

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter is comprised of summary, conclusions, and recommendations. All three sections are derived from the multiple data sources mentioned in Chapter III. A variety of suggestions are offered for administrators, faculty, and staff whose jobs are directly and indirectly related to recruiting, retaining, and graduating African-American males in engineering programs. However, many of the suggestions are not limited to “African-American males” and “engineering programs” but, in many ways, are applicable to students in general and minority students in particular at PWIs.

SUMMARY OF FINDINGS

The summaries highlight the eight research questions of the study, connecting the data with the research questions in an organized manner. Table 10 helps explain the variables that enhanced and inhibited the persistence of African-American males in the College of Engineering.

Research Question (1)

What individuals have been influential in African-American males’ academic interest in engineering? How have these individual influence their academic interest in engineering?

According to the focus groups, individual interviews, biographical questionnaires, and field notes, a range of individuals helped these African-American males make their decision to major in engineering. It ranged from family (especially father), teachers, and school counselors in some cases. However, participants’ fathers were the most mentioned persons in the study. From an early age, a significant number of the participants’ fathers

were very active in their lives, especially in helping them develop their math and science problem-solving skills. The fathers were considered sources of inspiration.

During these early childhood years, many of the fathers repeatedly took time out of their busy schedules to help their sons with basic math, geometrical shapes, math homework, and science projects. Math was a major area of interest for many of these fathers because they were either engineers, worked jobs that had engineering-related duties, or just had a knack for doing math in general. The fathers, in many ways, acted as role models for their sons.

Teachers were also influential in inspiring some of these African-American males to pursue engineering as a major. Several commented how their teachers inspired, nurtured, encouraged, and developed their interest for math, science, and as a result in engineering. The researcher found that these African-American males were most impressed with how their teachers valued their interest and aptitude in math and science. Many of these teachers encouraged them to take advanced level courses in math and science, and even to participate in special programs that emphasized math, science, and/or engineering.

School counselors were influential in some cases. The school counselors who were regarded as influential unusually encouraged these participants to pursue engineering after they had already decided to major in engineering. For the most part, they were most influential in helping these African-American males with college admissions.

Research Question (2)

What experiences, both positively and negatively, have had the greatest impact on African-American males' academic persistence in the College of Engineering?

In this study, the researcher discovered that these African-American males had both positive and negative experiences in the College of Engineering and Virginia Tech. Many of the positive experiences mentioned were establishing lasting relationships with faculty, staff, and friends. This was especially true for the *Ultimate-Persistent Group*. In addition, participants in this sample group also mentioned how they appreciate overcoming the challenges (e.g., social isolation, stereotype threats, white peer degradation, etc.) in the College of Engineering. Many of them stated that they were experiencing related challenges in their present engineering jobs. After enduring the challenges in the College of Engineering, many of the participants have attitudes that they can endure anything. Of course, their negative experiences were directly or indirectly related to white peer degradation, stereotypical perceptions, lack of engineering role models, and lack of opportunities to participate in extra-curricular activities.

Research Question (3)

How has the engineering, institutional, and social culture, both positively and negatively, affected the experiences of African-American males in the College of Engineering?

Most of the African-American males in this study experienced challenges in the College of Engineering directly or indirectly related to social isolation, stereotype threats, white peer degradation, and lack of role models/mentors. These challenges also impacted various areas of these African-American males' lives, which caused some to search internally for their identity. Also, the challenges made it difficult to develop

psychosocial identity because of the necessity to put all their concentration and energy into engineering coursework, assignments, and projects.

Regardless of one's race and/or gender, engineering inherently was difficult for most students. The workload was extremely heavy and demanded consistent attention and effort. However, the rewards at the end simply outweighed the challenges and made it worth enduring. This was more evident with the *Ultimate-Persistent* Group because most of them were already working as engineers. Among these African-American males, they all recognized that they received certain privileges because they were males. Many of them recognized that African-American female engineering students experienced more challenges than African-American males. In a sense, this made them both remorseful and grateful at the same time.

Research Question (4)

Why do some African-American males persist in the College of Engineering and others don't?

In this study, many of the African-American males were able to persist through engineering, but some did not persist. African-American males in the College of Engineering were often perceived as not having the potential to persist in engineering majors. Engineering, in itself, was challenging, but these negative perceptions made it even more challenging. In this study, both the persistent groups and non-persistent group felt like they had to prove themselves. The most significant difference was that the persistent groups made a conscious effort to "prove them wrong." They made sacrifices, worked harder, and dedicated themselves to engineering so they could prove to their white engineering classmates and professors that they belonged in engineering and at

Virginia Tech. Similar attitudes were consistent with other African-American students in a prior study conducted at Virginia Tech (Scott, 1995).

Stereotypes threatened all aspects of the lives of African-American male engineering students, particularly their academic lives. Academically, it was more evident for the *Unsatisfactory-Persistent Group* and *Non-Persistent Group*. The big difference was that the *Non-Persistent Group* transferred out of engineering to other non-engineering majors, and the persistent groups decided to continue. In general, the persistent groups aggressively tried to sustain and/or develop positive attitudes, relationships, and academic strategies that would help them persist through engineering until graduation.

Research Question (5)

Are there any differences in the persistence of African-American males in the College of Engineering with a 2.5 QCA or higher, between a 2.0 – 2.5 QCA, and less than a 2.0 QCA?

There were clear differences in the degree of persistence for the different sample groups. The *Exemplary-Persistent Group* was clearly more focused and grounded academically. Overall, this sample group expected to succeed in the College of Engineering, in spite of the challenges. Individuals in this sample group were more willing to seek help from professors and more willing to cross racial barriers in order to persist and excel in the College of Engineering.

The *Satisfactory-Persistent Group* was more people-oriented than the *Exemplary-Persistent Group*. These individuals often got sidetracked with extra-curricular activities (e.g., basketball, weightlifting, socializing, etc.). They were not as successful crossing

racial barriers in study groups as the *Exemplary-Persistent Group*. However, they did have the same “prove them wrong” attitude.

Participants in the *Unsatisfactory-Persistent Group* were as determined or even more determined to complete their engineering degrees as the two other sample groups. Many of these participants were fighting not only to complete their engineering degrees but also fighting to pull up their QCAs. The danger of not pulling up their QCAs was academic suspension, which many of them had already experienced. A distinguishing point about individuals in this sample group was that they were more employed than both the *Exemplary-Persistent Group* and *Satisfactory-Persistent Group*. However, their employment made it more difficult to get help from peers, professors, and tutors when needed.

Research Question (6)

To what degree are African-American males willing to persist in engineering?

The persistent African-American males in this study were able to persist through the challenges in the College of Engineering because they felt certain that they could complete the qualifications for the engineering degree of their choice. At an early age, the vast majority of them commented that they wanted to become engineers; therefore, failing and/or dropping out of engineering were perceived as “unacceptable” and “inapplicable.” These individuals saw themselves fulfilling a lifelong dream, and they were willing to do whatever was necessary to complete their engineering degrees in order that they might fulfill their lifelong dreams. This included but was not limited to working twice as hard, reducing extra-curricular activities, and extending their stay in school. Their “prove them wrong” attitude was one of the many underpinnings that propelled

them to persist. Other factors such as family (mother), faith, obtaining a good-paying engineering job, and being role models for siblings served as motivators to persist.

Nevertheless, the individuals in the *Non-Persistent Group* were unable or unwilling to persist because (1) they were tired of the hostile and competitive atmosphere in the College of Engineering; (2) they were frustrated with not doing well academically; (3) they became uninterested in the content; and/or (4) they realized that engineering was not for them. These individuals were not as committed to engineering because they did not really know what engineering entailed. Many of them commented on not having a sense of what engineering entailed before matriculating in the College of Engineering. They commonly opted to major in engineering because people told them that they would make a “good” engineer. Regardless of their reason(s) for transferring out of engineering, the majority of them was happy with their new majors and was doing relatively well.

Research Question (7)

What support do African-American males seek to help them persist through engineering? Why?

The vast majority of the study’s participants commented on using the services in the OMEP (e.g., tutoring, mentoring, and advising). These programs were highly regarded by those who used them. In addition, some of the most salient support sought was help from engineering professors, African-American peers, non-African-American peers, and family. Family support in general and support from mothers in particular were mentioned repeatedly throughout the study. Many attributed most of their persistence to their mother’s encouragement, love, and prayers.

Research Question (8)

Are there any differences in the types of help sought by African-American males in the College of Engineering with a 2.5 QCA or higher, between a 2.0 – 2.5 QCA, and less than a 2.0 QCA?

The vast majority of the sample groups tapped into the same resources available to engineering students in the College of Engineering and around Virginia Tech's campus. For the most part, they sought help from engineering professors, African-American peers, non-African-American peers, and tutors in The SEC Student Assistance Center in the College of Engineering. The biggest difference was their willingness and consistency in using these resources. Members of the *Exemplary-Persistent Group* were very familiar with the resources around campus. Usually, when these individuals needed help, they sought help from engineering professors, African-American peers, non-African-American peers. The *Satisfactory-Persistent Group* used the same resources but also sought help from tutors in The SEC Student Assistance Center. They usually were not as proactive using the resources as the *Exemplary-Persistent Group*. In other words, they often waited to the last minute to receive help or just did not seek help at all. This sample group sometimes demonstrated patterns of laziness.

The *Unsatisfactory-Persistent Group* was also familiar with many of the resources on campus, but often neglected using any of them, even when needed. This sample group found it difficult to use the resources on campus because they worked full-time or part-time jobs. As a result of working, many found that their grades suffered.

CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn. They are organized into four sections: (1) the impact of early exposure to math and science,

(2) perceptions of Virginia Tech and its College of Engineering, (3) obstacles in the College of Engineering, and (4) academic achievement in the College of Engineering. Note that this study focused entirely on the persistence of African-American male engineering students who were enrolled and/or graduated from Virginia Tech. As a result, caution should be taken when generalizing these conclusions, especially with other groups of students, majors and/or universities.

The Impact of Early Exposure to Math and Science

1. Early exposure to math and science was extremely helpful in stimulating the academic interests and aptitudes of African-American male engineering students.
2. Special academic programs, schools, and camps that emphasized math, science, and/or engineering contributed to these African-American males' interest and skill development in engineering.
3. Such factors as parents, teachers, money, and special programs (e.g., schools, curricular, and camps) influenced African-American males' interest in engineering. For some, school counselors impacted their interest.

Perceptions of Virginia Tech and its College of Engineering

4. The African-American male engineering students were insightful and keenly cognizant of the challenges related to being an engineering student. To persist in engineering, it was important that they had the basic study habits, time management skills, and directness to seek and use the resources (e.g., OMEP, faculty, advisors, peers, etc.) on campus when needed.
5. Many African-American males felt they had to work twice as hard in the College of Engineering because they were "black" and "male." Resourcefulness and social competence were highly associated with persistence. The degree of persistence was determined in large measures by these two factors.
6. Perceptions of the racial climate both negatively and positively influenced the persistence of African-American males in the College of Engineering.
7. Many African-American male engineering students from the different sample groups believed that their white peers did not think that they could perform as well as white students in engineering. As a result, they felt that they had to work twice as hard to get the same credit, recognition, and/or grades.

Obstacles in the College of Engineering

8. African-American males transferred out of engineering because they have difficulty connecting with white faculty, administrators, and students. In other words, many experienced isolation and loneliness in their engineering courses.
9. African-American males transferred out of engineering because they felt unable or unwilling to persist in the College of Engineering. Most of these transfers occurred because of the following: lack of motivation, poor study habits, and/or inadequate problem-solving skills for engineering.
10. Black inferiority was communicated both overtly and covertly to African-American males in the College of Engineering. Such communications either motivated or discouraged them to persist.
11. The overall sentiments of the sample groups were that white students in general and white males in particular had more peer support groups and faculty role models in the College of Engineering.
12. Many of the issues African-American male engineering students experienced in the College of Engineering were issues faced by African-American males in other majors. A summation of this notion was best articulated by one of the participants in the *Satisfactory-Persistent Group* – “The College of Engineering is a microcosm of Virginia Tech, and Virginia Tech is microcosm of Blacksburg.”

Academic Achievement in the College of Engineering

13. It was evident by the data that traditional measures such as SATs and high school GPAs were unreliable at predicating academic performance for African-American males in the College of Engineering at Virginia Tech.
14. Commitment and interest were requisites for persistence and success in the College of Engineering. African-American male engineering students who transferred out of engineering had the ability to complete an engineering degree but lacked the commitment.
15. The data indicated that familial support in general and parental support in particular played a major role in the persistence of African-American male students in the College of Engineering.
16. The vast majority of the African-American males who were both persistent and academically successful (e.g., Ultimate-Persistent Group, Exemplary-Persistent Group, and Satisfactory-Persistent Group) reported having a lot of support from family. In addition, they also stated that the desire to “prove them wrong” motivated them to excel academically and persist through the curriculum.

17. Repetitive underachievement had negative effects on persistence, and academic success had positive effects.
18. OMEP was a vital source of support and encouragement. Many relied heavily on the programs and services offered, especially during early years.

RECOMMENDATIONS

Based on the findings and conclusions of the study, several suggestions were given for parents and high school personnel. These recommendations are also given to improve standard practices and policies in the College of Engineering. Many of these suggestions were extrapolated from recommendations made by the five sample groups. In addition, the researcher made several recommendations for future research. These recommendations are predicated on expanding the body of knowledge on “persistence,” “engineering,” and “African-American males.”

Recommendations for Parents

1. Parents should make sure that their children have appropriate resources, supplies, and support needed to excel educationally. It also may be necessary that they advocate for their children to get in gifted programs, schools, and activities.
2. Many of the participants in this study mentioned that their parents had high expectations for them academically, and they also mentioned that they did not want to let their parents down by not doing well in school. Therefore, parents should set high expectations for their children academically and for life in general. From an early age, parents should help African-American males develop a positive racial identity as “African-American males.”
3. Many of the participants mentioned that they were taught by their parents to have a great sense of pride in their cultural identity. Furthermore, their parents told them that they would have to work twice as hard to overcome societal stereotypes and negative messages. Parents should provide healthy guidance, support, and strategies to help their sons overcome such obstacles.
4. Early attempts should be made to expose African-American males to math, science, and engineering. Sending them to special schools, programs, and camps that emphasize math and science could do this.

5. Parental support was found to be important in the persistence of African-American males in the College of Engineering. Therefore, parents should provide a lot of support and encouragement to their sons.

Recommendations for High School Officials

6. Starting in elementary school, teachers and school counselors should develop programs that would expose African-American males to scientific and technical occupations not customarily pursued by such populations.
7. Teachers and school counselors should develop strategies to identify African-American males for special programs that emphasize math, science, and engineering.
8. Teachers and school counselors should encourage African-American males to take advanced level math and science courses so they can be prepared to pursue degrees in engineering. Many of the participants mentioned that high school teachers influenced their decisions to pursue engineering; only a small number of them mentioned school counselors.
9. School counselors should develop comprehensive career guidance programs, which include the following: shadowing, field trips to industry and universities, and summer programs. Such career guidance programs should help increase the awareness of careers available to them as a result of math and science. In addition, they should help with finding scholarships.
10. Teachers and school counselors should contact parents directly about the academic progress and/or special programs available to their children.

Recommendations for Practice and Policy in the College of Engineering

11. Attempts should be made to include parents and other significant family members in retention and academic efforts, especially since these individuals play a major role in the persistence of African-American males in engineering.
12. Faculty members and advisors should closely monitor the academic progress of African-American male students. Such practices will help students avoid making unnecessary mistakes related to their academic studies.
13. Efforts should be made to increase the relationships between engineering faculty/advisors and African-American male engineering students. Such efforts could help these students connect more to the College of Engineering and the university at large.
14. OMEP and other entities around campus (e.g., Black Cultural Center [BCC], Center of Academic Enrichment and Excellence [CAEE], etc.) should collaborate to develop initiatives specifically for African-American males. These initiatives

- should be designed to challenge, encourage, motivate, and nurture African-American males.
15. OMEP should continue to offer its pre-college initiatives. Most of the participants in the study cited that special math and science programs were influential in inspiring them to pursue engineering as a career.
 16. Efforts should be made to enhance faculty/advisors' understanding of developmental issues and challenges that African-American males' experience at Virginia Tech. This could easily be achieved through seminars and workshops conducted by staff in the OMEP and/or CAEE
 17. Faculty should be given the names of the offices (e.g., OMEP, BCC, and CAEE) around campus that specialize in working with minority students. Such offices could serve as a resource for faculty.
 18. OMEP should consider expanding the mentoring and summer bridge programs. These programs were cited continuously throughout the study. More specifically, OMEP should consider offering the mentoring program for a whole entire year instead of the one semester during students' freshman year.
 19. Aggressive efforts should be made to increase the number of African-American students and faculty in the College of Engineering. Such efforts would have direct and indirect benefits to persistence of African-American males.
 20. OMEP should develop an honor society to reward those African-American students who excel in the College of Engineering. In addition, members' names should be posted in a special place for peer viewing.
 21. In the study, many participants mentioned that they decided to attend Virginia Tech because they received scholarships from Virginia Tech. Efforts should be made to make more scholarships available to high achieving and capable African-American engineering students, which are competitive with other universities.
 22. Collaborative relationships should be made between African-American engineering alumni and the students. Alumni could serve as mentors and role models for the students. Such interactions would help the students in developing contacts for summer employment and research opportunities.
 23. OMEP should design a one credit hour seminar to help African-American males adjust to the College of Engineering. The seminar should emphasize time management, study skills, and resourcefulness.

Areas for Future Research

1. A follow-up quantitative study should be conducted to determine the generalizability of this study.

2. Both quantitative and qualitative research should be conducted to determine whether there are similarities and/or differences between African-American males and African-American females in the College of Engineering.
3. A comparative qualitative study should be conducted to determine if there are similarities and/or differences among other engineering programs at PWIs.
4. A comparative qualitative study should be conducted to determine if there are similarities and/or differences among engineering programs at HBIs.
5. Both quantitative and qualitative research should be conducted to determine whether there are similarities and/or differences between African-American male engineering students and African-American males majoring in other disciplines.
6. Investigations should be pursued to examine the relationship between parenting and academic achievement among African-American males.
7. A follow-up study should be conducted to determine if the findings are indicative of all men in the College of Engineering.

Table 10

A Conceptual Model of Persistence for African-American Males in College of Engineering at Virginia Tech

**Basic Assumption: African-American males are capable of completing a degree in engineering due to their pre-entry characteristics (e.g., SAT scores, high school GPA, class rank, etc).*

