Personal Journeys, Professional Paths: Persistence in Navigating the Crossroads of a Research Career

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Persistence in a research career can be readily understood within the trainee models that have emerged from undergraduate and graduate instruction. These models offer a common language for discussing training processes, serve as guides for assessing trainee needs, promise to render training programs that are more comprehensive and attentive than are current programs to the factors that contribute to academic and scientific persistence, and enable us to measure with greater precision, internal consistency, and generalizability the elements that logically belong in research career development programs. (*Am J Public Health.* 2009;99:S20–S25. doi:10.2105/AJPH.2007. 133603)

NUMEROUS PROGRAMS HAVE emerged in recent years to recruit junior investigators to the social, behavioral, and health sciences; to enhance their scholarly productivity; to increase their ability to secure externally sponsored research; and to improve the likelihood of their promotion within academia, thereby retaining them in their respective fields of inquiry.[1] Successful examples of such programs include the Robert Wood Johnson Foundation's Clinical Scholars Program,[2] the Resident Scholars Program at the University of Cincinnati,[3] the University of California at San Diego's National Center of Leadership in Academic Medicine,[4] the University of Pittsburgh's junior faculty scholars program,[5] Emory University's Internal Medicine Research Group,[6] the Morehouse Faculty Development Program,[7] the Native Investigator Development Program at the University of Colorado,[8,9] and others. However, such programs typically have not been erected on a firm conceptual foundation; rather, they draw upon longstanding formulas, usually dictated by funding agencies, that cry out for theoretical reexamination.[10] Surprisingly, despite decades of conceptually driven instruction at earlier levels of education, which has analogous goals, albeit tailored to undergraduate and graduate preparation, little of this thoughtfulness has found its way into postdoctoral or postresidency research training.

A rich intellectual tradition is evident in the literature regarding the recruitment and retention of minority students in higher education.[11–14] Much of it is rooted in Tinto's[15–17] general theory of academic persistence. His model asserts that students enter higher education with a variety of personal attributes (e.g., gender, culture), precollege experiences (grade-point averages, academic and social attainments), and family backgrounds (socioeconomic status, parental educational level), each of which has direct and indirect impacts upon performance in college. Furthermore, once these students are in college, Tinto argues that the degree to which they become integrated into the academic and social systems of their respective institutions is directly related to their commitment to that institution and, in turn, the greater likelihood they will complete college. This line of thought holds considerable merit for informing later points in the developmental trajectory of scientists-to-be.

I have extended Tinto's model of student persistence to postdoctoral and postresidency training, with special emphasis on the individual, structural, and organizational elements particular to preparing for a successful career in social, behavioral, and health sciences research. This conceptual framework takes into account the broader, more fluid context of developing such a career. This framework includes the tasks and competencies—communicating across disciplines; formulating specific, fundable research questions; designing meritorious studies; requesting sponsorship; developing community partnerships; conducting and managing research; using appropriate analytic procedures; writing for diverse audiences; and negotiating employment demands—that are intrinsic to mounting and sustaining a professional research agenda. Various mechanisms can be used to address these tasks and acquire related competencies; proactive mentorship is preeminent among them. I have drawn on my own experience in the Native Investigator Development Program to illustrate the proposed model and to suggest indicators of persistence.

A CONCEPTUAL FRAMEWORK

During the past 25 years, academic persistence has garnered considerable attention, largely focusing on undergraduate and graduate retention, especially with regard to women and underrepresented minorities.[18,19] Much of the related research revolves around Tinto's work,[15–17] which springs theoretically from the psychological literature on person–environment fit.[20,21] The emergent model is interactional in nature, viewing students' social and academic outcomes as intimately influenced by their individual attributes, dispositions, family histories, previous educational experiences, and the institutions within which they reside. A major tenet of this model is that integration into the academic and social realms of the university

strengthens commitment to graduation, to the institution, and to the likelihood of persistence. A substantial body of evidence has been assembled in support of the respective contributions of these key components as well as the model in general.

Tinto posited that parental education, family income, and high-school preparation are linked to decisions regarding academic persistence. Subsequent studies have documented that parental education and academic preparation before college entry are associated with decisions to remain in school.[18,22] It also has been shown that high-school grade point average is one of the strongest predictors of later academic success.[23,24] Family encouragement, school enjoyment, peer support, and positive relationships with teachers contribute to staying in and excelling at school.[25,26]

This line of inquiry recently has broadened to consider a range of other psychosocial constructs: self-beliefs, social support, and university comfort.[18,22,27] Self-beliefs are conceptualized as consisting of self-efficacy, self-esteem, and personal valuing of education. Social

support encompasses family and friend support as well as faculty or staff mentoring. University comfort includes perceptions of the institutional environment, cultural congruity, and academic stress. All 3 constructs consistently have been related to academic persistence in students across a range of diverse gender, racial, and ethnic backgrounds.[18,27,28]

Compared with men, women often exhibit lower self-esteem and subscribe to fewer positive beliefs that they can succeed and excel in the university, leading to increased attrition.[24] It also is well established that the less a student values education, the more likely it is that he or she will prematurely leave college.[29] Social support, indexed by Tinto as support from family, friends, staff, and faculty, is frequently related to academic persistence.[30,31] Again, compared with men, women typically report receiving less parental support for pursuing higher education, but paradoxically tend to rely more on their families for instrumental and affective support while in college.[29] Actual receipt of this support is closely linked to their subsequent academic success. Among most students, contact with

faculty as teachers and mentors, inside and outside the classroom setting, is critical to their academic support, happiness, and survival.[32] Lastly, perceptions of warmth and receptivity in the institutional environment,[33] a sense of cultural congruity,[34] and stress related to academic demands[35] affect one's perceived fit with the university setting and, in turn, persistence to completion of a degree.

Though this body of knowledge derives from an almost exclusive focus on undergraduate education, much of it can inform a theory-driven approach to postdoctoral and postresidency research training. Toward this end, Figure 1 presents an adapted version of Tinto's model, specifying the elements relevant to preparing entry-level colleagues for careers as social, behavioral, and health scientists. This version retains the same basic constructs, which include the trainee's background and institutional environment, and trainee processes, as well as short-term and long-term outcomes. It articulates a conceptual framework that applies to individuals early in the postdoctoral or postresidency experience. This framework

is exemplified in the Native Investigator Development Program.

TRAINEE BACKGROUND AND ENVIRONMENT

Regarding the trainee's background, parental college experience and family interdependence play an important part in one's academic persistence even at this more advanced stage. Examples regularly surfaced in the Native Investigator Development Program.[8,9] All of our trainees are American Indian/Alaska Native; the large, interrelated nature of their families offered substantial affective and instrumental support. Conversely, the size of and linkages among the families also increased the probability of the occurrence of personal and familial crises that jeopardized trainees' likely completion of the program: clearly, a double-edged sword.[24,36–39]

The quality of previous undergraduate and graduate education better positions some individuals to seek, appreciate, and realize research careers at later stages in their career development.[37,38] Participants in our program include individuals with PhD as well
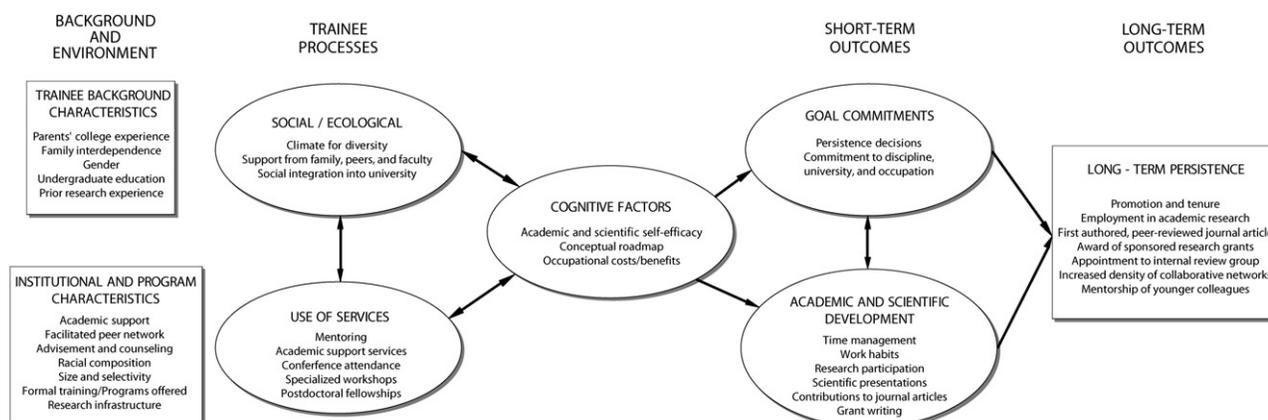

FIGURE 1—Conceptual model of factors that influence the development of a research career.

as MD degrees. Both traditions comprise members whose previous training introduced them to research and offered didactic as well as experiential opportunities to explore this endeavor—more often in the social and behavioral than in the health sciences, though a clinical orientation in either area tends to temper any interest in and commitment to research.

PROGRAM AND INSTITUTIONAL CHARACTERISTICS

Program and institutional characteristics have received the greatest attention over the past 25 years in the effort to enhance academic persistence, largely at the undergraduate level.[40] Features thought most relevant to this goal include academic support; facilitating peer networks; advising and counseling resources; racial composition of students, staff, and faculty; institutional size and selectivity; formal training programs; and research infrastructure.[11,23,28,41] Mechanisms for optimizing these elements include affirmative action, revisiting institutional missions, curriculum and faculty development, and more aggressive, targeted recruitment, admission, and retention policies specific to students, staff, and faculty. The parallels to postdoctoral and postresidency training are direct and immediately apparent.[42–45]

The Native Investigator Development Program, for example, has pointedly addressed each of these mechanisms. Its academic support revolves around 4 mentors—a senior, primary mentor with substantive expertise; a secondary mentor drawn from past graduates of the training program; a statistical mentor; and a science editor—assigned to each trainee, contributing an average of 16.5 hours of assistance each week, provided largely by telephone and e-mail. The mentoring process is guided by a highly structured, competency-based curriculum that underpins six 2- to 3-day intensive, face-to-face sessions held each year over a 2-year program cycle. Sessions convene trainees, guest lecturers, and core faculty, and entail didactic as well as experiential instruction.

All trainees are either American Indian or Alaska Native, as is the majority of the faculty. The program is able to sustain a critical mass of same-race exemplars by including previous graduates as secondary mentors and core faculty. These role models affirm the possibility of meaningful, rewarding research careers for American Indian/Alaska Native people. We and our non–American Indian/Alaska Native counterparts also make explicit the often tacit blueprints for success in academic institutions, leading spirited discussions of the problems younger colleagues have had or will likely encounter as they navigate the professional and personal demands posed by this career choice. As importantly, the program offers a nonthreatening venue within which to voice concerns, to express self-doubt, to vent anger, and to benefit from the lessons learned by others. Indeed, the affective and instrumental support available through the growing collaboration of peers and older colleagues has become a central aspect of the training program, and carries well beyond its specific focus.

TRAINEE PROCESSES

The availability of program and institutional resources of the kind noted previously is a necessary but insufficient condition for strengthening an individual's persistence academically, at any level.[3,6,46,47] Once such resources are present, the challenge becomes accessing and activating them. A successful training program teaches participants how to search for program and institutional resources, how to recognize the potential benefits to them, how to acquire the human and academic capital offered, and how to exploit these assets.[48–52]

Upon entry to the program, many trainees simply do not know what they need to succeed and are unaware of available resources (e.g., specialized workshops and conferences, as well as summer internships) or how to access them. Trainees, for example, bemoan the fact that they write poorly, and speak of this skill as if it is a natural or God-given talent, which seems true to them because they usually compare their abilities to those of more senior, experienced faculty members. Through intensive mentoring, individually as well as collectively, program faculty and recent graduates are able to dispel this myth. We begin by sharing examples drawn from early in our own careers as well as from the natural history of specific articles. Once trainees recognize that writing for scientific publication is a learnable skill, we turn to identifying local and national resources. One participant, a poor writer, when repeatedly pressed to search for help at her home institution, was surprised to discover a professor of composition in the English Department who both taught a course in science writing and was available to consult individually with her. Supported by her mentor, the trainee made remarkable progress, resulting in several peer-reviewed journal articles, thereby bolstering her sense of the possible and illustrating to her peers that writing is teachable. Suddenly, program participants began to identify many different resources to improve their writing abilities.

A clear corollary is that self-awareness and knowledge do not guarantee subsequent activation of resources.[24,53,54] Younger colleagues often see the act of help-seeking as a weakness—signaling to peers and to senior colleagues their deficiencies, which they mistakenly assume no one else suffers or suffered from at a similar point in their careers.[6,46,55] Peer support groups, a diverse faculty willing to share the trials and tribulations of their own professional journeys, and nonstigmatizing forms of assistance, in our experience, are key to moving trainees past this resistance.

Other related cognitive dynamics may be considered with regard to trainee processes. As noted in Figure 1, one such is a conceptual roadmap of a research career.[56] A roadmap delineates options, stages, and trajectories to becoming an investigator. One track, for example, may chart a course to an independently functioning, externally sponsored position dedicated exclusively to research and its attendant activities. Another path may lead to the role of scientist and practitioner, blending research and clinical functions. A third track may guide one to a position as policymaker, which integrates advocacy and scientific inquiry. Yet a fourth route may take one to program administration and the formal evaluation of intervention processes and effects. Most trainees begin their career pursuits with only vague notions of these possibilities, of the rewards and demands, and of the rites of passage.

Participants in our training program are attracted initially to

a research career by the thrill of discovery, by naïve assumptions about autonomy and control over their professional lives, and by a desire to make a difference in the world around them.[24,28,57] They vigorously apply themselves to acquiring specific competencies, including study design, investigative techniques, analytic procedures, or writing. However, absent a conceptual roadmap for developing and sustaining a research career, their enthusiasm and motivation soon wane as they become increasingly frustrated by a lack of direction. We characterize this as "working hard rather than working smart." The acquired skills feel disjointed, unintegrated, or purposeless until located within a strategic planning process. A central function of postdoctoral, postresidency training programs, then, must be to provide participants with roadmaps of this nature to illustrate the possibilities, enable trainees to explore the best fit with their aspirations and predilections, make informed decisions about the relevant mix of skills and experiences, and become autodidactic—that is, eventually to serve as their own guides for judging progress.[5]

Academic and scientific self-efficacy closely aligns with a roadmap for developing a research career.[11,24,28,58] Feelings of control and mastery, a sense of impact on people and things, perception of coherence, and positive self-regard focus a trainee's effort, fueling persistence, and enabling him or her to anticipate and cope with adversity. Participants enter our program as high-achieving self-starters; up to this point, they have been capable and efficacious. But the environmental demands and opportunity structures of a research career often are different

from their past experiences and are largely unfamiliar. A conceptual roadmap charts these demands and opportunities, and may even identify the requisite knowledge and skills. Yet it does not introduce trainees to the actual acquisition process. In the Native Investigator Development Program, that responsibility falls to mentors and faculty.

We carefully orchestrate trainees' exposure to tasks in a manner that maximizes and reinforces success. For example, preparing a personal scientific biography—a complex, multifaceted undertaking—is divided into distinct, but related, activities: clarifying its purpose, identifying the audience, developing a theme, personalizing the discussion, assembling facts, organizing them in a chronological as well as developmental order, crafting the text in a grammatically correct manner, and weaving the content together in a manner consistent with the overarching theme. Having framed the task in this fashion, we present exemplars produced by past trainees, read and discuss these biographies as a group, then work individually in mentee–mentor teams to create initial drafts, which subsequently are reviewed, critiqued, and revised by the entire group. This process repeats several times, providing numerous opportunities for trainees to excel, to offer as well as receive constructive criticism, and to appreciate the impact of different approaches to chronicling one's life story. We extend the same formula to all of the major tasks that underpin the short- and long-term outcomes of developing a research career. Trainees consequently learn the method for doing so, and are prepared to apply it to other, future tasks that may not have been anticipated by the program.

The ability to plot one's career path and feel equipped to travel that course has to be balanced by an economy of effort informed by understanding the costs and benefits of occupational opportunities.[59–63] Here, again, mentors play an important role.[41,64,65] Many trainees in our program, as a consequence of being American Indian/Alaska Native, are highly sought after to serve on university committees, to review grants for research sponsors, to participate in governmental advisory boards, to submit grant applications, to lecture, and to publish. These invitations appear on a career roadmap as guideposts to success, rendering them reasonable, creditable, even desirable opportunities. They are self-validating and, as a result, seductive. Yet, without a yardstick for measuring the costs and benefits attached to each opportunity as it arises within the trajectory of one's research career, young scientists-in-the-making are at great risk of overemphasizing one more than others, resulting in a poor investment of limited time and energy.[4,42,43,61]

OUTCOMES OF PREPARING FOR A RESEARCH CAREER

The literature on student persistence distinguishes between short- and long-term outcomes of preparing for a research career; with respect to the former, it further recognizes outcomes related to scientific development and to goal commitments (Figure 1).[17,28,40] For purposes of this discussion, scientific development refers to mastering the key elements of a successful research career. These elements include productive work habits, active participation in research, effective collaboration, skillful verbal as

well as written presentation of scientific findings, and the acquisition of sponsored support.[11,43] Related outcomes consist of decisions to continue pursuing a research career, and associated membership in a discipline, university, and occupation.

Longer-term outcomes of persistence are the classic benchmarks associated with mature, thriving research careers. These benchmarks are well-known to most of us: employment in an institution that encourages and rewards research, scholarship as reflected in peer-reviewed journal articles or their equivalent, a portfolio of externally sponsored research, substantial collaborative networks, appointments to prestigious panels or advisory groups, leadership in professional organizations, and awards recognizing scientific contributions.[48,59,66,67] In combination, such accomplishments facilitate promotion, stability, and longevity within one's institution.[2,37,51] Ultimately, the developmental process comes full circle, evidenced by the senior investigator's active involvement as a primary mentor to younger colleagues about to embark on a similar journey.[4,47,68,69]

CAREER ROADMAPS, HIGHWAYS, SIDE ROADS, AND DEAD ENDS

Lessons learned regarding academic persistence at the postdoctoral and postresidency levels of preparing for a research career can be readily understood within the model that has emerged from undergraduate and graduate instruction. But what is the value of such a model and what is its relevance for efforts at the later stages of career development as evidenced by initiatives such as the Native Investigator Development Program?

This model offers us a common language and framework for discussing elements of the training process. Even a cursory reading of the literature on developing a research career reveals enormous variability in the ways we talk about this endeavor, how we organize such efforts, the aspects we emphasize, how we evaluate progress, and how we think about barriers and facilitators to success. Is it any wonder that this same literature reads like repeated, independent discoveries of familiar experiences? Reference to a common model will greatly improve our ability to compare processes and outcomes, and enable us to build upon one another's initiatives.

The model serves as a guide for assessing trainee needs and for tailoring our interventions accordingly. The notion of person–environment fit, which underlies this model, resonates with the challenges voiced in virtually every article on the subject of research career development. Using such models, we can systematically identify trainee needs in advance, can mobilize necessary resources, and can be proactive in assisting our younger colleagues to navigate the many crossroads before them.

The model also promises to improve our training programs, rendering them more comprehensive and attentive to the range of factors that contribute to persistence. Many initiatives focus on some aspects of career development over others, placing primary emphasis on individual competence, program structure, or institutional climate. The model presented here underscores their interdependence, and views mentoring as the process for activating academic growth and persistence.

Last, this model suggests that we can measure with greater precision, internal consistency, and generalizability the elements that logically belong in research career development programs. Evaluating their short- and long-term effects must take on a higher priority, moving us past descriptions of what to do and exhortations to do more of it. How else are we to determine whether these efforts truly lead to the highways of research success and not to side roads or dead ends? j

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