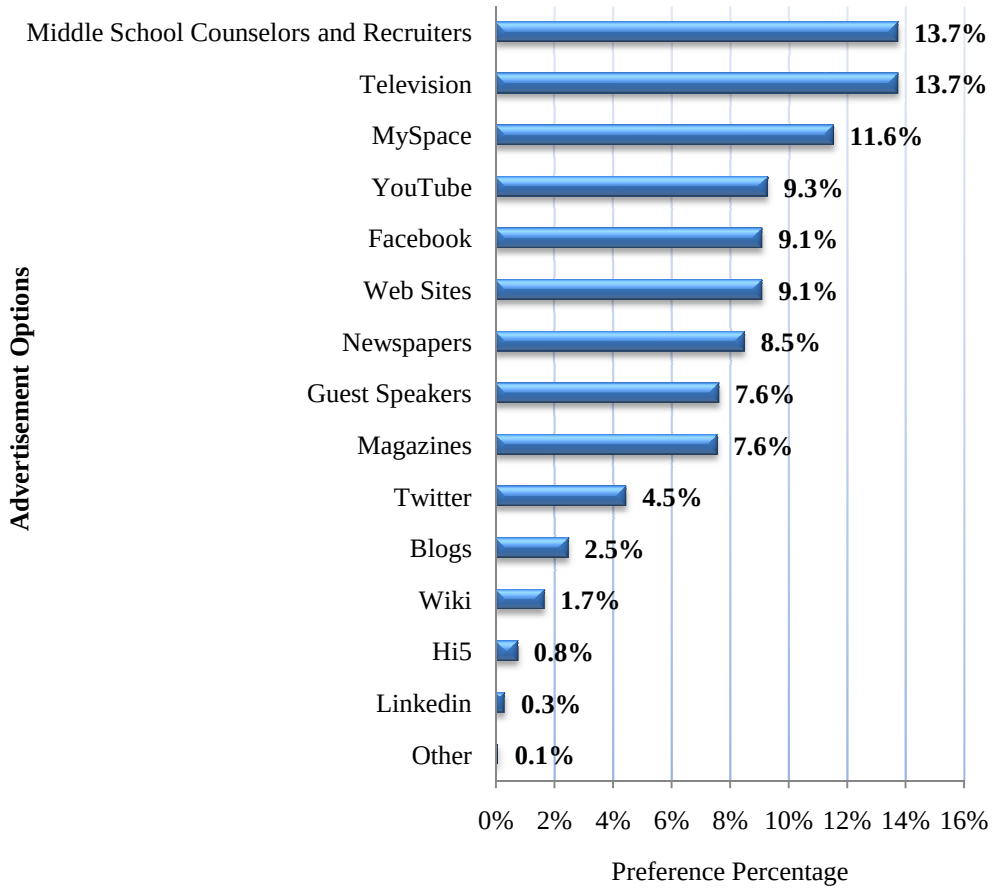

Fig. 17. StudentAdvertizing preferences (n= 3186)

According to the priority set by students in response to how they would like to learn about career opportunities related to high school programs, “Counselors and Recruiters” are the most effective source to provide this information. Among 684 students, 41 percent gave first priority to “Counselors and Recruiters.” The detailed results are shown in Table 4 where priority 1 indicates the highest priority.

Table 4. Priority Student's to Obtain Knowledge about Career Opportunities Related to High School Programs

Priority	Sources of obtaining knowledge			
	Counselors and Recruiters (n=684)	Guest Speakers (n=688)	Television (n=664)	Web Sites (n=657)
1	278 41%	205 30%	125 19%	77 12%
2	178 26%	275 40%	104 16%	116 18%
3	88 13%	133 19%	219 33%	209 32%
4	128 19%	59 9%	186 28%	233 35%
5	12 2%	16 2%	30 5%	22 3%

In the general area of the questionnaire on career opportunities students were asked if they would like to visit a business related to their high school program. The response to this was overwhelmingly positive. Fig. 18 shows that 92 percent of the students desired an opportunity to visit a business related to their high school program.

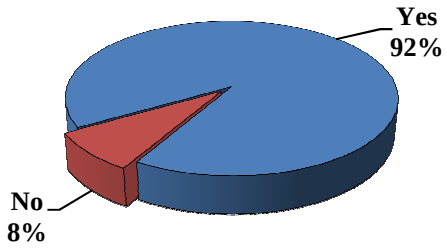

Fig. 18. Students desiring to visit a business related to their CATA program

A question was asked regarding student awareness of events that have been created to promote awareness of an interest in science, mathematics, architecture, construction and engineering educational programs and careers. A listing of these events is presented along with student responses in Fig.19.

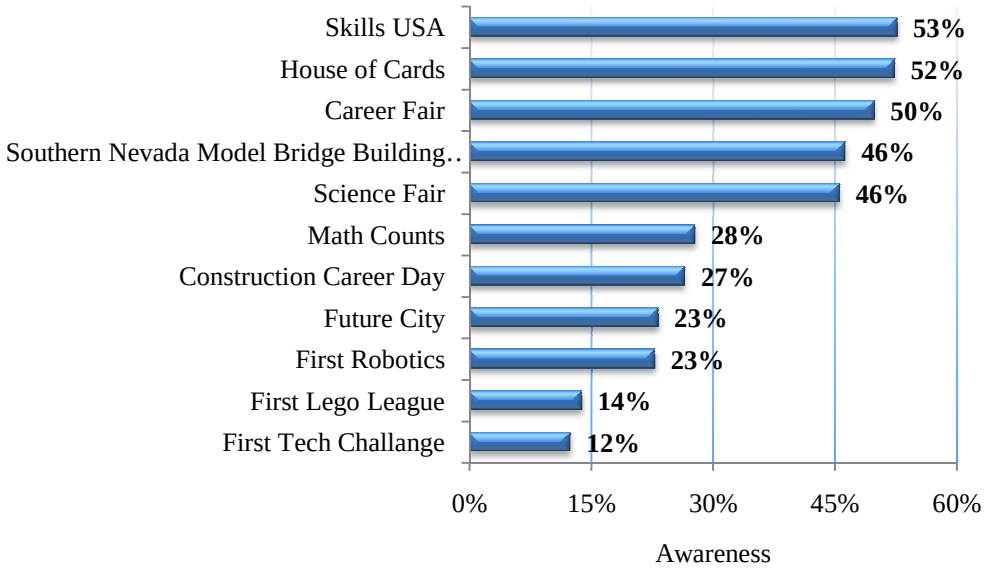

Fig. 19. Students' awareness of the existence of events (n=724)

The data shows that students were most aware of the Skills USA, House of Cards, Career Fair, Southern Nevada Model Bridge Building, and Science Fair events respectively. These five events ranged in awareness of 53 percents to 46 percent. Then the awareness of events fell of sharply to 28 percent for Math Counts. The percentage calculation was based on total number of yes responses for each event. Fig 19 does not

show that some students were aware of multiple events and that some students were not aware of any events. A total of 724 students responded to the question for each event. The detailed response information is broken down in greater detail and is presented in Appendix B: Table B-1.

Participation of students in the events listed in Fig. 19 was next determined. Fig. 20 presents the participation statistics for the students in the events.

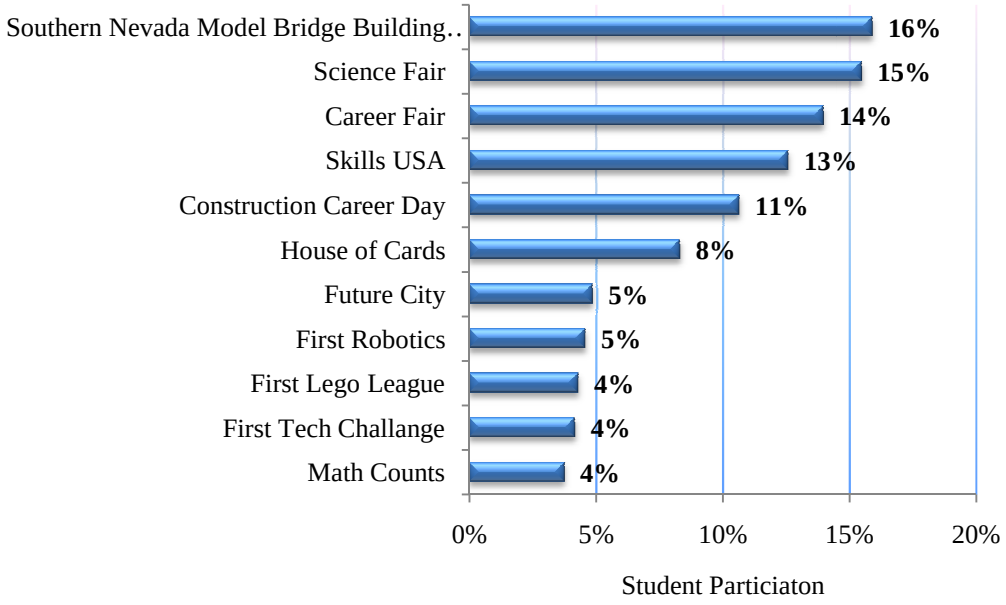

Fig. 20. Students' participating in different events (n=724)

Participation rates were much lower that were awareness. Participation ranged from 16 percent to 11 percent for the top five events participated in. The top five events were

Southern Nevada Model Bridge Building, Science Fair, Career Fair, Skills USA, and Construction Career Day respectively. The detailed response information is broken down in greater detail and is presented in Appendix B: Table B-2.

Students were asked if they attended a comprehensive high school the year before they enrolled in a CATA at the time of the survey, Fig. 21 shows that only seven percent of the students attended a comprehensive high school the previous year. When CATA's are initially opened they start with grade 9 and grade 10 students. This would account for some of the students attending a comprehensive high school the previous year,

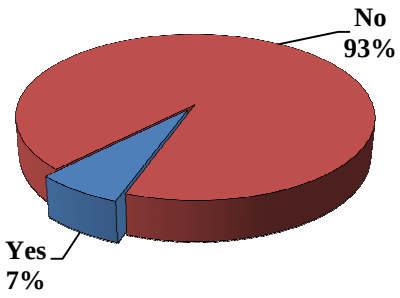

Fig. 21. Students attending a comprehensive high school the year before enrolling in a CATA (n=701)

The students that attended a comprehensive high school the year before were questioned if they had taken a Career and Technical Education (CATE) class during that time. Of the 49 students that attended a comprehensive high school the previous year, Fig. 22 shows the distribution of CATE courses that the students were enrolled in.

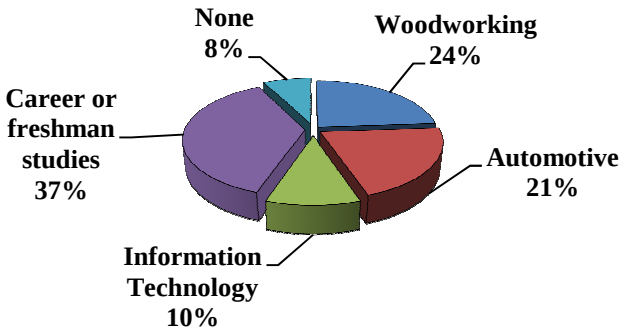

Fig. 22. CATE courses taken by students in enrolled in a comprehensive high school during the previous year (n=49)

Two questions were asked about Community Night. The first question asked if the student attended the school's Community Night. Fig. 23 shows 18 percent of the 703 students attended Community Night.

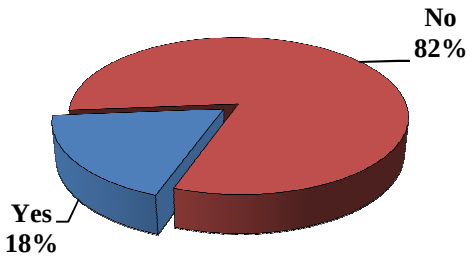

Fig. 23. Students attending school's community night (n=703)

A following question was asked about who attended Community Night with the student. Fig. 24 shows the distribution of family members who attended this Community Night with the student. In some cases the student may have had multiple family groups attending Community Night and this is not reflected directly in Fig. 24. For example a student could have had both parents and a brother attending, the combination is not shown. The figure indicates that the brother attended and both parents attended but not that the combination occurred.

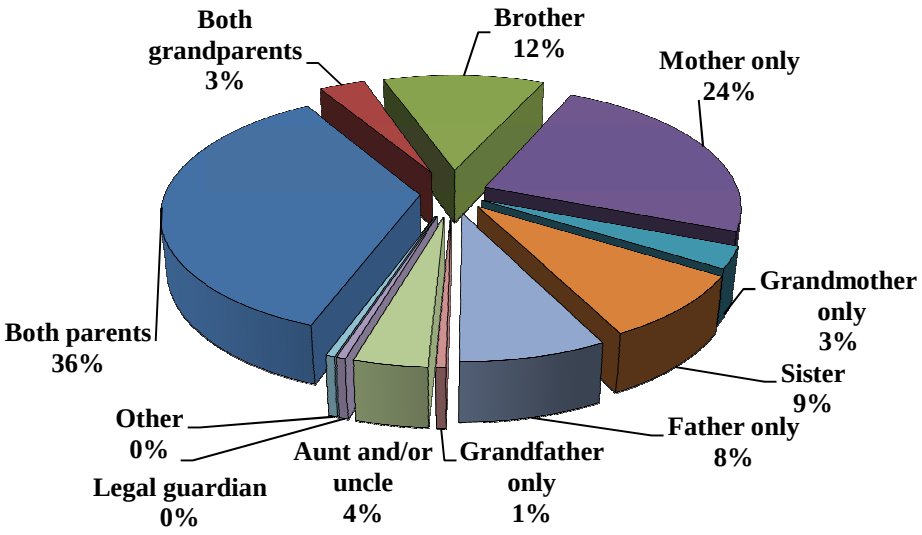

Fig. 24. Family members attending Community Night with student (n = 128)

5.2 Work Experience and Influences

The students were surveyed to ascertain if they had any work experience related to architecture, construction or engineering. The largest category of experience was "construction, home improvement or repair in their residence (unpaid)" with 48 percent of the students indicating this experience. Fig. 25 shows the breakdown of percentages that they were involved in architecture, construction or engineering related work. The detailed result of the responses is provided in Table B-3 of Appendix B. In this research the potential combinations of work experience that students had were not investigated. Therefore, a student having construction home improvement and having worked around engineers would both be shown in Fig. 25 in the separate categories but there is no way to identify the combination of experience from the figure. The calculation to determine the combinations can be performed from the database but it is beyond the present research's scope.

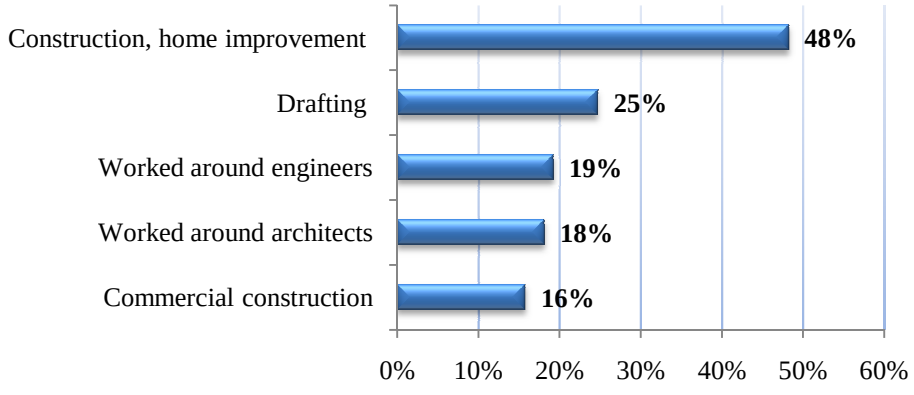

Fig. 25. Students' work experiences (n=724)

Table 5 provides a summary of the results obtained in response to the question 22 of the questionnaire. In the questionnaire there was a work category entitled “other” that recorded only 22 responses. Therefore, due to the low number of responses this category is omitted from Table 5. 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 5. Family Members Involved in ACE-Related Work

Family members	Work Experience		
	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%
Grandfather	37 11%	120 15%	106 17%
Grandmother	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%

Table 6 provides a summary of results that was obtained in response to question 23 which was intended to determine if non-family members that the student knew were involved in architecture-, construction- or engineering-related work.

Table 6. Involvement of Non-family Members in ACE-Related Work

Non-family member categories	Work Experience		
	Architecture (n=346)	Construction (n=529)	Engineering (n=485)
Friend	102 29%	179 34%	188 39%
Friend of family	145 42%	236 45%	186 38%
Acquaintance	93 27%	113 21%	103 21%
Nobody	6 2%	1 0%	8 2%

The survey result of individuals and factors that influenced the student's decision to select different areas of study in high school is presented in Table 7. The result shows that mostly the father influenced the student to select ACE- related areas of study in high school.

Table 7. Influence Factors Related to Student's Choice of Study Area

Influence factors	Areas of study in high school					
	Architectural Design (n=1452)	Construction Management (n= 877)	Construction Technology (n=493)	Entertainment Engineering (n=500)	General Engineering (n=1368)	Other (n=38)
Father	148 10%	120 14%	62 13%	41 8%	173 13%	2 5%
Mother	103 7%	52 6%	20 4%	33 7%	123 9%	3 8%
Brother	37 3%	21 2%	13 3%	15 3%	30 2%	2 5%
Sister	30 2%	17 2%	6 1%	15 3%	30 2%	2 5%
Uncle	68 5%	57 6%	26 5%	19 4%	61 4%	2 5%
Aunt	43 3%	18 2%	10 2%	13 3%	42 3%	3 8%
grandfather	60 4%	39 4%	21 4%	19 4%	62 5%	1 3%
Grandmother	38 3%	18 2%	12 2%	15 3%	43 3%	1 3%
Friend	88 6%	51 6%	26 5%	26 5%	67 5%	3 8%
Friend Of Family	76 5%	51 6%	29 6%	27 5%	64 5%	2 5%
Teacher	77 5%	44 5%	21 4%	22 4%	63 5%	1 3%
Former Teacher	65 4%	36 4%	17 3%	19 4%	57 4%	1 3%

Influence factors	Areas of study in high school					
	Architectural Design (n=1452)	Construction Management (n= 877)	Construction Technology (n=493)	Entertainment Engineering (n=500)	General Engineering (n=1368)	Other (n=38)
High School Recruiter	61 4%	24 3%	19 4%	14 3%	44 3%	1 3%
Employer Recruiter	26 2%	22 3%	17 3%	12 2%	25 2%	1 3%
Professional	37 3%	19 2%	18 4%	9 2%	32 2%	1 3%
Presentation	92 6%	59 7%	26 5%	28 6%	74 5%	1 3%
School Courses	91 6%	62 7%	29 6%	23 5%	86 6%	1 3%
Television	75 5%	54 6%	36 7%	42 8%	64 5%	2 5%
Programs/ Documentaries	60 4%	33 4%	23 5%	24 5%	62 5%	2 5%
Internet Media	59 4%	27 3%	23 5%	28 6%	57 4%	2 5%
Newspaper Articles	33 2%	18 2%	8 2%	21 4%	35 3%	2 5%
Magazine Articles	43 3%	17 2%	17 3%	18 4%	40 3%	1 3%
Advertising/ Marketing	42 3%	18 2%	14 3%	17 3%	34 2%	1 3%

Fig. 26 shows 49 percent of the students discussed the program prior to their enrollment with some other students who were enrolled in their high school program.

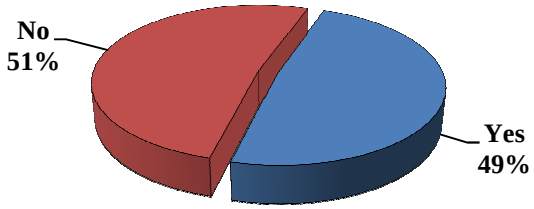

Fig. 26. Percentage of students discussing their program with currently enrolled students prior to their enrollment in the program (n=707)

Fig. 27 shows only 26 percent of the students consulted with teacher in their high school program prior to their enrollment.

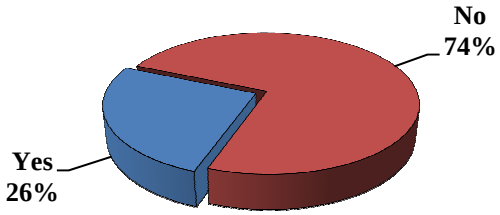

Fig. 27. Percentage of students consulting with a program teacher prior to enrollment in the program (n=712)

Students were asked, when they were in middle school, did they listen to a recruiter's presentation on the high school program. The result in Fig. 28 shows that 55 percent of middle school students listened to a recruiter's presentation on the high school program.

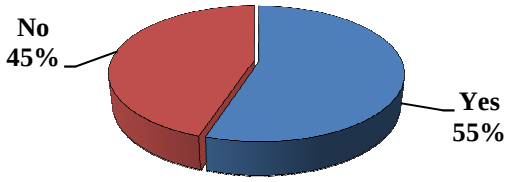

Fig. 28. Middle school students who listened to a high school recruiter's presentation (n=713)

5.3 Student's Future and Academic Interest

Students were surveyed to determine what their post high school graduation plans were and what their areas of academic interest in higher education were. The results are presented in Fig. 29. Approximately 15 percent of the students in the survey indicated they were undecided regarding their future plans. The category "Join armed forces" in Fig. 29 aggregates the independent questions from the questionnaire which included joining the Air Force, Army, Coast Guard, Marines, and Navy. Fig. 30 provides the detailed breakdown for the different branches of the armed forces. While only 676 students responded to the question, some students gave multiple responses leading to the total number of responses being 998. Further analysis would be required to analyze the

multiple responses and interpret their meaning and pattern which is beyond the scope of this research.

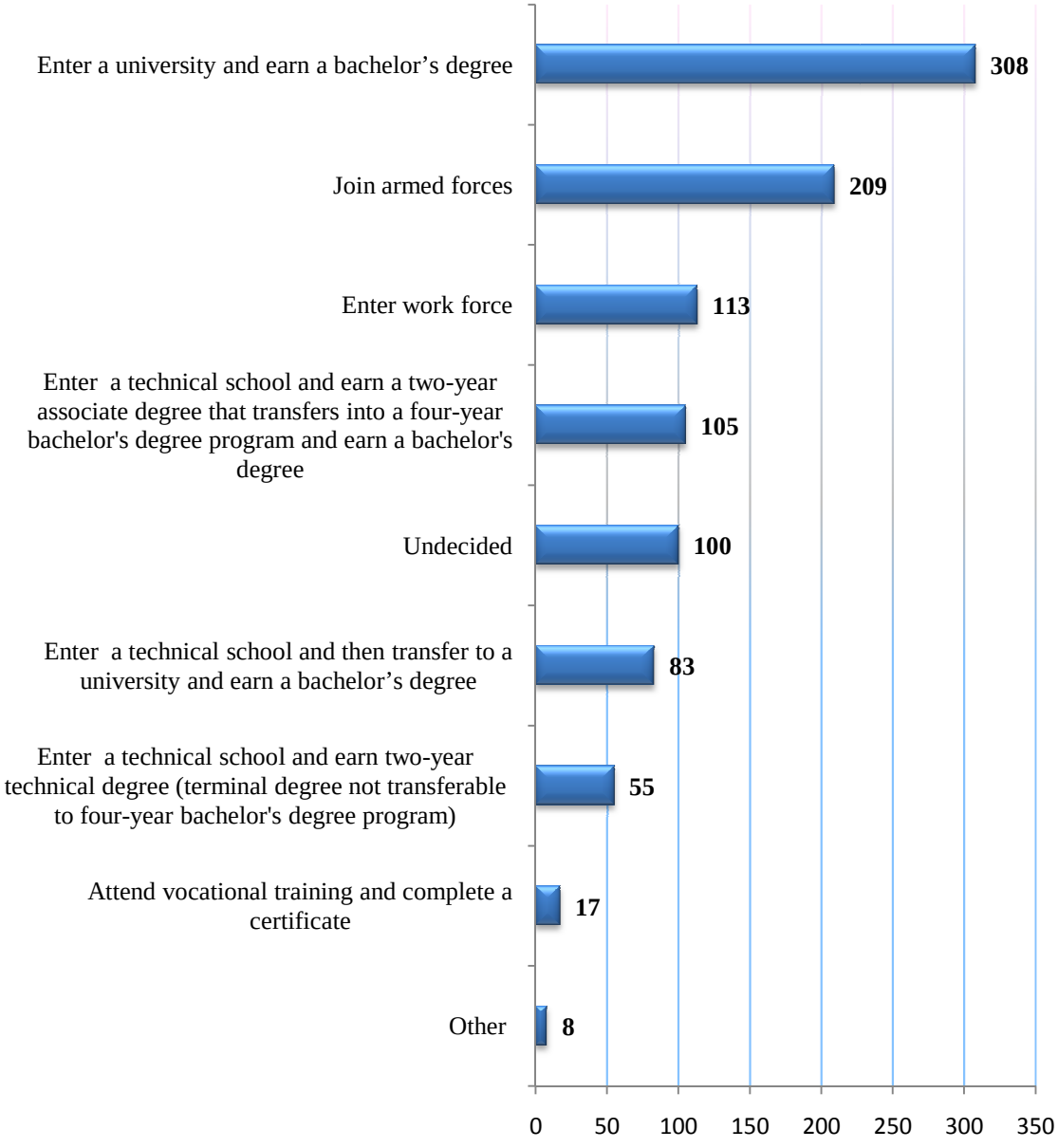

Fig. 29. Students post high school graduation plans (n=998)

Approximately 31 percent of the students indicated that they planned to join the armed forces following graduation from high school. The armed forces can further be subdivided into a military category that includes only the Air Force, Army, Marines, and Navy. Therefore, 93 percent of the students that plan to join the armed forces will enter the military. Fig. 30 shows the breakdown of the "Join armed forces" category that the high school students planned to do following graduation from high school.

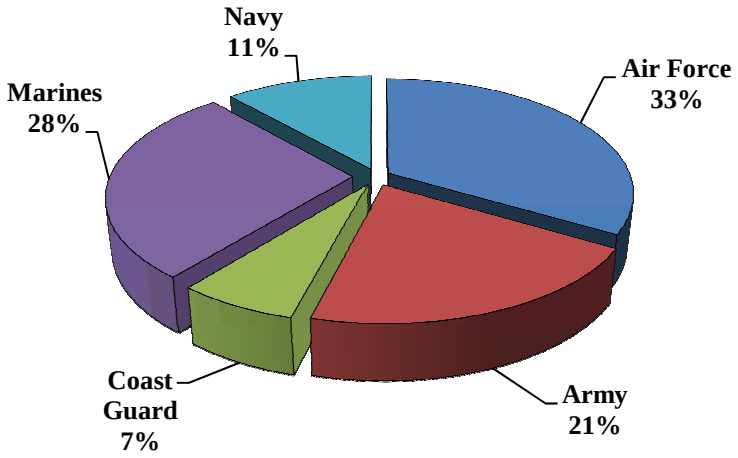

Fig. 30. Distribution of students who plan to join the armed force (n=209)

Fig. 31 shows the survey result of further higher education that CATA students plan to pursue following their high school graduation. Sixty-five percent plan to enter a four year institution following graduations. Approximately 34 percent plan to pursue higher education in southern Nevada with 28 percent planning to attend UNLV. Approximately

26 percent plan to attend an out-of-state four-year university. Approximately 23 percent students were undecided about their future educational plans. Some students answered in multiple categories of this question. Those with multiple answers were not included.

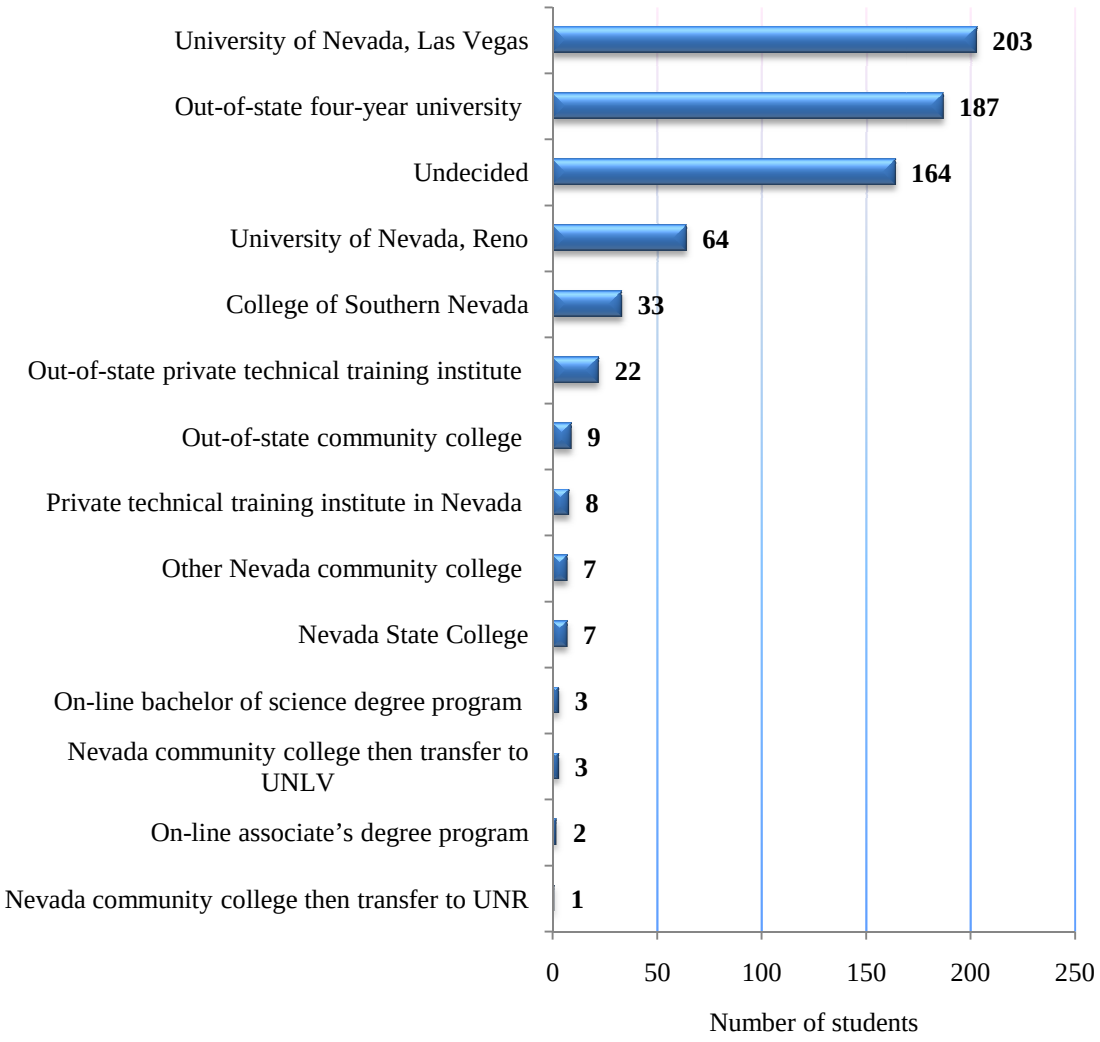

Fig. 31. Students' plans to pursue additional education following high school graduation (n=713)

Table 8 shows the priority given by the students to pursue a baccalaureate in different areas of study. Priority 1 shows the highest interest in that area of study.

Table 8. ACE baccalaureates that students plan to pursue

Study Areas	Priority		
	1	2	3
Architecture	140	57	34
Architectural Engineering	64	70	43
Mechanical Engineering	53	33	31
Aeronautical/ Aerospace Engineering	48	23	23
Construction Management	47	33	31
Civil Engineering	42	35	40
Computer Engineering	33	42	33
Interior Design	26	47	37
Construction Engineering	25	37	40
Computer Science	23	35	25
Entertainment Engineering	23	20	30
Electrical Engineering	22	15	29
Biomedical Engineering	15	5	17
Chemical Engineering	10	22	4
Agricultural Engineering	9	15	13
Nuclear Engineering	9	17	12
Environmental Engineering	7	9	12
Landscape Architecture	5	11	39
Industrial Engineering	4	11	10
Informatics	3	1	4
Materials Engineering	3	5	6
Petroleum Engineering	0	4	5

Fig.32 presents the results of baccalaureate degrees that CATA students are interested in pursuing. It shows only the first priority areas extracted from Table 9.

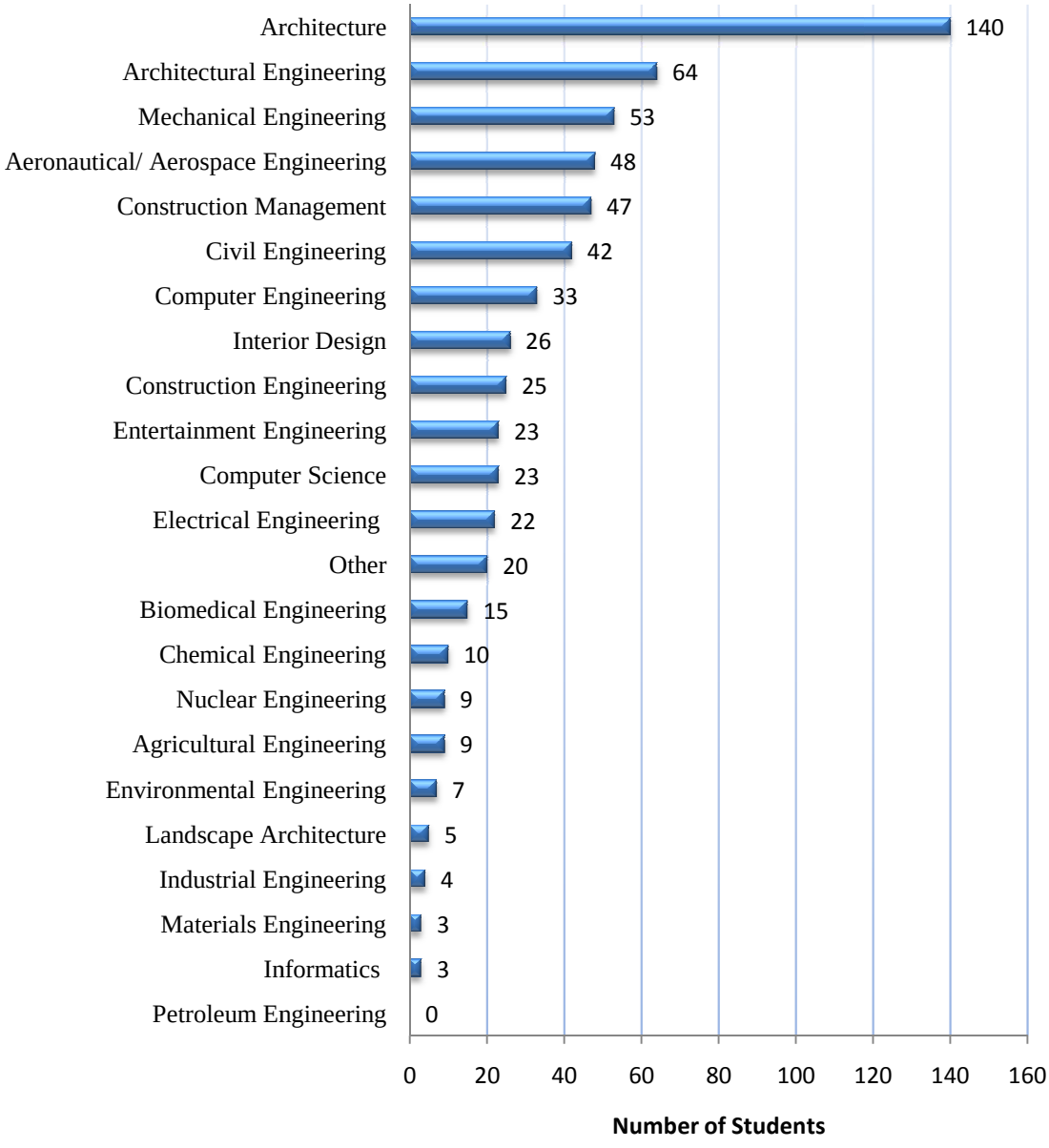

Fig. 32. ACE baccalaureate degree CATA students plan to pursue (n=631)

Table 9 presents the CATA student's interest in the different high school subjects which are listed in the table below. A Likert scale was used to ascertain the student's interest level. The categories of vocational arts, mathematics, computer science, fine arts, and physical science ranked between 64 and 61 percent totals of strongly agree and agree. The other areas were 48 percent or below for combined strongly agree and agree totals. There is a definite line of strong subject interest displayed in the data for the CATA students. The detailed result of the response is provided in Appendix B: Table B-4.

Table 9. CATA Student's Subject Interest

Subjects	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
Mathematics	28%	36%	22%	8%	6%
Physical science	25%	36%	24%	9%	6%
Life Sciences	19%	29%	29%	15%	8%
Business	14%	29%	34%	17%	6%
Social Sciences	18%	27%	34%	15%	7%
Liberal Arts	17%	27%	30%	17%	9%
Fine Arts	31%	30%	23%	11%	5%
Political Science	16%	26%	30%	18%	10%
Vocational Arts	31%	33%	25%	8%	4%
Computer Science	29%	34%	22%	7%	6%

Table 10 shows the grade categories that CATA students reported they mostly earned in the different subject areas. These grades are self-reported by the students and were their perceptions of their performance. Actual transcripts were not referred to by the students in the development of their perceptions. It was beyond the scope of the present

research to verify the validity of the student perceptions. The survey result as they responded is summarized in Table B-5 in Appendix B.

Table 10. CATA Student Perception of Their Academic Performance

Subjects	Grades					
	Mostly A	Mostly A and B	Mostly B	Mostly B and C	Mostly C	Mostly less than C
Math	23%	34%	16%	18%	6%	4%
Physical science	22%	30%	18%	19%	9%	2%
Life Sciences	26%	29%	19%	16%	8%	2%
Business	27%	30%	18%	17%	5%	3%
Social Sciences	28%	33%	17%	14%	5%	3%
Liberal Arts	34%	33%	15%	12%	5%	2%
Fine Arts	42%	29%	11%	11%	5%	3%
Political Science	29%	36%	15%	13%	6%	2%
Vocational Arts	42%	33%	11%	9%	3%	2%
Computer Science	38%	31%	13%	10%	5%	2%

In question 49 of the questionnaire 670 students responded that they planned to pursue an associate's degree. The response to this question is puzzling considering that only 92 students in question 33 had indicated that they planned to attend community college (see Fig. 31 for results). Of the respondents to question 49, 70 percent indicated that they wanted to obtain an Associate of Science Degree (AS) which is a two-year associate degree and transfers to four-year baccalaureate degree programs.

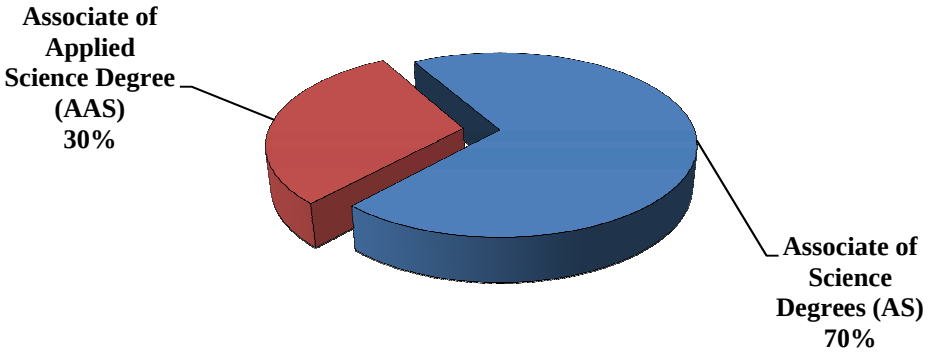

Fig. 33. Two-year associate degree that Students plan to pursue

Based on their answer to question 49, students were supposed to answer question 50 or 51. Therefore, there should have been a total of 670 responses to question 50 and 51. However, there were 487 responses to question 50 and 226 responses for question 51 for a total of 713 responses. Illuminating yet another discrepancy in how students answered the three questions (49-51) regarding associate degrees.

There were 487 respondents to question 50 and the results are presented in Fig. 34. The list of A.S. degrees was based upon those offered by the College of Southern Nevada (CSN). Thirty-two percent of CATA students want to pursue the pre-engineering AS degree.

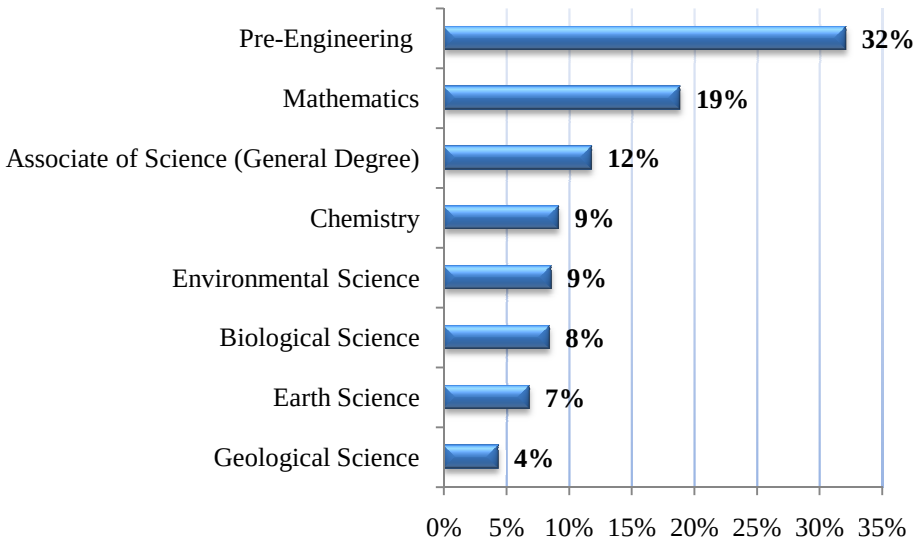

Fig. 34. Associate of Science Degrees that CATA Students plan to pursue

The list of Associate of Applied Science (AAS) degrees that were used in question 51 are those AAS degrees offered by CSN. AAS degrees are considered to be terminal degrees that contain few, if any credits that will transfer to a traditional baccalaureate degree program. Question 51 had 226 respondents. The students mostly preferred architecture related programs followed by construction management. This distribution is shown in Fig. 35.

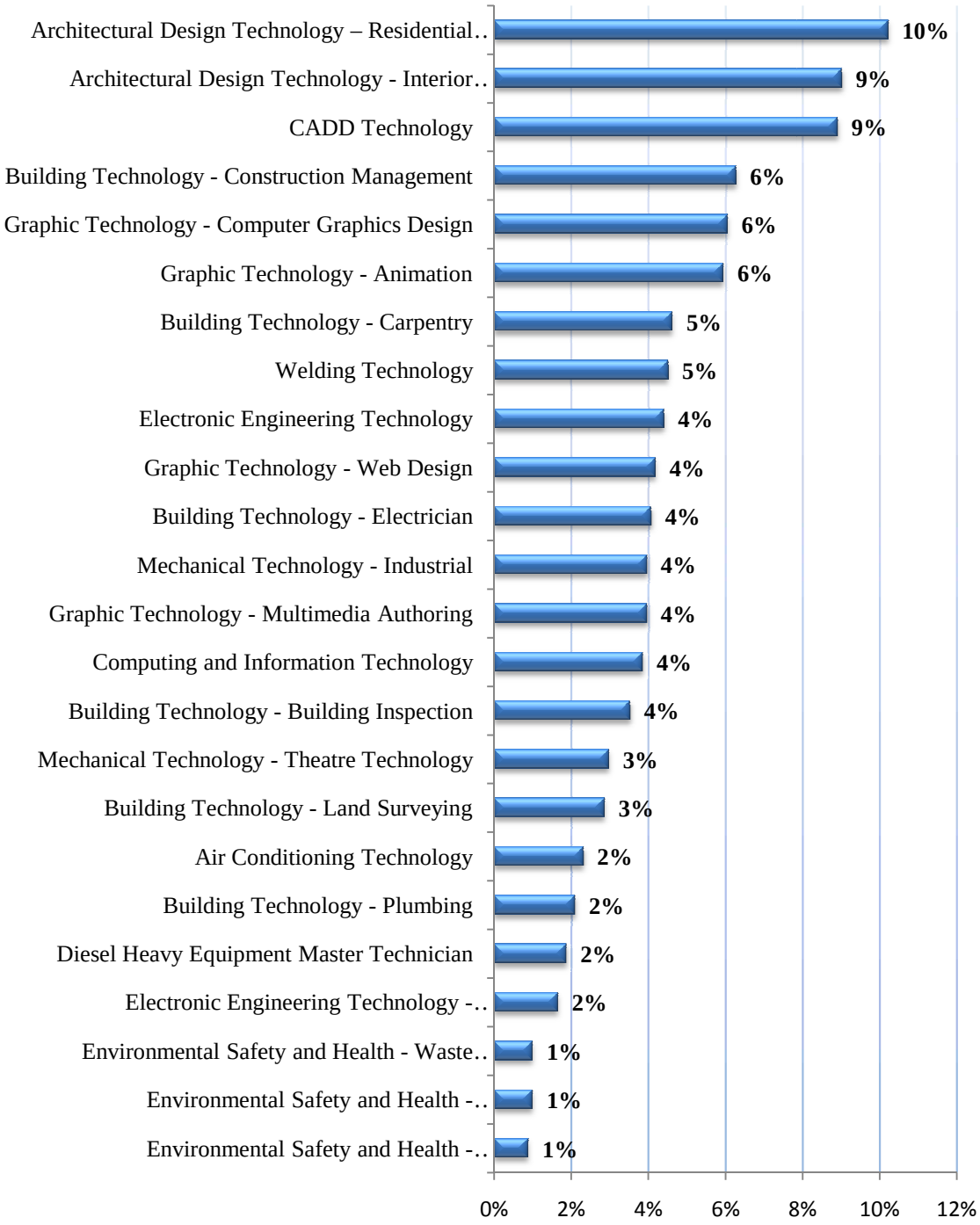

Fig. 35. AAS Degrees that CATA students plan to pursue

5.4 UNLV Specific Survey Results

Six questions (37-42) specifically related to UNLV architecture, construction and engineering education programs were included in the survey.The following figures and tables show the responses that were received regarding UNLV.

Question 37 asked whether the student had seen a presentation on any of the UNLV programs in architecture, construction management, and/or engineering. Slightly less than 17 percent of the 724 respondents had seen any presentation on architecture, construction and engineering education programs at UNLV. More students had seen presentations on engineering than anything else as shown in Fig. 36.

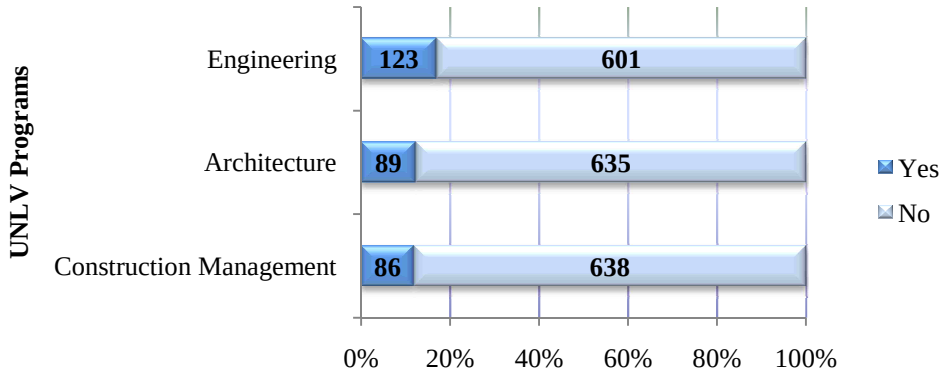

Fig. 36. Students who saw a presentation on UNLV programs by program area (n=724)

Question 38 asked if the student knew what specific baccalaureates that UNLV offered in architecture, construction, and engineering. Between 59 and 79 percent of the

CATA students were unaware of the architecture, construction, and engineering degrees offered at UNLV. Question 38 contained a complete listing of all architecture, construction, and engineering degrees offered at UNLV. The result is shown in Fig. 37.

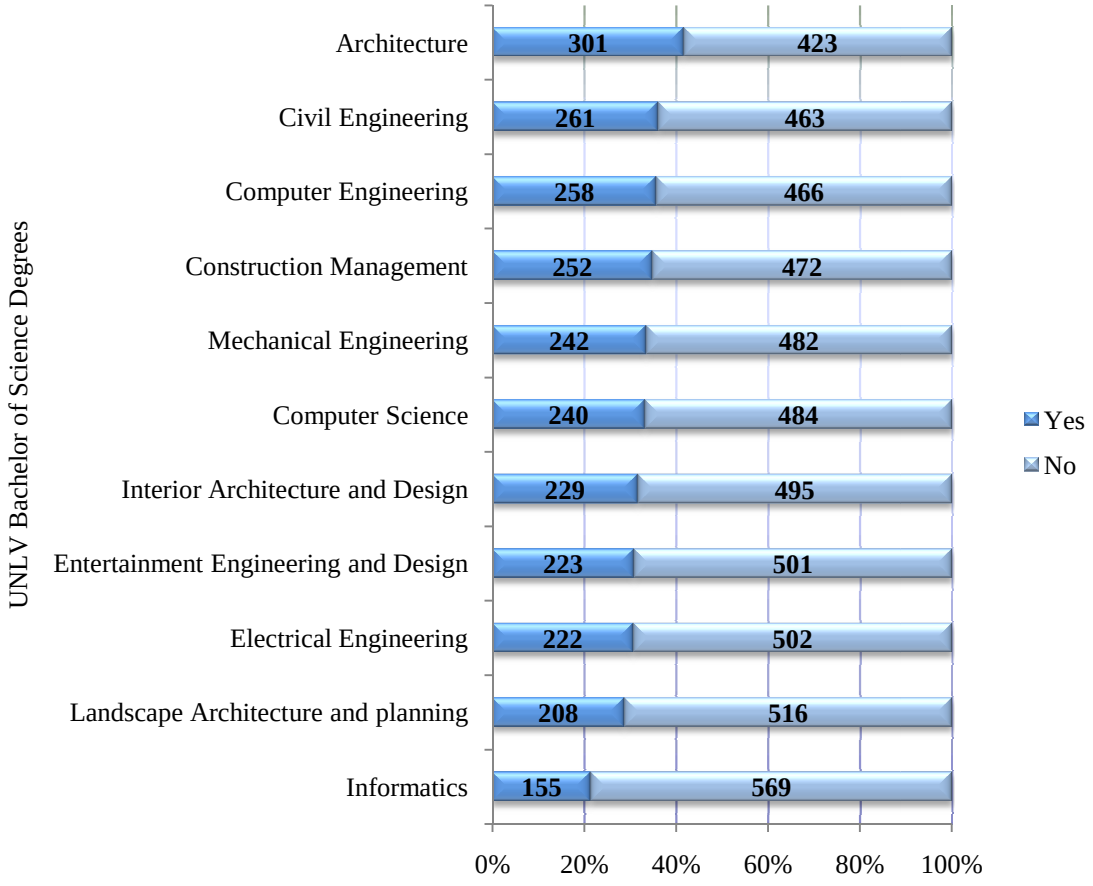

Fig. 37. Student awareness of baccalaureate degrees at UNLV (n=724)

Question 39 was asked if the student knew what specific masters of science degrees that UNLV offered in construction and engineering. Fig. 38 shows that less than 33 percent of the CATA students were aware that UNLV offers Master of Science degrees in construction management and engineering.

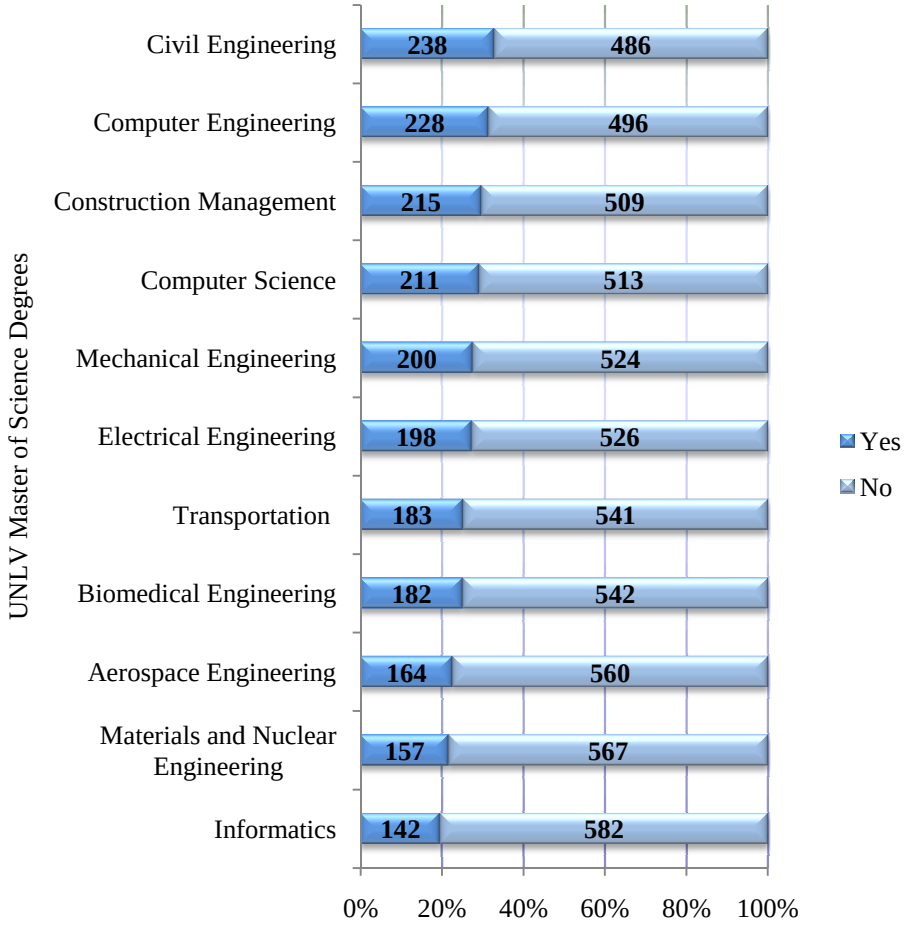

Fig. 38. Student awareness of Master of Science Degrees at UNLV (n=724)

In question 40 students were asked to priority rank their interest in earning a baccalaureate degree in the architecture, construction management, and engineering degrees at UNLV. Many of the students failed to understand the question and ranked multiple degrees with the same priority. There were 724 respondents which resulted in 1149 first priority rankings for the degrees. If all the students that did multiple same priority rankings were removed from the data to be analyzed a small data set would result and there would be no way of knowing whether it is truly representative of not. Because of this the results are not valid and are not presented in this research. Because of the problem associated with question 40 the response to questions 41 and 42 were invalid and the responses to those questions are not presented.

5.5 Job Environment and Pay Survey Results

Figs. 39 - 41 present responses on whether it would be easy to get a job in architecture, construction, and engineering after earning the requisite baccalaureate degree. Twenty-nine percent of the respondents indicated in the affirmative for architecture, 34 percent in the affirmative for construction, and 35 percent in the affirmative for engineering.

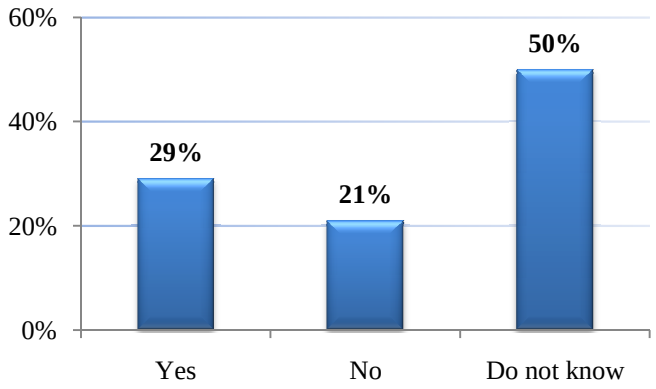

Fig. 39. Student's belief that is easy to get a job in architecture after earning a baccalaureate in architecture (n=702)

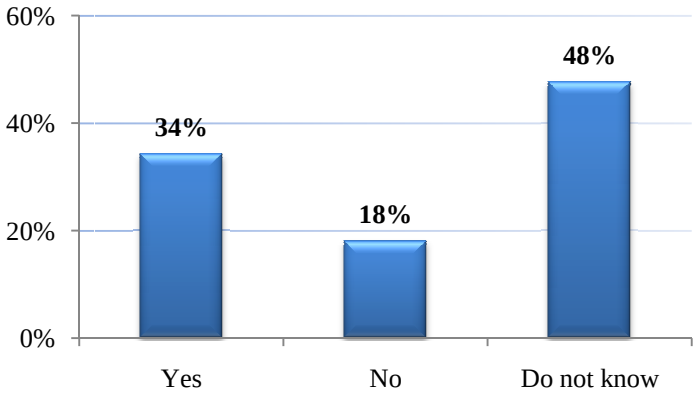

Fig. 40. Student's belief that is easy to get a job in construction after earning a baccalaureate in construction (n=703)

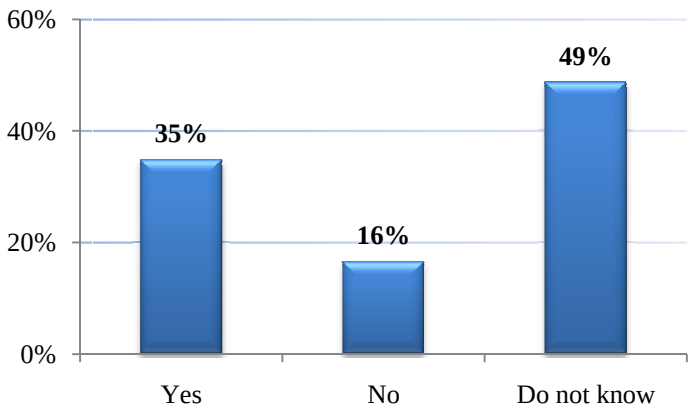

Fig. 41. Student's belief that is easy to get a job in engineering after earning a baccalaureate in engineering (n=704)

The result shown in Fig. 42 discloses that CATA students believed that post-baccalaureate salary is higher in engineering than architecture and construction. Thirty-eight percent of the students thought that they will earn post-baccalaureate salary above $65,000 per year in engineering; 32 percent of the students in architecture thought they would be above this salary level, and 27 percent in construction thought they would be above this salary level n. On average, the perception of students is that employment in engineering is more highly paid than in architecture or construction.

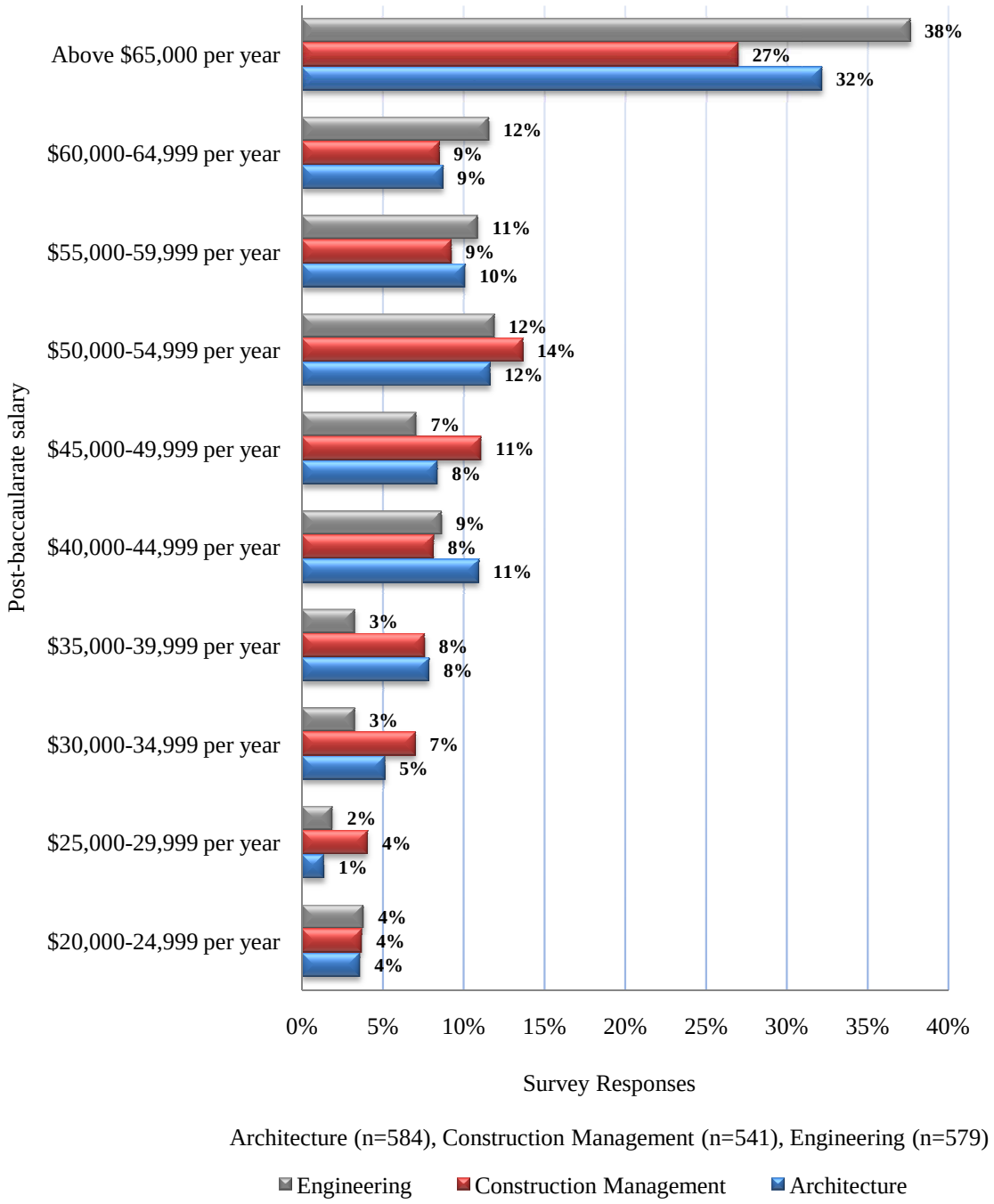

Fig. 42. Student expectation of salary upon completion of a baccalaureate in ACE

Fig. 43 shows that only 33 percent of the students believe that the construction industry provides a safe working environment and a near equal 31 percent believe that the construction industry does not provide a safe working environment. Thirty-seven percent did not know if the construction industry had a safe working environment.

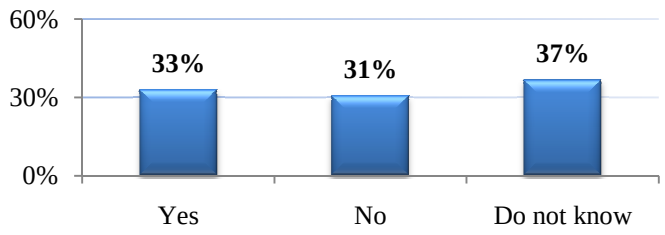

Fig. 43. Student's belief that the construction industry provides a safe working environment

Sixty-six percent of the respondents were familiar with the construction projects in their local area as shown in Fig. 44.

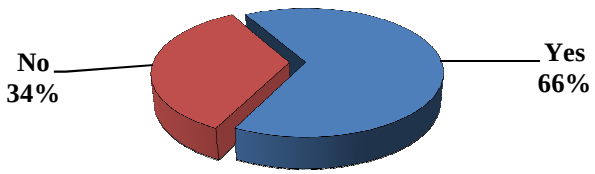

Fig. 44. Student familiarity with construction projects in the local area

CHAPTER 6

DATA ANALYSIS

This chapter discusses the analysis of the data collected in this research.

The results obtained on the questions on whether students were aware or unaware of different events and whether they participated in those events were combined and are presented in Fig.45

The results are quite contrasting. There were only three events that greater than 50 percents of the students indicated an awareness of. These events were “Skills USA,” “Career Fair” and “House of Cards.” Even though students had the highest awareness of these three events the awareness did not translate to the highest level of participation. The participation in the three events was 13, 14 and 8 percent respectively. The two events with the greatest level of participation were “Southern Nevada Model Bridge Building Contest” and the “Science Fair” at 16 and 15 percent respectively. The awareness of the “Southern Nevada Model Bridge Building Contest” and the “Science Fair” were both 46 percent. “Construction Career Day” had an extremely high level of participation given the level of awareness of the event. Approximately 41 percent of the students that were aware of “Construction Career Day” participated in it. The awareness of “Construction Career Day” by the total student population was 27 percent and participation was 11 percent. Other events which had a good participation to awareness percentages were “Southern Nevada Model Bridge Building Contest” and the “Science Fair” both at 34 percent.

The details of student participation in, student awareness of, and unawareness of the events are shown in Fig. 45 below. The participation to awareness percentages are shown in Fig. 46.

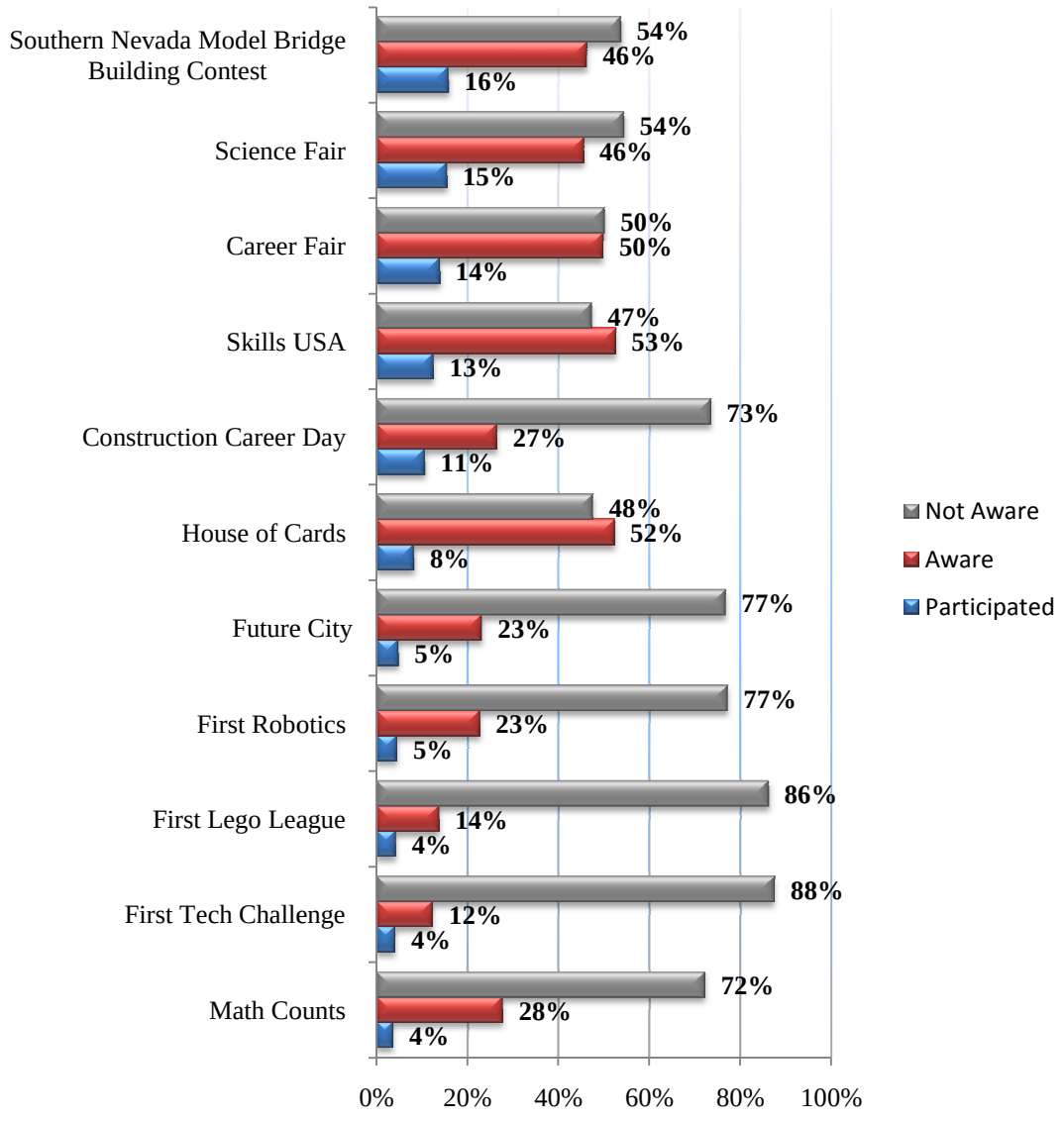

Fig. 45. Student participation, awareness, and unawareness of the events (n=724)

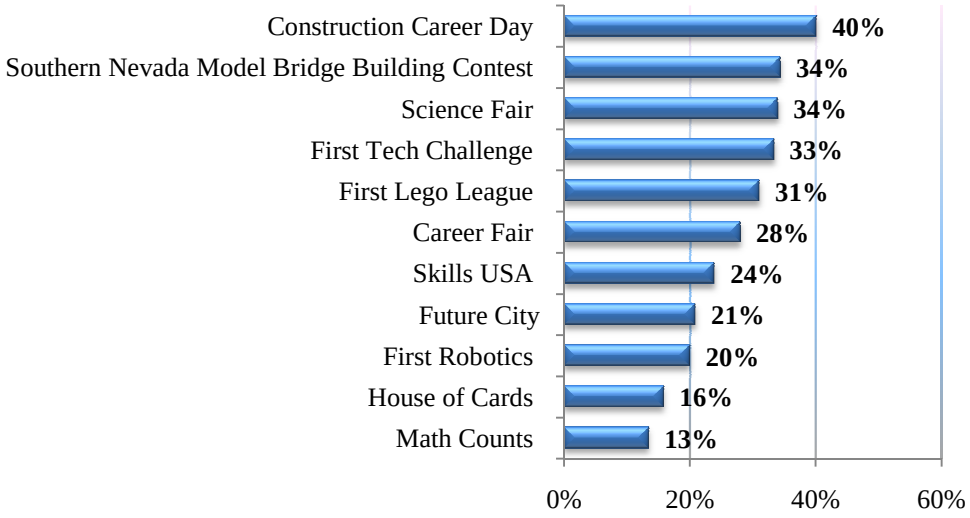

Fig. 46. Participation to awareness ratio

Percentages were calculated for the male and female students that were interested in pursuing the various baccalaureate degrees in architecture, construction and engineering listed in the questionnaire. In all there were 23 different baccalaureate degrees listed. The total number of students were 631 of which 469 were male (74 percent) and 162 female (26 percent). Fig. 47 shows the percentages of male and female students that were interested in pursuing each of the different degrees. When gender is not considered architecture, architectural engineering, mechanical engineering, aeronautical/aerospace engineering were the four most desired areas of study as shown in Fig. 32. Construction management was the fifth highest ranked baccalaureate degree and construction engineering the ninth highest ranked baccalaureate degree that students indicated an interest in as shown in Fig. 32.

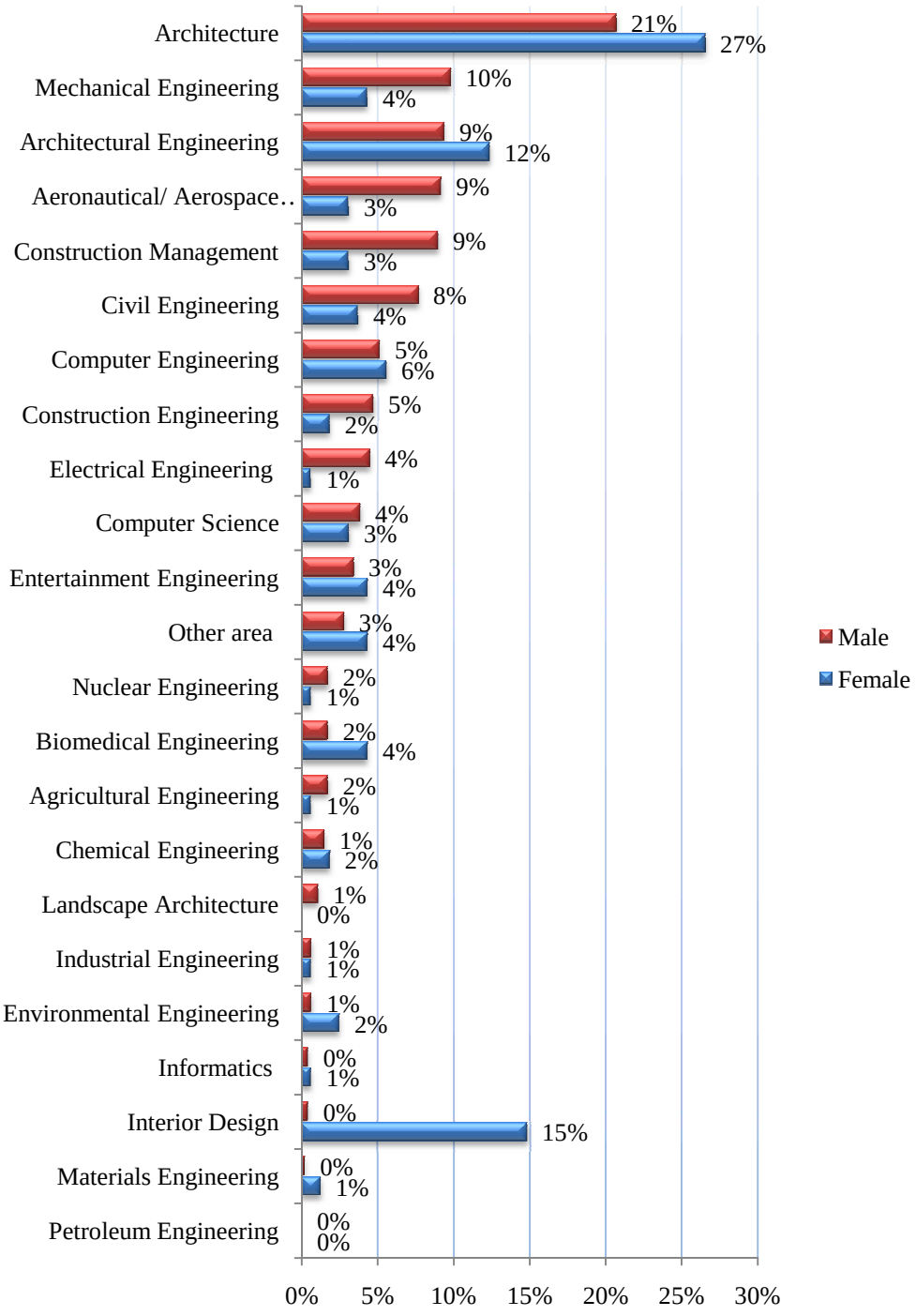

Fig. 47. Interest in pursuing a baccalaureate degree by gender (n=631)

There were clear gender preference differences in the selection of many of the degrees. Fig. 48 shows the degrees that females indicated a greater preference for than did their male peers. These degrees where female interest was greater than male interest account for 78 percent all the females respondents. Fifty-four percent of the females selected architectural-related degrees. Architecture, interior design, and architectural engineering accounted for 27, 15 and 12 percent respectively. The next highest area of female interest was computer science at six percent as shown in Fig. 48. Appendix C Fig.C-1 provides the ranked degree preferences for females only and Appendix C Fig.**C-2** provides the ranked degree preferences for males only.

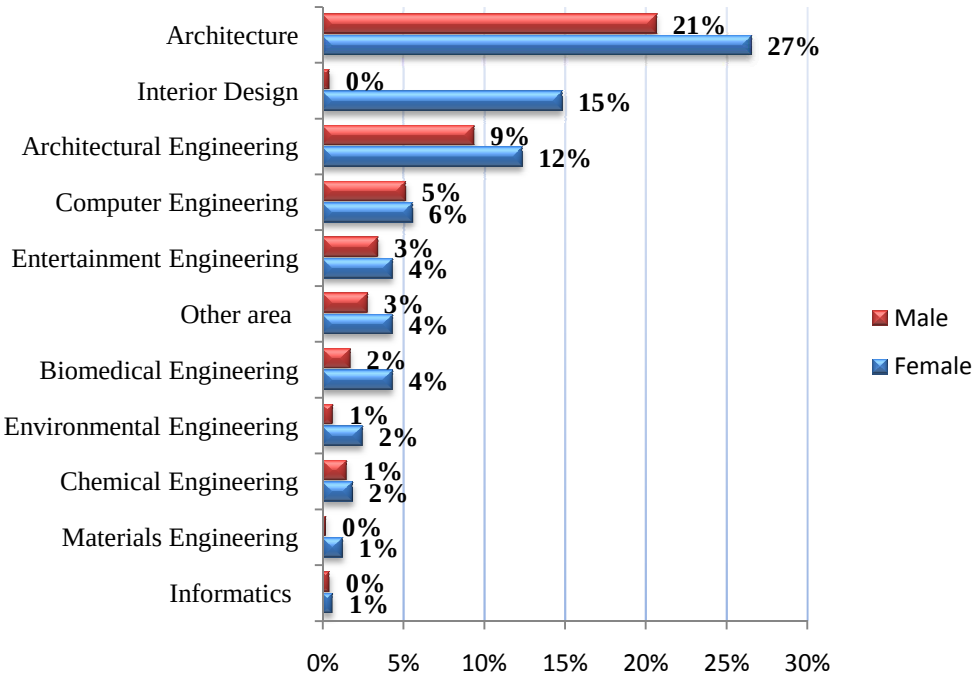

Fig. 48. Baccalaureate degrees with greater female interest than male interest

Fig. 49 shows the degrees that males indicated a greater preference for than did their female peers. Males were more than twice as likely as to prefer mechanical engineering, aeronautical/aerospace engineering, construction management, and civil engineering baccalaureates than their female peers.

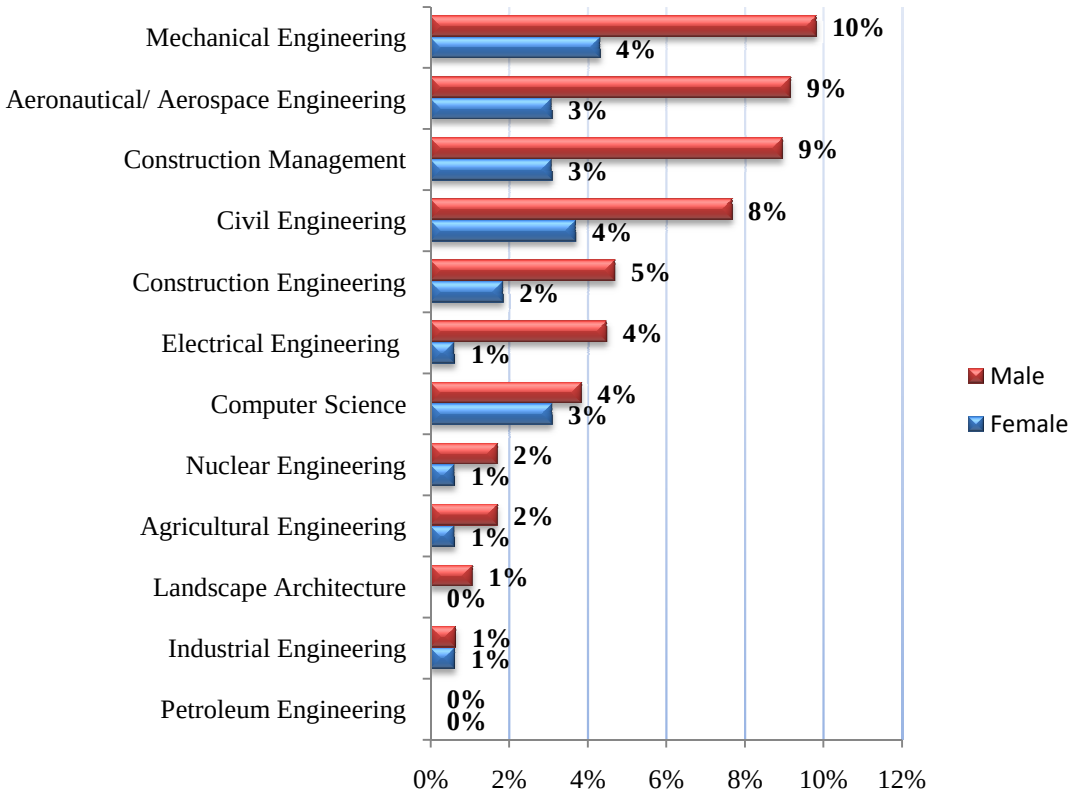

Fig. 49. Baccalaureate degrees with greater male interest than female interest

Fig. 50 reflects that fathers were mostly employed in the construction and engineering areas; 35 percent of fathers were employed in construction, and 28 percent of fathers were employed in engineering. Only 19 percent fathers were employed in architecture. There was a much lower employment among mothers (only four percent (21 of 547 family members) in the architecture, construction, and engineering areas. Thirty-three percent (176 of 535 mothers) of mothers held a baccalaureate of above degree. The data showed that among family members, uncles were generally employed in the architecture area with; 31 percent of the uncles so indicated.

The high employment of fathers and uncles in the architectural area may be a contributing factor why so many students selected architectural-related baccalaureates as their planned area of study.

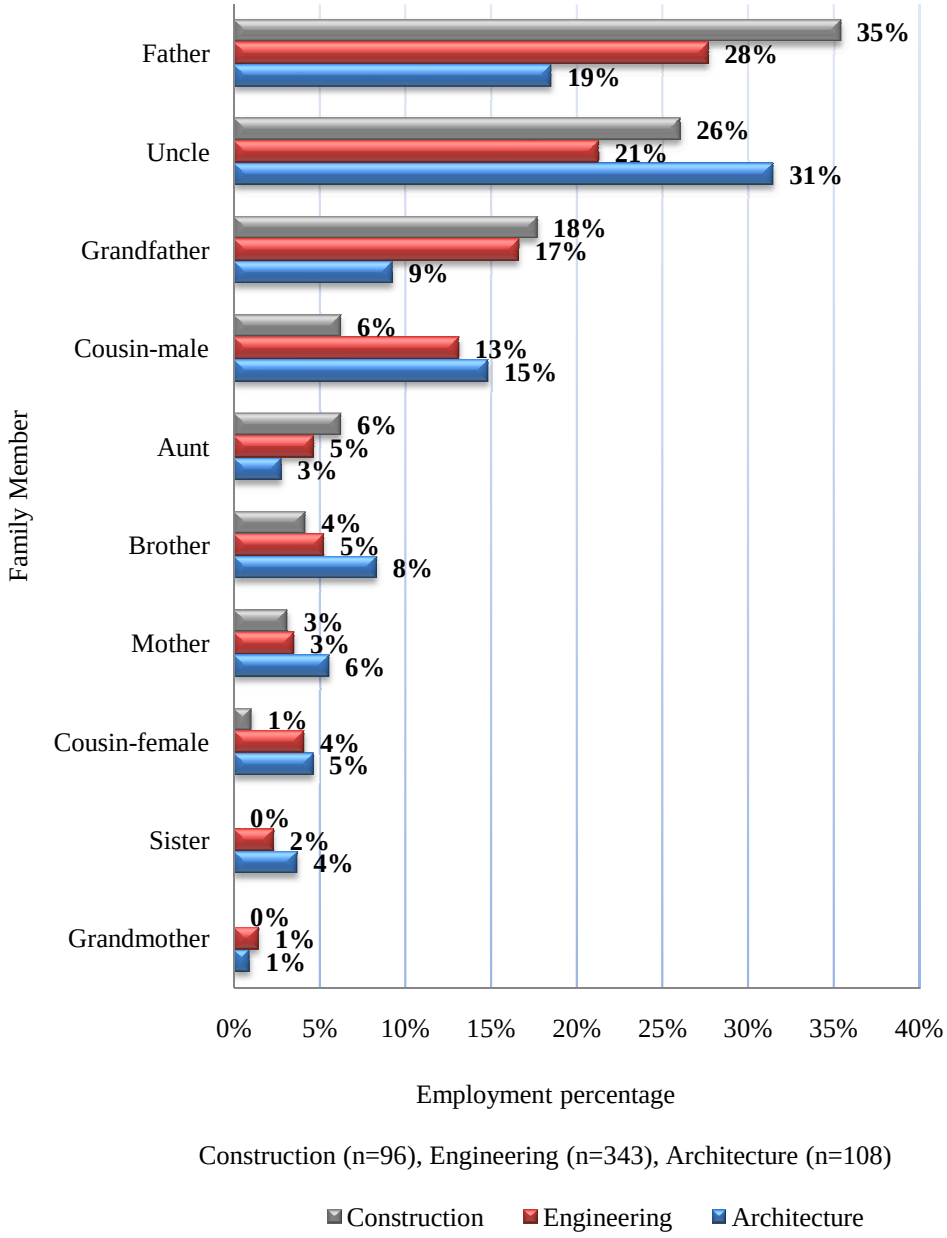

Fig. 50. Family member employment in architecture, construction, and engineering

The results of influencing factor versus employment of family members in ACE are shown in Appendix B: Tables B-6 – 11. The cross tabulation of influencing factor to chose architecture versus percentage of family members employed in architecture shows that 34 percent of fathers were employed in architecture when the father influenced a student to select architecture. At the same time, seven percent of mothers, seven percent of brothers, five percent of sisters, 28 percent of uncles, 6 percent of aunts, 10 percent of grandfathers and 3 percent of grandmothers were also employed in the architecture-related area. Likewise, when the uncle influenced a student to select architecture, 41 percent of the uncles were employed in architecture whereas only 20 percent of the fathers were employed in the architecture-related area. The results of the detailed analysis are shown in Table B-6 of Appendix B.

The cross-tabulation of construction, Table B-7 in Appendix B, shows that whichever family member influenced a progeny to choose construction the most highly employed member in construction in the family was the father. This means the father's employment in construction industry result in other family members influencing their children to select construction. The analysis related to engineering is shown in Table B-8 of Appendix B. The result shows that if father, uncle, and grandfather were employed in engineering then there is a high probability that the other family members will recommend that their children go into engineering.

The cross tabulation shown in Tables B-9 to B -11 in Appendix B deals with how much the percentage is that a family member influences when anyone of the family members is employed in architecture-, construction- or engineering-related areas.. The

result shows that when the father was employed in architecture his influence factor was 33 percent for the progeny to choose architecture, and at the same time, the mother's influence factor was 18 percent, a brother's 10 percent, a sister's 6 percent, an uncle's 7 percent, a grandfather's 9 percent, and a grandmother's 10 percent. But, when an uncle was employed in architecture, his influence factor on the progeny was 14 percent whereas the father's influence factor was 25 percent and the mother's was 15 percent. This contrasts with the previous result that an uncle's influence was much larger when the uncle was employed in an architecture-related area. The conclusion is that the father, mother, grandfather, and grandmother have greater influences on the progeny even though other family members were employed in an architectural-related area. However, the case is different in construction and engineering. Table B-10 in Appendix B shows the father was the greatest influencing factor on the progeny selecting to study construction despite employment of other family members in construction. Similarly, Table B-11 in Appendix B shows that the father and mother were the greatest influencing factor on their progeny to choose engineering.

Table 11 presents the summary of data collected about the students and the curriculum that they are enrolled in at their CATA and their future interest in pursuing a baccalaureate in either architecture, construction or engineering, The priority of pursuing a baccalaureate in either architecture, construction or engineering is also indicated. The "Curriculum" column in the table contains the three divisions that are related to architecture, construction and engineering. The "Curriculum" column also contains "CADD" and "Commercial Construction" as separate categories since they were related

curricula, however, they were not considered for testing the first research hypothesis that there is a relationship between the student's choice to pursue a baccalaureate and the curriculum in which they were enrolled.

The table reflects that high percentage of students who were enrolled in a architecture curriculum planned to pursue a baccalaureate in architecture as their first priority. For example, 58 percent of students enrolled in architectural design curriculum at ATA planned to pursue baccalaureate in architecture as their first priority. Not only the students enrolled in architecture wanted baccalaureate degree in architecture but also they intended for baccalaureate degree in engineering. Similarly, students enrolled in engineering curriculum desired to get baccalaureate degree in engineering. On the other hand fewer numbers desired to pursue baccalaureate degree in construction.

In general the result shows that students enrolled in construction curricula desire to pursue a baccalaureate in engineering as their first priority and rather than architecture or construction itself. ATA and SECTA has commercial construction curriculum which is generally related to carpentry and cabinet making that differs from construction technology/management. Sixteen students at SECTA responded in the Commercial Construction which is vocational in nature. Therefore, these 16 students' responses were not utilized as the research was targeted towards students enrolled in college preparatory curricula. The responses from students who were enrolled in commercial construction were not considered in testing research hypotheses.

Table 11. Student's Plan to Pursue a Baccalaureate

Name of School	Curriculum	Number of student enrolled	Plan to pursue baccalaureate								
			Architecture			Construction			Engineering		
			P1	P2	P3	P1	P2	P3	P1	P2	P3
Advanced Technologies Academy (ATA)	Architectural Design	65	34	25	18	1	2	7	24	27	26
	General Engineering	58	3	4	7	4	3	3	35	30	25
	CADD	24	19	4	11	0	3	3	3	15	7
East Career and Technical Academy (ECTA)	Architectural Design	4	1	0	0	2	0	0	1	1	1
	Construction Management	135	26	17	12	22	20	4	51	55	61
	General Engineering	8	0	4	0	0	0	0	2	1	5
Northwest Career and Technical Academy (NWCTA)	Architectural Design	15	6	2	4	1	0	1	6	7	5
	Construction Management	73	13	8	12	19	17	10	31	29	28
	General Engineering	204	26	31	31	6	10	13	158	137	129
Southeast Career and Technical Academy (SECTA)	Architectural Design	57	30	9	8	1	6	10	21	30	22
	Construction Technology	26	3	3	1	8	4	4	8	8	8
	Commercial Construction	16	2	1	2	3	2	2	7	8	5

The data were scrutinized and grouped into ACE areas of study and identified the relationship between CATA student's plans to pursue a baccalaureate and the ACE curricula they are enrolled in. The results are shown in Table 12.

Table 12. Student's Curricula and Intent to Pursue a Baccalaureate

CATA area of study	Students enrolled	Students responded	First priority to pursue baccalaureate (number)	First priority to pursue baccalaureate (%)
Architecture	141	128	71	55
Construction	234	181	50	28
Engineering	270	234	195	83

The above table reveals 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. 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 (Swoboda and Cieslik1997).’ 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 (Allen 2009) which highlighted the dangerous nature of construction.

In response to the question 9 and question 22 of the survey, the 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 13 shows that more than 50 percent of of the students who chose architecture, construction, or engineering, had a least one family member employed in the area that the student was enrolled.

Table 13. Student’s CATA Curriculum Related to Family Member’s Employment in Corresponding Field

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

When analyzing 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, more that 50 percent of the students' responses indicated that they had one or more family members who were involved in construction or engineering. Only 37 percents 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 14 shows the relationships in these areas.

Table 14. Relationship Between CATA Student's Plan to Pursue Baccalaureate and Employment of at Least One Family Member in ACE

Area	Interested in earning bachelor's degree	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 15 shows the weak association between interest pursuin an architecture, construction or engineering baccalaureate and post-baccalaureate employment in architecture, construction, and engineering.

Table 15. Relationship Between Post-baccalaureate Employment and Interest in ACE

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. Table 16 shows the numerical values assigned according to their interest and grade in a subject.

Table 16 Numerical Values Assigned for Interest and Grade

Interest in a subject	Numerical value assigned	Grade in a subject	Numerical value assigned
Strongly agree	5	Mostly A	4
Agree	4	Mostly A and B	3.5
Neither agree nor disagree	3	Mostly B	3
Disagree	2	Mostly C and B	2.5
Strongly disagree	1	Mostly C	2
No opinion	0	Mostly Less than C	1.5

The descriptive statistics of academic level of performance on mathematics and the student's interest in mathematics is shown in Table 16. Similarly, Tables 17-23 show the descriptive statistics of academic level of performance in physical science, life science, business, social sciences, liberal arts, fine arts, political science, vocational arts, and computer science respectively.

Table 17. CATA Students' Interest and Grade in Mathematics

	N	Minimum reported value	Maximum reported value	Mean	Std. Deviation
Interest	686	1.0	5.0	3.713	1.132
Grade	686	1.5	4.0	3.211	0.663

Table 18. CATA Students' Interest and Grade in Physical Science

	N	Minimum reported value	Maximum reported value	Mean	Std. Deviation
Interest	648	1.0	5.0	3.674	1.115
Grade	648	1.5	4.0	3.174	0.656

Table 19. CATA Students' Interest and Grade in Life Science

	N	Minimum reported value	Maximum reported value	Mean	Std. Deviation
Interest	631	1.0	5.0	3.358	1.184
Grade	631	1.5	4.0	3.214	0.666

Table 20. CATA Students' Interest and Grade in Business

	N	Minimum reported value	Maximum reported value	Mean	Std. Deviation
Interest	585	1.0	5.0	3.463	1.148
Grade	585	1.5	4.0	3.422	0.652

Table 21. CATA Students' Interest and Grade in Social Science

	N	Minimum reported value	Maximum reported value	Mean	Std. Deviation
Interest	543	1.0	5.0	3.413	1.159
Grade	543	1.5	4.0	3.355	0.641

Table 22. CATA Students' Interest and Grade in Liberal Arts

	N	Minimum reported value	Maximum reported value	Mean	Std. Deviation
Interest	616	1.0	5.0	3.385	0.623
Grade	616	1.5	4.0	3.279	1.181

Table 23. CATA Students' Interest and Grade in Fine Arts

	N	Minimum reported value	Maximum reported value	Mean	Std. Deviation
Interest	579	1.0	5.0	3.725	1.175
Grade	579	1.5	4.0	3.470	0.645

Table 24. CATA Students' Interest and Grade in Political Science

	N	Minimum reported value	Maximum reported value	Mean	Std. Deviation
Interest	553	1.0	5.0	3.221	1.224
Grade	553	1.5	4.0	3.337	0.617

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 24 reflect that there is strong association between the student's academic level of performance achieved in a subject and their interest in it. The results are significant at 0.01 significance levels.

Table 25. Spearman's Rank Correlation Coefficient between Interest and Academic Performance

	Number (n)	Spearman's rho (ρ)	Significance coefficient	Significance level (2-tailed)
Mathematics	686	0.402	< 0.005	0.01
Physical Science	648	0.348	< 0.005	0.01
Life Science	631	0.280	< 0.005	0.01
Business	585	0.164	< 0.005	0.01
Social Science	543	0.237	< 0.005	0.01
Liberal Arts	616	0.247	< 0.005	0.01
Fine Arts	579	0.283	< 0.005	0.01
Political Science	553	0.220	< 0.005	0.01

CHAPTER 7

DISCUSSION OF THE RESULTS

Students enrolled in the four CCSD CATA high schools were the source of data for this research. All the students in the CCSD study were enrolled in grade 9 through grade 12 studying in either an architecture-, construction- or engineering-related curriculum The information provided allowed for the research to determine the specific CATA curriculum the student was enrolled in, what the student intended to do following high school graduation, how family influence was related to the student's choice of curriculum, baccalaureate choices, and various perceptions held by students related to architecture, construction, and engineering careers.

Thirty percent of the total respondents were highly interested in pursuing a baccalaureate. Eighty-three percent of the students selected as their first priority to pursue an engineering baccalaureate. However, the category, engineering baccalaureate, included baccalaureates in 16 engineering disciplines. The engineering discipline with the largest interest was architectural engineering with slightly more than10 percent of the students selecting this discipline.

The single discipline in the research that had the greatest number of students selecting it for baccalaureate study was architecture with slightly more than 22 percent of the students.

Architectural engineering which is the second highest ranked degree is not offered at any university in Nevada. In fact the Accreditation Board for Engineering and Technology (ABET) lists only 17 universities that offer an accredited baccalaureate in

architectural engineering (ABET 2010). The three closest universities offering this degree are California Polytechnic State University, San Luis Obispo, University of Colorado at Boulder and University of Wyoming (ABET 2010).

Aeronautical/aerospace engineering was the fourth highest ranked baccalaureate degree. Again Nevada does not have a university that offers a baccalaureate in aeronautical/aerospace engineering. UNLV does offer a Master of Science in Aerospace Engineering through the Department of Mechanical Engineering (UNLV 2010). The closest universities offering ABET accredited aeronautical/aerospace engineering baccalaureate degrees would be one of the 11 located in California or three located in Arizona (ABET 2010).

Construction management was the fifth highest ranked (Fig. 32) baccalaureate degree that students indicated an interest in. The ninth highest ranked (Fig. 32) baccalaureate degree that students indicated an interest in was construction engineering. This is another degree that is not offered in the state of Nevada. There are only eight universities that offer an ABET accredited baccalaureate in construction engineering (ABET 2010). The closest university offering the degree is the University of New Mexico.

There may be some correlation to the 26 percent (Fig. 31) of students that indicated they planned to attend an out of state university and degrees that are not offered within the Nevada System of Higher Education (NSHE). However, this was not investigated in this research as it was beyond its scope.

The result shown in Fig. 42 shows that the student's belief that the annual salary that they will receive upon completion of a baccalaureate is high. Well over one third of the total students surveyed believed they would earn $65,000 per year or above and over 50 percent of the total students believe that the yearly salary they would receive was greater than $55.000 in engineering and architecture, and construction occupations as shown in Table 25.

Table 26. Salary Perceptions

Yearly salary	Architecture (n=584)	Construction (n=541)	Engineering (n=579)
Above $65,000 per year	32%	27%	38%
$60,000 - 64,999 per year	9%	9%	12%
$55,000 - 59,999 per year	10%	9%	11%
Above $55,000 per year	51%	45%	61%

The 10 highest paid baccalaureate degrees in the 2010 Salary Survey by the National Association of Colleges and Employers (NACE 2010) are shown in Table 26. All 10 highest paid baccalaureate degrees were in engineering, computer science and information technology. Overall students' salary expectations regarding engineering appear to be reasonable in light of the data shown in Table 27. By the time that these students graduate with an engineering baccalaureate in from five to nine years from the present, their perceptions will probably be low.

Table 27. 2010 Top Ten Baccalaureate Salaries (NACE 2010)

Engineering Discipline	Average Starting Salary
Petroleum Engineering	$86,220
Chemical Engineering	$65,142
Mining & Mineral Engineering (incl. Geological)	$64,552
Computer Science	$61,205
Computer Engineering	$60,879
Electrical/Electronics & Communications Engineering	$59,074
Mechanical Engineering	$58,392
Industrial/Manufacturing Engineering	$57,734

NACE (2010) reported an average annual salary for job offers in construction science/management was $51,688 based on 41 offers. The average annual salary for job offers in architecture was $50,254 based on 5 offers (NACE 2101).

Anecdotal information suggest that construction management starting salaries which were near $55,000 per year in 2008 are falling significantly in the Las Vegas area and are now in the $40,000 to $50,000 range per year. Anecdotal starting salaries for architects appear to be in the $30,000 to $40,000 per year range in Las Vegas. Even during the Las Vegas construction boom starting architect salaries were well below those of construction management graduates.

The tables and figures shown in Chapter 5-Data Analysis provided the summary of all the analysis that was used to prove the five research hypothesis.

One goal of this research was to determine the ACE students' academic interests. Since the survey was conducted with high school students who were enrolled in ACE-related curricula, it proved the face validity. The survey was intended to measure the

CATA high school students' academic interests, and the questionnaire included test items that covered as well as measured various aspects of students' interests related to career and technical fields. This measured content validity. Similarly, this research measured interest in subject and academic achievement in the subject at the same time and this resembled concurrent validity which is a type of criterion-related validity. Finally, by drawing conclusions about the relationships mentioned in the five research hypothesis, the analysis validated statistical conclusion validity.

7.1 Research Hypotheses

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.

The result shown in Table 12 indicates that 55 percent of the students who were enrolled in an architecture curriculum were interested in pursuing a baccalaureate in architecture. Similarly, 83 percent of the students who were enrolled in an engineering curriculum were interested in pursuing a baccalaureate in engineering. However, there was a weak relationship with construction as only 28 percent of the students who were enrolled in a construction curriculum were interested in pursuing a baccalaureate in construction. This proves our research hypothesis.

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.

The result shown in Table 13 indicates that 55 percent of the students who were enrolled in architecture curriculum had at least one family member employed in architecture related industry. Similarly, 51 percent of the students who were enrolled in construction curriculum and 59 percent of the students who were enrolled in engineering curriculum had at least one family member employed in construction and engineering related industry respectively. This proves our second 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.

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.

The result presented in Table 14 proves this hypothesis in the case of students who wanted to pursue baccalaureate in construction and engineering where more than 50 percent of the students had one or more family members involved in construction and engineering related industry. In the case for students who students wanted to pursue a baccalaureate in architecture the strength of the hypothesis was weaker as only 37 percent of the family members were involved in architecture,.

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.

The result shown in Table 15 shows that very few students, less than 42 percent, believed that they will obtain employment just by earning a baccalaureate in ACE. Therefore, 58 percent of the responses indicated that students were not going to pursue a baccalaureate in ACE based upon the assumption that it will be easy to obtain employment just by earning a baccalaureate. Thus it proves the hypothesis that 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.

Spearman's rank correlation coefficient result presented in Table 25 shows that there is a positive relationship between the student's academic performance in a subject and his interest in the subject with the significant coefficient less than 0.005 at a 0.01 significance level. Thus the hypothesis that there is a relationship between the student's academic performance in a subject and his interest in it is proved.

7.2 Research Limitations

The limitations of this research are the following:

- The research is based on student 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.

- The research deals with architecture-, construction-, and engineering-related professions. However, the curricula in four CCSD CATAs were not the same, and that may result in false interpretation of the questions. For example, students who were not enrolled in construction technology or construction management curricula might not have information about construction trades. The results may not reflect the proper conclusion.
- 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.
- The academic achievement in a subject was measured with an approximate scale, such as mostly A, mostly A and B, and so on. The statistically significant correlation can only be achieved between interest and grade if the data corresponds to the actual grades measured from official transcripts. This research lacks the actual grades, and assumes that the academic performance reported was representative of the student's actual performance.
- Due to various discrepancies in data collected regarding associate degrees no legitimate conclusions can be drawn regarding the students surveyed and their intent or lack of intent to earn an associate degree. It appears that students

answered specific questions regarding associate degrees whether they intended to pursue an associate degree or not based upon the responses to question 33 whose results are presented in Fig. 31. It appears that the response to question 33 and the data presented in Fig. 31 would be more reliable than responses to questions 49-51.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

The summary of results obtained from the relationships between CATA students' plans to pursue baccalaureate and an architecture, construction, and engineering curricula they are enrolled in 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.

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.

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 that 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 the 0.01 significance level. 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.

8.2 Recommendations for Further Research

The use of factor analysis is recommended to further study and identify what the factors are that influence the students' academic interests. Further research can be done to find out whether the education level of a family member affects a child to pursue a baccalaureate in ACE following high school graduation.

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. The hypothesis should be there is a relationship between students' interests in ACE and their grades in mathematics and science.

Further research is recommended to determine the real perception of CATA students in construction management of the construction industry. Different questions related to construction curricula, their interests, job potential, and image of the construction industry should be included and comments taken so that the real problems about academic interest in construction can be addressed. Multivariate analysis is recommended for doing this research.

There still remain unanswered questions regarding whether CATA students plan to pursue associate degrees and what number of students plans to pursue associate degrees. It is recommended that if additional research in this area be performed if there is an appropriate level of interest by institutions offering associate degrees..

Because of the numerous errors encountered in student questionnaire responses it is recommended that the questionnaire be administered in a different manner. One approach would require that each question be read to the students and directions provided about how they are required to answer each question. In this administration format students' questions about how to respond to a question could be handled on a question-by-question basis. This approach would be a lengthy procedure with the present questionnaire. Another alternative would be to write very specific and lengthy instructions on how to

respond to each question. This would result in an already lengthy questionnaire being extremely long and also result in a lengthy period of time to complete the questionnaire.

Because of the numerous response errors the questionnaire was most likely to complex and exceeded the survey comprehension level of the students. The questionnaire's sampling methodology required greater respondent maturity than possessed by grade 9 through grade 12 grade students as they had no survey experiential basis on how to respond to some of the question formats used in the questionnaire.

Future data collection efforts should use a web-based survey format. This would result in students only being able to respond in a manner that the researcher intended. Additionally, the paper-based format requires too much data entry time by the researcher. Data entry from another paper-based format survey cannot be completed in a reasonable amount of time for a student pursuing a master's thesis.

APPENDIX A

ACRONYMS

List of Commonly Used Acronyms

AAS	Associate of Applied Science Degree
ABET	Accreditation Board for Engineering and Technology
ACE	Architecture, Construction, and Engineering
AS	Associate of Science Degree
ATA	Advanced Technologies Academy
CADD	Computer-Aided Design and Drafting
CATA	Career and Technical Academy
CATE	Career and Technical Education
CCSD	Clark County School District
CSN	College of Southern Nevada
ECTA	East Career and Technical Academy
NWCTA	Northwest Career Technical Academy
SECTA	Southeast Career and Technical Academy
UNLV	University of Nevada, Las Vegas

APPENDIX B

SURVEY RESULTS AND DATA ANALYSIS

Table B-1 Student Awareness of Events

Events	Yes	No
First Tech Challenge	90	634
First Lego League	100	624
First Robotics	165	559
Future City	168	556
Construction Career Day	192	532
Math Counts	201	523
Science Fair	330	394
Southern Nevada Model Bridge Building Contest	335	389
Career Fair	361	363
House of Cards	379	345
Skills USA	381	343
Total	2702	5262

Table B-2. Student Participation in Events

Events	yes	No
Math Counts	27	697
First Tech Challenge	30	694
First Lego League	31	693
First Robotics	33	691
Future City	35	689
House of Cards	60	664
Construction Career Day	77	647
Skills USA	91	633
Career Fair	101	623
Science Fair	112	612
Southern Nevada Model Bridge Building Contest	115	609
Total	712	7252

Table B-3. Student Work Experience

Work Experience	Yes	No
Commercial construction	114	610
Worked around architects	131	593
Worked around engineers	139	585
Drafting	179	545
Construction, home improvement	349	375
Total	912	2708

Table B-4. Student Interest in Subject Areas

Subject Area	Interest					
	strongly agree	agree	neutral	disagree	strongly disagree	no option
Math	191	241	147	56	39	28
Physical science	170	241	158	62	37	32
Life Sciences	126	192	193	98	56	32
Business	91	187	214	109	37	49
Social Sciences	114	174	218	98	45	37
Liberal Arts	109	179	194	113	57	40
Fine Arts	202	197	152	74	36	35
Political Science	103	163	189	113	66	46
Vocational Arts	197	211	159	49	27	46
Computer Science	193	225	146	49	42	34

Table B-5. Student Academic Performance in Subject Areas

Subject Area	Grades					
	Mostly A	Mostly A and B	Mostly B	Mostly B and C	Mostly C	Mostly less than C
Math	161	242	110	125	44	25
Physical science	150	205	123	127	59	13
Life Sciences	173	193	128	110	56	15
Business	137	149	90	84	26	14
Social Sciences	154	179	92	78	26	14
Liberal Arts	225	221	97	80	31	13
Fine Arts	252	170	66	63	29	15
Political Science	178	220	91	81	34	13
Vocational Arts	240	186	63	52	19	9
Computer Science	228	189	80	61	32	15

Table B-6. Cross Tabulation of Influencing Factor to Choose Architecture Verses Distribution of Family Members Employed in Architecture

Employment	Influencing factor							
	Father	Mother	Brother	Sister	Uncle	Aunt	Grandfather	Grandmother
Father	34%	29%	29%	30%	20%	24%	23%	31%
Mother	7%	14%	5%	4%	7%	9%	5%	11%
Brother	7%	3%	13%	0%	7%	0%	2%	3%
Sister	5%	3%	3%	4%	2%	3%	0%	3%
Uncle	28%	26%	29%	39%	41%	32%	32%	22%
Aunt	6%	10%	3%	4%	5%	15%	5%	3%
Grandfather	10%	13%	16%	13%	12%	12%	27%	19%
Grandmother	3%	3%	3%	4%	5%	6%	7%	8%

Table B-7. Cross Tabulation of Influencing Factor to Choose Construction Verses Distribution of Family Members Employed in Construction

Employment	Influencing factor							
	Father	Mother	Brother	Sister	Uncle	Aunt	Grandfather	Grandmother
Father	46%	38%	36%	28%	47%	31%	28%	28%
Mother	4%	7%	4%	7%	2%	6%	3%	5%
Brother	7%	4%	13%	7%	8%	8%	7%	2%
Sister	3%	2%	0%	7%	2%	8%	3%	7%
Uncle	27%	25%	27%	28%	6%	21%	25%	23%
Aunt	4%	7%	7%	7%	8%	8%	4%	7%
Grandfather	7%	14%	9%	14%	22%	13%	25%	19%
Grandmother	2%	3%	4%	3%	4%	4%	4%	9%

Table B-8. Cross Tabulation of Influencing Factor to Choose Engineering Verses Distribution of Family Members Employed in Engineering

Employment	Influencing factor							
	Father	Mother	Brother	Sister	Uncle	Aunt	Grandfather	Grandmother
Father	39%	30%	29%	31%	26%	22%	21%	29%
Mother	5%	10%	2%	2%	4%	2%	4%	3%
Brother	5%	4%	12%	6%	3%	4%	4%	7%
Sister	2%	2%	2%	4%	1%	2%	0%	2%
Uncle	22%	24%	31%	24%	31%	26%	25%	25%
Aunt	5%	5%	5%	6%	6%	15%	7%	2%
Grandfather	19%	22%	17%	25%	27%	28%	38%	29%
Grandmother	1%	1%	2%	2%	1%	2%	1%	3%

Table B-9. Cross Tabulation of Employment Verses Influencing Percentage of Family Members to Choose Architecture

Employment	Influencing factor							
	Father	Mother	Brother	Sister	Uncle	Aunt	Grandfather	Grandmother
Father	33%	18%	10%	6%	7%	7%	9%	10%
Mother	24%	30%	6%	3%	9%	9%	6%	12%
Brother	40%	10%	25%	0%	15%	0%	5%	5%
Sister	42%	17%	8%	8%	8%	8%	0%	8%
Uncle	25%	15%	9%	8%	14%	9%	12%	7%
Aunt	24%	28%	4%	4%	8%	20%	8%	4%
Grandfather	19%	16%	11%	5%	9%	7%	21%	12%
Grandmother	18%	12%	6%	6%	12%	12%	18%	18%

Table B-10. Cross Tabulation of Employment Verses Influencing Percentage of Family Members to Choose Construction

Employment	Influencing factor							
	Father	Mother	Brother	Sister	Uncle	Aunt	Grandfather	Grandmother
Father	41%	14%	6%	3%	15%	6%	10%	5%
Mother	32%	23%	6%	6%	6%	10%	10%	6%
Brother	35%	9%	13%	4%	15%	9%	13%	2%
Sister	30%	9%	0%	9%	9%	17%	13%	13%
Uncle	41%	16%	8%	5%	3%	6%	15%	6%
Aunt	23%	18%	8%	5%	18%	10%	10%	8%
Grandfather	17%	15%	4%	4%	19%	6%	25%	9%
Grandmother	21%	13%	8%	4%	13%	8%	17%	17%

Table B-11. Cross Tabulation of Employment Verses Influencing Percentage of Family Members to Choose Engineering

Employment	Influencing factor							
	Father	Mother	Brother	Sister	Uncle	Aunt	Grandfather	Grandmother
Father	36%	18%	7%	7%	11%	5%	8%	7%
Mother	29%	37%	3%	3%	11%	3%	11%	5%
Brother	28%	15%	18%	8%	8%	5%	10%	10%
Sister	36%	21%	7%	14%	7%	7%	0%	7%
Uncle	24%	17%	9%	6%	15%	7%	12%	8%
Aunt	23%	16%	7%	7%	14%	18%	14%	2%
Grandfather	21%	16%	5%	7%	14%	8%	19%	9%
Grandmother	25%	17%	8%	8%	8%	8%	8%	17%

APPENDIX C

RANKED DEGREE PREFERENCES

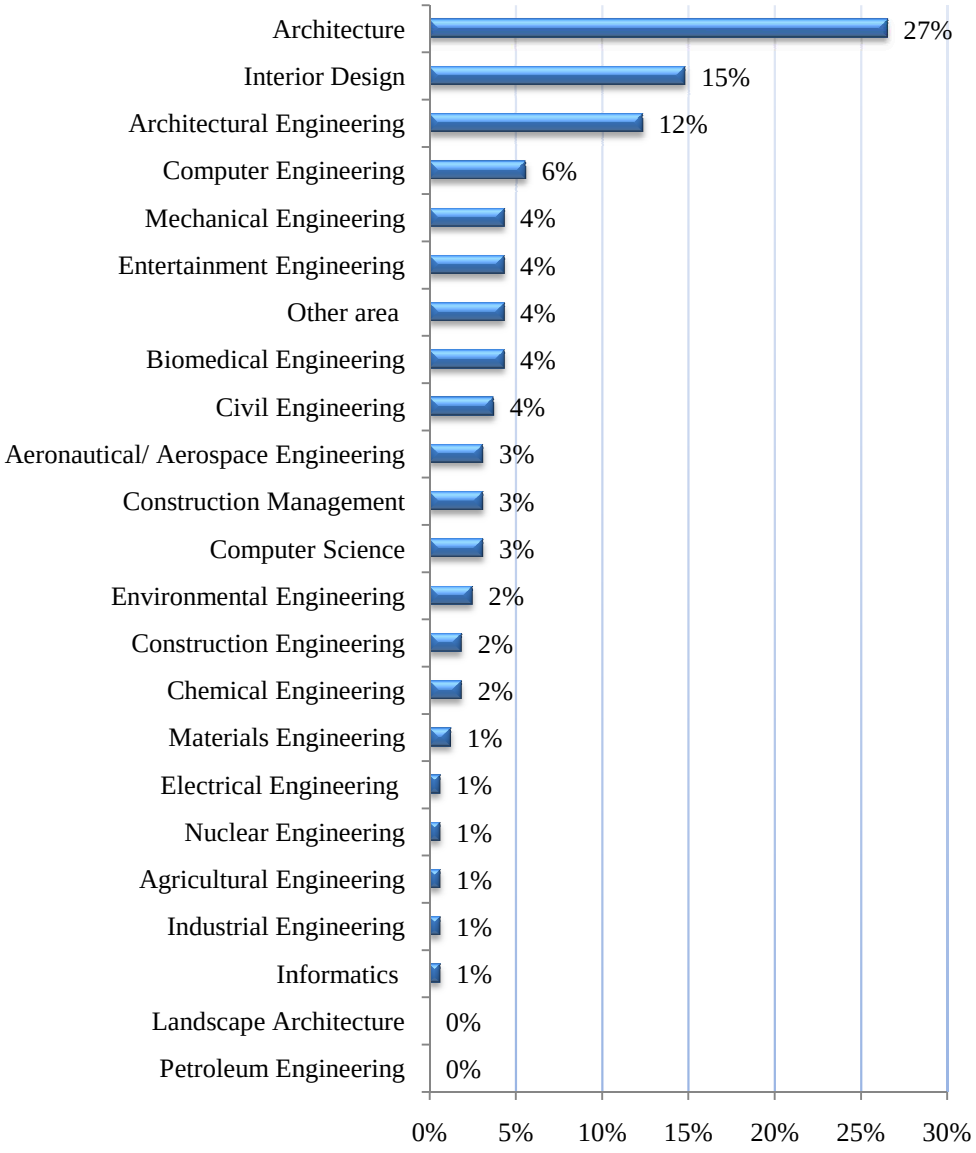

Fig.C- 1 Degree preferences for females (n=162)

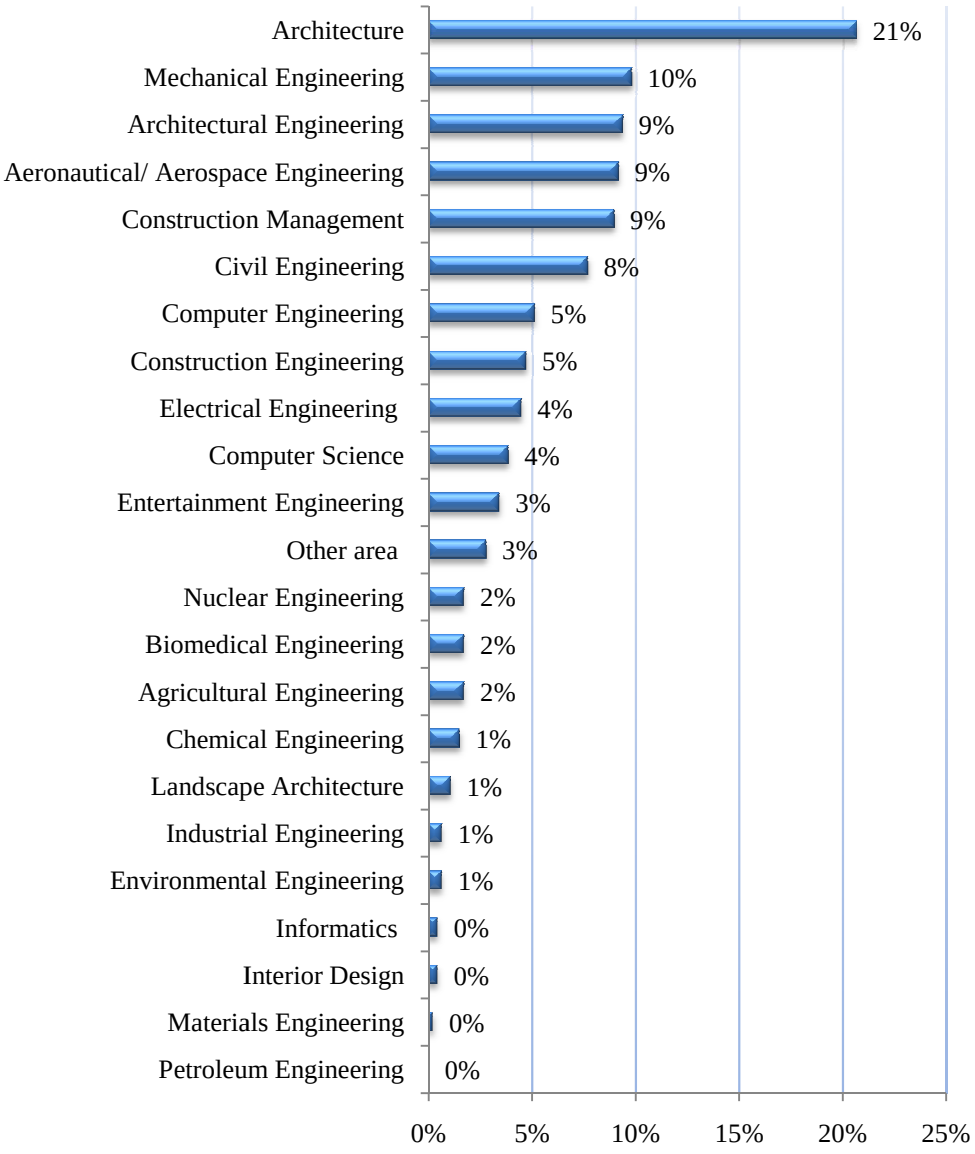

Fig.C- 2 Degree preferences for males (n=469)

APPENDIX D

SURVEY QUESTIONNAIRE

Nevada ACES (Architecture, Construction, Engineering Student's)

Academic interests

General Information:

1) Gender: ☐ Male ☐ Female

2) Age: ☐13 ☐14 ☐15 ☐16 ☐17 ☐18 ☐19 ☐20

3) Race:

☐ American Indian and Alaska Native ☐ Asian
☐ Black or African-American ☐ Hispanic or Latino
☐ Native-Hawaiian ☐ White
☐ Other (write in)_____

4) High school grade that you are presently enrolled: ☐ 9 ☐ 10 ☐11 ☐ 12

5) I live with: (check only one)

☐ Both parents ☐ Both grandparents ☐ Brother
☐ Mother only ☐ Grandmother only ☐ Sister
☐ Father only ☐ Grandfather only ☐ Aunt and/or uncle
☐ Legal guardian
☐ Other (write in)_____

6) Number of brother(s) and/or sister(s):

	None	1	2	3	4	5	6 or more
Brother(s)	☐	☐	☐	☐	☐	☐	☐
Sister(s)	☐	☐	☐	☐	☐	☐	☐

7) Select the highest level of education that your family members have obtained: (check all that apply)

	Father	Mother	Brother(s)	Sister(s)
Doctorate degree (Ph.D.)	☐	☐	☐	☐
Master's degree (M.S.)	☐	☐	☐	☐
Bachelor's degree (4 years of college) (B.S.)	☐	☐	☐	☐
Associates degree (2 years of college) (A.S., A.A.S)	☐	☐	☐	☐
Some college but did not obtained degree	☐	☐	☐	☐
High school diploma	☐	☐	☐	☐
GED	☐	☐	☐	☐
Completed through 11th grade and then left school	☐	☐	☐	☐
Completed through 10th grade and then left school	☐	☐	☐	☐
Completed through 9th grade and then left school	☐	☐	☐	☐
Completed through 8th grade and then left school	☐	☐	☐	☐
Completed through 7th grade and then left school	☐	☐	☐	☐
Completed through 6th grade or less	☐	☐	☐	☐
Don't know	☐	☐	☐	☐

8) Which school do you presently attend?

☐ Advanced Technologies Academy (ATA)

☐ East Career and Technical Academy (ECTA)

☐ Northwest Career and Technical Academy (NWCTA)

☐ Southeast Career and Technical Academy (SECTA)

9) Which curriculum are you enrolled in?

☐ Architectural Design ☐ Construction Technology

☐ Construction Management ☐ Entertainment Engineering

☐ General Engineering

☐ Other (write in)_____

10) Do you have any of the following who have attended these schools:

	Brother(s)		Sister(s)		Friend(s)	
Schools	Yes	No	Yes	No	Yes	No
Advanced Technologies Academy (ATA)	☐	☐	☐	☐	☐	☐
East Career and Technical Academy (ECTA)	☐	☐	☐	☐	☐	☐
Northwest Career and Technical Academy (NWCTA)	☐	☐	☐	☐	☐	☐
Southeast Career and Technical Academy (SECTA)	☐	☐	☐	☐	☐	☐
Southwest Career and Technical Academy (SWCTA)	☐	☐	☐	☐	☐	☐

11) If you could change programs, would you switch? ☐Yes ☐No

(If no go to question 13)

12) If yes to question 11, which program would you choose? (Choose only one)

- ☐ Business Administration
- ☐ Culinary/Hospitality
- ☐ Heath Science/Health Related Occupations
- ☐ Information Technology (Television Production, Web, 3D Animation)
- ☐ Other (write in)_____

13) Would you prefer to attend a different Career and Technical Academy? ☐Yes ☐No

14) Would you attend a different Career and Technical Academy if transportation was provided?

☐ Yes ☐ No

15) What other Career and Technical course(s) would you like offered? Choose no more than three and indicate the priority as 1, 2, 3 with 1 being highest.

____Computer Networking /Computer Science

____Cosmetology

____Design (Fashion and Interior)

____Robotics

____Veterinary Science

____Other (write in)_____

16) How should Career and Technical Academy programs be advertised? Choose no more than five but you may select less than five..

- ☐ Blogs
- ☐ Facebook
- ☐ Guest Speakers
- ☐ Hi5
- ☐ Linkedin
- ☐ Magazines
- ☐ Middle School Counselors and Recruiters
- ☐ MySpace
- ☐ Newspapers
- ☐ Television
- ☐ Twitter
- ☐ Web Sites
- ☐ Wiki
- ☐ YouTube
- ☐ Other (write in)_____

17) How would you like to learn about career opportunities related to your high school program? Indicate priority as 1, 2, 3, 4, 5 with 1 being highest.

____Counselors and Recruiters

____Guest Speakers

____Television

____Web Sites

____Other (write in)_____

18) Would you like an opportunity to visit a business related to your high school program?

☐ Yes ☐ No

19) Are you aware of the existence of any of the following events?

Career Fair	☐ Yes	☐ No
Construction Career Day	☐ Yes	☐ No
First Lego League	☐ Yes	☐ No
First Robotics	☐ Yes	☐ No
First Tech Challange	☐ Yes	☐ No
Future City	☐ Yes	☐ No
House of Cards	☐ Yes	☐ No
Math Counts	☐ Yes	☐ No
Science Fair	☐ Yes	☐ No
Skills USA	☐ Yes	☐ No
Southern Nevada Model Bridge Building Contest	☐ Yes	☐ No

20) Have you participated in any of the following events?

Career Fair	☐ Yes	☐ No
Construction Career Day	☐ Yes	☐ No
First Lego League	☐ Yes	☐ No
First Robotics	☐ Yes	☐ No
First Tech Challange	☐ Yes	☐ No
Future City	☐ Yes	☐ No
House of Cards	☐ Yes	☐ No
Math Counts	☐ Yes	☐ No
Science Fair	☐ Yes	☐ No
Skills USA	☐ Yes	☐ No
Southern Nevada Model Bridge Building Contest	☐ Yes	☐ No

21) Do you have work experience in any of the following:

Construction, home improvement or repair in your residence(unpaid)	☐ Yes	☐ No
Commercial construction	☐ Yes	☐ No
Drafting	☐ Yes	☐ No
Worked around architects	☐ Yes	☐ No
Worked around engineers	☐ Yes	☐ No

Other (write in)_____

22) Check all of the family members and relatives who have previously worked or presently work in the following areas.(Check all that apply)

	Engineering-related	Construction-related	Architecture-related	Other
Father	☐	☐	☐	☐
Mother	☐	☐	☐	☐
Brother	☐	☐	☐	☐
Sister	☐	☐	☐	☐
Grandfather	☐	☐	☐	☐
Grandmother	☐	☐	☐	☐
Uncle	☐	☐	☐	☐
Aunt	☐	☐	☐	☐
Cousin-male	☐	☐	☐	☐
Cousin-female	☐	☐	☐	☐

23) Do you know someone other than your family or relatives who has previously worked or presently works in the following areas? (Check all that apply)

	Engineering-related	Construction-related	Architecture-related	Other
Friend	☐	☐	☐	☐
Friend of family	☐	☐	☐	☐
Acquaintance	☐	☐	☐	☐
Nobody	☐	☐	☐	☐

24) Check all of the following individuals and factors that have influenced your decision to select any of the following areas of study in high school?

	Architectural Design	Construction Management	Construction Technology	Entertainment Engineering	General Engineering	Other
Father	☐	☐	☐	☐	☐	☐
Mother	☐	☐	☐	☐	☐	☐
Brother	☐	☐	☐	☐	☐	☐
Sister	☐	☐	☐	☐	☐	☐
Uncle	☐	☐	☐	☐	☐	☐
Aunt	☐	☐	☐	☐	☐	☐
Grandfather	☐	☐	☐	☐	☐	☐
Grandmother	☐	☐	☐	☐	☐	☐
Friend	☐	☐	☐	☐	☐	☐
Friend of family	☐	☐	☐	☐	☐	☐
Teacher	☐	☐	☐	☐	☐	☐
Former teacher	☐	☐	☐	☐	☐	☐
High school recruiters	☐	☐	☐	☐	☐	☐
Employer recruiter	☐	☐	☐	☐	☐	☐
Professional	☐	☐	☐	☐	☐	☐
Presentation	☐	☐	☐	☐	☐	☐
School courses	☐	☐	☐	☐	☐	☐
Television	☐	☐	☐	☐	☐	☐
programs/documentries	☐	☐	☐	☐	☐	☐
Internet media	☐	☐	☐	☐	☐	☐
Newspaper stories	☐	☐	☐	☐	☐	☐
Magazine articles	☐	☐	☐	☐	☐	☐
Advertising/Marketing	☐	☐	☐	☐	☐	☐
None of the above	☐	☐	☐	☐	☐	☐

Other (write in)_____

25) Did you attend a different (comprehensive) high school last year? ☐Yes ☐No

(if no go to question 27)

26) If yes, did you take a Career and Technical Education class? (check all that apply)

- ☐ Woodworking
- ☐ Automotive
- ☐ Information Technology
- ☐ Career or freshman studies
- ☐ None

27) Did you attend this School's Community Night? ☐ Yes ☐ No

28) Did any of the following attend this School's Community Night with you? (Check all that apply)

☐ Both parents ☐ Both grandparents ☐ Brother
☐ Mother only ☐ Grandmother only ☐ Sister
☐ Father only ☐ Grandfather only ☐ Aunt and/or uncle
☐ Legal guardian
☐ Other (write in)_____

29) Did you talk to any students enrolled in your present high school program about the program prior to your enrollment in the program? ☐ Yes ☐ No

30) Did you talk to the program teacher in your high school program prior to your enrollment in the program? ☐ Yes ☐ No

31) While in middle school did you listen to a recruiter's presentation on the high school program that you are presently enrolled in? ☐ Yes ☐ No

32) What do you plan to do following graduation from High School?

☐ Enter work force
Join armed forces
- ☐ Air Force
- ☐ Army
- ☐ Coast Guard
- ☐ Marines
- ☐ Navy

☐ Enter a technical school or community college and earn a two-year technical degree (terminal degree not transferrable to four-year bachelor's degree program)
☐ Enter a technical school or community college and earn a two-year associate degree that transfers into a four-year bachelor's degree program and earn a bachelor's degree
☐ Enter a technical school or community college and then transfer to a university and earn a bachelor's degree
☐ Enter a university and earn a bachelor's degree
☐ Attend vocational training and complete a certificate
☐ Undecided
☐ Other (write in) _____

33) If you plan to pursue additional education following high school graduation where do you plan to receive this education? (check only one box)

- ☐ University of Nevada, Las Vegas
- ☐ University of Nevada, Reno
- ☐ Nevada State College
- ☐ College of Southern Nevada
- ☐ Other Nevada community college (write in name)_____
- ☐ Out-of-state four-year university (write in name)_____
- ☐ Out-of-state community college (write in name) _____
- ☐ Nevada community college then transfer to University of Nevada, Las Vegas
- ☐ Nevada community college then transfer to University of Nevada, Reno
- ☐ Nevada community college then transfer to Nevada State College
- ☐ Private technical training institute in Nevada (for example ITT, DeVry University, Regis College, etc) (write in name)_____
- ☐ Out-of-state private technical training institute (for example ITT, Embry-Riddle Aeronautical University, Wyo Tech,etc) (write in name)_____
- ☐ On-line bachelor of science degree program (for example University of Phoenix, National University, Nova Southeastern University, etc) (write in name)_____
- ☐ On-line associate's degree program (two-year degree) (for example University of Phoenix, National University, etc.) (write in name) _____
- ☐ Undecided

34) If you plan to attend college to pursue a Bachelor's Degree which area of study are you most interested in? Choose your top three and indicate priority by 1, 2, 3 with 1 being highest.

___Aeronautical/ Aerospace Engineering	___Computer Science	___Informatics
___Agricultural Engineering	___Construction Engineering	___Interior Design
___Architecture	___Construction Management	___Landscape Architecture
___Architectural Engineering	___Electrical Engineering	___Materials Engineering
___Biomedical Engineering	___Environmental Engineering	___Mechanical Engineering
___Chemical Engineering	___Entertainment Engineering	___Nuclear Engineering
___Civil Engineering	___Industrial Engineering	___Petroleum Engineering
___Computer Engineering		

Other area (write in)_____

35) Which subjects do you find interesting? Use the following rating system.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	No Opinion
Mathematics (Algebra, Geometry, Trigonometry, etc)	☐	☐	☐	☐	☐	☐
Physical Science (Physics, Chemistry, Geology, etc)	☐	☐	☐	☐	☐	☐
Life Sciences (Biology, Zoology, etc)	☐	☐	☐	☐	☐	☐
Business (Accounting, Marketing, etc)	☐	☐	☐	☐	☐	☐
Social Sciences (Psychology, Sociology, etc)	☐	☐	☐	☐	☐	☐
Liberal Arts (English)	☐	☐	☐	☐	☐	☐
Fine Arts (Art, Painting, Sculpture, etc)	☐	☐	☐	☐	☐	☐
Political Science (Government, History, Political Science)	☐	☐	☐	☐	☐	☐
Vocational Arts (Drafting, Carpentry, Cabinet-making,)	☐	☐	☐	☐	☐	☐
Computer Science (Programming, Software, Hardware)	☐	☐	☐	☐	☐	☐

36) The grades I earn in the following areas are:

	Mostly less than C	Mostly C	Mostly C and B	Mostly B	Mostly A and B	Mostly A
Mathematics (Algebra, Geometry, Trigonometry, etc)	☐	☐	☐	☐	☐	☐
Physical Science (Physics, Chemistry, Geology, etc)	☐	☐	☐	☐	☐	☐
Life Sciences (Biology, Zoology, etc)	☐	☐	☐	☐	☐	☐
Business (Accounting, Marketing, etc)	☐	☐	☐	☐	☐	☐
Social Sciences (Psychology, Sociology, etc)	☐	☐	☐	☐	☐	☐
Liberal Arts (English)	☐	☐	☐	☐	☐	☐
Fine Arts (Art, Painting, Sculpture, etc)	☐	☐	☐	☐	☐	☐
Political Science (Government, History, Political Science)	☐	☐	☐	☐	☐	☐
Vocational Arts (Drafting, Carpentry, Cabinet-making, etc)	☐	☐	☐	☐	☐	☐
Computer Science (Programming, Software, Hardware, etc)	☐	☐	☐	☐	☐	☐

37) Have you seen a presentation on any of the following UNLV programs?

Architecture	☐ Yes	☐ No
Construction Management	☐ Yes	☐ No
Engineering	☐ Yes	☐ No

38) Do you know that the University of Nevada Las Vegas (UNLV) offers the following bachelor of science degrees?

Architecture	☐ Yes	☐ No
Civil Engineering	☐ Yes	☐ No
Computer Engineering	☐ Yes	☐ No
Computer Science	☐ Yes	☐ No
Construction Management	☐ Yes	☐ No
Entertainment Engineering and Design	☐ Yes	☐ No
Electrical Engineering	☐ Yes	☐ No
Informatics	☐ Yes	☐ No
Interior Architecture and Design	☐ Yes	☐ No
Landscape Architecture and planning	☐ Yes	☐ No
Mechanical Engineering	☐ Yes	☐ No

39) Do you know the University of Nevada Las Vegas (UNLV) offers the following master of science degrees?

Aerospace Engineering	☐ Yes	☐ No
Biomedical Engineering	☐ Yes	☐ No
Civil Engineering	☐ Yes	☐ No
Computer Engineering	☐ Yes	☐ No
Computer Science	☐ Yes	☐ No
Construction Management	☐ Yes	☐ No
Electrical Engineering	☐ Yes	☐ No
Informatics	☐ Yes	☐ No
Materials and Nuclear Engineering	☐ Yes	☐ No
Mechanical Engineering	☐ Yes	☐ No
Transportation	☐ Yes	☐ No

40) Are you interested in earning bachelor of science degree in any of the following degree programs at UNLV? Rank them in order of priority with 1,2,3,4, with 1 being the greatest interest and 4 being the lowest interest. Select no more than four degree areas.

	1	2	3	4
Architecture	☐	☐	☐	☐
Civil Engineering	☐	☐	☐	☐
Computer Engineering	☐	☐	☐	☐
Computer Science	☐	☐	☐	☐
Construction Management	☐	☐	☐	☐
Entertainment Engineering and Design	☐	☐	☐	☐
Electrical Engineering	☐	☐	☐	☐
Informatics	☐	☐	☐	☐
Interior Architecture and Design	☐	☐	☐	☐
Landscape Architecture and Planning	☐	☐	☐	☐
Mechanical Engineering	☐	☐	☐	☐
None	☐	☐	☐	☐

41) Would you like to participate in an internship program included in the four university degree programs you selected in question 40?

Architecture	☐ Yes	☐ No
Civil Engineering	☐ Yes	☐ No
Computer Engineering	☐ Yes	☐ No
Computer Science	☐ Yes	☐ No
Construction Management	☐ Yes	☐ No
Entertainment Engineering and Design	☐ Yes	☐ No
Electrical Engineering	☐ Yes	☐ No
Informatics	☐ Yes	☐ No
Interior Architecture and Design	☐ Yes	☐ No
Landscape Architecture and Planning	☐ Yes	☐ No
Mechanical Engineering	☐ Yes	☐ No

42) Would you be willing to work in an unpaid internship in your degree area for up to 200 hours for one credit hour? Answer for four degree areas you selected in question 40.

Architecture	☐ Yes	☐ No
Civil Engineering	☐ Yes	☐ No
Computer Engineering	☐ Yes	☐ No
Computer Science	☐ Yes	☐ No
Construction Management	☐ Yes	☐ No
Entertainment Engineering and Design	☐ Yes	☐ No
Electrical Engineering	☐ Yes	☐ No
Informatics	☐ Yes	☐ No
Interior Architecture and Design	☐ Yes	☐ No
Landscape Architecture and Planning	☐ Yes	☐ No
Mechanical Engineering	☐ Yes	☐ No

43) Do you believe that it will be easy to get a job in architecture after earning a bachelor's degree in architecture?

☐Yes ☐No ☐Do not know

44) Do you believe that it will be easy to get a job in construction after earning a bachelor's degree in construction management?

☐Yes ☐No ☐Do not know

45) Do you believe that it will be easy to get a job in engineering after earning a bachelor's degree in engineering?

☐Yes ☐No ☐Do not know

46) What is your expectation of salary upon completion of a bachelor's degree in: (check only one box in Architecture, Construction Management and Engineering categories)

Architecture	Construction Management	Engineering
☐ $20,000 – 24,999 per year	☐ $20,000 – 24,999 per year	☐ $20,000 – 24,999 per year
☐ $25,000 – 29,999 per year	☐ $25,000 – 29,999 per year	☐ $25,000 – 29,999 per year
☐ $30,000 – 34,999 per year	☐ $30,000 – 34,999 per year	☐ $30,000 – 34,999 per year
☐ $35,000 – 39,999 per year	☐ $35,000 – 39,999 per year	☐ $35,000 – 39,999 per year
☐ $40,000 – 44,999 per year	☐ $40,000 – 44,999 per year	☐ $40,000 – 44,999 per year
☐ $45,000 – 49,999 per year	☐ $45,000 – 49,999 per year	☐ $45,000 – 49,999 per year
☐ $50,000 – 54,999 per year	☐ $50,000 – 54,999 per year	☐ $50,000 – 54,999 per year
☐ $55,000 – 59,999 per year	☐ $55,000 – 59,999 per year	☐ $55,000 – 59,999 per year
☐ $60,000 – 64,999 per year	☐ $60,000 – 64,999 per year	☐ $60,000 – 64,999 per year
☐ Above $65,000 per year	☐ Above $65,000 per year	☐ Above $65,000 per year

47) Do you believe that the construction industry provides a safe working environment?

☐ Yes ☐ No ☐ Do not know

48) Are you familiar with any construction projects in your local area? ☐ Yes ☐ No

49) If you plan to pursue a two-year associate degree which of the following will you pursue? If AS go to question 50 and if AAS go to question 51.

☐ Associate of Science Degrees (AS).This is a two-year degree which transfers to four-year bachelor's degree programs

☐ Associate of Applied Science Degree (AAS).This is a terminal degree which does not transfer to four-year bachelor's degree programs.

50) Which one of the following AS degrees would you want to pursue? This is a two-year undergraduate Associate's degree which transfers to four-year degree programs.

☐ Associate of Science (General Degree)
☐ Biological Science
☐ Chemistry
☐ Earth Science
☐ Environmental Science
☐ Geological Science
☐ Mathematics
☐ Pre-Engineering

51) Which one of the following AAS degrees would you want to pursue? This is a terminal degree which does not transfer to four-year degree programs.

- ☐ Air Conditioning Technology
- ☐ Architectural Design Technology - Interior Design
- ☐ Architectural Design Technology – Residential Design
- ☐ Building Technology - Building Inspection
- ☐ Building Technology - Carpentry
- ☐ Building Technology - Construction Management
- ☐ Building Technology - Electrician
- ☐ Building Technology - Land Surveying
- ☐ Building Technology - Plumbing
- ☐ CADD Technology
- ☐ Computing and Information Technology
- ☐ Diesel Heavy Equipment Master Technician
- ☐ Electronic Engineering Technology
- ☐ Electronic Engineering Technology - Telecommunications
- ☐ Environmental Safety and Health - Environmental Resource Technology
- ☐ Environmental Safety and Health - Occupational Safety Management
- ☐ Environmental Safety and Health - Waste Water Treatment
- ☐ Graphic Technology - Animation
- ☐ Graphic Technology - Computer Graphics Design
- ☐ Graphic Technology - Multimedia Authoring
- ☐ Graphic Technology - Web Design
- ☐ Mechanical Technology - Industrial
- ☐ Mechanical Technology - Theatre Technology
- ☐ Welding Technology

APPENDIX E

INSTITUTIONAL REVIEW BOARD-EXEMPT LETTER

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

Biomedical IRB – Exempt Review
Deemed Exempt

DATE: July 16, 2010

TO: **Dr. Pramen Shrestha**, Construction Management Program

FROM: Office of Research Integrity – Human Subjects

RE: Notification of IRB Action by Dr. John Mercer, Chair
Protocol Title: **High School Student Interest in Architecture, Construction and Engineering Education**
Protocol # 1007-3511M

This memorandum is notification that the project referenced above has been reviewed by the UNLV Biomedical Institutional Review Board (IRB) as indicated in Federal regulatory statutes 45CFR46.

The protocol has been reviewed and deemed exempt from IRB review. It is not in need of further review or approval by the IRB.

Any changes to the exempt protocol may cause this project to require a different level of IRB review. Should any changes need to be made, please submit a **Modification Form**

If you have questions or require any assistance, please contact the Office of Research Integrity Human Subjects at IRB@unlv.edu or call 895-2794.

Office of Research Integrity – Human Subjects
4505 Maryland Parkway • Box 451047 • Las Vegas, Nevada 89154-1047
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