

Running head: PROPOSAL: MATHEMATICS AND ATHLETICS

Proposal for The Search for Athletic Mathletes: The Lack of Connections

Between Mathematics and Collegiate Athletics

Lee Roberson

University of Northern Colorado

ABSTRACT

There is no research promoting the attitude and actions of student-athletes in regards to their mathematical success. This phenomenological research sets out to address this deficiency by exploring the nature of student-athletes' relationship with mathematics through interviews with student-athletes from three higher education institutions. These interviews provide insight to the student-athletes' attitudes, interests, motivations, and perceptions of mathematics and an understanding of how these factors influence their area of study. The result of this study will bring the student-athletes' scholastic identity back into focus and will assist educators to provide student-athletes the opportunities and resources to learn mathematics.

CHAPTER 1

INTRODUCTION

The phrase, "Success breeds success" holds true for both athletics and mathematics, yet while there is research promoting the attitude and actions of student-athletes' in regards to their athletics success there is no research promoting the attitudes and actions of student-athletes in regards to their mathematic success.

Myles Brand, the president of the NCAA commented that academic departments' lack of research concerning athletics at the college level reflects their opinion of athletics. Jay Coakley, a professor emeritus of sociology at the University of Colorado at Colorado Springs, countered this idea by providing factors, such as a coach protecting their programs from possibly damaging inquires, and a researcher's biased opinions regarding athletics role in higher education, for the

limited amount of academic studies regarding collegiate athletics. R. Scott Kretchmar, a professor of exercise and sport science at Pennsylvania State University, expressed his desire to see an increase in student-athlete research involving a variety of disciplines to fill the current deficiency of investigations (Powers, 2008).

It is important for academia to answer this call to action and take up research to bring the student-athletes' scholastic identity back into focus and assist educators to fulfill their responsibility to provide all students equal opportunities and resources necessary to learn mathematics (NCTM, 2000). With an understanding of student-athletes' collegiate roles and experiences during their collegiate career and of the predictive factors of mathematical engagement it is possible to research the nature of the relationship between student-athletes and mathematics. The results of such a study will help determine the best course of action to address these relationships, leading to the diversification and improvement of the student-athletes' overall education.

Definition of Terms

I will define the following terms:

Student-Athlete – students enrolled at a higher education institution that is a member of either a men's basketball or football program affiliated with a school's athletic department. Since student-athletes participating in non-revenue sports college experiences differ little from non-athletes, I am restricting my definition of student-athletes to these sports (Pascaraella et al., 1999).

Low Amount of Mathematical Experience – students whose mathematics course work consists of no mathematics course higher than College Algebra. Their other mathematic-related courses require no mathematical prerequisites higher than College Algebra.

Medium Amount of Mathematical Experience – students whose mathematics course work consists of mathematics courses from Calculus I through Calculus IV. Their mathematic-related courses require mathematical prerequisites higher than College Algebra.

High Amount of Mathematical Experience – students whose mathematics course work consists of mathematics courses higher than Calculus IV. Their mathematic-related courses require mathematical prerequisites higher than Calculus II.

Significance of Study

This study will address the deficiency in literature researching the nature of the relationship between student-athletes and mathematics. Extending this research to include participants in other schools and sports will provide a more in depth study to enhance the transferability of the results. A study analyzing the relationship between student-athletes' and their mathematical perspectives offers many benefits to both the athlete and the educational institution. Understanding student-athletes' concerns surrounding mathematics can provide institutions an outline to actively engage student-athletes to enrich their mathematical experiences. The process of the student-athlete discussing their academic concerns can not only serve as stress reliever, it can also spark the student take interest and invest in their own education (Whitner & Meyers, 1986). This dialogue can also help the student to address their academic and athletic demands. The most important result of this type of study is to encourage further research into student-athletes' perspectives on other subjects besides mathematics to increase the educational diversity and strengthen the overall education of the student-athlete population.

Research Question

This study will address the questions:

What is the nature of a student-athlete's perceptions of mathematics?

How does the mathematical content of a college major affect a student-athlete's engagement in that area of study?

Specifically, how does the student-athlete's attitude, interest, motivation, and perception of mathematics affect their selection of college major?

Delimitations

Since the sample of participants involved in this study are restricted to be student-athletes participating in either football or men's basketball programs that are affiliated with one of the three universities selected from the Rocky Mountain region this research possess delimitations. However, it is possible to extend the research question to include student-athletes from a broader range of sports and higher education institutions. This increase in participants would generate a much larger study requiring a substantial increase in resources.

Limitations

The method of sampling creates a limitation in the research since its function does not allow for randomness. Soliciting every football and men's basketball team members to participate in this study will not compensate for the probability that only student-athletes actively involved in their education will volunteer. This will limit the ability to generalize the results of the research. Additional limitations stem from the nature of qualitative research and interview process. The participant may not be entirely truthful and forthcoming with their responses due to the presence of the interviewer. The ability for the participant and interviewer to communicate effectively with one another also factors into the quality and accuracy of the data collected. Filtering this information through both conscious and unconscious subjective interpretations of the researcher will influence the results of this study.

CHAPTER 2

LITERATURE REVIEW

A student-athlete is a member of an intercollegiate team affiliated with an institution's athletic department (*Athletics, Intramurals, and Recreational Sports: Definitions*). Student-athletes have a unique role within their college community, and encounter many obstacles during their transition to college and overall college experience that the general student population will never 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 will 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 predictors of mathematical achievement.

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. Their parents tend to focus on scholastic success

while peers and coaches focus on their athletic achievement, and at the collegiate level, the influence of peers generally overshadow 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 reception of special treatment (Papanikolaou, 2008; Simons, 2007). These mixed messages 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.

Whitner's and Myers's 1986 qualitative research article *Academics and an Athlete: A Case Study* outlines an educational profile of Mike Jones, a freshman student-athlete at the University of Toledo in 1984 that was identified as an academic high risk by the university's Athletes Educational Planning Program (AEPP). To develop an understanding of the student-athlete's educational background and establish academic goals, they held an academic consultation session. Mike divulged that throughout his high school education, his sister completed his class work and his teachers were lenient. These factors allowed Mike to pass high school. Unfortunately, Mike's high school academic experience is common; many student-athletes arrive to college underprepared for the scholastic rigors they face due to colleges' admission of academically unqualified and underprepared students, eligibility standards, and the time constraints of their athletic requirements (Maloney & McCormick, 1993; Papanikolaou & Alexopoulos, 2003). The National Collegiate Athletic Association (NCAA) is currently attempting to address this issue by increasing the number of high school core courses required for incoming freshmen student-athletes to complete from 14 to 16 starting August 2008 (NCAA

Eligibility Center, 2007). Thurston Banks (2008) stresses in *Integrated Mathematics Courses and the NCAA Core Course System* the need for intensive mathematics courses to be included in the NCAA core course requirements, since many college programs demand that students complete at least one mathematics course beyond a developmental or remedial mathematic course. However, the number or type of courses the NCAA requires is meaningless unless the teachers evaluate athletes and non-athletes equally.

Papanikolaou and Alexooulos (2003) express concerns in their article *The Freshman Experience: High Stress – Low Grades* that student-athletes generally lack encouragement to foster their academic identity until they reach college, creating many problems for student-athletes as they transition to their collegiate career. Since the student-athletes are unfamiliar with their role as a student, they arrive to college with little motivation or interest in their academics. This obligation to fulfill scholastic demands to maintain athletic eligibility frustrates many first year student-athletes. Student-athletes experience high levels of stress learning to manage their academic responsibilities within an intensive athletic schedule that consumes both their energy and time (up to 40 hours a week) (Simons, 2007). Unfortunately, many incoming freshman have underdeveloped time management and coping skills, which can lead to added difficulties with their coursework. These problems can generate further stress for the student-athletes, which hinder their ability to complete rational or organized mental tasks making it even more challenging to maintain academic goals (Papanikolaou & Alexooulos, 2003).

Student-athletes not only have to cope with their new collegiate identity, they must learn to cope with the change of perception from being highly revered in high school to being viewed as academically inferior (Papanikolaou & Alexooulos, 2003). Simons, Bosworth, Fujita and Jensen surveyed 538 student-athletes at a university, in their 2002 quantitative study *The Athlete*

Stigma in Higher Education, to discover how the faculty members and the general student population perceived student-athletes. This study reported that 33% of the athletes' professors viewed them in a negative manner, and only 15% of the athletes' professors thought of them positively. Furthermore, the surveyed reported that almost 70% of the student-athletes experienced direct negative stereotypical remarks from faculty members. Surprisingly, a larger percentage of the general student population regarded the student-athletes more negatively than the faculty at the university.

In addition to adjusting to their academic role, student-athletes must adapt to their athletic role within their college and team. Many of the students participating in collegiate sports transition from an elite athlete among their high school competition to an average or below-average athlete among their collegiate competition. This can be very difficult for a student-athlete to cope with since such a large part of their identity stems from their athletic achievement. This feeling of inadequacy further intensifies due to the lack of personal relationship between the athlete and coach at the collegiate level, and can result in loneliness, self-doubt, and a general sense that no one cares about them (Papanikolaou & Alexooulos, 2003). To combat these feelings it is important to provide a system of guidance and assistance to nurture the student-athlete's academic and athletic growth.

Whitner and Myers (1986) research provides an excellent example of how a plan of support can benefit the educational development of a student-athlete. In a consultation meeting Mike, the student-athlete participating in the study, voiced his frustrations with his courses, and discussed the possibility of quitting school despite the fact that he, while struggling greatly, was academically surviving his classes. This is not a problem unique only to the student-athlete community, various student counseling services, such as Getting Ready for College, list this type

of frustration as one of the main reasons college students struggle (*10 Reasons College Students Struggle*). Mike's aggravation with school led to his avoidance of a series of consultation sessions, and when Mike finally returned he voiced his desire to drop out and concerns for the consequences that would follow. Without the support from these meetings, it is not hard to imagine that Mike would have ended his collegiate career much earlier (Whitner & Myers, 1986). When a student-athlete chooses to withdraw from school, they are also withdrawing from their athletic commitment. Johnson (1985) claims, in his article *Educating Misguided Student Athletes: An Application of Contract Theory*, that schools have a contractual obligation to their student-athletes to assist in their educational progress. Thus, it is in the interest of the entire university, not just the coaching staff and athletic department, to provide their student-athletes with support for all aspects of their collegiate experience. Lack of a coordinated college program and professional standards fail to support the individual needs of the student athlete.

Often, the actions of well-intentioned people and institutions set up the student athlete for a troubled college career. To ensure student-athletes maintain their academic eligibility, some coaches and advisers persuade student-athletes to register for irrelevant courses that offer little academic challenge. Many times this means avoiding basic subjects such as math and writing. While some feel they are protecting the student-athletes by managing which courses they enroll in; they are in fact, depriving the student-athletes of their education (Johnson, 1985). Pascaraella, Bohr, Nora, and Terenzini (1995) elaborate on this issue, reporting that male student-athletes participating in football and basketball enrolled in more courses involving applied and preprofessional curriculums, such as physical education, speech pathology, or child and family studies, than the general student population. These classes offer little assistance in improving reading comprehension or mathematics. This research was expanded upon in Pascaraella et al.'s

1999 research article *Cognitive Impacts of Intercollegiate Athletic Participation: Some Further Evidence* by studying the negative relationship between student-athletes and their college experience, career maturity, educational and occupational plans, and moral judgment. However, they concluded that the student-athletes participating in non-revenue sports college experiences differed little from non-athletes. 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 experiences, 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 experience (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 why students tend to avoid courses with mathematical content.

A student's attitudes and emotions towards mathematics play an influential role in determining the level of mathematics pursued. Markku Hannula's examines this notion in his 2002 qualitative research article *Attitude Towards Mathematics: Emotions, Expectations and Values* in which he focuses on Rita's, a female Finnish student, developing attitudes towards mathematics as she progresses through elementary school and on to her early secondary education. Hannula's definition of attitude is broken down into four categories: the emotions a student has during activities related to mathematics, the student's emotions connected to the topic of mathematics, the evaluation of how student responds to confronting a mathematical setting, and how a student values goals linked to mathematics in relation to their overall educational goals. The researcher analyzed these aspects of Rita's attitude through interviews with her authority figures and peers, and by observing her behavior in the classroom. Collecting this data over a number of years provided the information needed to recognize and understand the changes in her attitudes towards mathematics. The student explains that her dislike for mathematics stemmed from the negative emotions that she associated with the subject, and that these emotions affected her confidence in understanding mathematics. As Rita's confidence declined her expectations for success declined as well. Working mathematical problems with fellow students did little to improve her perception of mathematics. Rita became annoyed during the task, she felt the difference in abilities between herself and others made her an "outsider" in the group. She sensed that the group viewed her as a hindrance, which furthered her irritation. Rita's petitions for help went unnoticed; in response, she refrained from positively participating with the others, and declared the task useless. This type of flight response is normal; to preserve one's self-image, the student will denounce, avoid, and attempt to distort their academic standing (Papanikolaou, 2008; Middleton & Spanias 1999). Repeated failure prompts student dropout.

Lack of designs to detect individual weaknesses and provide support comprise an inefficient college program.

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, and students begin to form the notion that mathematics is a subject where only the able 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 mathematics 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 certain pursuing 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 which courses the student will engage in. 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 that students will 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 each avenue is in competition with the other 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 a student's 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; a student's mathematical performance and success generally directly influence their interest in the subject. The phrase, "Success breeds success" holds true for both athletics and mathematics, yet while there is research promoting the attitude and actions of student-athletes' in regards to their athletics success there is no research promoting the attitudes and actions of student-athletes in regards to their mathematic success.

Myles Brand, the president of the NCAA commented that academic departments' lack of research concerning athletics at the college level reflects their opinion of athletics. Jay Coakley, a professor emeritus of sociology at the University of Colorado at Colorado Springs, countered this idea by providing factors, such as a coach protecting their programs from possibly damaging inquires, and a researcher's biased opinions regarding athletics role in higher education, for the limited amount of academic studies regarding collegiate athletics. R. Scott Kretchmar, a

professor of exercise and sport science at Pennsylvania State University, expressed his desire to see an increase in student-athlete research involving a variety of disciplines to fill the current deficiency of investigations (Powers, 2008).

It is important for academia to answer this call to action and take up research to bring the student-athletes' scholastic identity back into focus and assist educators to fulfill their responsibility to provide all students equal opportunities and resources necessary to learn mathematics (NCTM, 2000). With an understanding of student-athletes' collegiate roles and experiences during their collegiate career and of the predictive factors of mathematical engagement it is possible to research the nature of the relationship between student-athletes and mathematics. The results of such a study will help determine the best course of action to address these relationships; leading to the diversification and improvement of the student-athletes' overall education.

CHAPTER 3

METHODOLOGY

Theoretical Perspective and Research Design

The theoretical framework for this research is primarily phenomenological since I am employing a qualitative study in which I will attempt to identify the nature of student-athletes' relationship with mathematics. In addition to this phenomenological approach, the lack of literature addressing this relationship gives rise to the exploratory characteristics in this study. My theoretical perspective for this explorative phenomenological research follows that of a constructivist, since the interpretations of this study derive from my own principles and ideals.

The participants in my study share common athletic and academic experiences. Athletically, these student-athletes participate in sports requiring similar physical and time demands that can sometimes hinder the educational progress. Academically, the 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. In addition to these requisites, the participants of this study must complete the minimum mathematic requirements to receive a degree from their respective institutions.

By interviewing the participants, I will gather data regarding their educational experiences with mathematics. Then I will code each interview transcript to derive the participants' shared mathematical experiences and discover the nature of the relationship between student-athletes and mathematics.

Role of the Researcher

The phenomenological nature of this study leads to the incorporation of my background and experiences in this observed phenomenon. I possess similar experiences as the participants

of the study, having participated in both school and club affiliated sports teams during my secondary education. In addition to this, I also was involved in a school affiliated club team during a portion of my collegiate career. However, I received no scholarship for my contribution and faced no sport related punishment for poor academic performance. My involvement in these activities may provide some insight into the psyche of the participants as student-athletes.

Besides my own experiences as a student-athlete, I have interacted with I have tutored collegiate student-athletes individually for approximately three years, and I have also had student-athletes enrolled in courses I taught at the university level. These experiences have given me an insight into both the athletic and the academic demands student-athletes face. I will use this asset, along with my passion for sports, to stimulate engaging dialogue with the participants of this study during the open-ended interviews.

The institutions in this study were selected due to their close proximity to me; making it convenient and feasible for me to commute to the schools to solicit participants and conduct interviews within a reasonable time frame.

Participants

Student-athletes who participate in football or men's basketball programs at three universities in the Rocky Mountain region during the spring of 2009 will constitute the participants of this study.

Data Collection

I will obtain these participants on a volunteer basis by soliciting them through a questionnaire (see Appendix A). The purpose of the questionnaire is to determine the level of the student-athlete's mathematical exposure. From those student-athletes who reply to the questionnaire, I will select 12 total participants for my study: four with a low amount of

mathematical experience, four with a medium amount of mathematical experience, and four with a high amount of mathematical experience.

I will then proceed to organize times and places to meet with each of these 12 student-athletes individually to talk to them about the study and informed consent letter. Afterwards I will proceed to interview with them. The interview will take approximately 45 minutes to one hour to complete and will be audio recorded. The purpose of the interview is to question the student-athletes about their educational experiences with mathematics, perception of mathematics, and their educational and career goals (see Appendix B).

Data Analysis

There has been no research regarding the nature of the relationship between mathematics and student-athletes, thus to gain an understanding of this relationship each of the 12 participants' audio recorded interviews will be transcribed. Included in these transcriptions will be notes concerning participants body language and tone of voice. Afterwards, the transcripts will then be analyzed for repeated key statements and topics. This system of open coding allows for reoccurring themes within the interviews to create a general perspective of the interviews as a whole. Furthermore, interpreting this data will provide mean and a rich description of the overall research experience.

REFERENCES

- 10 reasons why college students struggle.* (n.d.). Retrieved October 9, 2008, from Getting Ready For College Web site:
http://www.gettingreadyforcollege.com/10_Reasons_Why_College_Students_Struggle.pdf
- Banks, T. (2008). *Integrated mathematics courses and the NCAA core course system.* Retrieved Sept. 18, 2008, from NCTM Web site:
<http://www.nctm.org/resources/content.aspx?id=1720>
- California State University at Monterey Bay. (n.d.). *Athletics, intramurals, and recreational sports: Definitions.* Retrieved October 30, 2008, from
<http://sports.csumb.edu/site/x18942.xml>
- Hannula, M. S. (2002). Attitude towards mathematics: Emotions, expectations and values. *Educational Studies in Mathematics*, 49(1), 25-46.
- Johnson, D. Q. (1985, January). 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, Summer). 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, March). 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>
- Middleton, J. M., & Spanias, P. A. (1999, January). 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?MOD=AJPERES

- 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, December). 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, July/August). 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, January/February). Cognitive impacts of intercollegiate athletic participation: some further evidence. *The Journal of Higher Education*, 70(1), 1-26.
- Schiefele, U., & Csikszentmihalyi, M. (1995, March). 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, June). The athlete stigma in higher education. *College Student Journal*, 41(2), 251-273.
- Stage, F. K., & Kloosterman, P. (1995, May/June). Gender, beliefs, and achievement in remedial college-level mathematics. *The Journal of Higher Education*, 66(3), 294-311.
- Whitner, P. A., & Myers, R. C. 1986, November/December). 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 be courses that 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

APPENDIX B

Sample Interview Questions

Directions: During this audiotape interview, I am going to ask you some questions related to your educational experiences with mathematics, to your perception of mathematics, and to your educational and career goals. Please elaborate on your response as much as possible. 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 an interview at any time. Do you have any questions or concerns before we start?

HIGH SCHOOL EDUCATION

1. What was your high school experience with mathematics?
2. Describe any success you experienced with mathematics during your high school education.
3. Describe any failure you experienced with mathematics during your high school education.
4. What was your experience with your mathematics teachers/instructors during high school?
5. Were you motivated in high school to do well in mathematics?
6. If you were motivated, what motivated you? If you were not motivated, describe why.
7. What was your attitude towards mathematics during your high school education?
8. What was your interest in mathematics during your high school education?
9. Did your parents motivate or encourage you to do well in mathematics in high school?
10. Did your high school teachers/instructors motivate or encourage you to do well in mathematics?
11. Did your high school/club team coaches motivate or encourage you to do well in mathematics?
12. Did your peers/teammates in high school motivate or encourage you to do well in mathematics?

COLLEGE EDUCATION

13. What has been your experience with mathematics during your collegiate education?
14. Describe any success you experienced with mathematics during your collegiate education.
15. Describe any failure you experienced with mathematics during your collegiate education.
16. What has been your experience with your mathematics professors/instructors during your collegiate education?
17. Do you participate in any programs that assist you with your mathematics?
18. If so, are they helpful? If not, would you be interested in participating in one?
19. What current attitudes or feelings do you have about mathematics?
20. What is your current motivation to engage in mathematics?
21. What are your educational aspirations?
22. Explain your motivations for these goals.
23. Has the involvement of mathematical content influenced your aspirations?
24. What are your career aspirations?
25. Explain your motivations for these goals.
26. Has the involvement of mathematical content influenced your aspirations?
27. What is your current level of interest towards mathematics?

28. Do your parents motivate or encourage you to do well in mathematics?
29. Do your professors/instructors motivate or encourage you to do well in mathematics?
30. Do your team coaches motivate or encourage you to do well in mathematics?
31. Do your peers/teammates motivate or encourage you to do well in mathematics?