BEST BUILDING ENGINEERING & SCIENCE TALENT

MEMORANDUM FOR: Director for Basic Research, Office of the Assistant Secretary of Defense for Research and Engineering, and Director, Office of Diversity Management and Equal Opportunity
DATE: 21 NOVEMBER 2014
ATTN: Dr. Robin Staffin and Mr. Clarence Johnson
SUBJECT: WHITE PAPER ON MENTORING WOMEN IN DOD STEM

EXECUTIVE SUMMARY

This background memorandum synthesizes contextual information on DoD's mentoring practices in STEM, with specific focus on women, to inform the Department's engagement with Million Women Mentors, a national call to provide mentors for girls and women in STEM. As the largest federal employer of scientists and engineers, some 28% of which are women, the Department of Defense (DoD) has an avid interest in building a more diverse technical workforce.

Mentoring is one means for dismantling barriers to women in the STEM fields. Research shows that mentoring helps women students combat the isolation they feel in many STEM environments, and persist in their pursuit of STEM education and careers. The President's Council of Advisers on Science and Technology posits that "retention of STEM majors from 40% to 50%"—of which mentoring is a major part—is necessary for our nation to continue leading the world in scientific and technical innovation (PCAST, 2012).

Mentoring has long been recognized within DoD as a tool to help both military personnel and civilian employees discover and reach their potential (Military Leadership Diversity Commission [MLDC], 2010a). The DoD Diversity and Inclusion Strategic Plan 2012-2017 addresses mentoring in Goal 3, Develop, Mentor, and Retain top talent from across the Total Force (DoD, 2012).

The STEM Diversity Campaign support team explored the scope and structure of women's mentoring across the Department's STEM workforce. Information was gathered via literature and Internet searches, as well as a small sample of executive interviews with key personnel. The inquiry encompassed *formal mentoring* (supported and organized by DoD), *informal mentoring* (occurring outside formal program boundaries), *mentoring channels* (the varied settings and means through which mentoring takes place) and an examination of selected practices outside DoD.

This inquiry produced the following major findings:

1. ***Lack of Consensus***. Our canvassing revealed no shared understanding of the role, structure, practices and investment in mentoring practice across the Department. Without a common understanding about mentoring it is not surprising that there is a lack of champions at the senior level who could provide leadership and direction.

2. ***Prevalence of Informal Mentoring***. The structured mentoring that occurs on the uniformed side of DoD does not have a counterpart in the civilian technical workforce. Instead, the collaborative nature of the work in STEM and its related apprenticeship model are presumed to include mentoring *naturally*. The informal mentoring that occurs as a matter of course in much of the DoD science and engineering enterprise rarely includes formal training, monitoring or evaluation to determine actual effectiveness.
3. ***A Thin Evidence Base***. We found significant anecdotal examples of beneficial informal mentoring, while the research literature focuses largely on the benefits of formal mentoring. Many studies, however, rely only on perceptions of whether participants enjoyed the experience without assessing specific effects on protégé career progression.
4. ***The Potential of a DoD Mentoring Portal***. The DoD Mentoring Portal being developed by the Office of the Undersecretary for Personnel and Readiness has great potential as a shared resource about mentoring practice across the Department. To realize its potential, the portal will have to be backed up by opportunities for deep engagement between DoD practitioners, and connected to the community of mentoring practice beyond DoD, where the vast majority of practical knowledge and documented effectiveness happens.
5. ***The value of decentralization***. Implementation happens most effectively in small units, ultimately in mentor-protégé pairs. Supervisors are uniquely helpful due in part to their ability to provide guidance on what success looks like in the local context (MLDC, 2010b).

Two principal recommendations flow from our gathering and analysis of background information:

- First, DoD should focus on providing resources, documenting effectiveness, and improving the quality of informal mentoring practice, particularly for civilian STEM personnel. Part of this emphasis should include an explicit, systematic effort to build future capacity through the mentoring of young women and girls in the STEM pipeline.
- Second, DoD should consider piloting several programs and practices from the corporate academic and nonprofit sectors with proven records of success.

PURPOSE

The purpose of this memorandum is to synthesize knowledge on DoD's mentoring practices in STEM, with specific focus on those approaches that are particularly efficacious for women. This document is intended to inform the Department's engagement with Million Women Mentors, a national call to provide mentors for girls and women in STEM.

DoD Stake in STEM Diversity and Mentoring

The Department of Defense (DoD) has an avid interest in building a more diverse science and engineering workforce, and especially in bringing more women onboard who have degrees in the STEM disciplines. DoD is the largest federal employer of scientists and engineers, employing 222,107 of the 259,383 in the federal STEM workforce (National Science Foundation [NSF], 2013; Harper, 2014a).[1] Women make a slightly lower portion of the DoD STEM workforce (25.8%, or 57,332) than their representation among overall federal STEM occupations (28.5%, or 74,018).

DoD's commitment to diversity and inclusion in its military and civilian workforce was underscored in April 28, 2014, when Secretary of Defense Chuck Hagel and Chairman of the Joint Chiefs of Staff Army General Martin E. Dempsey signed the 2014 Department of Defense Human Goals Charter. During the signing ceremony, Hagel emphasized the importance of ensuring that everyone contributing to DoD's mission has the opportunity to succeed, excel, and reach his or her full potential (Lyle, 2014).

Mentoring has long been recognized as a tool to help both military personnel and civilian employees discover and reach their potential (Military Leadership Diversity Commission [MLDC], 2010a). In addition, mentoring has been a key tool of both civilian and military career development.

Further, the DoD Diversity and Inclusion Strategic Plan 2012-2017 addresses mentoring in Goal 3, Develop, Mentor, and Retain top talent from across the Total Force, which is designed to ensure the Services and DoD agencies incorporate innovative development, mentoring, and retention tools to maintain an equitable work environment through merit-based decision making (DoD, 2012). Strong mentoring programs, both formal and informal, are critical elements that can be leveraged to provide diverse talent the tools to compete for leadership opportunities at the highest levels of DoD. The value of mentoring should be infused throughout the training continuum, beginning at the point of accession and continuing through the career. Critical mentoring skills must be fully developed in senior leaders and lessons learned shared and retained throughout the organization.

Accordingly, the Office of Secretary of Defense (through the Office of the Under Secretary of Acquisitions, Technology and Logistics, AT&L; and the Office of Personnel and Readiness, P&R) has launched a STEM Diversity Campaign (SDC). With the SDC DoD aims to foster STEM awareness, develop STEM skills, and widen STEM career pathways into its technical workforce for women and underrepresented minorities. Through the collaboration between AT&L and the Office of Diversity Management and Equal Opportunity, the SDC has committed to support a DoD women's mentoring initiative as part of its action agenda.

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[1] Since the National Science Foundation data on the STEM workforce excludes health practitioners and health technicians, the totals for those occupational categories were deducted from the overall DoD STEM workforce totals to achieve comparability.

The Million Women Mentors Initiative

The Million Women Mentors (MWM) Initiative is an engagement campaign and national call to action that mobilizes corporations, government entities, non-profit and higher education groups, around the imperative of mentoring girls and young women in STEM fields. The initiative's stated goal is "to increase the interest and confidence of girls and young women to persist and succeed in STEM programs and careers." MWM supports the engagement of one million science, technology, engineering and math (STEM) mentors (male and female) to increase the interest and confidence of girls and young women to persist and succeed in STEM programs and careers. DoD has agreed to participate in the initiative along with other federal agencies.

SDC Approach. To inform DoD's engagement with MWM, the SDC team canvassed the scope and structure of women's mentoring across the Department's STEM workforce. Information was gathered via literature and internet searches, as well as a small sample of executive interviews with key personnel. While this inquiry was limited in scope and timeline, the knowledge gathered provides critical insight into existing mentoring practices and opportunities to increase DoD's contribution to the nation's STEM workforce needs.

Motivation: Why Mentor Women in STEM

Mentoring is one of the means for dismantling barriers to women in the STEM fields. Research shows that mentoring helps women students combat the isolation they feel in many STEM environments, and persist in their pursuit of STEM education and careers (Eisenhart et al., 2009; Klassen, Stockard, & Akbari, 2004; Ong, et al., 2011; Sader, 2007).

By engaging girls and young women early in their lives and careers, mentoring makes them aware of opportunities in STEM occupations and more confident of their aptitudes and abilities to pursue degrees and to have rewarding careers in the STEM disciplines. This engagement process is especially important as women obtain their education and enter the workforce, but mentoring is also instrumental in workforce retention and, ultimately, progression into STEM leadership positions.

> *If we're going to out-innovate and out-educate the rest of the world, we've got to open doors for everyone. We need all hands on deck, and that means clearing hurdles for women and girls as they navigate careers in science, technology, engineering, and math.*
>
> First Lady Michelle Obama, September 26, 2011

The President's Council of Advisers on Science and Technology posits that "retention of STEM majors from 40% to 50%"—of which mentoring is a major part—is necessary for our nation to continue leading the world in scientific and technical innovation (PCAST, 2012). Further, the Presidential Awards for Excellence in

Science, Mathematics and Engineering Mentoring (PAESMEM) recognizes individuals for their mentoring of persons from groups underrepresented in STEM, including women.

MENTORING IN DOD

This section will review existing DoD practices in formal and informal mentoring, as well as the channels through which these practices are enacted. For this discussion, we use the following definitions:

- The Military Leadership Diversity Commission (MLDC) defined **formal mentoring** as "supported and authorized by the organization" and characterized by relationships initiated via an organizationally run and monitored "matching process" (2010b).
- **Informal mentoring** is that which happens outside of these bounds, including that which occurs completely without organizational knowledge.
- Just as mentoring can be either formal or informal (or a combination), mentoring can take place in a variety of settings and through different **channels**: face to face, email, phone or online.

Formal Mentoring

DoD maintains a number of formal scholarship, internship, and apprenticeship programs for undergraduate and graduate students that include a mentoring component. Some programs are DoD-wide, while others are offered only at specific DoD facilities. Two examples of such programs for students include:

- The Summer College Student Program (SCSP) at Eglin Air Force Base provides hands-on research opportunities and mentoring for undergraduate students, and master's degree and PhD candidates in STEM disciplines.
- The U.S. Army Natick Soldier Systems Center shares lab space at colleges and universities in Massachusetts, and through these partnering arrangements, Army scientists and engineers serve as academic advisors to students in STEM majors.

Mentoring activities are an intrinsic feature of these formal STEM learning programs. In addition, some of the DoD laboratories and research and development (R&D) centers sponsor structured mentoring programs for all employees, including those in the STEM disciplines. For example, the Natick Soldier Systems Center sponsors formal mentoring as part of its Total Leadership program in which employees, both technical and administrative, are randomly assigned to teams whose members mentor one another using online mentoring tools. These types of formal, site-wide programs appear to be adopted on a lab-by-lab basis, depending on local management decisions.

Most DoD STEM programs that have a formal mentoring component at the undergraduate and graduate level do not exclusively serve women but research has shown that such programs often have a disproportionate benefit for the women who participate in them (Maton et al, 2009). For example, women report that such programs provide mentoring they otherwise would not have at all, or that their mentors were instrumental in their decision to persist in STEM. However, many formal K-12 STEM programs do have a focus on young women. One example is the Space and Naval Warfare Systems Center Pacific in San Diego sponsors in-school STEM learning opportunities and summer internships for female high school students (ages 14 to 18) who attend St. Mary's Academy, an all-girls school near Los Angeles that serves a largely minority student body. Students are often paired with female scientists and engineers and participate in extra activities such as the Matlab course, research experiences, and trips to local universities to provide a rich experience. The goal is to develop a pathway for the high school girls to participate in a program where they can be mentored in STEM areas of interest. Many of the students have graduated in STEM fields or are currently pursuing degree.

Additionally, each of the Services offers formal Service-wide mentoring, which include personnel who perform STEM-related functions (MLDC, 2010b). Since these programs are Service-wide, STEM-specific mentoring activities cannot easily be identified. However, the Navy's structure of using well-established affinity groups as the backbone of its mentoring programs and the extensive use of electronic mentoring may allow for some amount of STEM targeting due to concentrations of STEM-related functions within several affinity/enterprise/community groups.

Research from outside DoD revealed that personnel who receive formal mentoring by their supervisors felt more interpersonal comfort with their mentors (Mullen, 1994), and believed they received greater career guidance (Sosik & Godshalk, 2004) than when they did not have a supervisory relationship with their mentors. These data bolster the supervisory mentoring practices currently in place across DoD.

Informal Mentoring

Informal mentoring is prevalent in the DoD science and engineering community. This is to be expected since informal mentoring is a traditional feature of the academic and research environments and arises naturally from the methodologies and protocols used to discover and develop new knowledge and technologies. In science and engineering, projects are typically carried out by teams comprising seasoned principal investigators, mid-career scientists and engineers, post-doctoral scientists and engineers, entry-level professionals, and students. Typically, younger, less experienced scientists and engineers perform project tasks under the guidance of more senior members of the team, who provide mentoring to varying degrees as part of the project's execution. Similarly, this type of mentoring is assumed an inextricable part of the college academic advisory relationship.

Debbie, a human resources manager in DoD, noted that many opportunities to mentor or advise female students in STEM arise from the relationships between DoD laboratories and university research programs. She said, "When DoD laboratories share lab space or other facilities with universities or collaborate with professors, mentoring relationships naturally evolve."

The likelihood of informal mentoring depends to some degree on the participants. Scientists and engineers who have been mentored in the past often take it upon themselves to seek out and sustain mentoring relationships with up-and-coming professionals. Some do it because it gives them a sense of gratification, and they enjoy it. And some get involved because younger scientists and engineers seek out the advice and wisdom of more seasoned colleagues they trust and for whom they have developed an affinity. However, mentoring is not confined to relationships where the mentor is the older, more experienced participant. Informal mentoring within DoD also takes place among peers or among employees who work in different disciplines or offices.

Informal mentoring also has a networking aspect since it often involves a mentor opening doors for a mentee and making introductions to other professionals in his or her STEM field of interest. In addition, mentors are a source of recommendations for mentees applying for acceptance to more advanced educational programs or work projects.

As a senior engineering researcher in the Department, Teri specifically identified the importance of informal mentoring as a vehicle to show women their options. "A mentor can inform the mentee of new opportunities, make introductions to investigators both inside and outside the lab, and generally help expand a young woman's realization of her many career options in STEM," she stated.

Informal mentoring is not defined by any specific amount of contact time or intensity. Some informal mentoring is as casual as occasional phone calls or emails to ask how a former student or colleague is doing or periodic luncheons. Some informal mentoring is sporadic in nature, yet the participants recognize a connection that elevates their perception of the relationship. Many formal mentoring relationships evolve into informal mentoring and lifelong friendships.

Thus, informal mentoring relationships are common throughout the DoD science and engineering community but do not necessarily exhibit common characteristics and are not generally measured, tracked, or managed. In other words, informal mentoring is not planned or structured, and much of what is known about informal mentoring within DoD is anecdotal. The MLDC reported on several research studies that document the efficacy of mentoring relationships in both corporate and DoD settings, noting that neither formality nor supervisory status differentiated the impacts (2010a). Unfortunately, this reporting did not distinguish STEM mentoring from mentoring in non-STEM work.

Mentoring Channels

Face-to-Face Mentoring. Face-to-face mentoring has been the most prevalent form to date. It can occur in the workplace or over lunch, for example. Allison, a DoD engineering educator and researcher, noted that both men and women who were mentored as students or young S&Es appear to be more likely to engage in mentoring. She added, "scientists and engineers whose parents were in science or engineering are likely to consider them role models and to remember the support and encouragement they received and therefore want to pass it on." As a result, the experience of being mentored produces new generations of mentors.

Email, Online and Telephone Mentoring. As students graduate or careers change, face-to-face mentoring often transitions to other channels, such as email or telephone. Online mentoring opportunities are becoming more common as well. For example, AcademyWomen sponsors an "eMentor Program" for military personnel, veterans, and STEM professionals who are looking to achieve their highest potential and work/life balance. Debbie has seen that the process of mentoring can be facilitated with a variety of tools, such as the lab-wide leadership development program, the Army Soldier Systems Center uses the Total Leadership Package, which includes randomly assigned mentoring groups. The program makes available online tools to support team-based mentoring.

Sponsorship Mentoring. Some mentoring takes place through a formal workplace sponsorship mechanism in which mentors sign up to sponsor a new employee or someone who is transitioning from the military into the civilian STEM workforce. Sponsorship mentoring helps the mentee with introductions, relocation, networking with other professionals, balancing life and work, and seeking promotions or other opportunities.

STEM Outreach and Multilevel Mentoring. College STEM students can be engaged in mentoring younger girls in K-12 STEM outreach programs. Cathy, a senior technical program manager, described how the "Imagine More" program at SPAWAR Pacific supports a "vertical scaffolding" arrangement in which a professional DoD engineer mentors a college student at the University of California San Diego, and they both work together to mentor a middle or high school girl interested in STEM.

DoD Mentoring Portal. The Office of the Deputy Assistant Secretary of Defense (Civilian Personnel Policy: H.R. Strategic Programs and Advisory Services) is in the process of finalizing the DoD Mentoring Resource Portal, with a planned release of Winter/Spring 2015. The portal will comprise several resources, including a Mentoring Toolkit, Mentoring Training, Mentoring Library and Mentoring in Action (Harper, 2014b). Among these resources are publicly available websites on mentoring and diversity for the Navy, Air Force, Army, Marine Corps and Coast Guard.

For example, the Marine Corps lays out roles, responsibilities and benefit on both sides of the mentoring relationship; provides advice on forming, monitoring and ending a mentoring relationship; and presents a form to document goals and progress, as well as both formative and final evaluation forms (U. S. Marine Corps [USMC], Date unknown).

The Navy also articulates roles and activities for formal/supervisory forms of mentoring, recognizing the critical role these interactions may play in career progression.[2] Additionally, a number of affinity groups are organized around both demographic and non-demographic commonalities, and informal mentoring is encouraged within these groups. Lastly, the Navy recognizes the need for mentoring and social connection across lines of differences, and therefore explicitly encourages the use of social networking to build cohesion.

MENTORING OUTSIDE OF DOD

Outside of DoD, there are several useful examples of mentoring practice in government, corporate and academic settings. The Federal Workforce Flexibility Act of 2004 requires federal agencies, in consultation with the U. S. Office of Personnel Management (OPM), to train managers on how to mentor employees (Federal Workforce Flexibility Act, 2004). Four years later, OPM published a guide on best practices in mentoring that resulted from OPM's collaboration with the Department of State, Department of Energy, Nuclear Regulatory Commission, Environmental Protection Agency, National Aeronautics and Space Administration, Alcohol, Tobacco and Firearms, and Corporation for National and Community Service (2008).

The Department of Energy (DoE) recently released an extensive description of its guidance and program plan for mentoring across the Department (2014). DoE's plan details how mentoring is a "lifelong learning tool" and sets out benefits, roles and responsibilities for both mentors and protégés. Formative and summative assessments are integrated in the program plan, and roles are defined at all organizational levels.

While DoE's plan looks forward toward implementation, the National Science Foundation (NSF) has ongoing efforts in mentoring. NSF has a specific emphasis on postdoctoral scientists and the criticality of the transitions taking place at this stage of development. To address this criticality, NSF requires grant proposals that include postdoctoral personnel to include a mentoring plan (NSF, 2013). In addition, NSF administers the White House Presidential Awards for Excellence in Science, Mathematics and Engineering Mentoring which recognizes individuals for their mentoring of persons from underrepresented racial and ethnic groups, women, and persons with disabilities, persons from disadvantaged socioeconomic backgrounds, and early career scientists and engineers.

[2] http://www.public.navy.mil/bupers-npc/support/21st_Century_Sailor/diversity/mentoring/Pages/default2.aspx

Evidence of Effectiveness

Mentoring in corporate and academic settings has a longer record of both implementation and effectiveness than in federal agencies. Examples include:

- Sodexo has been recognized as best-in-class by Diversity Inc., and provided an executive-level expert to advise MWM.A case study of Sodexo's program notes the structure and detail of its program, systematic formative and summative assessment, and a return of $2.28 for each $1 invested (as measured in retention/increased productivity) (Diversity Inc., 2014).
- The National Center for Faculty Development & Diversity has a solid record of using practices commonly associated with mentoring to promote academic success. Yet Kerry Ann Rockquemore, President and CEO, questions whether the term "mentoring" should even be used, recommending instead that those interested in helping professionals progress in their careers focus instead on helping them identify specific needs and get those met (2011).
- Terrell Strayhorne, a professor at The Ohio State University and an expert in diverse populations in STEM, frequently tells audiences, "Mentoring should never be convenient. It should never be comfortable. It should be intrusive," for both the mentor and the protégé (Strayhorn and Saddler, 2009). Professor Strayhorne identifies several key elements of effective mentoring that characterize it as offering opportunities protégés would not otherwise have, including:
    - Mentoring should happen in a place the protégé doesn't even know that they want to go, but when they get there, they find out that it's fantastic;
    - Mentors should have high expectations, and the capability to signal to their protégés that they have these high expectations "without reservation;"
    - Mentors should be able to build the pathways for protégés to achieve those high expectations.

In each of these cases, it is clear that women are not the only ones who can mentor women. In fact, solid mentoring efforts recognize that any mentoring program for women in STEM must engage both men and women mentors:

> [M]*en need to take responsibility to create a culture of inclusion for women in the tech space. … Men need to create a climate where sexism, permissiveness, and prejudices are not tolerated. More than this, male leaders need to be active and engaged in creating a culture of inclusion and participation*.
>
> LaPlaine, 2014

IMPLICATIONS

Lack of Consensus

This inquiry also found a lack of consensus across the Department on the role, structure, practices and investment in Formal Mentoring programs. Clearly, some services and units enact very detailed models that offer opportunities to all personnel. Others focus more on personnel who show promise for leadership, or those in specific roles. Without a dedicated organization leader to "own" mentoring and coordinate mentoring practice across DoD, this lack of consensus is likely to persist. Based on this finding, a critical first step is for DoD to construct a working organizational definition of mentoring.

Formality, Structure and Resources

When describing mentoring activities, many practitioners do not distinguish between formal mentoring (as we have defined it above) and mentoring that happens as part of some other formal program or activity. This is particularly true in STEM, where the collaborative nature of the work and its related apprenticeship model for training novices are presumed to include mentoring *naturally*, as our interview participant Debbie described. Unfortunately, this assumption, like other assumptions made about informal mentoring rarely includes formal training, monitoring or evaluation to determine actual effectiveness, as most formal mentoring program do. Given this reality, and perceptions that this type of mentoring is more *natural* than what occurs in separate formal mentoring programs, resources must be added to ensure that effectiveness can be maximized in this context.

Given the prominence of informal mentoring, it is clearly a permanent practice in many organizations, including DoD. Despite the advantages of process, documentation and evaluation found in formal mentoring, it is near impossible to force the personal connections, and resultant investments mentors make in protégé success, simply motivated by personal affinity. A better approach may be to provide additional resources that informal mentor-protégé pairs can access to increase the opportunities an informal mentor can individually provide.

Recommendations for learning from and enhancing resources for informal mentoring are presented below.

Formality and Effectiveness

This inquiry found limited evidence that formal mentoring was superior to informal mentoring, primarily in the research literature. This aligns well with the MLDC finding that effectiveness was not related to whether mentoring was formal or informal (2010a, 2010b). A substantial part of this lack of evidence is that few solid studies even attempt to answer this question, and many that do rely only on perceptions of whether participants enjoyed the experience without assessing how the interactions actually happen or examining specific effects on protégé career progression. This represents an opportunity for DoD to learn about the benefits of

both formal and informal mentoring, and thereby increasing the effectiveness of mentoring practices overall.

DoD Mentoring Portal

While the DoD Mentoring Portal has great potential to increase communication by centralizing information about mentoring practice across the Department, it also has two key limitations. First, the descriptions and links provided by the Portal *cannot* alone adequately bridge the gap between policy and effective practice. Implementation of dynamic processes such as mentoring require more engagement between successful practitioners and those seeking to replicate their successes than can be facilitated simply by descriptions of practices and links to resources.

Second, as a resource intended for internal Department use only, the Portal (and the practices it displays) will be isolated from the benefits of engagement and feedback with the community of mentoring practice beyond DoD. Given that the vast majority of practical knowledge and documented effectiveness happens outside the Department, this disconnection we thereby lessen the impact of the Portal in making leading edge content available to DoD mentoring practitioners.

Level of Implementation

While successful mentoring in DoD will require leadership and resource allocation from the top, the examples we cited all emphasize that implementation happens most effectively in small units, ultimately in mentor-protégé pairs. DoE's program plan explicitly states that implementation *must* be decentralized (2014). As research suggests, supervisors are uniquely helpful due in part to their ability to provide guidance on what success looks like in the local context (MLDC, 2010b). Therefore, while centralizing policy leadership and resource allocation for mentoring might be useful, decentralized implementation also seems to align with existing models of effective mentoring practice.

RECOMMENDATIONS

Enhancing Informal Mentoring

In addition to providing resources and documenting effectiveness of informal mentoring practice, as is typically done for formal programs, interview participants mentioned several opportunities that increase the impact of mentoring on protégé success, many of which happen *naturally* in informal mentoring relationships. They described the important role mentors played in "lobbying" on behalf of the protégé. For example, a mentor can bring up the protégé's name in conversations with peers, make her/his talents and attributes known outside the immediate research group or chain of command, or make sure the protégé's name is added to a list of prospects for new projects. Teri described how mentors often speak to their peers in upper management when new research teams are forming, and thus have the ability to say, "I have the perfect person for you." Without such conversations, these kinds of

connections might not otherwise have been made. This can be a critical way to provide protégés with opportunities they otherwise might not have access to.

Teri also discussed the importance of mentors staying abreast of current trends in career development. She said:

> *Young folks aren't like we were 35 years ago. I came in thinking that this would be where I stayed for my career, and it has been. Young people today are coming in thinking that this is cool, really interesting work. But they are also thinking about where they'll be in four years. Maybe working for a contractor? Maybe going back to get a business degree? They are not asking how much they will get when they retire. We have to be better at not projecting our own experiences on them. I had tons of opportunities but not a lot of leadership development opportunities. As mentors, we need to share opportunities that don't necessarily reflect our own experience but that represent what would be best for our young folks. We have to be careful not to say, 'I did it this way' because it may not be relevant*.
>
> Teri

Thus, ongoing training and a willingness on the part of mentors to go beyond just dispensing advice based on their own experience can be critical, especially in providing opportunities that are more salient in the current employment context.

DoD's mentoring efforts would benefit from learning how these and other key features of informal mentoring impact protégé success.

Mentoring Pilot Programs

To provide additional models of mentoring practice and test out their efficacy within the DoD content, it is recommended that the Department pilot several programs and practices from the corporate academic and nonprofit sectors with proven records of success. Examples include:

- Several elements of Sodexo's Spirit of Mentoring program, including detailed structure, regular assessments, and specificity of goals;
- Since most of the programs that show effectiveness are not specific to STEM, a training module on STEM-specific mentoring practices should be development and tested within existing formal programs, based on a deeper inquiry into the use of STEM content in existing mentoring practice;
- Based on proven academic practices, training modules should be developed and implemented around developing community, sponsorship, building pathways to opportunity and signaling confidence that protégés can meet high expectations without reservation;

Make use of existing STEM mentoring programs with proven records of success, particularly for underrepresented populations in STEM, such as MentorNet.[3] DoD

[3] http://mentornet.org/

could also benefit from efforts that Million Women Mentors has captured in a white paper that brings together facts that illuminate the opportunity and the gaps for women in STEM education and careers collaboration with industry partners. One of several recommendations identified in the 2014 White Paper, Women in STEM: Realizing the Potential, was that sharing best practices about STEM-related partnerships and programs is key to helping grow mentorships in the STEM pipeline. (2014 White Paper, Women in STEM: Realizing the Potential).

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