

Mentoring as a Statistical Educator in a Christian College

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Abstract

In this paper, I present principles based on more than thirty years of intentional mentoring as a statistical educator in a Christian college. I believe this mentoring has been enhanced due to the setting—a Christian college, and the discipline—statistics. I review distinctives of the Christian college setting that positively impact mentoring in any discipline with respect to the mentor, the mentee, and the pervading campus atmosphere. I focus on mentoring as a statistical educator by specifically considering the following: attracting students to the discipline of statistics, preparing students for careers using statistics, and preparing students for graduate study in a statistics-related field. For each, I consider principles of successful mentoring in statistics at the undergraduate level regardless of the type of institution and how these principles can be expanded within the context of a Christian college.

1 Introduction

In this paper, I present principles based on more than thirty years of intentional mentoring as a statistical educator at Messiah College, a Christian college of the liberal and applied arts and sciences. In addition to two introductory statistics courses provided as a service to other departments, Messiah's statistics program includes eight more mathematically-based courses of which six can be chosen to form a statistics minor. This minor was initiated in 1985 with the first cycle of that program completed in 1987. One measure of the program's success is the large number of strong students who have decided to pursue graduate work in a statistics-related field. To date, more than forty-five students have done so at more than thirty schools.

As I have reflected on reasons for the success of the statistics program at Messiah College, I conclude that mentoring plays a significant role. My *thesis* is that *this mentoring is efficacious due to two factors: the setting - a Christian college, and the discipline - statistics*. Several years ago, a graduate encapsulated these two factors as follows.

“There are just a few pivotal moments in my life that have been transformational, and you have been part of two of them - encouraging me in the field of statistics (both to take the minor and to pursue graduate studies) and helping me to reconcile the secular and the sacred in my life's pursuits. I would be foolish to think I have arrived where I am today because of myself; that's

why I like to take the opportunity to thank those who have given me a hand up along the way, like you.”

In this paper, I use *mentor* as both a noun and a verb. As a noun, a *mentor* is “someone who teaches or gives help and advice to a less experienced and often younger person” (Merriam-Webster (2016)). As a verb, *mentor* is the action of being a mentor. A *mentee* is the one being mentored. At Messiah, my mentoring has been purposeful but informal. My interactions could be scheduled (e.g., during a class or in my office) or incidental (e.g., in the library or dining hall). The mentee is always a student, and my primary goal is to help that student use their God-given gifts in a way that brings maximum satisfaction and fulfillment to the student.

I assume that the reader already has some appreciation of the role of mentoring in higher education. For those who do not, perhaps because they were never mentored themselves, I encourage consulting the rich body of literature which espouses the benefits of mentoring in higher education. I direct the interested reader to Johnson’s (2007) thorough consideration of the topic which includes an extensive list of references. Zachary (2000) considers the higher education setting, as well as business and nonprofit settings, and also includes an extensive list of references.

“Good mentoring relationships (mentorships) in academic settings are dynamic, reciprocal, personal relationships in which a more experienced faculty mentor acts as a guide, role model, teacher, and sponsor of a less experienced student (protégé)” (Johnson (2007: ix)). Mentoring is much more than academic advising. Many of my most significant mentoring relationships involved students who were not my formal academic advisees.

While mentoring is done to some extent at all undergraduate institutions, religious or secular, and in all disciplines, statistics or otherwise, the nature of mentoring can depend on the type of institution and the discipline involved. For example, if the spiritual dimension is included, mentoring at a religious institution may be more comprehensive than that at a secular institution.

The intended audience for this paper consists of educators in Christian colleges, in general, and statistical educators in Christian colleges, in particular. While readers from wider audiences can benefit from the ideas presented in this paper, those from the target audiences should benefit the most.

I develop my thesis by focusing on the setting in Section 2 and the discipline in Section 3. In Section 2, I review distinctives of the Christian college setting that have a positive impact on mentoring in any discipline. I consider the mentor, the mentee, and the pervading campus atmosphere. In Section 3, I focus on mentoring as a statistical educator by specifically considering the following: attracting students to the discipline of statistics, preparing students for careers using statistics, and preparing students for graduate study in a statistics-related field. For each, I consider principles of successful mentoring in statistics at the undergraduate level regardless of the type of institution and then how these principles can be expanded within the context of a Christian college. I conclude by revisiting the thesis of this paper in Section 4.

2 The Christian College as a Setting for Mentoring

2.1 Overview

In this section, I focus on a particular type of mentoring - between a Christian educator and a Christian student within a Christian college. I look at the Christian college as a setting for mentoring by considering the key factors - the *mentor*, the *mentee*, and the *campus atmosphere* - that influence the mentoring process rather than the mentoring process itself.

In describing mentoring in Christian higher education, Penner (2001: 9) asserts that the Christian college is a natural setting for mentoring. "The Christian community has incentive to be a mentoring community based on its nature as a caring family, explicit directives for spiritual elders to equip youngers, and the mentoring examples of Barnabas and Paul. At heart, mentoring is about being concerned not only with one's own success but also that of one's colleagues and students. Much of such successful facilitating requires not only the transmission of information but also the care and encouragement of persons. To the extent we are able to do this well, we will achieve the end goal of education."

2.2 The Mentor

In this paper, I focus only on mentors who are educators. In an explicitly Christian college, I will assume each educator has a personal faith commitment to Christ that can be articulated. Such a commitment can be expected to shape each part of the educator's life - private and professional. Using Jesus Christ as their example, all Christians are urged to strive to attain qualities or virtues such as selflessness, humility, gentleness, graciousness, and patience (Ephesians 4:2, Philippians 2:3, Colossians 3:12). When these qualities are reflected in the life of the educator, that educator's mentoring will be mentee centered. That is, mentoring will focus on what is best for the mentee, not on what is best for the mentor (e.g., developing a personal professional portfolio.)

Hopefully, Christian educators think of their position as a calling or vocation and not just a career. With this view, an educator at a Christian college is in that position because they sensed a calling to teach specifically in a Christian college. The deliberate choice of this type of teaching venue should shape how educators view their responsibilities to their students. Appropriately telling students of this choice sends them a powerful message.

A Christian mentor is more likely than a nonChristian mentor to appreciate a mentee's other interests and motivations such as vocational Christian service or ministry as well as the fact that materialistic concerns may have little influence on one's choice of a vocation. Recognizing the importance of the individual, the Christian mentor should not adopt a one-size-fits-all approach and can help the mentee navigate through the discipline/ministry decisions.

2.3 The Mentee

In this paper, I focus only on mentees who are students. In general, in an explicitly Christian college, one cannot assume each student has a personal faith commitment to Christ that can be articulated. However,

in this paper, I assume that the students being mentored will have such a personal faith commitment. One manifestation of this commitment is that students should have a keen sense that their natural abilities are God-given, that God expects them to be good stewards of those abilities (Matthew 25:14-30), and that God has a plan for how those abilities should be used vocationally. This perspective helps them through the tough times when they might otherwise doubt the path they have chosen (e.g., while in a particularly challenging course or in graduate school).

The idealism which incoming students bring into college often has a “save-the-world” theme. If a Christian student combines this idealism with the example and call of Jesus Christ to be a servant, the student can be motivated by a mentor in additional ways. Examples in the discipline of statistics will be given in the next section.

For most students, a major factor in the choice to attend a Christian college instead of a secular one is that the college is Christian. While likely not fully understanding the nature of a mentoring relationship, or perhaps not even being familiar with the word “mentoring,” these students expect to relate to faculty members in a Christian college differently than they would in a secular institution. Thus, these students enter college with an expected appreciation of at least some of the distinctives that a Christian mentor provides.

2.4 Campus Atmosphere

When educator-student mentoring is done in a Christian college, it most likely will involve a Christian mentor with a Christian mentee. As noted before, this is the nature of the mentoring relationship I assume in this paper. A Christian-with-Christian pairing can occur on a secular campus, but it will occur with much less frequency.

A significant factor that makes Christian-with-Christian mentoring on a Christian campus different from that on a secular campus is the pervasive Christian atmosphere that exists on the Christian campus. The messages conveyed in the Christian-with-Christian relationship are reinforced by those messages conveyed in most, if not all, aspects of the student’s curricular and cocurricular life.

One such message is the importance of a sense of vocation. It is easy for students to confuse the concept of career with life calling or vocation. The concept of Christian vocation should be more motivating to Christian students than the concept of vocation in general because it combines the concept of vocation with the concept of Christian responsibility.

In a Christian college setting, the mentor and mentee are likely to share more core values resulting in the mentee trusting more of what the mentor says. This trust is based on something more than expertise. Shared core values can extend the mentor-mentee relationship into a friendship and/or fellowship relationship.

Closely related to the shared core values in a Christian college setting is the holistic nature of mentoring there. In a Christian college, mentoring can address the spiritual component of a student’s life in addition to the usual academic and personal components. The spiritual component is crucial in the mentor’s modeling of a sense of vocation. In broad terms, the academic component involves the mentor’s profession or career while the personal and spiritual components involve the mentor’s calling or vocation. Thus, the setting of a Christian college is more conducive to the mentor instilling a sense of vocation in

the mentee.

3 Mentoring as a Statistical Educator

3.1 An Overview

A substantial part of the general statistics literature on mentoring deals with one statistician mentoring another (i.e., where both the mentor and mentee are professional statisticians). For example, Allen (2005) is recognized for his expertise in mentoring and was the first recipient of the Jeanne E. Griffith Mentoring Award which was established to encourage mentoring of junior staff in the Federal statistical system. His experience is primarily in the statistician-with-statistician context. His insights on mentoring are based on “40 years of observing individuals who achieved solid mentoring results” (Allen (2005: 9)) and the principles he presents are applicable in a wide variety of fields.

In the statistics *education* literature, mentoring is usually considered only in a limited sense, at best touching on one of the three areas in the following subsections: *Attracting Students to the Discipline of Statistics*, *Preparing Students for Careers Using Statistics*, and *Preparing Students for Graduate Study in a Statistics-related Field*. There is no attempt to integrate all three areas.

An exception is the literature describing the five-year \$1.3 million National Science Foundation grant awarded to Legler, Roback, and Richey (2004) at St. Olaf College. St. Olaf already had a well-developed undergraduate statistics program prior to the awarding of this grant. The goals of this grant addressed four areas: the three areas in Subsections 3.2 through 3.4 and a fourth area which was one of two primary goals for the project, attracting statistics PhD's to faculty careers in four-year colleges. (Because of the ever-increasing demand for statisticians with graduate degrees, the other primary goal of the project was to increase the number of graduates from four-year colleges who pursue graduate study in a statistics-related field.) Legler, Roback, et al. (2010) report on one work product resulting from this grant, the creation of an interdisciplinary undergraduate research program. This program complements the already-existing robust student research programs at St. Olaf, particularly in the sciences, and builds on the relatively unique interdisciplinary collaborative nature of the field of statistics.

Mentoring by a statistical educator is facilitated when statistics is a respected discipline within the college. Rarely at the undergraduate level is statistics housed in its own department. It is often combined with mathematics with or without other disciplines. In this setting, it is not uncommon for statisticians to be regarded as somewhat “second-class citizens” by mathematicians. Some of this is due to mathematicians not understanding what makes professional endeavors (e.g., scholarly research) in statistics different from those in mathematics. This treatment can also be fueled by professional rivalry or selfishness. As can be seen in Subsection 3.2 and elsewhere, there are aspects of statistics that may make it more attractive to students as a career option than mathematics.

Hopefully, this mathematics-statistics alienation is not present, or at worst minimal, in Christian colleges. A refreshing example is my experience at Messiah College where statistics is housed in a mathematics, physics, and statistics department. Instead of alienation, I have experienced a very supportive environment. My mathematician colleagues are happy for the success of our statistics graduates and do not resent their choice of statistics over mathematics. Through their teaching of mathematics, they are an integral part of their academic preparation.

3.2 Attracting Students to the Discipline of Statistics

One may tend to think of mentoring taking place with students that are already part of one's program or discipline, but as noted by Gray (2005), mentoring can be used to recruit students into one's discipline. Landes (2009) considers problems and solutions in recruiting individuals into the profession of statistics. While he recognizes the importance of attracting students to the discipline of statistics, his paper is broader in scope than the topic addressed in this section. He deals with the public's misperception of a statistician's professional activities. He defines "public" as those outside of the statistics profession. Landes organizes the problems and solutions drawn from his extensive review of the statistics literature on these issues. He also suggests some strategies drawn from a more general body of literature, including literature specific to other disciplines, which may be applicable for statistics. Landes cites Eby (2006) as providing a helpful list of suggestions that statistical educators can use to attract students to the discipline of statistics and cites some of the suggestions specifically. Eby (2006) wrote to a secular audience, and thus does not suggest ideas unique to the context of a Christian college. I now consider such ideas in this section. However, I first consider at what point in the process mentoring should begin.

It is important to start early. One can start recruiting students even before they begin college by speaking to high school classes. This is particularly helpful in the discipline of statistics because, as Landes (2009) notes, most individuals have little or no understanding of a professional statistician's activities. One of our graduates who is a high school teacher uses Skype to have professional statisticians interact with the students in her *AP Statistics* class.

A more formal mentoring relationship begins in college. The educator must take the initiative in establishing the mentoring relationship. As Johnson (2007: 119), writing from a secular perspective, notes, "...owing to developmental immaturity and low awareness of the value of mentoring, undergraduates may be less assertive and intentional in pursuing potential mentors. In spite of these obstacles, mentoring college students can be deeply rewarding for faculty and genuinely life-altering for undergraduates. Rarely will you have the opportunity to more profoundly shape both a student's life and career path than in the context of bachelor education." Understanding the idea expressed in the last sentence should strongly motivate Christian educators.

One of the more attractive features of statistics to students is the increasing gap between the demand of professionally trained statisticians and the supply of such professionals. Lindsay, Kettenring, and Siegmund (2004: 406) address the seriousness of this shortage in their report on the future of statistics. Dixon and Legler (2003) focus on the serious shortage of statisticians needed to work on applications in the biological sciences. Such statisticians are called biostatisticians. (Biostatisticians are involved in the development of new drugs, the evaluation of the effectiveness of medical procedures, efforts in fighting disease and other public health problems, and environmental issues.) In presenting this message in the Christian college setting, the mentor's emphasis can be opportunity-driven (i.e., the many opportunities that exist to use one's God-given abilities) in addition to career- and dollar-driven.

Knowing that there is a greater likelihood of being employed in one's actual field allows students to be more focused in their preparation. It is reasonable for them to think that what they are doing now in college will likely be closely related to what they will be doing later. The Christian student who has a sense of God-given abilities and the responsibility to use them for His glory can especially appreciate this opportunity to develop their abilities in a purposeful manner.

The shortage of professionally trained statisticians also allows a statistical educator (mentor) to recruit

students into the discipline with integrity, something which should be quite important to the Christian educator. One would expect all educators to be very enthusiastic about their respective disciplines. A statistical educator can say, with integrity, to a prospective student, “If you pursue this discipline and do well in your studies, there is a very great likelihood, particularly with a graduate degree, that you will find a meaningful professional position.” Even if the bachelor’s degree is the terminal degree, there is a greater likelihood of employment in a discipline-related field, in this technological and data-driven age, for the student with preparation in statistics.

Another attractive feature of statistics is the breadth of application. Wherever there are data with variability, there is the opportunity for the application of statistics. There is virtually no discipline devoid of data. No other scientific discipline can be applied in more discipline areas than can statistics. With the ever increasing presence of data-driven research, this supremacy is likely to be maintained. Beginning in introductory statistics classes, the educator should deliberately make the students aware of the breadth of application. Encountering real-life examples helps the students see purpose in studying the discipline. Having statistical consulting experience is particularly beneficial for an educator since an overview of some of the diverse applications encountered in those experiences can be presented in class.

Outside speakers can speak of statistical applications in their areas. Practitioners not only bring relevance to their presentations, but they also tend to be enthusiastic about their discipline. Possible speakers are graduates from your institution who are now in graduate school in a statistics-related field or have already earned a graduate degree; professional statisticians from academia, industry, or government; and current students with statistics-related internships. Choose speakers who will describe statistical applications, promote statistics as a career, and/or encourage graduate study in statistics. When the speakers are Christians (e.g., former students), have them include the concept of Christian vocation in their presentations. Former students are particularly effective recruiters because current students often perceive themselves to be more similar to former students from your institution than to faculty members. Thus, they may be more open to their encouragement and suggestions. Also, these former students likely were involved in a mentoring relationship during their undergraduate years and can help current students see the value of such relationships.

The breadth of application should be particularly attractive to Christian students who may have more diverse interests (e.g., ministry) than other students. Not only can Christian students have interest in most typical areas of application, they can also be interested in all sorts of ministry-type applications. Presentations about ministry-type applications can be well received by students in a Christian college. For example, their statistical skills can be used in church and parachurch organizations that need help in designing studies and analyzing data. Some specific examples of ministry-type applications are presented in the following sections.

As noted in Subsection 2.3, many students enter college with a desire to make a difference. Christian students can have an especially strong desire to work on “things that really matter.” By its breadth of application, statistics is a discipline where that can be done. The following two examples reflect this desire and its discipline fulfillment in statistics.

One former student, who was quantitatively strong, entered college with the career goal of “helping people.” He initially chose to major in one of the behavioral sciences because he did not see how he could use his quantitative strengths to achieve his goal. While taking an introductory statistics course for nonmajors, he learned otherwise. Sometime later, he switched his major to mathematics and took several statistics courses. He then pursued graduate study in statistics. Today, he is a PhD statistician in

one of the major cancer research centers in the world. As a young professional, he has already made an extraordinary number of significant contributions in his field and has given invited presentations on six continents.

Another former student entered college with the goal of being a mathematics teacher. Along the way she was introduced to, and chose to minor in, statistics. Initially, she had no graduate school plans, but through several statistics-related internships, listening to professional statisticians speak in her classes, participation in a collaborative research project, and extensive mentoring, she saw the benefits of graduate study in statistics. Today, she is a PhD biostatistician in another one of the major cancer research centers in the world.

Since students often have the misperception that a statistician works alone or only with other statisticians, it is essential to communicate to students that statistics is very much a collaborative discipline. Its collaborative nature is emphasized by Brown and Kass (2009). In fact, its collaborative nature is relatively unique. A statistician can be part of virtually any research effort since most involve data. As mentioned before, real-life examples should be presented to show the diversity of statistical application. Such examples should also be used to show the discipline diversity among team members on a collaborative project. Being part of a collaborative effort in another discipline requires the statistician to learn something about that discipline. For those students with a real love of learning, the prospect of doing this professionally is very appealing. Christian students can see this as an opportunity to continue learning, using their God-given abilities. Collaborative work allows the professional impact of a statistician to be much wider. A Christian can also see this as an opportunity for the personal impact through one's profession to be widened. One graduate reports that his being a successful statistical scientist provides him opportunities to share his faith in situations that would be otherwise closed to him.

Since most real-world problems have data associated with them, students can more easily envision their involvement in the solution by using their statistical skills in a collaborative setting. For Christian students, these real world problems can be in ministry-type situations. Thus, they can see using their professional skills as a statistician to build on their Christian call and commitment to service.

Another appealing aspect of being a statistician is that one must be a holistic professional. This goes against the popular misperception of a statistician as a "nerd." Statistics is very much a people-related discipline, a feature that is attractive to the Christian student who has a strong commitment to reflect Christ in every aspect of their life and wishes to interact with others frequently. A successful statistician needs good communication skills - written, oral, and interpersonal. Being able to work with others on a team is essential.

While ethical and expertise considerations are present in all disciplines, they often take on added importance in the application of statistics because data-driven research decisions can affect every area of life. Since Christians are called to be people of integrity, they should be especially sensitive to ethical considerations, and a discipline that regards such considerations seriously could be attractive to them.

First, I consider expertise. There is something about the discipline of statistics that too often tempts individuals with insufficient statistical training to perform statistical work. Such individuals are more likely to do things inappropriately out of ignorance; hence, the importance of statistical training. That importance should be stressed to students, particularly those in beginning courses. Students in these courses should also be cautioned about independently attempting to do too much statistically. The syllabus for my introductory course contains the following paragraph: "My goal is not to make you a

statistical practitioner but rather an intelligent consumer of statistical information. Knowing that valid research results are very much dependent on careful consideration of the statistical aspects will lead you to seek professional statistical help in most major research projects and, also, to review the research results of others with appropriate caution and skepticism.”

Second, I consider the ethical. Individuals, regardless of level of training, can willfully do things inappropriately. These are ethical violations. It is very important to talk about these dangers in class. It should be noted that most people cannot distinguish between erroneous results based on insufficient statistical training and those based on ethical violations, but the impact of either type of result can be quite serious.

Finally, attempts to attract students to the discipline of statistics (i.e., recruiting) can be done corporately in class situations and individually with students having quantitative potential. The personal or individual contact by the statistical educator is impressive to the student. Statistical educators should not become discouraged. Successful recruiting can be a slow process. They should be persistent since there may be only a few recruits initially. However, success breeds success. Some of the most effective recruiters are students who have already been recruited into the discipline. Think of recruiting efforts as “planting the seed,” a concept familiar to many Christians. I attest that one can be pleasantly surprised by the results of these efforts, not knowing where they will take effect and maybe not seeing the results for years.

3.3 Preparing Students for Careers Using Statistics

In this section, I consider preparation applicable to all statistics students - those who attend graduate school and those who do not. As much as possible, this preparation should be attentive to those features of statistics that attracted students to the discipline. A major component of the preparation is the coursework. As long as other appropriate courses are taken, a student will never be disadvantaged by taking too many statistics courses. ASA (2001a), Dixon and Legler (2003), and Eby (2007) give course suggestions. Since the theoretical foundation of statistics is mathematics (i.e., why statistical methods work), I believe strongly that a mathematics-based statistics minor provides a better preparation for a career using statistics than does a statistics major. This does not imply that all statistics minors need to be mathematics majors, but they must be quantitatively strong.

The American Statistical Association (ASA) Undergraduate Statistics Education Initiative (USEI) (ASA (2001a)) curriculum guidelines for undergraduate programs in statistical science (ASA (2001b)) recommend development of the following five skills: statistical, mathematical, computational, nonmathematical, and substantive area.

The first three skills should be primarily developed through the coursework required by the statistics program. Nonmathematical skills include written, oral, and interpersonal communication skills which are necessary for a holistic professional. These should be primarily developed through the general education requirements, if they are strong, of all undergraduate programs. They can also be further developed through the coursework required for the statistics program, statistics-related internships, and/or collaborative projects. Development of skills in a substantive area can be accomplished through a second major, minor, concentration, and/or work on an interdisciplinary collaborative project. Study in this substantive area can provide a good foundation for current or future interdisciplinary work.

In Subsection 3.1, I briefly described the work of Legler, Roback, et al. (2010) at St. Olaf College - the creation of an interdisciplinary undergraduate research program called the Center for Interdisciplinary Research (CIR). In the CIR, statistics students work collaboratively on a variety of interdisciplinary research projects. Each research team consists of a statistical educator mentor and a faculty member mentor from the primary discipline of the project. These authors see the CIR as an effective recruiting tool for the discipline of statistics, a means of providing preparation for a career in statistics, and primarily a way of encouraging students to pursue graduate study in a statistics-related field.

With respect to the transportability of the St. Olaf CIR model, it appears that relatively few colleges possess the necessary infrastructure (e.g., undergraduate research centers and faculty release-time funding) in student-involved interdisciplinary research to support the full CIR model. However, there are possibilities for more modest forms of the model. At Messiah College, the Collaboratory for Strategic Partnerships and Applied Research “adds value to classroom learning by enabling participants to apply academic knowledge and live out Christian faith through imaginative, hands on problem solving that meets needs brought . . . by Christian mission, relief, and development organizations and businesses. . . . projects enable students to engage classroom fundamentals in an authentic client provider environment. Student leaders run the Collaboratory organization in partnership with the educators who mentor them. Collaboratory projects connect the scholarship and service of faculty members directly to student learning.” (Messiah College (2016: 1)).

Over the years, several statistics students have become involved in Collaboratory projects requiring statistical expertise. While no statistical educator was a formal member of any of these Collaboratory teams, statistical educators were consulted from time to time on all of these projects.

Two students were involved in the multiyear *Mali Water and Disabilities Project* in Mali, West Africa. The project had goals of assisting disabled individuals in three ways - accessing and using hand pumps, transporting and using water domestically, and accessing and using latrines. (A major sponsor of this project was the Conrad N. Hilton Foundation.) One student was a member of a site team that visited Mali during the project. Her role on that trip was to begin the statistical assessment of water access by conducting survey work. That student is now a PhD biostatistician working on major health issues. The other student on that project pursued graduate study in a statistics-related field dealing with public health issues in developing communities.

Another statistics student was part of the Collaboratory Education Group working on the *Strengthening Mathematics Literacy Project*, a two year project of curriculum development and teacher interaction in Burkina Faso. Her project required her to travel with a site team to Burkina Faso to conduct a statistical survey of educational practices and levels in three regions of the village. Her work was summarized in a departmental honors paper, “Educational Assessment in Burkina Faso, West Africa.” This student hopes to use her statistical expertise in working with a national or international organization focusing on needs in third world countries.

Still another student provided statistical expertise for the Collaboratory Water Group on the *Village Water Ozonization System (VWOS) Project*. This project’s goal was to develop and implement a simple small scale water purification system to meet the needs of partnering Honduran communities. This student went on to complete his doctorate in applied mathematics.

Whenever possible and relevant, Christian values should be incorporated with a topic. In statistics, a primary way of doing this is by considering ethical issues. In the previous section, I noted that ethical

considerations are very important in the application of statistics, more so than in many other disciplines. The pressures to compromise in grant-driven and profit-motivated research environments are strong and Christians need to be able to withstand them. The ASA's ethical guidelines can be found on its web site (ASA (1999)). In a Christian college setting, educators can take the consideration of ethics to a deeper level by adding morality to the consideration. The ethical code is the code of conduct for the profession. The moral code is the code of conduct for all of life. A Christian's moral code should exceed, and include, their ethical code. It is not unusual for a statistician to serve as an expert witness. However, a Christian statistician should not be a "hired gun." The Christian should not only consider the ethical aspects of the project but also the moral aspects. For example, there may not be anything ethically wrong with a statistician providing expertise in a study of the economic viability of a proposed location for a state-sponsored gambling facility. However, a Christian statistician may feel it would be morally wrong to participate in such a study.

3.4 Preparing Students for Graduate Study in a Statistics-related Field

An obvious part of preparing students for graduate study is coursework. In an invited presentation at the 2007 Joint Statistical Meetings (JSM), Eby (2007) provided guidelines for courses that should be part of the undergraduate preparation for graduate study. Dixon and Legler (2003) and Legler, Roback, et al. (2010) also give course suggestions. If necessary and possible, departments should supplement students' programs with independent studies and/or special topics courses. To do so requires institutional support. Since directing independent studies may not be rewarding monetarily, these efforts may require professional sacrifice.

At St. Olaf, "mentoring undergraduates in the field of statistics with the aim of encouraging them to attend graduate school in statistics has been the overarching goal" (Legler, Roback, et al. (2010: 61)). I recommend a broader view of mentoring. Mentoring should include all statistics students, not just those intending to pursue graduate study. Because of the wide spectrum of graduate programs in statistics, more students are capable of pursuing graduate studies than one might realize. The goal should be to match the student with the graduate program that is most appropriate. Consideration of what is best for the student is paramount. While one might love to see students enter prestigious graduate programs, such programs are certainly not the best fit for every student with graduate school potential. Hopefully, the Christian statistical educator will focus primarily on the student's need and not so much on one's professional or undergraduate statistics program reputation.

Not all students with graduate school potential will pursue graduate study. The statistical educator must respect the student's sense of calling and unconditionally accept it if that calling leads the student somewhere other than graduate school. Because of shared core values, the Christian mentor should be better equipped to respect and accept the student's calling. The overarching goal should be what is best for the student, whether or not they go to graduate school.

Several years ago, one student who was eminently qualified to pursue graduate study in a statistics-related field chose instead to accept a position in full-time ministry. Two years later, she told me how much she appreciated my support of her call into ministry even though she had the ability to do graduate study.

Another student, the one quoted in Section 1, with a ministry-sensitive heart chose to pursue graduate study. He and his wife, who grew up on a foreign mission field, had a ministry to international students

while in graduate school. Now that he is a professor, that ministry continues through their involvement in an international church. While he was an undergraduate, I mentored him about incorporating the academic (e.g., statistics) with his call to and love of ministry.

Perhaps the greatest area where a mentor needs to encourage is in convincing students that they have graduate school potential. An experienced mentor has the advantage here. If you have a record of former students achieving success in graduate study, ask current students to rely on your judgment in assessing graduate school potential. That is, you are asking them to trust you. That should be relatively easy for them to do if you have demonstrated your trustworthiness to them throughout the mentoring relationship. If you do not yet have a record of former students achieving success in graduate study, use your ability as a graduate student and that of your graduate school peers as your frame of reference.

The example of one former student summarizes well the role of mentoring particularly with respect to preparation for graduate study. She is appreciative of the opportunities to study the extra things she needed for graduate school but did not know that she needed. She regards the persistent encouragement, particularly with respect to graduate study, as a very positive factor in her experience, stating that she probably would never have considered that option if I had not continually put the thought in her head. Today, she is a biostatistics professor in an R1 university.

4 Conclusions

The title of this paper, *Mentoring as a Statistical Educator Within the Context of a Christian College*, might suggest a rather narrow focus. However, my thesis, *this mentoring is efficacious due to two factors: the setting - a Christian college, and the discipline - statistics*, allows for the possibility of broader considerations.

To show the increased positive impact of a Christian college setting on a mentoring relationship, I also considered positive impacts of a mentoring relationship in any college setting. To show the added possibilities for mentoring as a statistical educator in a Christian college setting, I first discussed mentoring as a statistical educator in any setting. As a statistical educator in a Christian college, I believe the impact is greater than the sum of the impacts of the parts - the Christian college setting and the discipline of statistics.

I close with my vocational life verse which I embraced early in my career at Messiah College. “You yourselves are our letter of recommendation, written on our hearts, to be known and read by all” (2 Corinthians 3:2 English Standard Version). This verse shows the regard of a mentor for the mentee and the disseminating nature of mentoring. Several years ago, a former mentee affirmed my life calling by independently quoting this verse to me.

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