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The Search for Athletic Mathletes: The Lack of Connections

Between Mathematics and Collegiate Athletics

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### Abstract

Myles Brand, the late president of the National Collegiate Athletic Association (NCAA), along with other members of the NCAA expressed concerns over the lack of current research involving student-athletes' academic role and achievement. It is important for academia to answer this call to action and conduct research to bring the student-athletes' scholastic identity back into focus. This will assist educators in fulfilling their responsibility to provide all students equal opportunities and necessary resources to learn mathematics (NCTM, 2000). The results of these types of studies may help determine the best course of action to address these relationships, leading to the diversification and improvement of the student-athletes' overall education. The following qualitative research is an attempt to begin such research inquiries. The purpose of my phenomenological study is to serve as an initial exploratory research involving how collegiate student-athletes construct and perceive their relationship with the field of mathematics. In particular, I seek to understand if and how student-athletes' identity, authority figures, career goals, educational experiences, and support systems influence their attitude, interest, and motivation in pursuing mathematical or mathematically related fields of study.

My research involved two Division I student-athletes, Roxanne and Chelsea, from a public university in the Rocky Mountain region of the United States having an enrollment of about 12,000 students. These two student-athletes were purposefully sampled from a student-athlete population of 369 through a short survey. Roxanne, a communications major, and Chelsea, a mathematics major with an emphasis in secondary education, possessed different levels of mathematical experience and engagement. I interviewed Roxanne and Chelsea individually to investigate factors that influenced the development of their perception and engagement of mathematics. The analysis of these interviews lead me to discover that a common influence on

student-athletes was their previous experiences mathematics teachers. The data also suggested that student-athletes have multiple means of academic support that influence their overall academic success. I also found that my constructs did not all impact student-athletes' perception and engagement.

### Introduction

The phrase "success breeds success" holds true for both athletics and mathematics. Research exists (Marx, Huffmon & Doyle, 2008; Papanikolaou, Nikolaidis, Patsiaouras, & Alexopoulos, 2003) promoting the attitude and actions of student-athletes in regards to their success in athletics, yet there is little to no research investigating the relationship between a student-athlete's identity, support system, authority figures, career goals, or educational experiences and their attitudes toward mathematics. Myles Brand, the late president of the National Collegiate Athletic Association (NCAA), addressed this lack of current research focusing on the academic identity and experience of collegiate student-athletes at the 2008 colloquium *College Sports: A Legitimate Focus for Scholarly Inquiry?*. He commented that this deficiency in research focusing on student-athletes evidences the values and perceptions the academic community place on student-athletes education (Powers, 2008).

Myles Brand's desire to see an increase interest in academic studies that involve the student-athlete community was echoed by Scott Kretchmar, a professor of exercise and sports science at Pennsylvania State University. Kretchmar encouraged research from a broad spectrum of academic disciplines to take action to fill the current deficiency of inquiries (Powers, 2008). This lack of literature concerning student-athletes' mathematical achievement, interests, and perceptions, required me to synthesize research from two areas of focus: student-athletes'

identity and overall education experience and factors relating to the general student population's attitude, motivation, interest, and achievement in mathematics.

Student-athletes have a unique role within their college community, and this role presents them with many obstacles during their transition to college and overall college experience that the general student population will rarely face. Recently the focus of the student-athletes' athletic identity has intensified due to the progression of the media's coverage of intercollegiate athletics, resulting in their academic identity becoming ignored or disregarded. It is important that educators not allow this to affect their responsibility to provide student-athletes with a proper education. This means ensuring student-athletes possess the primary skills necessary to enter a highly competitive job market. Since mathematics is part of this fundamental knowledge it is essential that student-athletes acquire a strong mathematical background. To make certain student-athletes enroll in courses that provide high quality mathematical experiences, it is critical to understand why they would not enroll in such classes. Before research can take place to address this concern, it is necessary to obtain an understanding of both the student-athlete and the factors that influence their mathematical experience.

To gain an understanding of collegiate student-athletes' mindset it is necessary to understand how they construct their identity. Marx, Huffmon, and Doyle report in their 2008 quantitative study *The Student-Athlete Model and the Socialization of Intercollegiate Athletics* that student-athletes' parents, peers, and coaches significantly influence how student-athletes construct their academic and athletic identities. Parents tend to focus on scholastic success while peers and coaches focus on student-athletes' athletic achievement. At the collegiate level, the influence of peers generally overshadows the effects of parental guidance. Unfortunately, these peers can negatively affect a student-athlete's identity by coercing them to fall in line with

perceived athlete stereotypes, such as lack of concern for academics, display of little intellect, and expectation of special treatment (Papanikolaou & Alexooulos, 2003; Simons, et al., 2007).

These mixed messages can make it difficult for student-athletes to assess their collegiate responsibilities and discern their roles at their institution. These perceptions can be influenced by the student-athletes' experiences at their previous schools. To understand how these viewpoints developed it is critical to analyze student-athletes' academic and athletic background.

The nature of athletic competition in higher education creates many obstacles for student-athletes during their academic experience. The psychological and physical toll of their sports leave only limited amount of energy left to devote to their academic progress, and student-athletes also have fewer hours of the day to invest in their coursework due to their athletic obligations. In addition to these responsibilities, the athletic culture does not necessarily place a high value on academic achievement, and the segregation of student-athletes from non-athletes hinders their intellectual growth (Papanikolaou & Alexooulos, 2003). It is important to continue this type of research to further student-athletes' educational achievement since less than 5% of all student-athletes compete professionally in their respective sports and they need fundamental skills to survive in the current highly competitive job market (*Life After Sports*, 2007). It may be ambitious and unreasonable to overhaul the academic structure of the student-athlete, but improving one facet of their education at a time is certainly a more realistic goal. Pascaraella et al. (1995) discuss that student-athletes tend to score lower in mathematics and reading comprehension than non-athletes. Focusing on the advancement of student-athletes in one of these areas could yield benefits to the student-athletes' overall education. Promoting the enrollment of student-athletes in mathematics related classes is the first step in addressing their

mathematical deficiencies. To advocate the pursuit of mathematics education properly, it is necessary to first gain an understanding of students' attitudes towards mathematics.

Middleton and Spanias (1999) point to a deficiency in encouragement and classroom atmosphere for the deterioration in student attitudes and motivations towards mathematics. As students' perceptions of mathematics become more negative, they learn to dislike mathematics. Students begin to form the notion that mathematics is a subject where only the capable succeed and everyone else struggles or fails. Students that explain their failure in mathematics by citing their personal intellect and ability generally have an aversion to mathematics related courses and majors. On the other hand, students that direct their success in mathematics to their skills and effort tend to gravitate more toward mathematics related fields. Students believe their success in mathematics is completely dependent on their natural mathematical abilities. This type of attitude provides students with little motivation to apply themselves in the field of mathematics.

Achievement is a large influence on a student's motivation to succeed. A student's prior accomplishments in mathematics significantly affect their motivation to engage in higher levels of mathematics with the expectation to do well. However, students' understanding of the importance of mathematics has not affected the decline in students enrolling in mathematics related courses (Middleton & Spanias, 1999). Stage and Kloosterman explain in their 1995 quantitative research article *Gender, Beliefs, and Achievement in Remedial College-Level Mathematics* that students view mathematics courses as obstructions that prevent them from pursuing certain careers, due to their inability to overcome their emotional or cognitive challenges in mathematics. On the other hand, some students' interests provide them with the motivation necessary to confront and conquer their deficiencies.

A student's interests play a critical role in determining their level of engagement within a course. Koller and Baumert report on the effects of interest in academic engagement and success in their 2001 research article *Does Interest Matter? The Relationship between Academic Interest and Achievement in Mathematics*, explaining students seek knowledge and endeavors that gives them a sense of adequacy and self-control. There are numerous avenues of interest a student can pursue in attempt to attain these goals, and these paths are in direct competition with another to hold the student's interest; selecting one generally requires neglecting others. Providing the student a high quality mathematical education experience in school is critical to maintain the student's mathematical interest. Schiefele and Csikszentmihalyi stress, in their 1995 article *Motivation and Ability in Mathematics Experiences and Achievement*, that students' interest in mathematics reliably determines the student's experiences, grades, and level of achievement and understanding in mathematics. The converse of this statement is also true; student's mathematical performance and success generally directly influences his or her interest in the subject. Therefore, a student-athlete's awareness of mathematical aspects within their particular sport may influence their interest in mathematics.

These studies served to inform me on the perceived roles and responsibilities student-athletes undertake within their schools, and provided insight into possible determining factors for students' mathematical experiences, achievement, and perceptions. The purpose of my study is to serve as an initial exploratory research involving how collegiate student-athletes construct and perceive their relationship with the field of mathematics. In particular, I seek to understand if and how student-athletes' identity, authority figures, career goals, educational experiences, and support systems influence their attitude, interest, and motivation in pursuing mathematical or mathematically related fields of study.

Throughout this paper, I will consider a student-athlete as a member of an intercollegiate team affiliated with an institution's athletic department. Through my discussions with experts in the field and from reviewing literature on student-athletes and influencing factors in mathematical achievement, I determined that there are five categories; identity, authority figures, career goals, education experiences and support systems, which affect student-athletes' relationship with mathematics. Student-athletes' *identity* is constructed through their associated roles both inside and outside a school environment, and also by their relationships with their fellow student-athletes, athletic department, coaches, professors, and fellow classmates (Johnson, 1985; Papanikolaou, et al., 2003; Simons, Bosworth, Fujita, & Jensen, 2007; Whitner & Myers, 1986). A student-athlete's *authority figures* include their coaches, parents and teachers (Johnson, 1985; Papanikolaou, et al., 2003; Simons, et al, 2007). Their *career goals* relate to their desired career upon graduation (*Life After Sports*, 2007). *Educational experiences* involve their successes and tribulations while taking mathematics courses (Hannula, 2002; Middleton & Spanias, 1999; Schiefele & Csikszentmihalyi, 1995). A student-athletes' *support system* includes influence from their peers, teammates and sport as it relates to mathematics (Koller, Baumert, & Schnabel, 2001; Marx, Huffmon, & Doyle, 2008; Whitner, 1986). The number of mathematics courses taken determines their level of *mathematical experience*. I consider student-athletes who progress past Calculus IV to have a *high* level of experience, and student-athletes who have had no mathematics higher than college-algebra to have a *low* level of experience. I define all other participants as having a *moderate* level of experience. For this study I consider mathematically related courses to involve some amount of mathematical procedures or knowledge in their content, such as physics, economics, or statistics.

## Methodology

This methodology section outlines my research's setting, population, sample, and theoretical framework. Subsections include discussions of the purposeful sampling instrument, interview questions and role of the researcher. The *Sampling Instrument* subsection elaborates on the purpose and development of my method for sampling the student-athlete population. The *Interview* subsection provides an overview of the interview process adopted for this study, relating my research constructs to the interview questions, and discusses the validity, reliability, and trustworthiness of the interview process. The *Role of the Researcher* subsection discloses any potential biases that may stem from my mathematical background and prior interactions involving student-athletes.

The site of this study was a public university in the Rocky Mountain region of the United States having an enrollment of about 12,000 students from 46 states and 51 countries. The student body is composed of 61% females, 39% males, and 15% minorities (University, 2009). The focus of my research was restricted to the university's student-athletes participating in Division I intercollegiate sports, which is roughly 60% male and 40% female (Roberson, Capels, Yacoub, 2009).

The student-athletes at this university share common athletic and academic experiences. Athletically, these student-athletes participate in sports requiring similar physical and time demands that can sometimes hinder their educational progress (Maloney & McCormick, 1993; Papanikolaou, et al., 2003; Pascarella, Bohr, Nora, & Terenzini, 1995; Pascarella, Truckenmiller, Nora, Terenzini, Edison, & Hagedorn, 1999; Whitner & Myers, 1986). Academically, these student-athletes have satisfied the NCAA's core course requirements during their secondary education career or have completed the necessary coursework at a prep school to participate in

athletics at the collegiate level (NCAA, 2007). In addition to these requisites, the students attending the institution of interest for this study must complete a minimum mathematic requirement to graduate and earn a degree. This requirement ranges from completing one course of *mathematics for liberal arts majors* to completing a sequence of *college algebra* and *topics in calculus* courses, depending on their chosen major area of study. The university's course catalog (University, 2009) describes the content of these classes as the following:

*Mathematics for Liberal Arts Majors* - Prerequisite: Minimum of one full year of high school algebra with a grade of "C" or better (C- is not acceptable). Non-majors only. Learn about several topics in mathematics through intuitive presentation to help those who want to know more about mathematics. Not open to mathematics majors and minors.

*College Algebra* - Prerequisite: Full year of modern, second year high school algebra with the grade of "C" or better (C- is not acceptable). Treat quadratic, exponential and logarithmic functions. Topics from matrices and the theory of equations.

*Topics in Calculus* - Prerequisite: MATH 124 or MATH 175 or equivalent; or two years of high school algebra with a grade of "C" or better (C- is not acceptable). Techniques and applications of differential and integral calculus with an emphasis on applications to economics and business.

It is my radical constructivism philosophy that individuals construct their own subjective knowledge and interpretations of lived experiences (Creswell, 2007; Crotty, 1998; von Glasersfeld, 1995). Therefore, it is my perspective that even though my research population, the student-athletes, share common athletic and academic experiences their individual perceptions and understanding of these experiences may vary. Since the student-athletes' individual understanding of their lived experiences constitutes the focus of my study I adopted a phenomenological design for my research.

### *Sampling Instrument*

The purpose of this research is to develop an understanding of the nature of student-athletes' perceptions of mathematics and how these perceptions may influence student-athletes' decision to pursue higher levels of mathematics. This engagement of mathematics is generally reflected in a student-athletes' choice of major. Since each major has different levels of mathematical content requirements I categorized these levels into three groups, low, moderate, and high levels of mathematical experience. To ensure that I represent student-athletes from each of these groups in my research, I created a survey instrument so that I may purposefully sample the student-athlete population and induce a level of variation in interview participants to strengthen the external validity of the research (Merriam, 2009). This Mathematical Experience Questionnaire (MEQ) (Appendix A) instrument prompts student-athletes to list the number and level of mathematics and mathematically related courses they have completed, enrolled in, or intended to enroll in during collegiate careers. At the end of the questionnaire the student-athletes are asked to provide their contact information if they would be willing to be interviewed at a later time.

In an attempt to accumulate as many student-athletes to select my interviewees, I wanted to ensure the student-athletes feel as comfortable as possible while completing the MEQ. To accomplish this I had a member of the athletic department distribute the questionnaire when he met with the student-athletes during normally scheduled academic advising meetings. I also wanted to provide some compensation for the student-athletes' assistance with my research to encourage participation in the study, but due to NCAA regulations on student-athletes I was unable to do so. However, with permission from the assistant athletic director, I was allowed to

provide the student-athletes a small incentive of substituting one hour of their required study hall time for volunteering one hour of interview time with me.

### *Interviews*

The athletic department staff member was only able to distribute the MEQ to 20 student-athletes during their academic advising meetings due to the timing constraints of my research and some scheduling conflicts. After reviewing the 20 returned MEQs, I found that only six of the MEQs provided contact information to volunteer for to participate in a scheduled interview. I then emailed each of these six student-athletes to inquire if they would be willing to volunteer as interview participants. Of these six student-athletes I received confirmation replies from three student-athletes to meet at arranged times to be interviewed. As interview participants, the three student-athletes agreed to meet with me individually for individual, 45 minute to one hour long interview sessions in a closed-door conference room located on their university campus. Fortunately, these three student-athletes participants provided me with participants with three different levels of mathematical experiences; Roxanne, a senior communications student, possessed a low amount of mathematical experience, Doug a moderate amount of mathematical experience, and Chelsea, a junior mathematics student with an emphasis in secondary education, a high amount of mathematical experience. Unfortunately, the interview with the student-athlete with Doug, the student-athlete with a moderate amount of mathematical experience, was never carried out due to repeat no shows from the student-athlete at agreed upon interview times and also due to the time constraints of my research.

I conducted the interviews with my two participants, Roxanne and Chelsea, in a semi-structured format; audio recorded each interview, and also transcribed the interviews (Creswell, 2007). This format for interviewing allowed me to direct the participants to discuss certain

aspects of their educational experiences with mathematics so that I could later analyze and code the response data for reoccurring themes.

The questions from each interview included some form of the sample questions listed in Appendix B, along with various follow-up questions. These questions were designed from my examination of the literature concerning student-athletes identity and academic success and factors influencing general student engagement and perception of mathematics. From the literature and expert consultation I consistently found five factors that either influence student-athletes' academic performance or general students' perception of mathematics: student-athletes' self-identity, previous educational experience with mathematics, authority figures' perceptions of the student and students' perception of authority figures, systems of support for aid and encouragement, and career motivations. Appendix B connects the sample interview questions with either its purpose or one of my five research constructs.

### *Role of Researcher*

As a researcher, I desire to be aware of and acknowledge any assumptions, bias, and theoretical or ontological perspectives that may influence my study (Merriam, 2009). Undue and unspoken bias could potentially undermine the objectivity and validity of the results of my study; thus, hampering the ability to generalize conclusions from my research (Crotty, 1998; Gall, Gall & Borg, 2003).

I possess a strong mathematical background and value mathematics highly within my life. This value system directly affected the construction of my mathematical experience explanatory variable. It is my belief that the completion of mathematics courses at or below the level of college algebra constitutes a low level of mathematical experience, since it is the minimal requirement to fulfill the mathematical requirement for graduation at the institution of

my research focus (University, 2009). I refer students with a moderate level of mathematical background as those whose completion of mathematical courses above college algebra, but no greater than calculus IV, evidences a solid foundational knowledge of mathematics. While much of the population outside of the mathematical community may perceive calculus IV as an upper level mathematics course, those within the mathematical community consider calculus IV as an elementary mathematics course since its curricular content does not usually involve formal mathematical proofs. Therefore, I characterize students with high mathematical experience as those that have engaged in formal mathematical proofs in their coursework. These definitions of low, moderate, and high may not be consistent with the general mathematical requirements and perceptions of individuals with a non-mathematical emphasis nor that of the participants in this study.

As the researcher, I must also discuss my perspective of the role athletics plays within an educational institution and my connection with university athletic departments. It is my belief that athletics provides an event and common goal for faculty, students, alumni, and the community of an educational institution to rally around together, and thus serving a vital function in establishing camaraderie and strengthening the sense of community of the school. During my undergraduate studies and following my master's studies, I worked within a division one athletics department at a public university as a private mathematics and statistics tutor to some of the student-athletes at the school. This gave me firsthand experience with a sample of student-athletes and their mathematical abilities and perceptions. In addition to these one-on-one interactions with student-athletes, my duties as a teaching assistant at multiple universities have included teaching courses in which student-athletes were enrolled.

My experiences with student-athletes go beyond that of the instructor-student dynamic. In the spring of 2009, I conducted a quantitative study focusing on student-athletes at a Division I university in the Rocky Mountain region. This quantitative research involved a cross-sectional survey of 369 student-athletes at a Division I university in the Rocky Mountain region to determine if sport, gender, major and depth of mathematical experience influences student-athletes' attitudes towards mathematics. The analysis of the survey examined the connection between student-athletes' support system, authority figures, career goals, and educational experiences as they relate to student-athletes' attitudes toward and value of mathematics (Roberson, et al., 2009).

### Data Analysis and Findings

#### *Trustworthiness and Dependability of Research*

Before I designed this study, I sought consultation from experts with varying backgrounds, a collegiate assistant athletic director, a former collegiate athletic director, two educational mathematics professors, and a qualitative research professor. I received advice on the focus of my research and efficient methods to obtain data that would help inform my research. These discussions directly lead to development of my method for distributing MEQs to the student-athletes and the purposeful goal of variation in the sampling of participants from the returned MEQs, the maximum variation in my study (Merriam, 2009).

I triangulated (Merriam, 2009) various sources to produce my research constructs; my review of literature involving student-athletes and my discussions with experts in the field of collegiate athletics and qualitative educational mathematic studies suggested that there were five constructs that may influence student-athletes' perception and engagement of mathematics. These

constructs included student-athletes' identity, authority figures, career goals, education experiences and support systems.

Throughout the duration of my study I continually discussed with my peers, in the educational mathematics doctoral program and in my qualitative research course, the purpose, structure, rigor, clarity, methods of analysis, coding and presentation of my research. These discussion directly lead to the development of my audit trail of transcripts, so that a peer could review my preliminary codes and themes from the interview data (Merriam, 2009).

To ensure I produce an authentic and accurate representation of my research participants' interview responses, I transcribed each interview and e-mailed a copy of the transcript to each respective participant. This member checking (Merriam, 2009) allowed for the participants to review their comments and make certain that the results from the interviews reflected their true intended meanings.

#### *Procedure for Analysis*

Due to the deficiency in research involving student-athletes and mathematics, there is no current evidence that these constructs are indeed factors that influence student-athletes' perception and engagement of mathematics. Therefore, my research was explorative in nature.

This exploratory quality lead me to first read through printed copies of the interview transcripts with an open mind, removing my assumptions and personal viewpoints. During this time, I would frequently stop reading to make notes in the text and in the margins of the paper, openly coding the participants' responses for reoccurring themes and unexpected findings (Creswell, . These marked up copies of the transcripts serve as an audit trail that can be referred to understand how I arrived at my results or findings of the data (Merriam, 2009). After reviewing my audit trail transcripts to check my understanding of the open codes, I reread the

transcripts to established more refined and condensed axial codes from the open codes of my data. Following this, I again reviewed my axial codes in attempt to refine and condense them into the major themes of the interview data.

Once I completed polishing my codes and themes, I presented them to a fellow educational mathematics doctoral student, who possessed greater knowledge and experience with qualitative research, for peer review. During this review, we discussed my codes and themes to arrive at a consensus of their meaning; to increase the probability that if another person was to read the interview transcripts they would develop a similar understanding and coding of the data. I then developed significant statements from these themes and attached the participants' responses that I identified and interpreted to reflect these statements in the clearest and most efficient manner. Finally, I compared my resulting statements, themes, and codes with my research constructs to see if they agreed, or if there was a need for the creation or removal of constructs for future research.

### *Findings*

My initial experience with this phenomenon of the low percentage of student-athlete mathematics majors was through my tenure as a private tutor for most undergraduate mathematics and introductory level statistics courses for student-athletes at a large Division I university in southeastern United States. As I worked with the student-athletes at this university over the course, of many semesters, I rarely worked student-athletes enrolled in mathematics courses above the calculus I level. Of these infrequent encounters, only one of these student-athletes' educational goal was a degree in mathematics. The others tended to pursue engineering or other science related degrees. For years I wondered if my personal experience with a student-athlete population and the composition of their respective educational goals was an isolated

incident or if this was a common trend among collegiate student-athletes. My review of literature concerning student-athletes provided little to no further assistance to provide me with satisfactory evidence either way.

While the current research is unable to my answer my query, my research's participants provided me with support that my personal experience was not a solitary one. When discussing how her classmates perceived student-athletes in the classroom Chelsea mentioned, "I feel like there aren't that many student-athletes that are math majors." Roxanne added at the end of her interview session, "I think that the number of math majors is really small in the athletic department though. I know two, but just like one on my team and one on the track team..." I am not alone; there is now evidence others, student-athletes even, believe in the existence of my theorized phenomenon, that the percentage of student-athletes that are mathematics majors is small. I then went to discuss this issue with the faculty and staff from mathematical sciences department within the university. I learned from these conversations that only three of the 369 student-athletes at the university were declared mathematics or mathematics with a teaching emphasis majors. I reflected on the participants' interviews and returned to the audited transcripts of these interviews to attempt to develop an understanding of the reason why less than one percent of the student-athletes were actively pursuing mathematical degrees.

While Roxanne and Chelsea lie on the opposite ends of the spectrum in regards to their engagement in mathematics, their reasons for their engagement both seem to involve the preservation and advancement of a positive self-image. Early in her interview Roxanne revealed, "I'm bad at math, so I don't like it." which influenced her mathematical engagement, "I never really liked it [math], so I kinda chose a different path than a math or science based education." In contrast, Chelsea perceived mathematics as "...the subject that I'm best at. I'm not absolutely in

love with it, but I like it...I really don't like any other subject." She goes on to describe math as "...it's something that kind of comes easy for me." Roxanne's and Chelsea's stories add credit to Middleton and Spanias (1999) suggestion that students' prior accomplishments in mathematics significantly influence their motivation to engage in higher levels of mathematics. Both of the participants mentioned their previous experience with their mathematics teachers when questioned further about the source of their proficiency and perception of mathematics.

Research (Middleton & Spanias, 1999) has shown that a lack of encouragement in the classroom can negatively impact a student's attitude and engagement of mathematics. Roxanne pointed to a high school mathematics teacher that was "...just rude and if you had questions on how to do it [math], he would just blow you off like you were stupid for not knowing it." as a big influence on her perception of mathematics and why she struggled with the subject. Now if we compare to the mathematically involved student; Chelsea's description of her mathematics teacher, "...my teacher was always joking and he was accepting. If you failed and stuff, he would always help you out." This evidence shows that student-athletes' authority figures do possess a level of influence over their engagement and perception.

Teachers are not the only authoritarian figure in a student-athletes' life. Chelsea cited another authority figure as the major influence in the development of her perception of mathematics, her mother. Throughout the interview Chelsea described her early experiences with mother, who is a mathematics instructor at a community college, "I used to go to work with her all the time and just sit with her in class while she was teaching, and I would work out the problems on the board." Chelsea later elaborated on some other experiences she had with her mother, "We would always play games. Lots of games. ... There was this one card game that we used to play to learn addition and subtraction. We would get three people and um, two people

had cards and one person was the counter. You would hold the card up to your forehead and the other person would do it too, and you couldn't look at your card. The counter would say this added with this is this, and you would have to figure out your card from their card. Just that kind of stuff. ... Just kind of silly things like that, that made it more fun than just sitting down and having to do the problems with no incentive really." Then when asked what Chelsea saw as her biggest incentive to do well was, "Just knowing like, that she[her mother] was like proud of like what you learned and stuff. ... Just that kind of stuff, positive reinforcement. It just all added up together."

Roxanne's parents supported her education with a different approach. Roxanne never mentioned her parents as an influence in her mathematical perception and interests, unless directly prompted to refer to her parents impact on her involvement with mathematics. She described the role her parents played in her education as "...they wanted me to go to college and pursue a higher education, so I know [pause] they make sure I would do my homework and stuff." Roxanne's parents seem to have let her have control over the direction her education, they're philosophy was "if you like that you can take that class or if you don't like it, they're [Roxanne's parents] not going to make you take a class you don't like." Therefore, if Roxanne would have developed a greater interest and positive perception of mathematics, the influence of her parents would seem to push her towards a more mathematically intensive degree than communications.

Chelsea and Roxanne only referred to their parents when discussing their academic identity. During the two interviews, when there were questions asking about their identity as a student-athlete and the culture surrounding student-athletes not once were either participants' parents mentioned. This seems to follow the research of Marx, Huffmon, and Doyle (2008),

which found that parents generally focus on the academic achievement of their student-athlete more than the athletic success. Marx, Huffmon, and Doyle suggest that athletic matters are more of a concern of the student-athletes' coaches.

The responsibility of coaches is to develop the athletic talents and foster the intelligence of their team in regards to their respective sport. However, coaches employed through educational institution must first ensure their athletes are academically eligible to participate in the sport before they can begin to utilize their athletes physical talents (Johnson, 1985; Papanikolaou, et al., 2004; Simons, et al. 2007). This adds another dynamic role these coaches must fill. It is this responsibility that separates them from many other coaching positions. Chelsea described how her coaches attempted to carry out this responsibility, "They're very encouraging people and they may not necessarily know a lot about math, but they'll always at least try to find some way to help you. Whether that's going to find a tutor for you or going to talk to someone that would know math. So they just really encourage you to do well and work to your highest potential, and they'll help you anyway they can." Roxanne relayed that her coaches "...always try to have us sit closer to the front of the classes and stuff. They try and make you pay attention in class, and so like your freshman year you never want to do that. Now that I'm older, I'm definitely glad they tell you to do that, because...I think you get better grades if you obviously attend class and stuff."

While both participant's coaches offered support for their academic well-being, most of it was for general classroom success. They didn't really seem to focus on one subject in particular. Roxanne mentioned that the nature of cross country and track lead to her coaches encouraging her to "...do math in my head. ...like trying to figure if I'm running this fast, like what I need to

run." The coach did not connect this mathematics with success in mathematics in the classroom though.

While these coaches employed at universities attempt to support their student-athletes academically, it is not their primary area of expertise. Luckily for them, the university, at which my study occurred, provides additional support for student-athletes in their scholastic endeavors. Chelsea refers to a particular member of the athletic department staff, "...he's kind of the head of the academics of the athletic department, and he helps her [Chelsea's teammate] find tutors and...makes, her, there is a set time which she has to be sitting and doing homework." Chelsea went on to add that "They [the athletic department staff] really push you to finish all your work and succeed."

Roxanne provided a little more detail to how the athletic department pushed them to succeed, "We have study hall where it's like if you're a freshman you have to be in study hall, if you have a certain GPA below, certain GPA you have to go... I know a lot of people hate study hall, but at the same time I think it helps you, because you're there and like you are having to do your homework so it kinda gives you more structure and time to get your work done, maybe." Roxanne acknowledged the benefits of this push "I was in it for my freshman and sophomore year, which was nice because I know there are times where you are just like...I get home from practice and I don't want to do my homework, I just want to go to bed, but since you're required to go to study hall it kind of makes you do your homework. If you don't get your study hall hours in you won't be allowed, like your coach, you will either not be allowed to compete or practice that day..." Johnson (1985) suggests that educational institutions have a contractual obligation to their student-athletes to assist in the student-athletes' educational progress. Thus, it is in the

interest of the university to provide services and support, such as this study hall, for their student-athletes.

The study hall serves another purpose besides immediate academic support. Roxanne mentions that "with study hall, you see everyone [other student-athletes] in there..." Study hall functions as a place where student-athletes can connect with one another in an academic atmosphere. These type of connections help foster the feeling that the student-athlete body is "...close knit." and "...like a family..." These relationships develop another system of support system for the student-athletes, other student-athletes. Chelsea spoke of working alongside her fellow student-athletes, "...we all study a lot together, even if we're not in the same courses. ...we really do help each other out a lot." Chelsea mentioned a particular teammate, "I go over her [College Algebra] homework with her, review stuff, help her if she's stuck on a problem. Just give her a little push, like you know you could look at it this way."

Since Chelsea is one of the few student-athletes that are mathematics majors in the student-athlete body she noticed "...most people on my team hate math." She does attempt to promote mathematics positively to them, "I'll be like I'll always help you and it can be fun if you can figure it out. You just have to find the right way to learn it [math], so it can be fun..." And when they call for help, "We'll go work on it have we have a good time." Chelsea demonstrates that members of the student-athlete body seek to provide mathematical help and guidance for their fellow student-athletes. Roxanne demonstrates that members of the student-athlete body seek mathematical help and guidance from their fellow student-athletes. Roxanne described instances that she was attempting to calculate splits for her runs, "There's a girl on my team who is a math major, so we always ask her what would it be if we did this and she's like faster at it than us." Student-athletes' peers have been shown to have a greater influence on their actions and

perceptions than the student-athletes' parents do at the collegiate level (Papanikolaou, et al., 2003; Simons, et al., 2007). The positive influence of the student-athletes assisting each other academically is evidenced by both Roxanne's and Chelsea's academic successes.

Student-athletes' peers are not restricted to only other student-athletes, their fellow classmates also provide support to the student-athletes. They can sometimes influence the student-athletes at my university of focus is somewhat counterintuitive. Roxanne and Chelsea mention the need to "...prove to them [classmates] like that you're at their intellectual level, cause there's sometimes that stereotype of the jock, they're not always the smartest in the crowd." Both participants stated the goal of dispelling this stereotype through their actions in the classroom. Chelsea commented that "I think if maybe people can see me succeed and have fun doing everything, athletic and math, like it could give them a better perception of math. ... So I feel like I might be putting a burden on myself, but I feel that I need to succeed in both athletics and academics to help other people see that they could too." Chelsea added "I don't know if it's rational though."

### Discussion

This study evidences that there are multiple factors that influence a student-athletes perception and engagement of mathematics. The constructs that I developed from the literature and expert consultation appeared to coincide with the findings from the participants' interview data. There is one exception though, neither student-athlete referred to their career goals as an influencing factor in their perception or engagement of mathematics. Roxanne's statement, " I probably won't try to get a job as a math teacher or anything.", along with Chelsea's assertion, " I just think the combination of me wanting to be a teacher and my ability in math, just kind of put

those two together." suggests that their career goals may be more of culmination of the other constructs in regards to their engagement of mathematics.

The research data also suggests that the student-athletes' experiences with their mathematics teachers was one of the common influencing factors in their perception and engagement of mathematics. The difference in which Roxanne recalls her mathematics teacher as "rude" and Chelsea's description of her mathematics teacher as "accepting" is reflected in both Roxanne's and Chelsea's current attitudes, educational experiences, and success involving mathematics. Now, Roxanne feels "I'm bad at math, so I don't like it.", while Chelsea sees mathematics as "...the subject that I'm a best at."

Another interesting result from the data involved how both student-athletes identified themselves as role models. This idea of performing in a manner that can be followed, seem to influence Roxanne's and Chelsea's behavior inside and outside of the classroom. Whether or not, both adhere to their goals as role models cannot be determined from this study. Still though, the thought that their actions could affect the manner in which others conducts themselves can be a large factor in controlling their own actions. Possible future research could investigate how to tap into this role model identity, to encourage student-athletes to become more engaged in mathematics.

The athletic department has a desire for their student-athletes to be "...positive role models...", so when student-athletes "...wear something that says [university] athletics or something..." people think "...oh that person is a student-athlete. So that person is special." This special quality that student-athletes possess is their identity. Their identity is "...the face of the university." If a university of wants to promote their student-athletes as its face or ambassadors,

the university should want to promote a diverse face possessing varying educational backgrounds and goals. With this goal in mind, it may be possible to persuade universities to allow research into determining how collegiate educators and athletics departments could work together to alter student-athletes perceptions of mathematics and encourage their engagement in mathematics. Since most students only require one or two math classes, this only provides a limited opportunity for the mathematics educators to create an impact. Therefore, there may be a need to develop cooperation between athletic department and mathematics educators to have an affect on the student-athletes. Conducting a case study of athletic department in attempts to better understand the role the athletic department plays in student-athletes education and how it influences their academic goals and achievement. This knowledge may provide insight to the level and type of cooperation needed to effectively encourage student-athletes to engage in more mathematics and mathematically related courses.

## References

- Creswell, J.W. (2007). *Qualitative inquiry & research design: Choosing among five approaches*. (2<sup>nd</sup> ed.) Thousand Oaks, CA: Sage Publications.
- Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. London: Sage Publications.
- Gall, M., Gall, J., and Borg, W. (2003). *Educational Research an Introduction*. (7<sup>th</sup> ed.) Boston: Pearson Education.
- Glaserfeld, E. von (1995). *Radical constructivism: A way of knowing and learning*. Washington, DC: The Falmer Press.
- Hannula, M. S. (2002). Attitude towards mathematics: Emotions, expectations and values. *Educational Studies in Mathematics*, 49(1), 25-46.
- Johnson, D. Q. (1985). Misguided student athletes: An application of contract theory. *Columbia Law Review*, 85(1), 96-129.
- Koller, O., Baumert, J., & Schnabel, K. (2001). Does interest matter? The relationship between academic interest and achievement in mathematics. *Journal for Research in Mathematics Education*, 32(5), 448-470.
- Life after sports: Overview*. (2007). Retrieved October 29, 2008, from <http://www.lifeaftersports.org/overview.php>
- Maloney, M. T., & McCormick, R. E. (1993). An examination of the role that intercollegiate athletic participation plays in academic achievement: Athletes' feats in the classroom. *The Journal of Human Resources*, 28(3), 555-570.
- Marx, J., Huffmon, S., & Doyle, A. (2008). The student-athlete model and the socialization of intercollegiate athletes. *Athletic Insight*, 10(1). Retrieved October 20, 2008, from <http://www.athleticinsight.com/Vol10Iss1/StudentAthleteModel.htm>
- Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco: Jossey-Bass A Wiley Imprint.
- Middleton, J. M., & Spanias, P. A. (1999). Motivation for achievement in mathematics: Findings, generalizations, and criticisms of the research. *Journal for Research in Mathematics Education*, 30(1), 65-88.

- National Collegiate Athletic Association. (2007). *NCAA freshman-eligibility standards quick reference sheet*. Retrieved Sept. 18, 2008, from NCAA Web site: [http://www.ncaa.org/wps/wcm/connect/resources/file/eb1afe0c529230b/Quick\\_Reference\\_Sheet\\_for\\_IE\\_Standards-5-2-08.pdf?](http://www.ncaa.org/wps/wcm/connect/resources/file/eb1afe0c529230b/Quick_Reference_Sheet_for_IE_Standards-5-2-08.pdf?)
- National Council of Teachers of Mathematics.(2000). *Principles and standards for school Mathematics*. Portland, Oregon: Graphics Arts Center.
- Papanikolaou, Z., Nikolaidis, D., Patsiaouras, A., & Alexopoulos, P. (2003). The freshman experience: High stress – low grades. *Athletic Insight*, 5(4). Retrieved October 8, 2008, from <http://www.athleticinsight.com/Vol5Iss4/Commentary.htm>
- Pascarella, E. T., Bohr, L., Nora, A., & Terenzini, P. T. (1995). Intercollegiate athletic participation and freshman-year cognitive outcomes. *The Journal of Higher Education*, 66(4), 369-387.
- Pascarella, E. T., Truckenmiller, R., Nora, A., Terenzini, P.T., Edison, M., & Hagedorn, L. S. (1999). Cognitive impacts of intercollegiate athletic participation: some further evidence. *The Journal of Higher Education*, 70(1), 1-26.
- Powers, E. (2008, January 11). Scholars and Sports. *Inside Higher Ed*. Retrieved from <http://www.insidehighered.com/news/2008/01/11/ncaa>.
- Roberson, L., Capels, D., & Yacoub, W. (2009). *Athletes to Mathletes: Factors Influencing Student-Athletes Mathematical Experiences*. Unpublished manuscript, University of Northern Colorado, Greeley, CO.
- Schiefele, U., & Csikszentmihalyi, M. (1995). Motivation and ability as factors in mathematics experience and achievement. *Journal for Research in Mathematics Education*, 26(2), (163-181).
- Simons, H. D., Bosworth, C., Fujita, S., & Jensen, M. (2007). The athlete stigma in higher education. *College Student Journal*, 41(2), 251-273.
- University. (2009). *University undergraduate catalog 2009 - 2010*. (Original work published 2009) Retrieved from university website.
- Whitner, P. A., & Myers, R. C. (1986). Academics and an athlete: A case study. *The Journal of Higher Education*, 57(6), 659-672.

## Appendix A

**Mathematical Experience Questionnaire**

**Directions:** In this questionnaire, I will ask about the amount of mathematics and mathematic-related courses you have participated in while in college and the level of mathematics and mathematic-related courses you have participated in while in college. Mathematic-related courses are considered to involve some amount of mathematical procedures or knowledge in their content. Some examples of mathematic-related courses are physics, economics, statistics, etc.

The purpose of this questionnaire is to determine the level of your mathematical exposure. Do not hesitate to ask questions if you are unsure what I am asking. If at any time, you feel uncomfortable with a question you do not have to answer it. You may also stop or withdraw from the questionnaire at any time. Do you have any questions or concerns before we start?

**Name:** \_\_\_\_\_

**Year (circle one):**    **Freshman**    **Sophomore**    **Junior**    **Senior**

**1.** How many mathematics courses or mathematic-related courses have you enrolled in during college?

**2.** List these courses

**3.** How many mathematics courses or mathematic-related courses do you intend to complete while in college?

**4.** List these courses

**5.** If you are willing to be interviewed, please leave your contact information below. I will contact you to schedule a time and place that is convenient for you. Note that the interview may take between 45 minutes to one hour to complete.

## Appendix B

Sample Interview Question	Construct
1. How many years have you attended college?	Demographics
2. What is your current major?	Demographics
3. Why have you chosen this field of study?	Educational experience
4. What is your perception of mathematics?	Exploratory
5. What factors have influenced your perception of mathematics? How so?	Exploratory
6. What has been your experience with mathematics, both inside and outside of school?	Educational experience
7. How have your teachers, parents, or coaches influenced your perception, interest, or engagement of mathematics?	Authority figures
8. What kind of support have you received from your teammates, athletic department, peers, sport, etc. that have influenced your perception, interest, or engagement of mathematics? How has this support influenced you?	Support systems
9. How has mathematics influenced your educational goals?	Educational experience
10. What are your career goals? Have these goals influenced your perception, interest, or engagement of mathematics?	Career goals
11. Can you describe the student-athlete culture at this university?	Identity
12. What do you see as your role as a student-athlete at this university?	Identity
13. How do you think your teammates and fellow student-athletes see their role as student-athletes?	Support system / Identity
14. How do you think your coaches and athletic department see your role as a student-athlete?	Authority figures / Identity
15. How do you think your professors see your role as a student-athlete?	Authority figures / Identity
16. How do you think your fellow classmates see your role as a student athlete?	Support system / Identity

## Appendix C

*Interview #2 Transcript*

Lee (researcher): First of all, how many years have you been in college, what year are you?

Chelsea: I'm a junior.

L: You're a junior. Okay, and what is your current major?

C: Math.

L: Math?

C: Yes.

L: So why have you chosen math?

C: Um, well it's just really the subject that I'm best at. I'm not like absolutely in love with it, but I like it, so...I really don't like any other subject.

L: So why do you like it?

C: I don't know, it's just something that kind of comes easy for me. I've always been able to...I've always been around it because my mom is a math teacher. I don't know...I prefer numbers over letters.

L: Okay, um, so what is your overall perception of mathematics?

C: My overall perception...

L: So your attitude towards math?

C: I think it's pretty cool. Most people don't appreciate it.

L: So what do you appreciate about it, can you give me an example.

C: It's magnitude, like how it can affect everything around us, you kind of have to use it in everything you do, like building stuff, and all sorts of things. You can't really live without math, so...

L: Okay, so can you think of any factors that have influenced this perception that you have or your attitudes toward math?

C: Uh...just growing up with my mom, who's a math teacher really.

L: So what did your mom do for you, like to push or seems like she's kind of be a big influence on you?

C: Well, let's see...I used to go to work with her all the time and sit with her in class while she was teaching, and I would work out the problems on the board. Just that kind of stuff, um...

L: What grade did she teach?

C: She's at a community college and teaches the elementary math. So, like, I don't know, fractions and that kind of stuff.

L: How early were you going to her classes?

C: I don't know, I would say like six...a while.

L: From early on?

C: Yeah, I don't know. She always helped me out when I had problems in math and like explained it. So like, I had fun doing it and like I could actually understand it. So...I think that's where that comes from.

L: Okay, so do you have any other experiences with math outside of school besides your mom as an influence on your perception of math?

C: I don't think so. Like, no...I don't think so.

L: Okay, what about inside of school? You haven't had your mom as a teacher, so is there anything else from your elementary school, high school, all the way through?

C: I really don't remember math that much in elementary school.

L: What about high school?

C: I just loved all my teachers, they did make math fun.

L: Can you give me an example of what they did? Do you remember?

C: I don't know whether necessarily it was about math, my teacher was always joking and he was accepting. If you failed and stuff, he would always help you out. It was like his attitude towards like us as students. Like I want to be a teacher, and so that helped me like, I don't know, those classes better. And then going along with like just being able to come by math naturally, that helped me like it even more.

L: So what about now that you're in college? Is there anything inside college that's influenced you to keep going in math or hasn't been something to stop you?

C: Let's see...mostly I just don't know what else to do besides math. I don't know. Recently, like I'm not a huge fan of geometry, so that kind of slows me down there. But all the other classes it's just really cool stuff that we're learning.

L: Like what are you learning right now?

C: Right now, I'm in Geometry II and we just write papers and that's not fun. Then I'm also in Abstract Algebra, and I have [Dr. S] and she's just a lot of fun. That's stuff is just interesting, but it's really hard. That also makes it more fun, cause once you figure out a problem you feel good.

L: You get the reward for the challenge?

C: Yeah, I mostly just like the reward. It's that stuff that keeps me going, and...I don't know. I don't really know. Just do it.

L: Is anything come up outside of class now that you notice math or math affecting you besides these courses that are challenging you?

C: Outside of school...No, I really don't have time outside of school, besides soccer and doing homework.

L: What about in soccer, can you ever think of math?

C: No, not really. No. No, I just play and kick balls and run into people.

L: Fair enough. So you said you've had your math teachers were a pretty big influence?

C: Mmhmm.

L: And your parents as well, or your mom, um, what about your coaches, have they ever influenced you? Like your education, to take certain courses, or push you to, influence your educational perception of math at all?

C: I mean, not necessarily with math, but with school they always encouraged us to work are hardest. Just like out on the field, give it your all.

L: So is this your high school coach or?

C: Pretty much all my coaches, my club, my high school, my coach here. They're very encouraging people and they may not necessarily know a lot about math, but they'll always at least try to find some way to help you. Whether that's going to find a tutor for you or going to talk to someone that would know math. So they just really encourage you to do well and work to your highest potential, and they'll help you anyway they can.

L: So you said find you tutors, so the athletic department provides support for you?

C: Yeah, I've never really actually ever had to have a tutor, but I know a girl on my team, like, she's working with the, I don't even know what [he] is...he's kind of the head of the academics of the athletic department, and he helps her find tutors and like just all that kind of stuff, makes her,

there is a set time which she has to be sitting and doing homework. They really push you to finish all your work and help you succeed.

L: Have you ever needed this time?

C: No. No.

L: Even as a freshman, you were just automatic.

C: Well my freshman year I took Calculus, which I already took in high school, so I already knew that. At the beginning of college, I could always call my mom. Now that I'm at the higher level stuff, she doesn't quite remember it. I mostly just asked my mom, but now I just ask my teachers if I need help.

L: And the teachers have been pretty supportive of you?

C: Yes, very much.

L: So pretty all through from high school, since you don't really remember elementary, or you middle school, but they've been supportive?

C: Mmhmm.

L: And you kind of said something about their attitude, can you give another example of like how they supported you?

C: Well we had to miss a lot school and stuff, so they would always...like if we missed a lesson we could go in and talk to them about it. We would always ask our other people in class for notes and stuff, but if we didn't understand anything we could go in and talk to them. They would give us the homework early and we could turn it in after we got back. They were really accommodating with our time constraints.

L: So is this your high school or...?

C: Both high school and college. Well I've had maybe two teachers in college that didn't quite approve of missing class time.

L: Can you describe how they showed that they didn't approve of it or...?

C: Well one of them was my philosophy teacher, and he got all philosophical on us asked well why is our, um, why is soccer more important than coming to his class...was pretty much what he asked.

L: Did you have a response for him?

C: Well for me it helps pay for me to go to that class. So in that way, but it's not like we're missing anything. We always get the notes and we always get the work, it's just the actual being in class time that we are missing. So I don't see why it's a big deal, but that's what we told him. He said, well okay.

L: You said there was another professor you had?

C: Yeah, um, I just think she didn't quite like athletes because she felt that, what's the word...they were allowed to do more than like other students. They were, um what's the word is...they're more privileged I guess, you know. And she didn't appreciate that.

L: What subject was this?

C: That was Africana studies.

L: What was that?

C: Africana studies.

L: Okay.

C: None of my math teachers have had any issues with soccer, so that's really helpful.

L: Okay, so let's see...So you said your teammates get help from the athletic department, have you, do you ever work with your teammates at all in your classes or do they ever give you any support in your work?

C: Yeah, we help each other a lot, like a girl that's getting tutoring now, I'll go help her study for a test. And then we'll, if...

L: What is she studying?

C: I don't even know what her major is, I don't know if she has decided what her major is yet, but it's not math?

L: So what class are you helping her with?

C: College algebra.

L: College Algebra.

C: Yeah. I go over her homework with her, review stuff, help her if she's stuck on a problem. Just give her a little push, like you know you could look at it this way. Just that kind of stuff. But mostly, we all study a lot together, even if we're not in the same courses. Like if I have a question, what do you think I should write here, if I'm writing a paper. And they'll be like you could say this and this. So we really do help each other out a lot.

L: But for the math is there anybody at your level for your math that you receive support for that?

C: Not on the team.

L: Do you have classmates that you work with?

C: Uh-huh, a lot. There's this one girl that's in both my math classes this semester and we set a lot of time aside to do the homework. We have a test on Tuesday actually, we're going to study this weekend individually and come together on Monday with any questions we have and try to figure them out together.

L: So your sport really hasn't conflicted that much where you can't meet up with her?

C: Well during soccer season, I was mostly on my own. It's been mostly since near the end of the season that we would work together. We would just work between classes. I still have lifting and stuff now, so that kinda takes up time, but we do it during the day instead of at night.

L: So how's math influenced your educational goals or what are your educational goals?

C: My educational goals are to get A's and um...I don't know just become a teacher, an effective teacher in math.

L: So are you a math major or are you a math...?

C: A math major with a secondary education emphasis.

L: Okay, so math influences , can you give how?

C: How math has influenced my goal to be a teacher?

L: Mmhmm.

C: I've always wanted to be a teacher since I went to my mom's class. And like, I usually love like all my teachers from high school and college.

L: So what level of teacher do you want to be?

C: I'm hoping high school, but if middle school comes first I'll work with it. [pause] I don't know, I just think the combination of me wanting to be a teacher and my ability in math, just kind of put those two together.

L: So would you do anything besides, would you use your soccer at all and once you become a teacher would you continue to become a coach maybe.

C: Yeah, I was going to minor in coaching, but I didn't have enough time.

L: They have a coaching minor?

C: Yeah, they do. I just don't have enough time, I can't stay any longer because I don't have a scholarship to pay for any of that. But I would love to be a coach in high school, I think it would be so much fun. I could be a high school coach and I think it would be fun to be a club coach. So I really want to continue with that kind of stuff.

L: So you're splitting time education and soccer is going to continue no matter where you go it sounds like.

C: I'm hoping.

L: So how do you think, as a coach, would you try to influence your students or teams educational goals at all?

C: Yeah, well I would try stay on top of them, making sure they do good. I think...cause most schools implement uh, a 2.0 or above to play. And like, I of course want all my players to be able to play. So I would push them to get extra help if they need extra help, and just to work hard in class. And like I would always be willing to help them out with math if they needed any extra help with math, so...

L: Okay, so career goals are obviously very closely tied to your educational goals. So you probably already answered that question. So now I'm going to ask you some questions on the culture of the student-athletes at this university. So can you describe what you perceive as the culture of the student-athletes here?

C: Culture of student-athletes...

L: Like the practices that you have or as whole or activities, perceptive of things that are common or different?

C: I don't really hang out with many of the other athletes. I know a lot of the people on my team do, but ...trying to think.

L: Is there a reason why you don't?

C: I don't have time. I feel like I'm just so busy, I'm always doing homework, studying for tests, playing soccer, or sleeping. Like I like to go hang out, like most of the time like when I'm not doing homework and stuff I hang out with girls on the team. I don't know, our culture or our team is pretty close knit. Culture of student-athletes...[pause] Can we come back to that.

L: Yeah, sure. Maybe these other ones will help you think of that. So your role of student-athlete at this university has a dual role, where you are a student and an athlete. What do you see as the responsibilities and duties of this role as a student-athlete at the university?

C: I think...we're part of the face of the university, so we have to act responsibly and be respectable. Otherwise, that puts a really bad...If we don't, it puts a bad mark on the university.

L: So how can you show you're responsible and respectful?

C: I think getting good grades helps a lot. I think responsible in the way of like, um...not acting out, like not getting in fights, not drinking if you're underage. I think that's a big one, if you get caught when you're drinking that's a big impact, not only on your team, it impacts the school as well.

L: Who are you trying to promote this face of the school to?

C: Our community, [our city], [our state], um...I feel like the other colleges in [the state] like I feel like they don't quite like respect [our university]. Just talking to some of their students, they are like...oh, you go to Greeley. I'm like yeah. I don't know, I just feel like they look down on us.

L: Do they say anything in particular that you can think of?

C: I think it's mostly just the fact that we're in [a smaller city]. It's kind of a scary place, or sections are kind of scary. I think that they see that as bad and then like our...I feel like athletics are a huge part of what people see in a school and the fact that our athletics aren't the best. Um, they look at that too, and they're like, oh we can beat you any day. Just that kind of stuff.

L: Not focusing on the academic aspects at all, just...?

C: Not at all. Not at all.

L: Do you ever try to mention anything about your academics in response or do you try to back it up with athletics?

C: It's mostly athletics. Some of my friends, are like why aren't you going out tonight, and I'm like I have a lot of homework to do. It's not like our classes are easy. I don't think they perceive them to be hard, I guess. So they, I don't know explain it really.

L: So since it's not a large school, that would make it easier?

C: Yeah, they think it's just an easy way to graduate, is the way I think they think. Kind of like, um, cause my mom teaches at a community college, and most people feel like a community college doesn't give you as good education as a university. I kind of feel like that's how they see us compared to [other colleges in the area].

L: That it's just a community college?

C: Maybe like a junior college. I don't know, I don't get it, but...

L: So which role do you see yourself more as, the athlete, the student, or is there somewhere in between that you...?

C: Personally, I see myself more as a student, just cause I'd rather be recognized as having good grades than being really good on the field. Because the student part is the part that's going to through the rest of your life. Where the athlete part is just kind of...for fun, more. So...that's what I see. I don't think a lot of people see it that way, but...

L: I have another question for you, so training for your sport, for soccer and studying, so which one comes first? Because I know that you're required to have so many hours as an athlete to train within a week, but then the studying is kind of when you can do it. So I'm trying to see...

C: Yeah, we don't get to play if we don't come to practice. So we have to go to practice, but I use any other any time to study so I'll stay up until two in the morning, which sucks. It sounds backwards, but the practice does come first.

L: So is there ever a time in practice that you think, oh I got to stay up late so I'm going to take this session light? Or is it pretty much that you're putting in consistent effort in?

C: I like to think that I'm putting in consistent effort.

L: So it's not a conscious...?

C: Well, when like I'm really stressed out about a test I can tell it effects how I play and stuff.

L: How?

C: Just, um, I'm not as focused. I'm always thinking, I have this much more studying to do. I'm not as focused. I'm kind of like out of it. I'm still working hard and stuff, but it's not my, my whole head is not in the game. I think that it doesn't make me play as well as I usually would.

L: You like to see yourself more as a student than an athlete. How does this matchup with your teammates or other people in the athletic department, are they similar, different, or just what do you think?

C: I definitely think there is some of both, but...most...[pause]...mostly see themselves as an athlete over a student. I don't know if that's cause it gives them more recognition outside of...like they get more recognition for being an athlete than being a student.

L: What kind of recognition are you talking about?

C: Just from their peers and stuff. Like it's not like a huge deal to be an athlete, but people recognize you as an athlete. People are like, oh you play soccer. I don't know, it seems simple, but it gives them a talking point like, a kind of connection with other people more than your academics. Because you don't want to really go around talking about math problems or papers

you have to right. So just kind of that, and maybe um, they see themselves as that because they're better at athletics than academics. And so, they want to see themselves in a higher...order I guess, than as a...lower. I don't know how to describe it.

L: So since you see yourself more as a student, do you think you are better academically than athletically?

C: Yes, I do. I mostly play soccer just for the fun of it and just for the people. I don't...I couldn't, like I could live without playing soccer. I could also live without going to school, but I kind of need it to go on. So...

L: So you said you could live without playing soccer, even though that you want to keep, continue with your soccer in your career as becoming a coach possibly. So you would get rid of soccer if it meant you would choose school over soccer?

C: Yes, I definitely would.

L: What about your coaches and the athletic department in general, what kind of role or what kind of identity do they try to promote for you guys to take on as a student-athlete?

C: I think they like to take, they like us to take a leadership role. That's how I perceive them as wanting us to do, but I don't know a leadership in what exactly?

L: So how do they promote to you to take a leadership role? Do you have a specific thing that they try to do?

C: I think, I don't know if this counts, but just trying to get out in the community, work with the community and stuff. I don't know if that counts as a leadership role.

L: What do they do in the community?

C: Just like community service, like we go work in the soup kitchen or, um, there's Santa cops. They don't like, we don't have to go do it, but they suggest. Like I think, last night there was this raffle thing for the athletic department. They wanted people to help out with that. Just get involved with more. So I guess maybe leadership isn't quite the right word, just more getting involved in things other than athletics. And then also, um, supporting each other, like not only within the team, but like the other athletic teams as well. They have like this point system that you get points for however many people go to different sporting events. The team that has the most points gets some sort of reward. Well, I think just mostly involvement and more than just athletics.

L: So does that work? Are you more involved?

C: No, I'm not. It's bad, but...

L: Why, is there a reason why?

C: It just keeps going back to the time issue. I just don't have time. I don't know where people find the time to everything they do. I think that I want to go out and help, it's just...don't have the time right now. Like during the summer I'll go help coach, like volunteer coach, and stuff like that. My job is summer camps for kids and stuff. So I feel like that's kind of helping the community, just influencing the young and stuff like that, but during school there's not much I can do.

L: Alright, okay. We already talked about some of this though, but you said that you had a couple professors that see you student-athletes in a different light than other students...

C: Yeah, like in bad light, is that the ones we're talking about.

L: Do you haven, are there any that think of you that think of in a better light than the rest of the students?

C: No, no. They're just accommodating. I don't think they think of us as superior or anything. Uh, I know like in high school, um...I didn't take a class from him but he was the football coach and he just loved athletes. Like he would let them miss class and just that kind of stuff. So there are those, but mostly they're related to athletics than just the people who haven't been involved in the school athletics. So...

L: What about your classmates in your classes, how do they see you? Or how do you think they see you? Do you think they see you differently than the other classmates?

C: Um, I don't think so. I think maybe sometimes you have to prove to them like that you're at their intellectual level, cause sometimes there's sometimes that stereotype of the jock, they're not always the smartest in the crowd. But mostly I don't think so, at least not at this level.

L: Do you ever have to go out of your way to show that you're not the stereotype?

C: No, they can respect me for who I am. I don't really care what they think.

L: You're too busy for that right.

C: I don't know. The other thing is like, um...I feel like there aren't that many student-athletes that are math majors. So I don't know how that affects that.

L: So can you think of the reason why there might not be?

C: It's weird, cause most people on my team hate math. I don't know why, I think it's...

L: Do you ever stick up for math?

C: Yeah.

L: So like how?

C: They're like I hate math, and I'll be like I'll always help you and it can be fun if you can figure it out. You just have to find the right way to learn it, so it can be fun, but... Just that kind of stuff.

L: Do they listen to you at all about it?

C: Yeah, sometimes like they'll call for help, and they're like I need help. We'll go work on it and we have a good time.

L: Nice.

C: Yeah, but I don't know why. I think maybe...cause I guess you could also ask the question why are like non athletes, why aren't they math majors. Cause I feel there aren't that many math majors all together. I think it's just kind of how you grow up and what you're good at. That kind of stuff.

L: Actually, I'll tell you the reason I'm doing this research right now with student-athletes and math, is that I tutored student-athletes at my last university and, um, in all my tutoring I tutored one math major. And I tutored student-athletes for four years, so I ran across one. And I kind of asked around and there was very few there. There was a larger population than there is here, but it was pretty comparable to the percentage here. I was just kind of curious why that is.

C: I think I maybe know of four student-athletes, maybe. I guess your math, you wouldn't know, but science and stuff, do you know if it's about the same?

L: I don't, but it's another reason why I'm doing the research cause there hasn't been a lot of research in student-athletes and academics. There used to be a lot, but it kind of dropped off, and it's picking back up again. It's generally student-athletes and their overall academic success, it's not focused on how they do in particular subjects. I'm trying to find ways that maybe encourage student-athletes to take more mathematics classes or become math majors. I'm not trying to make everyone a math major, I'm just trying to encourage their mathematical involvement or their interests. So if you have any suggestions or thoughts that might influence your fellow student-athletes...

C: Well most of them are pretty stubborn. [pause] I don't know. [pause] I think just making it fun, that's all I can think of.

L: You said making things fun, so...

C: Yeah, just playing games and stuff. Not always lecturing, um, like when you're doing practice in class make it like a jeopardy game or something. Make it more involved. Um, and also including, um, stuff that they're good at too. I don't know, let's see...[pause] Just like including their interests, like not necessarily their academic interests, but their interests outside of school. Um, putting them back into math, that kind of stuff. Cause mostly math classes are just numbers

and computations that don't have anything related to what you like, who you are, that kind of stuff.

L: So if you were a teacher, you said a couple things, what were the things that you would do to keep your students taking more math classes after they finish yours? Because it might be required to take your class, but how can you make, what are your thoughts on things you could do inside the classroom that might encourage them to take another math class, if they don't have to?

C: Maybe kind of, um, lead them into what they might be taking next. Um, like making it interesting for them and um, lead them in but don't, kind of keep them questioning. Don't give them the answers, necessarily. I think that might kind of interest or make them want to continue on with that. Does that make sense? I don't know how you do it. I also think it depends on the teacher also. So...[pause]

L: I'll give you one more thing to think about. Specifically student-athletes, you said to appeal to their interests. So if you trying to appeal to a student-athletes interest in your class, to encourage them to take another one, what things do you think would appeal to student-athletes to peak their interest?

C: I think maybe just doing projects that include, um, athletics. Like trying to figure out how hard you have to kick a ball to get it to go so far. That kind of stuff, just, um...that's hard. [pause]

L: That's why I'm doing the research.

C: Are you asking all these questions to people who aren't math majors too?

L: I'm getting actually people who only have very minimal math, and then your my high level for math, and I'm trying to find, I still trying to get one from in between. So I'm asking for opinions from anybody I can.

C: Good. Good. [pause] I think another thing that might get them more interested in it is like interacting with the other students. Like letting them help each other out so if you have an athlete with a non-athlete. The athlete could get them interested through their...[pause] Like help them maybe them understand through giving them examples through their athletic experience. The non-athletes could help them with giving examples and working with stuff that's not athletic. That gives them a broader perspective, and...yeah. That's a really hard question.

L: You said your mom was a big influence and she was a teacher, so how, I'm trying to think of her now because she obviously influenced you and you're a student-athlete. So what kind of things was she doing teaching wise, you said she made it fun for you, so can you think back to like what any of those things were?

C: It was a long time ago. Um, we would always play games. Lots of games. What kind of games did we play? There was this one card game that we used to play to learn addition and subtraction. We would get three people and um, two people had cards and one person was the counter. You would hold the card up to your forehead and the other person would do it too, and you couldn't look at your card. The counter would say this added with this is this, and you would have to figure out your card from their card. Just that kind of stuff. This is really simple and silly, but like have a work sheet and there would be a joke at the top or something, and you would have to figure out all the right answers to the questions and they would jumble letters that would spell out the answer to the joke. Just kind of silly things like that, that made it more fun than just sitting down and having to do the problems with no incentive really. If there is incentive, I guess... Like in the class that I'm observing now, the teacher keeps candy in his room, and like he'll have a competition every once in a while. The winning team will get a piece of candy, so that makes it more fun. I feel like we played a lot of games.

L: So what was your biggest incentive then?

C: Um, well sometimes she gave us money. Nickels...but I don't know, her praise was a lot. Just knowing like, that she was like proud of like what you learned and stuff. Like it built up throughout, like you're working on addition and she would be like, yeah good work you can do this. And when we were through learning really good addition, she was just so proud. Just that kind of stuff, positive reinforcement. It just all added up together, just made it fun. There was no negatives. Like sometimes we would argue, cause I would get mad or frustrated, um... Mostly just, I don't know. It all built together I guess, it wasn't one particular thing she did.

L: It was a whole?

C: Yeah.

L: Okay, I want to go back to this question. So let's see if the things you talked about helped you with this. So the culture of the student-athletes?

C: Culture of the student-athletes...[pause] I think maybe that the culture of the student-athletes is their all pretty close knit. And I think mostly they do see each other and themselves as athletes over students. And...culture...[pause] I think most of them, um, see themselves going on in some athletic way. Whether, they majored in SES and want to be a coach or continue on and play professionally. Let's see...culture...

L: How many people in this athletic program do you see going on to play professionally?

C: In soccer, or in athletes as a whole?

L: Athletes as a whole.

C: I honestly don't see very many. The only reason I could see, there is a football player that plays for San Diego now that used to play here, but... I think basketball, a couple of the basketball might have a good chance. Um, is wrestling even a profession besides WWF or whatever?

L: I think there is, there might be Olympians. I don't know if they're paid much. Is there pretty solid wrestling.

C: I think there is a couple that are pretty darned good. I honestly don't see soccer going on, um, unless it's coaching. But I don't see anybody playing professionally.

L: Is it something that most people are aware of, or do they still think there's a chance?

C: Yeah, I don't think most people even consider it, to be honest.

L: So most people think that after college it's over with?

C: Yeah. Like they'll probably continue playing in the old woman's league or whatever you know, the fun stuff. So...I don't see many. I don't know much about swimming or golf or tennis. I think there is a chance that there's at least a couple of athletes that will go on. I don't necessarily know of them, but...there's a chance.

L: I got one last question. Basically, is there anything or any thoughts that you would like to add about your mathematic background or your athletic background that may influence other people's perceptions of mathematics or your own?

C: I think if maybe people can see me succeed and have fun doing everything, athletics and math, like it could give them a better perception of math. Like it's not the worst thing in the world. So I feel like I might be putting a burden on myself, but I feel that I need to succeed in both athletics and academics to help other people see that they could too. That's...I don't know if it's rational.

L: Being a role model?

C: Yeah, kind of. More of a quiet role model though, I'm not really...

L: By actions instead...

C: Not words, yeah. Yeah.

L: Is there anything else you would like to add?

C: No, that's it. I hope this helps you.

## Appendix D

*Paper Submission Information*

The Journal of Higher Education

Edited by Leonard L. Baird, The Ohio State University

## Instructions to Contributors

Manuscripts should be mailed to Leonard L. Baird, Editor, *The Journal of Higher Education*, The Ohio State University Press, 180 Pressey Hall, 1070 Carmack Road, Columbus, OH 43210-1002, USA.

**Style.** *The Journal of Higher Education* has adopted as its official guide the *Publication Manual of the American Psychological Association*, 5th edition, and all manuscripts should be brought into conformity with this guide before they are submitted. Papers should be typed, double-spaced, on white 8 1/2 x 11 inch paper, with wide margins. An abstract of fifty words or less, summarizing the main points of the article, should accompany the manuscript. Since the journal's readers represent a variety of professional interests, it is recommended that any statistical material be presented as briefly and simply as possible. Although each paper submitted should deal with the methodology employed in addressing the subject in sufficient detail to place the data within the proper methodological setting, the editors of the journal are not primarily interested in papers setting forth practices of research methods (an acquaintance with fundamental procedures of scholarly analysis being assumed on the part of the reader) except for those papers that develop innovative methodological approaches.

Illustrations submitted with the final draft must be of professional quality, and executed on white paper or vellum, in black ink, with clear, medium weight, black lines and figures. Typewritten lettering should not appear in illustrations. Figures should be provided **at size**--no larger than 4 1/2 x 7 inches (full page) and preferably no larger than 4 1/2 x 3 1/2 inches (half page) and printed **camera-ready at a minimum of 600 dpi**. They should be numbered consecutively, and the number and author's name should be penciled lightly on the back of each. All illustrations must have captions, which should not appear on the artwork but should be typed, double-spaced, on a sheet at the end of the manuscript. If there is any potential for doubt, the word "top" should be written on the back of the illustration.

Authors should employ a Reference List format to list bibliographic data. Endnotes should be reserved for supplementary comment and typed on a separate page at the end of the manuscript.

**Manuscript Length.** Manuscripts may not exceed 30 pages of double-spaced typescript, including notes and references.

**Number of Copies.** Only 1 copy of the manuscript and illustrations is required by the editorial office.

**Review Process.** Those unsolicited manuscripts that are refereed are reviewed blind. Authors are thus requested to submit their name, professional position, institution, and contact information (including email address) on a removable cover sheet. They should also mask any items of self-reference where they appear. Authors must not submit the manuscript of any article that is still under consideration by another publisher.

**Editorial Reaction.** Papers will **not** be returned to authors after submission if they fail to meet by a wide margin the basic criteria for selection. Otherwise, authors may expect to receive some notification within three months.

If an article is accepted, it will usually appear in print within twelve months after acceptance. Upon acceptance, contributors will be asked to supply a computer file on an IBM-compatible standard disk in WordPerfect or Microsoft Word. A signed copyright agreement, provided by the publisher, must be received prior to publication.

If an article that has been subjected to a full review is rejected, the opinions of the referees will be transmitted to the author.

**Criteria for Selection.** Papers are evaluated on the following points: *Form*: writing style and readability, logical development, appropriate length, appropriateness of author's stated objectives to treatment as defined below. *Content*: significance to *JHE* readers. Additional criteria are based upon the following manuscript orientations: as a research paper, as a technical paper, as a professional practice paper, as a literature review, and as a policy paper. It should be emphasized that the editors respond most favorably to manuscripts that evidence both a freshness of vision and a vitality that may be informed by, but certainly go beyond, methodological qualities, and that are in congruence with our publishing goals and directions. The most effective approach in learning about our interests is to read previous issues of the journal. We expect that authors, the journal, and the field will develop through the publication process.