Abstract

Mentoring Two Year Engineering and STEM Faculty for Leadership Development:
From IBM to Academia: A Model for Knowledge Transfer through Mentoring

STEM faculty face numerous challenges as they try to meet the ever expanding and changing needs of their students, focus on student retention in STEM fields, and also keep abreast of their own rapidly evolving disciplines. This situation is especially acute at two-year colleges where funds for professional development are limited; expectations for content coverage are stringent; and faculty members serve increasing numbers of students who often arrive underprepared.

This paper will provide a model and guide for knowledge and skills transfer through mentoring to serve STEM faculty by applying to academia the lessons learned from the IBM mentoring model. The authors will use the example of a National Science Foundation Advanced Technological Education (NSF ATE) project "Mentor-Connect: Leadership Development and Outreach for Advanced Technological Education" (NSF DUE #1204463), hereafter referred to as Mentor-Connect, to illustrate successful strategies and best practices of how this business mentoring model can be translated to the two year college setting.

The three main areas of the IBM model are based on the company's imperatives for talent development and retention:

- **Socialization** for new hires or anyone who transfers to a new organization; purpose is to speed up the adjustment process
- **Career** is a long term process which facilitates progression
- **Expert** mentoring is intended to develop specific skills like technical, business, leadership, communication, etc.

The authors discuss how they have adapted these imperatives to an academic mentoring model for STEM faculty, using mentoring to support the preparation of competitive National Science Foundation, Advanced Technological Education (ATE) grant proposals as well as effective implementation of funded projects as a strategy for growing the next generation of leaders in advanced technological education.

Through the support of the mentoring process, faculty not only gain greater confidence, agility, and advancement in their careers but also become more empowered to recruit, retain and educate STEM undergraduates who will be the next generation of innovators. In this model the three imperatives evolve and focus on:

- Socialization for new administrators, faculty, or anyone (e.g. program manager) who transfers into a new environment (e.g. department, field of study) or movement from one area to another to speed up the adjustment process
- Career aspirations to achieve interim goals in current academic profession (e.g., tenure, leadership role) or long term achievement (e.g. Administrator, Dean, Specialized Skills, Field of Study)
- Expert education mentoring intended to develop specific skills (e.g. expert subject matter knowledge or skills, leadership attributes, communications, etc.)

Finally, authors will share with the audience (1) lessons learned from initial data gathered through their research process of adapting and implementing the IBM mentoring model for STEM faculty in the two-year college arena and (2) examples of the significant positive impacts faculty mentoring has had on grant funding success.

Mentoring Two Year Engineering and STEM Faculty for Leadership Development:
From IBM to Academia: A Model for Knowledge Transfer through Mentoring

Overview:

Science, technology, engineering and mathematics (STEM) faculty everywhere face numerous challenges as they try to meet the ever expanding and changing needs of their students, focus on student retention in STEM fields, and also keep abreast of their own rapidly evolving disciplines. This situation is especially acute at two-year colleges where funds for professional development are limited; expectations for content coverage are stringent; and faculty members serve increasing numbers of students who often arrive underprepared. One of the most effective ways in which to engage STEM faculty to achieve many of these tasks is through **expanding their capacity for leadership development and grant funding success.**

Both leadership development and grant funding success are highly dependent on faculty being given the time, opportunity and most importantly mentoring. Mentoring is especially necessary for navigating these areas of their professional lives while balancing other demands placed upon them in their daily teaching schedules.

This paper will provide a model and guide for knowledge and skills transfer through mentoring to serve STEM faculty by applying to academia the lessons learned from IBM's well established mentoring model. This proven model brings together a portfolio of mentoring initiatives to provide *Intelligent Mentoring.* The authors will use the example of a National Science Foundation funded Advanced Technological Education project, Mentor-Connect, to illustrate successful strategies and best practices of how this business mentoring model can be translated to and leveraged in the two year college setting.

Highly appropriate to the academic context, the IBM Experiential Learning Opportunities Portfolio consists of three components: 1) career development and mentoring 2) information and training 3) resource and knowledge sharing.[1]The Mentor-Connect team found that this type of learning, already established as highly effective for students, works just as well for faculty who also learn best by doing in a cohort-based situation guided, but not lectured to, by peers.

Educators who benefit from mentoring and leadership development form a community of practice that not only evolves but also grows the next generation of leaders. According to Murrell, Forte-Trammell, and Bing "one of the key notions within the idea of communities of practice is that organizations must understand the link between knowledge and the social context in which knowledge is created and shared. Learning is seen as "knowledge creation and the transfer is a process that requires participation. [the focus should be on] building social environments that support learning and knowledge among interrelated people." [2]

The Need for Science, Technology, Engineering and Mathematics (STEM) Faculty Mentoring at Two Year Colleges:

> "Mentors are guides...We trust them because they have been there before. They embody our hopes, cast light on the way ahead, interpret arcane signs, warn us of lurking dangers, and point out unexpected delights along the way."[3]

The National Science Foundation's Advanced Technology Education program is a fertile ground for focusing on leadership development through mentoring. It is one of the few NSF funded divisions that explicitly encourage never before funded community colleges to apply for their first technician education grant. Moreover, they encourage colleges to become part of a larger federally funded research and implementation community that has long been seen as the domain of the proverbial Ivory Tower.

There is substantial research documenting the effectiveness of mentoring in improving work outcomes and stimulating leadership development in all fields. Some of the earliest work done on mentoring in the business field showed, for example, that highly successful adults reported having a mentor in youth.[4] One study by Roche found that of the 63.5% of the 1,250 respondents who had a mentor (defined as "a person who took a personal interest in your career and who guided or sponsored you") were on the average better paid, reached their positions faster, and were more satisfied with their work and careers than their non-mentor counterparts.[5.]

- Some proven models of effective mentoring include:
- Apprenticeship Programs
- Formal Mentoring Programs (IBM, e.g.)
- Informal Mentoring—'each one teach one'
- Peer Mentoring—Students, Faculty, Co-workers
- Co-op & Internship Initiatives
- Taking Others Under Your Wing—Buddy Systems

Likewise, numerous studies have shown that in *educational environments and academic settings* mentoring is a highly successful and often necessary approach to creating change. Mentoring goes "beyond the transmission of knowledge and experience." It "generates a pervasive network to create learning." Researchers find that the "impact of leadership mentoring on the education system in influencing school leaders is substantial, over and beyond the period of its structured implementation."[6]

Research also shows that faculty members who have received mentoring in their college setting are more quickly socialized and are able to focus their energies on teaching and research. Data from the University of Michigan lists the following positive attributes of informal and formal peer mentoring in academia: [7]

- Quicker acclimation to the job
- Improved teaching
- Improved research skills and productivity
- Better informed choices regarding service activities
- Increased social contact

The potential benefits to mentors include:

- Satisfaction from contributing to the development of a colleague
- Exposure to new research techniques and topics, and different teaching styles and strategies
- Reinvigoration of teaching and research programs

The model described in this paper, the Mentor-Connect project, uses the mentoring process to bring in a new and diverse cadre of educators in to the NSF ATE program to build leadership capacity in the advanced technology fields that drive the nation's economy. Peer mentoring is critical in addressing what Daresh calls "a lonely effort." He argues that the "the role of the leader is a lonely effort, and that having the ability to relate to peers concerning personal and professional concerns is a way to reduce that sense of isolation."[8]

The networked, peer mentoring approach proposed by Mentor-Connect has been a key component to increasing the diversity (demographic and geographic) of PI's and colleges submitting proposals to the NSF ATE program. Carla Hymowitz points out that "mentoring is important, if not crucial, in helping women and minorities, to reach the top ranks in organizations."[9] Mentoring also helps transcend informational barriers and provides networks of support and connections to other professionals in the field which have been found to be key components not only for success but also for *leadership development* especially the case women and minorities.[10]

The opportunity provided by Mentor-Connect for educators to become engaged and be prepared for service enhances the vigor, broader impact, and reach of STEM faculty. Mentoring, according to Lamm and Harder, is a mutually beneficial form of professional development which has numerous benefits not only to the "protégé" but also to the mentor.[11]

These benefits include:

- exposure to new ideas, educational methods, technologies, and perspectives
- a sense of accomplishment in helping someone else professionally
- the ability to pass a legacy of information and history to the next generation of employees
- increased professional contacts through protégé's contacts
- utilization of coaching, communication, and counseling skills
- enhanced reputation through a demonstration of commitment to the organization and the knowledge that the profession will be enhanced as a result

Adapting the IBM Model of Knowledge Transfer to Academia:

The authors of this paper have found that the IBM Intelligent Mentoring Model is particularly applicable to academia for a number of reasons.

The IBM model is based on three *business* imperatives:

- **Socialization** for new hires or anyone who transfers to a new organization; purpose is to speed up the adjustment process
- **Career** is a long term process which facilitates progression
- **Expert** mentoring is intended to develop specific skills like technical, business, leadership, communication, etc.

For both IBM and the Mentor-Connect project "mentoring is not a quick fix. It is part of an overall strategy to reshape and revitalize the organization (or in this case the community) for not only short-term recruitment and retention goals, but also for long term learning and innovation priorities."[12]

The Mentor-Connect team repurposed the IBM model to suit the needs of educators and two year colleges to develop leadership potential and increase grant success, especially grant funding from the NSF ATE program. The project team chose to focus on three areas where the model would be particularly relevant; have impact; and effect change:

1. Socialization for new administrators, faculty, or anyone (e.g. program manager) who transfers into a new environment (e.g. department, field of study) or movement from one area to another to speed up the adjustment process. The process also extends to bringing faculty in to the NSF ATE community. ATE is program that is more than just a collection of funded projects. It is a community of educators working together to advance technician education. One goal of Mentor-Connect is to bring new educators into this community and to help them become socialized as a well-networked and vital member of the ATE Community. ATE has been recognized by researchers as being highly innovative in the world of community college education.[13]

2. Career aspirations with interim goals to achieve in current academic profession (e.g., tenure, leadership role); long term (e.g. Administrator, Dean, Specialized Skills, Field of Study); Regional and national leadership roles, and leaders within the ATE Community with impact extending beyond their home institution.
3. Expert education mentoring intended to develop specific skills (e.g. expert subject matter knowledge, leadership attributes, communications, etc.) and to include those with more experience in implementing grant-funded projects teaching those with less experience, beginning with the skills necessary to prepare competitive proposals.

As in many professions, the ATE workforce is aging. The Mentor-Connect project is also designed to provide existing ATE experts (long time PI's and Co PI's) with a systematic process to share their legacy expertise and leave their "thumbprint" on ATE's future generations. According to Anthony P. Carnevale, director and research professor at the Georgetown University Center on Education and the Workforce, the ATE program is

> cutting edge in the American system for teaching both high-level technical skills and soft skills like critical thinking and problem-solving…for two decades NSF ATE program directors have used an approach that some other funders have adopted only recently amid tight budgets. NSF has supported experimentation; has requested that ATE principal investigators capture what is effective in order to learn from it; and has encouraged efforts to scale innovations that have generated positive outcomes. *ATE grants generate positive changes because they get like-minded people to work together on initiatives* (emphasis added) that do not fit within colleges' regular operating budgets.[14]

The goal of the IBM model in academia is to help engineering and STEM faculty and indeed all faculty members to start developing what is popularly known as a "T" Shaped career model, a stark departure from the traditional "I" shaped model prevalent in academic settings. The IBM mentoring model was developed precisely to address this necessary shift in order for the company and its employees to remain both relevant and successful in an increasingly competitive global market. IBM used Tomas and Perrin's findings (in their report "Winning Strategies for a Global Workforce") that employees place a huge premium on having opportunity to learn and build their skills.[15] Thought leaders at IBM argue that the ability to acquire skills is the single most important element in creating higher levels of [employee] engagement.

Nowhere is this transposition more necessary than in the academic setting where engineering and STEM faculty are constantly lured by industry which can provide better remuneration and benefits than most community colleges. However, based on these findings it is entirely possible to set up other paths towards engagement for faculty based upon formal and informal mentoring strategies to make employees feel "supported, valued, and ultimately engaged." [16] The road to

mentoring begins with a new vision for career pathway development for faculty based on a larger set of long-term goals and aspirations than the simple focus on daily classroom activities.

According to Dr. Katharine Brooks, Executive Director of the Office of Personnel and Human Development at Wake Forest University:

> The most sought-after candidates for management, consulting, research and other leadership positions are T-shaped. The vertical stem of the T is the foundation: an in-depth specialized knowledge in one or two fields. The horizontal crossbar refers to the complementary skills of communication (including negotiation), creativity, the ability to apply knowledge across disciplines, empathy (including the ability to see from other perspectives), and an understanding of fields outside your area of expertise.[17]

The "I" shaped model in contrast is based on a single minded focus on one area of expertise, does not promote building of a multi-disciplinary skills portfolio, does not encourage professional connections with experts in other areas, and runs the risk of becoming obsolete.

The Mentor-Connect team members' long association with the NSF ATE program, and the informal mentoring processes innate to that community, led the team to develop an appreciation for the value of a T-shaped model career model. This is especially true for engineering and STEM faculty who are often "head's down" and confined to their own silos especially in community college settings.

The Mentor-Connect Story and Model:

Mentor-Connect is the product of a comprehensive planning process that involved ATE PIs, NSF Program Officers, current grantees, potential grantees, the National Academy of Engineering, the American Association of Community Colleges, and the IBM Corporation whose award winning Global Mentoring Program serves as a benchmark for this initiative.

The Mentor-Connect ATE Project is designed to 1) fill a void created by the 2012 elimination of the preliminary proposal review process for the ATE Program; 2) address the fact that roughly two-thirds of the nation's community colleges have never been awarded funding from the NSF; 3) better manage the rapidly growing number of requests received by ATE Center PIs and NSF Program Officers related to grant proposal development/project management; and 4) ***most importantly to develop grant writing and leadership skills among community college engineering and STEM faculty.***

A team of experienced ATE Principal Investigators (PIs), working in collaboration with successful ATE Center and project PIs and the American Association of Community Colleges has established the first phase of a regenerative mentoring system for leadership development and knowledge transfer to broaden the impact of the ATE Program. Initially, the Mentor-Connect system provides targeted outreach to stimulate and facilitate participation of technician educators from underserved groups and from community colleges who have never received funding from the NSF.

The system will be expanded to support:

- colleges being recommended for grant awards through the negotiation phase prior to funding
- first-time grantees
- repeat grantees who are considering undertaking larger, more complex projects
- grantees who seek to leverage the experience of others to help them maximize the outcomes of their projects or Centers
- grantees who encounter difficult situations that may threaten their ability to achieve their goals and objectives.

The system will be both high-tech and high-touch. It will minimize duplication of effort and information exchange while providing individual answers and support where needed. Leadership skills are strengthened in those providing mentoring as well as those being mentored. Finally, an important product of this initiative will be a searchable database of resources that will be available for both mentors and mentees.

The Mentor-Connect project was designed by the ATE community to leverage talent within the program to meet a common and growing challenge. Mentor-Connect is led by some of the program's most experienced and successful PIs and mentors. Mentors stimulate knowledge transfer and help prepare the next generation of community college faculty leaders in advanced technological education fields critical to economic development and national security.

The Impacts of Mentor-Connect:

Engineering and STEM faculty at community colleges who have never had NSF funding are learning to think like leaders, problem-solvers and entrepreneurs by developing grant planning and writing skills, project development, administrative management, and leadership skills to advance technician education and related STEM education. Mentors are developing knowledge transfer skills as they "give back" to those new to ATE.

This impact is perhaps best summed up by the faculty and administrators at Housatonic Community College in Connecticut, a mentee college from Cohort 1. They completed submission of their proposal and wrote the following to the PI: "It was honor to be selected to join the 2012-2013 Mentor-Connect Project. The technical assistance we received in putting together our very first National Science Foundation project was extremely helpful. This was a wonderful learning process for us and working on our proposal has created a buzz on campus and fostering an interest in other faculty members to learn about grant development." [18]

Mentor-Connect Project Outcomes Include:

- ✓ A peer-mentoring system for leadership development and knowledge transfer that is benchmarked to an award winning industry model;
- ✓ An increase in engagement with and competitive proposals from those underrepresented (geographically and demographically) in the NSF/ATE Program;
- ✓ Online referral, resources, and support services for use by mentors, prospective and current PIs, and NSF Program Officers;
- ✓ A cadre of new, diverse Principal Investigators with leadership skills;
- ✓ Broader utilization of existing ATE resources;
- ✓ Engagement of successful ATE PIs as mentors who give back to the ATE Program.

The project facilitates knowledge transfer from the more to the less experienced PI, and benchmarks to an award-winning industry standard: IBM *Intelligent Mentoring.*

Mentor-Connect:

1) Creates a regenerative, technology-enhanced, "high-touch", peer-mentoring model for leadership development and knowledge transfer adaptable within community colleges and for other NSF programs. Effective use of technology will increase Mentor-Connect capacity and accessibility. However, just as the IBM model notes, "technology is a tool not a panacea." [19]

2) Includes evaluating and disseminating results that are useful to broad audiences; and

3) Provides outreach workshops with ongoing mentoring for participants to engage effectively populations that are underrepresented geographically and demographically in the ATE Program and to develop future talent for STEM/technician education.

Since the project was funded in 2012, mentors have been providing guidance and assistance to their Mentees (Cohort 1) and technical assistance webinars are being offered to support and nurture Cohort 1. At the time of publication of this paper, Cohort 2 has also been selected and college teams are working with their mentors.

The Management Team has been monitoring this process through periodic surveys and interviews with Mentors and Mentees. In addition, an innovative "Value Creation" model based on the work of Wenger is being used for external evaluation of the project by veteran ATE Principal Investigator and experienced evaluator, David M. Hata.[20] The proposal development process culminated with submissions of completed proposals to NSF by the fall 2013 deadline. Out of the twenty schools selected for Cohort 1, eighteen schools successfully submitted proposals. The two not submitting proposals in fall 2013 are working to overcome institutional barriers and intend to continue working with Mentor-Connect and to submit proposals in fall 2014.

The project will continue to recruit cohorts of 20 two-person faculty teams each year for specific mentoring interventions while adding alternate mentoring pathways and technology support for others who seek mentoring assistance for applying for or managing grant-funded projects. The cohort selection cycle begins with a national orientation webinar when a NSF Program Officer introduces the NSF ATE funding program, and the Mentor-Connect project team introduces the mentoring opportunity and provides instructions for applying to participate.

Webinars continue to be a useful technology tool for providing just-in-time learning for mentees throughout the year. Those selected for each cohort, teams of two STEM faculty members, also receive support to attend a face-to-face technical assistance workshop where they learn grant writing strategies and work one-on-one with an assigned Mentor selected from among successful and experienced ATE PIs. A common flaw in grant proposal development is underestimating the time required to prepare a competitive proposal. For this reason, the first Grant Writing Workshop for each cohort of participants is held approximately nine months prior to the proposal submission date for the NSF ATE Program. The Grant Writing Workshop for Cohort 1 Mentors and Mentees was held in Portland, OR, on January 23-25, 2013. The workshop for Cohort 2 was held in Atlanta, GA, on January 22-24, 2014.

The annual Grant Writing Workshop is capped at twenty participating colleges per year. In 2013, 20 faculty teams from 18 community colleges representing 12 states participated in the workshop. Seventeen of the teams were accompanied by a grant writer or other supportive administrator from their college. In 2014, twenty faculty teams from 20 community colleges, one including a faculty member from a university partner, participated in the workshop. Cohort 2 faculty came from colleges in 13 states, including eight states not previously represented. All 20 Cohort 2 teams were accompanied by at least one grant writer or other supportive administrator even though those who accompany participating faculty teams receive no grant support to cover their registration or travel expenses.

Summary demographics for the initial two years of Mentor-Connect: *Cohorts 1 and 2 of the Mentor-Connect project include 79 community college faculty participants from 20 states. 40% of faculty participants are women and 20% are from under-represented racial or ethnic groups in STEM. The total of 80 participants includes one faculty member from a partner university of a participating community college.*

The annual Grant Writing Workshop agenda includes sessions on the ATE Program, project development, and proposal writing. Based on participant feedback, the most useful parts of the workshop were the "mock panel reviews" and the time each faculty team spent with their Mentor. During the mock panel review, participants had an opportunity to review actual NSF ATE proposals following the format of the actual panel reviews that are conducted by NSF as part of the merit review process to guide agency funding decisions. Another highlight of each workshop is an "elevator speech" activity. Near the end of the workshop through which initial visions are transformed into first draft project plans, each team presents an elevator speech to "sell" their grant proposal idea their peers.

Through the annual Grant Writing Workshop and subsequent project activities, Mentor-Connect is creating a collegial and networked environment that increases the number of competitive proposals by first time PI's who have become educated and integrated into a community of educators long before the submission of their first proposal. New members of the ATE Community are learning to use the resources of the program to build strong projects that are informed by the work of colleagues with similar interests nationwide. Also, grant-funded project development and implementation require knowledge and skills beyond those required for teaching and stretch faculty in new ways that can effectively develop leaders among faculty. Through the process of proposal development, and later project implementation, individuals are also given opportunities to develop or strengthen a number of leadership skills.

The following is a table of traits and skills that are being examined through this professional growth experience.[21]

Faculty Leadership Task Analysis: Major Responsibilities & Specific Tasks

A key challenge to Mentor-Connect issued by our IBM colleagues was to define what we meant by faculty leadership skills. Our initial research showed that much of the literature addressed the behaviors and traits needed by leaders in a variety of settings including education, but little information was found on the leadership skills specific to faculty leaders. There was also little information on the specific tasks required to develop faculty leaders. The following task analysis summary is excerpted from work in progress developed by Mentor-Connect that tentatively identify the specific duties and tasks expected of ATE faculty leaders, the skills and knowledge required to perform those tasks, and the traits and attitudes that characterize ATE faculty leaders.

Mentor-Connect staff is in process of further refining and validating this task analysis information with various ATE stakeholders.

- Prepare Funding Proposals
- Build and Manage Grant/Project Teams
- Facilitate Meetings and Activities with Various Internal & External Team Members
- Perform Formal & Informal Leadership Roles and Responsibilities
- Prepare Various Communication Documents, Reports and Materials
- Maintain Positive Working Relationships with Internal and External Project/Grant Faculty, Staff, Administrators and Industry Partners
- Recruit Students, Faculty, Administrators, Staff Members, and External partners for Grant/Project Activities
- Perform Increasingly Complex Budget & Financial Management Responsibilities
- Develop a Positive Work Environment & Culture for Students & Faculty
- Develop & Implement Grant/Project Programs and Activities
- Evaluate Program/Grant Progress & Effectiveness
- Maintain Required Program/Grant Documentation and Records
- Provide Professional Development Opportunities For Yourself & Others

Traits & Attitudes

The traits & attitudes most critical to the development of increasingly more complex and demanding leadership skills include the following:

- A forward-looking philosophy that prepares one for change
- A willingness to take risks informed by research and data
- An entrepreneurial perspective on activities and opportunities
- A willingness to take ownership and personal responsibility for decisions
- A high value on Integrity and trustworthiness
- Flexibility and adaptability in implementing goals, objectives and activities
- Personal self-care and balance
- Driven to achieve excellence
- A visionary approach
- A yearning for learning
- Preoccupation with simplicity and innovation
- A change catalyst—wwilling to embrace change and challenge tradition and the status quo
- Personal charisma and Inspirational leadership–use power to influence, generate excitement, create a sense of purpose and right action
- Democratic approach – everyone has a voice
- Influence with respect – understands the power of diversity

- Demonstrate intellectual curiosity – calculated risk taker
- Emotional self-awareness coupled with accurate self-assessment and emotional self-control
- Self confidence
- Optimism

Knowledge & Skills

The key duties and tasks identified above imply the need for specific knowledge and skills to perform those duties and tasks effectively. In addition to the implied knowledge and skills from the duty and task statements above, those listed below are most critical to the development of increasingly more complex and demanding leadership skills.

- Understand the mission, vision, goals and values of community colleges, and how one's role supports them
- Understand the organizational structure of the community college, and the function that one's unit plays in supporting institutional goals achievement
- Organizational and time management
- Reading an institution's budget
- Understands that opportunity resides within challenge
- Strong presentation skills
- Being articulate
- Listening, speaking, writing and presentation skills
- Building Relationships/Negotiation skills
- Ability to transform old mental maps- critical thinking/thought leadership
- Creative Problem Solving
- Conflict management
- Turn disruption and challenge into opportunity

Through the support of the mentoring process, faculty not only gain greater confidence, agility, and advancement in their careers but also become more empowered to recruit, retain and educate STEM undergraduates who will be the next generation of innovators. The authors of *Intelligent Mentoring* make a very important observation that "the original idea of communities of practices was developed from research looking at learning through the apprenticeship process. A well-known method for developing skill and expertise among newcomers, the apprenticeship approach is fundamentally about the transfer of knowledge."[22]

Perhaps most important, those who "apprentice" with Mentor-Connect and develop leadership skills through Mentor-Connect will consider IBM's business imperatives to be their personal imperatives. They will, themselves, give back to the ATE Community by mentoring others and

helping grow a generation of leaders in technician and related STEM education to move educational programs and the nation's economy forward.

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[18] Letter from Andrew Macnow, et al. Housatonic Community College, Bridgeport, Connecticut. November 12, 2013.
[19] Murrell, Forte-Trammell, and Bing. *Intelligent Mentoring*, 2009. IBM Press (p. 91)
[20] Wenger, Etienne, Beverly Traynor, and Maarten de Laat, "Promoting and Assessing Value Creation in Communities and Networks: A Conceptual Framework," Ruud de Moor Centrum, 2011.
[21] This document includes excerpted and revised material from the sources noted below:

- AACC Competencies for Community College Leaders, (2nd Edition), American Association of Community Colleges, August 2013
- Leadership Development Presentation, Sheila Forte-Trammel, Mentor-Connect Project Advisor Meeting. September 2013
- Excerpts: Faculty Leadership Task Analyses, Mentor-Connect Project, 2013.

[22] Murrell, Forte-Trammell, and Bing. *Intelligent Mentoring*, 2009. IBM Press (p. 53)