

Preparing The Future Faculty Workforce By Analyzing The Postdoctoral Experience

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ABSTRACT

To develop a curriculum for post-doctoral trainees and to determine the requirements and needs for such a program, a needs assessment study was performed. By using a survey-questionnaire, we were able to evaluate former post-doctoral trainees' experience and their later career outcomes. Our data shows that, across the time studied at our Institution, research science training proved to be outstanding; instruction in presentations and writing skills was reported to be low-average, while preparation in teaching, career development, and faculty dynamics was clearly insufficient. Taken all together our data indicates that in order prepare the next generation of higher education professoriate, we should seriously consider to develop a more comprehensive postdoctoral research training program in which trainees will acquire not only research skills but also teaching, writing, and other valuable expertise for improving their chances on becoming successful teachers and scientists.

Keywords:

INTRODUCTION

With increasing competition for positions intended for Ph.D. degree holders, to be eligible for appointments at the level of Assistant Professor in the Universities or the equivalent in government and private laboratories, some years of postdoctoral training are essential (Muniyappa 2007). The importance of a well-trained workforce of postdoctoral scientist is unquestionable. They are the next generation of researchers and higher education teachers. During their postdoctoral studies, these emerging scientists need to learn the essential skills required for an independent career under the supervision of a reputable and committed mentor. Postdoctoral trainees must use this period on their careers to expand their research interest, become familiar with new scientific perspectives, as well as new and current approaches, learn more laboratory techniques and skills, learn grant writing and laboratory management, master departmental dynamics in addition to teaching responsibilities.

The Association of American Colleges and Universities in 1993 created a program (Preparing Future Faculty program or PFF) supported by the National Science Foundation, as an initiative designed to develop alternative models of professoriate preparation (Association of American Colleges and Universities 1997; Pruitt-Logan, Gaff, & Jentoft 2002). These types of programs should be tailored to each individual institution and launched to help on the success of the future faculty in their early careers. Programs created under PFF entail specially the transformation of doctoral programs around the country, offering curriculum opportunities directed to master important faculty skills such as teaching, research and service. Regrettably, many of the higher education institutions have focused mainly on research activities rather than a well rounded program for their postdoctoral appointees.

Presently, the NIH and NSF has expressed concern for the apparent decline in teaching, career development, grantmanship, ethics and other type of skills in this future faculty workforce. As a result, they recommend some type of discussions at local and national level as well as collaboration among institution of higher education to create a high quality postdoctoral training experience. This concern has been taken into consideration by many Colleges and Universities, and the establishment of postdoctoral associations and postdoctoral training programs started emerging in recent years. Accordingly, our Institutions have to be committed to provide excellence in the post-graduate experience. The Baylor College of Medicine is considered one of the top medical school in the US and research

institution in the United States. Traditionally in this school, medical residents, medical and graduate students have a valued, positive experience as well as an excellent career outcome (Owerbach 2007). However the preparation of postdoctoral trainees for a faculty career has been somehow neglected over the years, what will have a negative repercussion in the future junior faculty trained at this institution and eventually in the reputation of the school. To close this gap, in this manuscript we offer a straightforward approach to help in the curriculum development of a post-graduate training program. A needs assessment study was prepared, which consisted on a survey followed by a questionnaire. The primary survey was conducted to assess the career outcome of former postdoctoral trainees, to evaluate the evolution across the time studied, as well as to collect demographic data. The questionnaire was designed to voice out, from experience, the effectiveness of the program by a retrospective evaluation of the participant on their training while in the postdoctoral position. In this section of the needs assessment, the participants were asked to rate their postdoctoral experience regarding research, career development, Faculty dynamics, writing skills, presentation skills, as well as teaching. Our data shows that, across the time studied at this Institution, research science training proved to be outstanding; instruction in presentations and writing skills was reported to be low-average, while preparation in teaching, career development, and faculty dynamics was insufficient. It is our goal that the evaluation and analysis of these data will lead to the creation of a post-graduate program that will provide an attractive training environment that prepares our post-graduate trainees for the next level in their career. This type of approach and evaluation can be followed at most institutions of higher education.

METHODOLOGY

Questionnaire Construction

In order to develop a curriculum for postdocs and to determine the requirements of such a program, we designed a needs assessment questionnaire to evaluate former postdoctoral trainees' experience and their later career outcomes (see Appendix 1). The questionnaire was designed using a tailored procedure (Dillman 2000). Several elements that relate to post-graduate training had been previously identified (DeNeef 2002; Adams 2002). Accordingly, we developed an initial 40-item questionnaire, in which 10 items were related to research training, 10 items were related to teaching, and 20 items were related to career development issues. This last category was further divided into 6 items for presentation skills, 4 items for writing, 5 items for career development, and 5 items for faculty and departmental dynamics. Two additional steps were taken to ensure that the item content was representative of each category being measured. First, the questionnaire was distributed among the current Faculty at our institution for their critical opinion and feedback. They confirmed that items were appropriate; however, they noted that some items overlapped among several areas or were not placed in the appropriate element to be measured. Second, interviews were set up with current postdoctoral trainees not included in the study (with appointments from 2006 to 2008) to refine the quality of the items, by asking them what was important for them in a post-graduate training program to achieve a well-rounded postdoctoral experience. As a result of these steps, we developed a final 31-item questionnaire, in which 5 items were related to research training, 6 items to teaching, and 20 items to career development issues. This last category was again further divided into 6 items for presentation skills, 2 items for writing, 6 items for career development, and 6 items for Faculty and departmental dynamics.

To answer the questionnaire a Likert scale was used. For data analysis purposes, and to rate their postdoctoral experience in research science, career development, faculty dynamics, writing skills, presentation skills, as well as teaching, numbers were assigned as follows: 1 = very insufficient, 2 = insufficient, 3 = average, 4 = satisfactory, and 5 = very satisfactory. At the post-graduate level, Institutions should be committed to maintaining the highest standards of training and to providing a program sufficient to ensure, that upon completion, the trainee can function independently as a scientific professional. Thus, in this study we considered that all the items that receive a score lower than 4 (satisfactory) should be revised and improved in the future postdoctoral training program to be created. Additionally, the survey section of the needs assessment was designed to obtain data related to demographics and career outcome after the postdoctoral training. A final section was added to the questionnaire in which the participants were free to make additional comments.

Participants

Former postdoctoral trainees from The Baylor College of Medicine from 1980 to 2005 represent the sample in this study (n=195). Recruitment of participants was made through the Postdoctoral Association and departmental records. This study was approved and reviewed by the Institutional Review Board for Human Subject Research at The Baylor College of Medicine. Surveys and questionnaires were e-mailed to the participants together with an explanatory letter describing the rationale for the study and giving detailed instructions for completing and returning the questionnaire. Participants were assured that responses will be kept anonymous and confidential. After a month, the non-responders received follow-up letters and questionnaires. After an additional month, remaining not responders received again a follow-up letter and questionnaire.

RESULTS OF THE STUDY

One hundred ninety five individuals were identified and included as participants for this study. Eighty seven out of 195 (45%) completed and returned the questionnaire. Because of the demographic questions included in the questionnaire, we were able to analyze the evolution of the postdoctoral training from the 1980's to 2000's in terms of gender, ethnicity, duration, productivity, funding, etc. Our data indicate that presently (2000's), gender and ethnicity are more equally represented than in the 1980's. At present, women hold a very substantial representation (66.7%) compared to female representation more than twenty years ago (0%). African-Americans and Native American/Alaskans are still underrepresented, while Hispano/Latino kept a steady representation across the time period studied (33.3%). Naturally, this can be a consequence of the geographical setting of the study (Texas), where the Hispano/Latino population is in all probability one of the main diversity groups.

Several facts provided further information about the evolution of the post-graduate training experience. The length of time a PhD spent as a postdoc has increase over the time. While the posdocs whose doctorates were earned in the 1980's and 1990's spent 4 and less than 3 years respectively in that type of appointment, for those whose doctorates were earned in the 2000's this figure has risen to 5 years, and some of the respondents were still in postdoctoral positions. If we analyze the short-term changes in labor market conditions during the 80's and 90's, this fact is not surprising for two specific reasons: 1) the proliferation of Bio/pharmaceutical companies that frequently offered jobs to PhD degree holders with none or low postdoctoral experience; and 2) the availability and uncompetitive nature of tenure-track and other positions in academia. Even though the post-graduate training is longer, the number of postdoctoral grants awarded has decreased considerably (from 33.3% in the 1980's to 0% in the 2000's). While two decades ago, postdoctoral trainees were encouraged to apply for widely available awards, at the present time these type of awards are very competitive and difficult to obtain. Moreover, frequently postdocs are included as key personnel on federal or foundation grants from their mentors and advisors rather than letting them apply for individual awards. The number of publications has decreased considerably as well (from 11 in the 1980's to 3.3 in the 2000's), again due possibly to the increase competitive and demanding nature of the scientific journals. However, compared to the 1990's the percentage of postdocs that published a manuscript during their training is considerably higher (going from 60% in the 1990's to 100% in the 2000's) and very comparable to the publication levels achieved in the 1980's. Related to career outcome, and across the time studied, former postdoctoral trainees held jobs primarily in academic institutions with mainly research responsibilities. This trend has been steady for over the past 25 years. However the number of tenure-track positions, as the first job upon completion of the post-graduate training, declined dramatically in the 2000's. Appointments at the level of Assistant Professor with tenure-track in the universities or the equivalent in government and private laboratories are scarce and have reached a high level of competitiveness. Thus, currently most of our postdoctoral trainees choose to follow a higher degree of training as Instructors or research assistant professors, which are non tenure-track Faculty appointments.

When analyzing the training they received while at the postdoctoral appointment, research and science training proved to be outstanding (Figure 1). Across the time studied, training in problem solving, professionalism, ethics,

laboratory skills and experimental design was exceptional. The program was also well considered regarding presentations and writing skills (Figure 2), although some aspects of this training such as presentations directed to job interviews, English proficiency for foreigners and use of technology were deficient. Development of teaching skills resulted to be insufficient for this type of trainees (Figure 3), as well as all aspects of faculty dynamics presented (Figure 4) and career development issues (Figure 5).

CONCLUSIONS

Most Colleges and Universities want faculty to be effective teachers, competent researchers, and active participants in academic life. However, there is a disparity between post-graduate training and the demands for new faculty. Frequently, the same institutions that require service, teaching and research skills in their new hires have not modified themselves their post-graduate programs to address these responsibilities on the next generation of professoriate. In this study and by using a survey/questionnaire as a needs assessment, we offer a tool to identify key content areas to help in the development of a postdoctoral training program. Moreover, we were able to describe the career outcomes of former postdoctoral trainees, analyze the impact of their training experience on career development, as well as the respondents' recommendations for changes and improvements in future postdoctoral research training programs. We believe that this type of questionnaire can be successfully used by others to define the needs for changes in their own postdoctoral programs.

To create a postdoctoral training program, all Institutions should be committed to maintaining the highest standards of training and to providing a program sufficient to ensure that the trainees can function as independent scientists and professional teachers. In our case, and after evaluating the results of this study, we started implementing this philosophy and initiated some necessary changes. We are taken two important steps leading to a more elaborated and well-rounded post-graduate training program. First, we are embracing the compact between postdoctoral appointees and their mentors, created by the Association of American Medical Colleges in December 2006 (Association of American Medical Colleges 2006). Second, we are investing in a Postdoctoral association, which will be concerned about problems related to the postdoctoral trainees. Additionally, a responsible institutional official (named Senior Associate Dean for Postdoctoral Affairs) was named to provide oversight on post-graduate matters, such as quality of postdoctoral training, mentoring, and flexibility in career choices, among others (Association of American Medical Colleges 2006). As recommended in the compact between postdoctoral appointees and their mentors, the next generation of postdoctoral trainees will enjoy a complete program in which individuals will be trained to "independently formulate meaningful hypotheses, design and conduct interpretable experiments, adhere to good laboratory practices, analyze results critically, understand the broad significance of their research findings, and uphold the highest ethical standards in research. The development of additional skills, including oral and written communication, grant writing, and laboratory management, will be considered integral to this training. Effective mentoring will be critical for postdoctoral training and will require that the primary mentor dedicate substantial time to ensure personal and professional development. Postdoctoral appointees will have training experiences of sufficient breadth to ensure that they are prepared to pursue a wide range of professional career options. Effective and regular career guidance will be essential and should be provided by the mentor as well as by the institution" (Association of American Medical Colleges 2006). The curriculum for such a program is coming; however we will need several years after its implementation to assess the outcome on the future faculty workforce.

REFERENCES

Adams, K.A. (2002). *What colleges and Universities want in new faculty?* Number 7. Washington, D.C.: Association of American Colleges and Universities.

Association of American Medical Colleges. (2006). *Compact Between Postdoctoral Appointees and Their Mentors*. Washington, D.C.: Association of American Colleges and Universities.

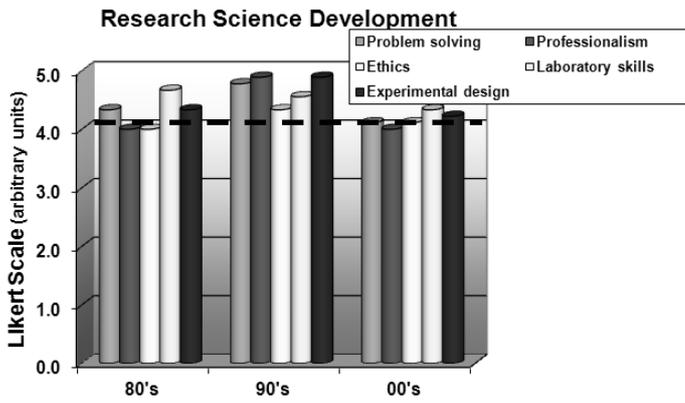


Figure 1.- Former postdoctoral trainees evaluation of their post-graduate preparation on

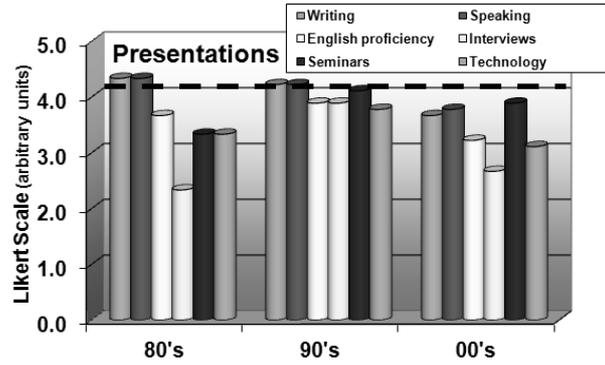


Figure 2.- Former postdoctoral trainees evaluation of their post-graduate preparation on

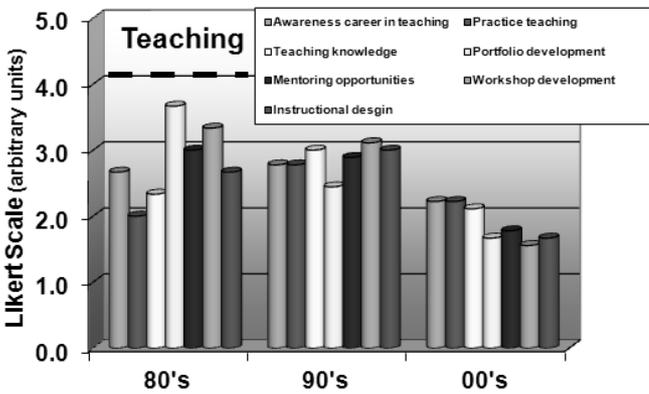


Figure 3.- Former postdoctoral trainees evaluation of their post-graduate preparation on

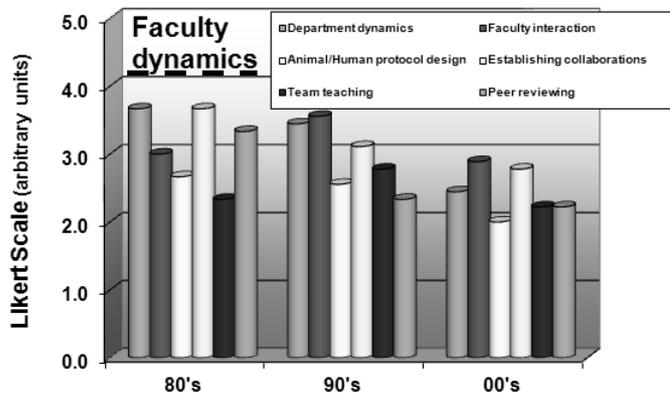


Figure 4.- Former postdoctoral trainees evaluation of their post-graduate preparation on

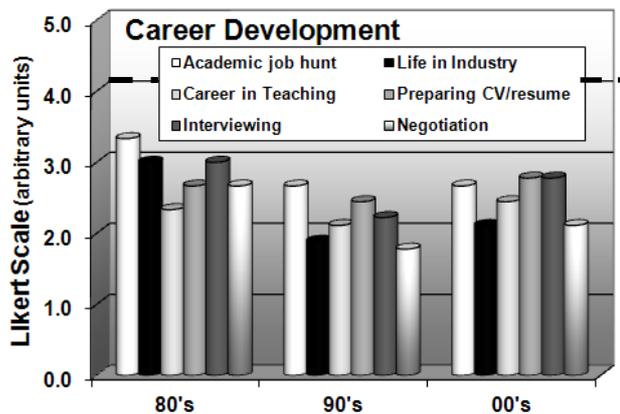


Figure 5.- Former postdoctoral trainees evaluation of their post-graduate preparation on