Mentoring Young Statisticians: Facilitating the Acquisition of Important Career Skills

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Summary

Statistics plays a very important role in science and research. The future of statistics as a field depends heavily on the training and mentoring of young statisticians by mature, experienced statisticians. The purpose of this paper is to discuss the role of mentoring in the development of future statisticians. We describe the importance of mentoring young statisticians and strategies that young statisticians can use to select a mentor. Mentoring of young statisticians is a model that can facilitate knowledge transfer and experience sharing for the betterment of statistics and human development. We offer suggestions for ways in which the mentor can and help their mentee acquire important career skills including suggestions for other things that young statisticians can do on their own to enhance career development. We share our experiences on mentoring and offer suggestions that people can use in their mentoring relationships.

Keywords: *Mentoring, mentur, mentee, protégé*

Résumé

La statistique joue un rôle important en science et dans la recherche. L'avenir de la statistique en tant que discipline dépend en grande partie de la formation de jeunes statisticiens et de leur mentorat par des statisticiens plus âgés et expérimentés. Le but de cet article est de discuter du rôle du mentorat dans le développement des futurs statisticiens. Nous présentons l'importance du mentorat des jeunes statisticiens et des stratégies qu'ils peuvent développer pour se choisir un mentor professionnel. Le mentorat de jeunes statisticiens est un modèle qui peut faciliter le transfert de connaissance et le partage d'expérience pour l'amélioration de la statistique et du développement humain. Nous proposons des voies par lesquelles le mentor professionnel peut aider son protégé à acquérir des compétences professionnelles, en suggérant notamment d'autres actions que les jeunes statisticiens peuvent entreprendre par eux-mêmes pour améliorer leur carrière. Nous partageons notre expérience de mentors et présentons des suggestions qui peuvent être utilisées par les mentors professionnels dans les conseils destinés à leurs protégés.

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1. Background

The Canadian English Dictionary and Thesaurus [1] defines a mentor as "a wise and trusted advisor or guide" and mentoring as "the practice of assigning a junior member of business staff to the care of a more experienced person who assists him [her] with his [her] career". Mentor is synonymous with "guide, teacher, coach, advisor, tutor, instructor, counselor, guru" [1]. A formal definition for mentee is not provided in this dictionary, but we shall use mentee to refer to a [young] person whose career is under the care of an experienced adult. We will occasionally use protégé as a synonym for mentee. Thus, mentoring is a relationship between a mentee [usually a young a person] and a mentor [usually a caring and more experienced adult] whose primary purpose is to help the mentee to define individual career and life goals and find ways to achieve them. A mentors need not necessarily be a friend although he/she may become so in the course of the mentoring process. Mentoring can take place in various forms including face-to-face interactions, by e-mail, telephone or telefax.

There is mounting evidence in the literature indicating that mentoring is an important element for career development of young scientists. Our initial search of Pubmed using the terms "mentoring or mentorship or mentor" revealed 4251 hits. A scan of the literature shows the use of mentoring to be prevalent in several medical fields, including medicine [2-6], nursing [7-10], and surgery [11-13]. We expanded our search to Web of Science (WOS) and Journal Storage (JSTOR). Table 1 shows the results of the search based on different search strategies in the three databases.

Table 1: The Number of Hits in Pubmed, Web of Science and JSTOR As searched on March 3, 2006

Search strategy	Pubmed	Web of science	JSTOR
(mentoring or mentorship or mentor) and statistician	0	4	354
(mentoring or mentorship or mentor) and biostatistician	0	0	52
(mentoring or mentorship or mentor) and biostatistics	4	1	284
(mentoring or mentorship or mentor) andstatistics	332	20	3535
(mentoring or mentorship or mentor) and (statistics OR statistician)	332	23	3539

JSTOR yielded the largest number of hits for each search strategy. However, many of the retrieved publications did not appear to be relevant to the topic. Overall, these numbers indicate the prevailing scarcity of literature on mentoring in the statistics field. This may also be an indicator of lack of systematic mentoring of young statisticians.

The purpose of this article is to discuss the role of mentoring in the development of future statisticians. The rest of the article is organized as follows: In the next section, we describe the importance of mentoring young statisticians; Section 3 describes strategies that young statisticians can use to select a mentor. In Section 4, we discuss the role of a mentor and provide some examples of things that the mentor can do to help their mentee acquire important career skills. Section 5 discusses some additional measures that young people can take on their own to enhance career development, and Section 6 presents some concluding remarks.

2. The Importance of Mentoring Young Statisticians

The training of statisticians takes place in many statistics programs across all of the five continents. While the curricula may vary from program to program, there is sufficient evidence that there is some consensus on the key skills that all statistics training programs should endeavor to deliver [14-22]. However, there is little on how to help young statisticians to develop their careers once they join the work force. Many programs, whether undergraduate or graduate, do not incorporate mentoring as part of their elements. Mentoring is different from supervision. The latter usually focuses on guiding a student on their education plan through proper selection of courses and thesis write-up. On the other hand, mentoring goes beyond graduate education to foster career development at the workplace.

Once they join the workforce, many young statisticians are left to learn important career skills by trial-and-error. There are some tips on career development for statisticians in the pharmaceutical industry [23, 24], research [25] and women in academia [26]. We propose that mentoring can greatly shorten the learning period and improve the process of acquiring skills that are important for career development. Bruce Alberts (from the US National Academy of Science) [27] states that, "The Future of Science… so important that the health and prosperity of the worlds depends on skillful mentoring of the new generation by the one that precedes it".

This sentiment is shared by several scientists including El Hoover [28] who writes that, "Mentoring is an essential component of a successful career in

any profession…". So important is mentoring that Garfield [29] describes it as an "ethical imperative and pragmatic necessity". The science fiction writer, H. G Wells [30], predicted in the early 1900s that, with developments in technology, statistical thinking "will one day be as necessary for efficient citizenship as the ability to read and write".

As in the past, today statistics continues to play a very important role in science and research, and it is a key ingredient in the advancement of human development [31-34]. It is, therefore, crucial that the young generation of statisticians is mentored appropriately to help them acquire the skills needed for the responsibilities they will take on in the future. In the next section, we describe some techniques that young statisticians can use to identify individuals that can act as mentors to them.

3. Identifying a Mentor

We now focus our attention to the mentee and provide some advice on how to select a mentor. We offer no scientific evidence to support our advice and/ recommendations, but these are based on the personal experience of one of the authors [Lehane Thabane] in his mentoring relationship with the third author [Charles Herry Goldsmith], and some of the mentees of both authors. The following steps can be used to guide the selection of a mentor:

I Identify your career goals: Prior to engaging in a mentoring relationship, it is essential to identify one's career goals. Some can be short-term while others may be long-term. For example, depending on the type of job and level, you may identify goals that relate to research, teaching (education) or organizational politics. Some young people may find it difficult to identify specific career goals and this may be sufficient reason for one to get a mentor. If this is the case, then move to Step II. Part of the mentor's role is to help the mentee identify career goals and to focus on the feasibility of these goals. It is important to be pragmatic in performing this step: the goals should be achievable.

II. Identify a potential mentor who matches the goals identified in Step I: Experience and anecdotal evidence suggest that people who make good mentors are those that set out to become mentors. Therefore, it is important that [the mentee] identify someone who has a real interest in mentoring young people. Do not hesitate to ask potential mentors if they are really interested in mentoring. Below are some desirable attributes for a mentor [35]:

a. Competence – a mentor has to be competent in some area of statistics;
b. Respect – (s)he should have respect of his or her peers;
c. Power/Influence – (s)he should have power, particularly for dealing with organizational politics;
d. Experience – (s)he must have experience in the role as a statistician, educator or researcher;
e. Political Acceptance – this is somewhat related to power/influence\ and having respect of his or her peers locally or outside the institution;
f. Honesty – a mentor should be honest in giving both positive feedback and constructive criticism. This is essential in building trust between the mentee and the mentor;
g. stablished Record of Mentoring – an ideal mentor would be someone with an established track record of working successfully \ with young statisticians. However, there are many individuals who \ may care about developing young people but may not have a formal mentoring relationship with them; and
h. Respect Confidence – The mentor should keep the discussions to him/herself and not broadcast them to others who may need to evaluate the mentee for tenure, promotion or career awards.

III. Set up a schedule of regular meetings with the mentor: The first the meeting with mentor sets the tone for the relationship. It is important to document the minutes of the meetings for later reference. Clarify the goals of the mentoring relationship; discuss methods of communication, how to resolve disagreements or conflicts when they arise and ask for feedback on goals and discuss strategies to achieve them. Subsequent meetings should provide feedback on the progress made on tasks related to the goals. The discussions may also be on the pros and cons of different choices at different times in the mentee's career. It is essential to keep the curriculum vitae (CV) up-to-date in the format required by the institution and ensure that it properly reflects accomplishments. It is important to acknowledge feedback and the efforts of the mentor. The mentee should do their best to follow on the advice that the mentor provides unless there is a good eason not to, which should then be discussed openly. A good mentor has a real interest in their mentee's success.

Both the mentee and the mentor should regularly evaluate the relationship and look for ways to make it better.

The Internet provides further information on mentoring. Examples include http://www.peer.ca, which provides several resources on peer mentoring including a list of top publications on the topic; and http://www.nwrel.org/mentoring/resources.html, which maintains a list of web resources on mentoring.

4. The Responsibilities of a Mentor

4.1 Montor's role

Being a mentor is an important role with serious responsibilities. Here we describe some of the practical things that a mentor can do to advance career development of their mentees [35-37]. A mentor's role is to:

- open doors – provide opportunities for the mentee. These would normally be opportunities that would not normally be available without a mentor's intervention or help;
- act as a coach – provide guidance on how to define career goals, where to get resources, help with networking, etc;
- act as an advisor – provide specific advice on how to achieve the mentee's stated career goals, provide alternatives and realistic measures of success;
- act as a protector – protect the mentee from internal system or organizational politics;
- provide honest and timely feedback – provide personal time and meet regularly with the mentee to provide feedback or supportive criticism on issues as requested by the mentee; and
- act as a guide – look after the mentee's interest and guide him/her to a successful career. It is important to remember that the mentor is not a supervisor, but an advisor whose primary role is to nurture the mentee.

4.2 Some practical suggestions for nurturing mentees

There are several practical things that a mentor can do to help a mentee to grow. We have used some of the below in varying degrees and they seem to work well. Because of their experience, most mentors serve on several professional, local, national or international committees, or have connections with people who do.

- Serving on review committees: A mentor can help to get a mentee to serve on committees such as:
  - Research Ethics Boards (REB) (or Institutional Review Boards). This can provide good learning experience and insight to young statisticians

on how to deal with ethics in design and analysis of research studies;
  - Grant Review Committees: Serving on these committees can provide valuable experience in research design and grant proposal writing.

Both of these let the mentee know the types of projects that are being conducted at the institution as well as how a grant is worded to successfully get through the funding hurdles.

- Reviewing Manuscripts: A mentor can write to editors of journals that publish work in the mentee's areas of research interest to request them to consider the mentee for manuscript reviewing. Reviewing manuscripts is one way to learn how to write good manuscripts. If a mentee is doing a review (whether it is journal manuscript or an REB submission), a mentor can provide blinded examples for illustrations to help him/her get started. The mentor can provide feedback on the first draft of the review until the mentee has acquired the skills to perform reviews on him/her own.
- Serving on local administrative committees: This will enable the mentee to serve the local community. Often, young people are excluded from administrative committees under the pretext of inexperience. It is recommended that they be introduced to serving on these committees under the guidance of a mentor. At first, a mentor can bring them to attend the committee meetings as observers, then facilitate for them to join the committee if they express an interest to serve. This also allows mentees to learn how the system works faster than if they were not involved.
- Serving on professional committees: Participation in professional activities is also crucial for career development and networking. The mentor should encourage the mentee to get involved in local chapters, sections and association-level activities.
- Provide feedback on presentations and manuscripts: Advancement of presentation skills, whether verbal or written, is one of the most neglected skills and an important aspect of career development for young statisticians.

  - A mentor can watch a mentee practice their oral presentations prior to formal presentations at meetings or seminars. This provides an opportunity for feedback and improvement in a friendly environment.

  - Similarly, a mentor can provide feedback on written work and guidance to appropriate resources for further information. It is important to keep a list of resources on different issues that are essential for career advancement. Examples include references on making presentations, reviewing a paper, writing a thesis, publishing research papers, teaching, research ethics, developing creativity, supervising (graduate) students, mentoring, job hunting, preparing for an interview, leadership, management, etc. These are important issues that every young statistician needs to know about, but are not exposed to systematically during their formal training. Appendix 1 provides a good example of a resource list that a mentor can use to guide their protégés.
- Protect the mentee from internal politics: If requested, the mentors should accompany the mentees to meetings that are important for the mentees' career. Examples include annual meetings for career review or performance appraisal.
- Provide networking opportunities: Networking is an essential part of career development. Part of the mentor's role is to introduce his/her mentee to different individuals that can help the mentee's career. For example, a mentor can introduce the mentee to other more experienced researchers that work in the same areas of research as the mentee. The selection of individuals for networking can also be based on the career goals of the mentee.

5. Suggestions on Things That a Mentee Can Do on Their Own

Mentoring can improve productivity, enhance career development and facilitate on-the-job learning. The success of a mentoring relationship depends on several factors, including enhanced communication between the parties, clear mentoring goals, increased commitment to the relationship, and a sense of mutual benefit. However, mentoring cannot guarantee career advancement. There is much more that a mentee needs to do on their own to complement the efforts of mentorship.

- Read! Read! And read some more! Reading is key in acquiring new knowledge and ideas. It is important that mentees update and expand their knowledge base through reading resources related to their work;
- Attend appropriate professional meetings or workshops: It is recommended that individuals set goals for attending meetings or workshops, and be selective in the meetings that they plan to attend

each year. For example, it may be important to attend meetings only if one plans to:
  - o give a presentation;
  - o present a poster;
  - o attend a continuing education workshop; or
  - o attend presentations by particular speakers with the additional goal of networking with them.

- Attend workshops in non-statistical areas: While it is important to attend workshops in statistical areas where one needs improvement, attending non-statistical workshops is also recommended. For example, most statisticians work in multi-disciplinary environments where they have to deal with the challenging dynamics of human interactions. Taking workshops on [time or people] management, stress management, team building, communication skills, financial management, etc. would preferred to attending a workshop in statistics field with which one already has familiarity.
- Attend or give (inter)departmental seminars/rounds: This provides a good opportunity for networking and to learn the culture of other fields or researchers. For instance, if a mentee works in health research where (s)he is expected to collaborate with clinicians, it is desirable to attend medical rounds/seminars given by clinicians to learn more about what is important in their field. Another example is to give seminars to users of statistics from one's office. Interaction with users enhances understanding between the parties and improves collaboration.
- Be a good citizen and contribute to the development of the discipline: Being a reviewer for granting agencies, journals, REB and so on, is one way to support the academic development of statistics. Be constructive in this role, without belittling the receiver of your comments. Additional benefits of getting involved in these activities include networking, knowledge improvement and better insight on many fronts.
- Ask for help and direction when you do not know. It is equally important to realize when to ask for help. This can save a mentee's time and resources.

6. Concluding Remarks

The future of statistics depends heavily on the training and mentoring of young statisticians. We call on experienced statisticians to increase their (to borrow the words of the Premier of West Cape, South Africa, Mr Rasool [38] at recent Conference of Commonwealth Statisticians), "… commit-

ment to go beyond what is usual…" to enhance career development of young statisticians. We have provided strategies that both mentees and mentors can use to facilitate their mentoring relationship. We hope that readers will find the ideas helpful and practical. Mentoring of and collaboration with young statisticians is a model that can facilitate knowledge transfer and experience sharing for the betterment of statistics and human development.

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