It Takes a Village to Raise an IT Student: Ten Observations on Institutional Collaboration by the Midwest Center for Information Technology

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The Problem: Collaboration in a Large Scale Information Technology Project

Ask anyone who has just received funding to lead a large-scale collaborative project and they will probably tell you that they went through two distinct emotions when they heard the news of their funding. Their first emotion was probably a mix of excitement and satisfaction, as the news of their funding promised new opportunities for putting their ideas into practice. A second emotion may have followed quickly behind the first one, and was probably one of thoughtful anxiety, as the responsibilities of leading a large-scale collaborative project settled in a bit. Why do we experience such anxiety with such good news? It may likely be that at such times we also begin to remember that collaboration in any setting can be hard and challenging work, and particularly so within a large-scale, funded project, with multiple partners who often have multiple agendas. Yet, effective collaboration may be the single most important catalyst to the successful growth of a new large-scale project. Using a twist on an old (and wise) African Proverb, it may be that like a child, it truly "takes a village" to raise a successful project.

Yet how does a project leadership team, move forward with effective collaboration? This paper describes some suggestions and tips from our successful information technology project, funded by the National Science Foundation (NSF), and involving ten different community colleges in a four state Midwestern region. Our project is called the Midwest Center for Information Technology, and is a project that has evolved over the duration of about seven years, with a close collaboration between the ten community colleges, a fiscal agent and lead organization representing IT businesses, and a university consultant, leading the evaluation process. The article provides ten suggestions for effective collaboration and the context of the discussion aligns with a new national focus in education: STEM. The acronym of STEM stands for the four disciplines of Science, Technology, Engineering, and Mathematics, which are becoming ever more important in our increasingly technical society. The four STEM disciplines can be some of the more challenging areas of classroom instruction for sparking student interest and engaging teachers in new instructional approaches (NSF, 1996; Putnam, 2002). The primary discipline of STEM represented in our project was "technology" or more specifically, "information technology" which has been the curriculum focus of the project.

The new focus on STEM in today's educational environment, as an integrated way to learn these important disciplines is perhaps itself, somewhat of an acknowledgement to the power of collaboration between people with relatively different areas of expertise. We are finding that if organized effectively, information technology instruction can come alive in the context of an applied problem that uses mathematics; or similarly, the wonders of science can be more accessible when illustrated with impressive technologies. Organizations such as the National Science Foundation recognize this potential, and are calling for a more careful alignment and integration of these four disciplines (1996). However, such a focus on the integration of different disciplines often requires bringing together individuals from a variety of academic and organizational cultures, and having them work together to accomplish something bigger than themselves. This was the ongoing challenge of the Midwest Center for Information Technology (MCIT) and an ongoing focus as we continue to grow and evolve.

In reflecting upon our past successes and challenges at a recent MCIT meeting, it was decided to undertake a careful reflection process that involved several data sources to build this article. First, all institutional representatives from the ten community colleges were interviewed related to collaboration and how it had evolved in MCIT. Secondly, area businesses (at least one from every institution) were also interviewed for their thoughts on collaboration. Thirdly, data from previous NSF annual reports for the project was retrieved and examined, related to the general impact and trends of the project, as illustrated by the various project objectives, associated with enhancing IT instruction and pathways at each of the area institutions. What emerged from this data driven reflection, was essentially ten suggestions regarding institutional collaboration within a large STEM oriented project, that are presented in this article. However first, it is important to understand the specific context of the project itself, the MCIT and its four state, ten community college efforts for enhancing IT pathways.

The Context of The Midwest Center for Information Technology

In many ways, the collaborative environment for the MCIT project is somewhat unique, in that the fiscal agent is not one of the ten community colleges, it is instead a non-profit business focused consortium. The Applied Information Management Institute (AIM), is a actually a 501(c)(3) business, education, and government consortium located in Omaha, Nebraska. AIM serves as the fiscal agent and project facilitator for the four-state consortium (Nebraska, Iowa, South Dakota, and North Dakota) of ten community colleges comprising the Midwest Center for Information Technology (MCIT). The MCIT was established in 2001 as a Regional Center of Excellence through the National Science Foundation's Advanced Technological Education Program. In 2006, it received a second three-year grant to develop, test and refine a comprehensive, integrated series of activities that focused on IT-related curriculum adaptation, faculty development, workforce development, program articulation, and dissemination/replication. The participating colleges, range from small to large, rural to urban, and vocational/technical to comprehensive, include: Central Community College (NE); Iowa Western Community College (IA); Metropolitan Community College (NE); Mid-Plains Community College (NE); North Dakota State College of Science (ND); Northeast Community College (NE); Southeast Community College (NE); Southeast Technical Institute (SD); Western Iowa

Technical Community College (IA); and Western Nebraska Community College (NE). These colleges educate 106,765 students annually, over 94% of the community college student population in Nebraska, Iowa, North Dakota, and South Dakota.

From its beginning, MCIT was designed to build an active consortium of community colleges with highly skilled faculty, a process for ongoing faculty professional improvement, a robust articulation-supported pipeline of students, and an interested and contributing business community. Most importantly, the project tried to laid the groundwork for the proposed project by establishing a viable consortium of ten community colleges with a relationship based on trust, collaboration and shared resources. Throughout its existence, the MCIT project tracked key variables to assess its impact on the region using baselines established at the outset of the project in 2001 and identified as project indicators. The MCIT demonstrated significant gains in the areas of (1) faculty certification and professional development; (2) the development of relevant curriculum; (3) participation of underrepresented groups in IT programs of study; (4) articulation of students following a 2+2+2 model; and (5) the number of students in the region graduating with IT degrees. Collectively, these initiatives had a primary goal of strengthening and expanding the region's information technology workforce. Data collected over the past ten years show gains toward all of these goals and suggest that the project is having a considerable impact on IT education in the region. Briefly, the next few paragraphs highlight some of these successes and general collaboration strategies.

Faculty Professional Development: Faculty professional development objectives in MCIT focused on IT faculty certification, degree and advanced coursework, as well as ongoing professional development. The results of these efforts were substantial. The percentage of IT faculty participating in faculty certification and advanced degree coursework rose steadily throughout the funding period of the project, from 60% of all MCIT faculty across the participating colleges in 2002 to 75% at the completion of the second phase of funding in 2008 and involving overall, more than 200 full- and part-time faculty across the ten colleges. The number of full-time IT faculty in the region with industry certification rose from 54 to 70, and the number of full-time faculty possessing a bachelor's degree increased from 21 to 39. With a total of 107 full-time IT faculty across the ten participating colleges, these gains in certification and degrees represented increases of 30% and 86%, respectively.

Throughout the project, MCIT initiated a regional approach to professional development through systematic participation in the AACC/Microsoft Working Connections IT Faculty Development Institute. Building upon the national model developed by AACC and the National Workforce Center for Emerging Technologies, the Midwest Center for Information Technology IT faculty board developed the Working Connections Institute, offering five full days, or 40 hours, of intensive professional development within six tracks that included graduate credit from the University of Nebraska at Omaha for participating faculty. The Working Connections Institute has thrived. Held annually in June, attendance has doubled from about 80 participants a year to as many as 160 per year. Feedback from Institute attendees attested to the high quality of the IT training provided and nearly 9 out of 10 attendees (86%) reported that the Institute had a positive impact on their curriculum. Partner colleges eventually helped to directly fund its continuation and to enthusiastically encourage faculty participation.

Relevant Curriculum: The MCIT led numerous efforts over the past ten years to ensure the availability of IT education that builds the competencies required by employers in some of the region's highest demand career fields. These efforts entailed the development of curriculum in new IT fields of study, systematic review and adaptation of curriculum in evolving core IT and IT-enabled fields of study, and lateral diffusion of the curriculum innovations across the consortium. Based on input from employers and using a modified DACUM process (Norton, 2008), teams of MCIT faculty, project staff, outside experts and senior personnel were engaged in curriculum development/adaptation throughout each of the two grant cycles. These initiatives resulted in the development of new degree and certificate programs in areas such as CyberSecurity, Computer and Network Support, Database Management, Web Development, Project Management, Bioinformatics, Health Informatics, Nanotechnology, eBusiness, and Telepharmacy. It also included adaptation in selected career/educational pathways with highest demand (using regional labor market data) focusing on the areas of Agriculture/Natural Resources, Business, Education, Government, Healthcare, and Manufacturing. Complementing the curriculum development/adaptation process was a continued focus on the integration of online course delivery and hybrid formats. The MCIT project also used surveys, focus groups and interviews to gauge employer satisfaction with the preparedness of the MCIT graduates, and the new programs. Employers reported general satisfaction with the technical skills of MCIT graduates and an admiration for the collaborative synergy being established through the MCIT activities.

Expanding Participation of Women: The Midwest Center for Information Technology successfully initiated several efforts to increase the number of women enrolling in IT programs of study. The number of female high school students articulating to IT programs of study across MCIT colleges has steadily increased, nearly tripling from 11.6% to 32.7%. Similarly, the number of female IT students articulating to 4-year colleges and universities has increased steadily from 20.3% to 27.2%, and the total percentage of women enrolled in MCIT-related IT programs increased from 32.1% to 43.7%, engaging, overall, more than 400 women in MCIT-related IT programs. A cornerstone of its recruitment of females into IT regionally has been the "Women in IT" initiative. Working collaboratively across institutions, the MCIT colleges created recruitment kits entitled "IT's for You," which included posters, CD ROMs, and curriculum guides and suggestions for local bridge programs, highlight women and minorities. These kits were used extensively at each college, distributed nationally and continually refined with institutional input. Additional local MCIT efforts to engage women entailed such activities as special career fairs; guest speaker programs; school-based visits and recruitment; women in IT clubs; a career camp for girls; and specialized 'Women in IT' events such as 'Build a Computer in a Day'. In addition to these efforts, three MCIT colleges received funding through the NSF S-STEMS competition to support student scholarships (particularly for women).

Another major development related to the recruitment and retention of women involved the establishment of a "Women in IT" Bridge Program prototype. The prototype, which was developed collaboratively by five MCIT site coordinators, was implemented and evaluated at several of the colleges. The prototype incorporated such features as outreach/recruitment; pre- and post-assessment; curriculum; instruction;

career services; support services; and program evaluation. Examples of the Bridge prototype spreading across the MCIT colleges include programs being implemented at *Northeast Community College (NECC), Iowa Western Community College (IWCC) and Western Iowa Technical Community College (WITCC).* Working with the Norfolk Early Beginnings program for referrals, NECC is providing women an "Introduction to Computer Concepts" Course, and coordinating mentors for the first 12 hours of IT coursework. *IWCC* is using a development course called "Introduction to Computers" for their Bridge Program that includes a placement exam for future IT courses. Further support systems designed especially for women students were also planned and implemented at IWCC. *WITCC* is offering a set of 10 sessions in IT prior to that equates to one free hour of college credit. All of these approaches helped the colleges to determine placements and are a motivating factor in student involvement in IT careers.

Articulation: Program articulation and shared planning for articulation has been an additional focus of the MCIT. Efforts in articulation have focused on increasing both the number of secondary students articulating to community college IT programs of study and the number of community college graduates articulating to four-year/university IT programs of study. Several interrelated activities were implemented toward these ends. Conceptualizing approaches for articulation, many of the MCIT community colleges worked with the high schools in their service delivery areas to establish or revise articulation agreements, based upon collaborative ideas from the consortium. Dual enrollment programs, also served as a valuable strategy, with programs developed in microcomputer fundamentals or introductory computing courses, networking, and graphic arts. Likewise, the community colleges have also worked closely with the four-year colleges and universities within the region to develop and refine articulation agreements, based upon shared ideas. Several 2+2+2 articulation agreements were created as a result of this effort and one university partner opened satellite offices on the rural campuses of the MCIT community colleges to increase rural students' access to the enhanced IT educational pipeline forged through the project.

Increasing the Number of Students Completing IT Programs of Study: A number of MCIT initiatives have been developed and implemented to increase student retention while improving the quality and quantity of the region's information technology workforce. During the first grant cycle these initiatives included early alert systems for struggling students; new student assessment/test-out procedures; instructor-led labs; campus-based internship programs, such as a student-run help desk; and the revision/adaptation of curriculum based on quantitative and qualitative student and faculty surveys conducted by the MCIT with ongoing input from each college's business advisory committee.

Designed to build upon these initiatives, the MCIT continuation grant targeted student retention. This effort included a close examination by each MCIT college of Hagedorn's "four corners of friction," (2005) and her research on the retention and transfer of community college students as being critical to long-term student success. The process included access, success, retention, and institutional accommodation. The first step in the process was to conduct an assessment of each college to determine where gaps existed in these areas using the Council for Adult and Experiential Learning's Institutional Self-assessment Survey (ISAS) and their Adult Learning Inventory (ALI). The results of the two surveys were compared and gaps identified for focused

improvements. The Council for Adult and Experiential Learning provided recommendations based on this analysis, presenting their findings in 2008 at a MCIT meeting with administrative representatives from all of the ten community colleges. Resultant changes by the MCIT colleges included expanded evening classes, increased advertising, revised policies and new forms of governance.

Two additional efforts implemented during the continuation grant period included the incorporation of problem-based learning and the implementation of Bridge programs across MCIT colleges. In 2006, Principal Investigators, project staff, faculty, high school teachers, and business representatives completed training in Project-Based Learning (Case Files) as provided by Dr. Ruth Loring, a professional development specialist at Nashville State Community College. Participants were taught a learning cycle process that has been proven to actively engage students in the learning environment – both in and outside the classroom – using a well-documented real life business problem that must be solved using the knowledge and skills targeted by the course in which the Case File is used (Lombardi, 2007; Pariseau & Kezim, 2007). Within this model, students work in teams to gather, organize, validate and interpret data as they work toward solutions. Each of the ten MCIT colleges sent a team to the training, and each team completed a Case File during the training. Each of the colleges has subsequently continued to develop their Case File and many have moved on to creating new Case Files targeting different curricular outcomes. The integration of problem-based learning has grown exponentially since it was first introduced in 2006 and is being implemented in a variety of courses throughout the region. Metropolitan Community College, for instance, has developed an entire AAS degree program using cases.

The Future Collaborations Planned in MCIT

Due to its success as a collaborative model between community colleges within the its first seven years of funding by the National Science Foundations Advanced Technological Education Program, and two years of demonstrated consortium sustainability without funding, the ten MCIT community colleges successfully applied for a rare third ATE Center grant to undertake additional more extensive collaborative efforts. These new efforts, based upon past successes will particularly focus on increasing student engagement through scenario-based learning in a shared cloud computing environment; enhancing resource sharing to better serve all MCIT colleges; a further targeting of research-based activities to increase women's participation in IT; and the implementation of a new student tracking system to measure impact.

Scenario-based learning within a virtualization context holds great potential for rural IT education in the MCIT institutions. Take Western Nebraska Community College (WNCC), for instance, where three full-time instructors comprise the IT Department. This is in stark contrast to Metropolitan Community College's (MCC) IT Department which employs 27 full-time and 70 part-time faculty. Through virtualization, WNCC can access the MCC scenarios from various courses, faculty perspectives and business perspectives. In turn, MCC can access scenarios from the very diverse institutions in the MCIT collaboration. It can also access consortium pricing on software and other resources. Rural businesses will be served both by the training itself but also by the

gradual shift to the cloud computing environment, in which no individual MCIT college could easily undertake on their own.

Previous years of MCIT collaboration identified the need for a more robust student tracking mechanism that better measures the quality and impact of specific interventions, within the context of particular student demographics, in both the short term and over time. The system would need to account for each college's specific data collection policies and IRB regulations and disaggregate students according to race, age, location and other characteristics to determine the impact of MCIT-related interventions on all students as well as subsets of students. Students, faculty, and colleges must also be willing to participate, and see a real value-added in their participation.

Such a mechanism is a key goal of new MCIT collaborations, and the ten community colleges feel that the foundation is now in place for attempting such a shared data system, using enhanced features of AIM's Careerlink system. While there are still some barriers that will need to be addressed in implementing such a new system, the conceptualized benefits have been defined and the colleges are now ready to participate. The Careerlink data mechanisms would allow the consortium to gauge the effectiveness of specific interventions and their impact on students, including various subsets of students. It would also enable the consortium to better identify which existing and prospective interventions have the greatest potential for impact and subsequently take a more strategic approach to serving students.

Ten Tips for Institutional Collaboration from MCIT

As MCIT has worked over the last decade to establish a collaborative environment of trust and cooperation for the ten participating community colleges, in the four state region, it has been identified at various conferences and NSF meetings as relatively unique its long-term sustainability and success. Such successful collaboration is the result of very focused and targeted efforts at collaboration, and did not necessarily come easily in MCIT. In order to more fully document the collaborative process that led to MCIT's success, and to provide suggestions to other institutions desiring to build a consortium of institutions in their local area, a focused interview process was undertaken with each of the MCIT Colleges asking about collaboration within MCIT, and tips for other institutions. In addition, a series of interviews were also undertaken with a representative business at each institution, as well as discussions with the AIM leadership for MCIT, and with input from the university external evaluation team which has been with the MCIT from its beginning.

As we reflect back in MCIT, we believe that we have learned first hand a bit about what constitutes effective collaboration within the context of a large-scale STEM project. We have generalized our thoughts to the following 10 tips for project collaboration.

Tip 1: Establish and periodically re-establish a common vision.

Our initial challenge was to establish a common vision for the MCIT Project, which ran across the collaborating community colleges, AIM, and the evaluation team. We wanted to make sure that whatever we did in our project, those shared efforts would result in a real contribution to the excitement and effectiveness of IT learning for

students. Like many large-scale STEM education projects, we were most concerned that we might not reach the classroom level, and positively impact the community college students themselves, unless we put some focused effort toward a common vision. We had a good set of goals and objectives, and supporting information, but those official documents seemed a bit dry and sterile, for what we hoped would be an exciting vision for our project.

Toward a common vision for operationalization in the grant, we did several rounds of "compression planning" as a group, which allowed us to all get on the same page of what we really wanted to accomplish at the ground roots level. This compression planning followed the common strategy of putting up brainstorming cards on a tack board, and then organizing the cards by category. Eventually, themes emerged about what might be the best next steps toward undertaking grant goals. This compression planning was undertaken about yearly in the grant. As one site facilitator mentioned when asked about the collaborative efforts and some of these planning efforts: "There is a clear direction from the grant perspective. We have a clear idea of what is going on".

As we transition to a newly funded grant cycle, we have again undertaken compression planning and have collaboratively generated some "next steps" ideas. We also refer to our vision and compression planning notes periodically as we strive to remember just what our project is really all about, and that our goal is to change the learning experience for students in mathematics and science. It is a very useful reminder for us, and somewhat of a motivational tool for our team.

Tip 2: It is all about making a significant contribution - not equal work!

Whenever people are busy working on a challenging project, it is quite natural to look at other partners in the project and wonder if everyone is doing a relatively equal share of the work. As the leaders of a funded multiple partner effort, it was somewhat natural for us to get into our leadership team, and discuss whether a particular person was "pulling their weight." This was further complicated by the fact that there really was very little compensation for the work being undertaken, with small amounts of organizational compensation or release time for the partners and site facilitators. Everyone was essentially a volunteer with these small levels of compensation. As we worked through the various years of the project, we started to realize that it was virtually impossible to have everyone do an equal share of the work, particularly since the tasks were so diverse, and the partner institutions with such variety of sizes and local contexts. We noticed during the first few years that our discussions evolved, from whether an institution was "pulling their weight" to whether they were making a "significant contribution." This discussion strategy made it easier to see how particular institutions or people were fitting (or not fitting in) within the collaborative environment. One person in the leadership team likened our situation to managing a baseball team, where some players did certain things at certain times, and with a particular expertise. The work itself might not be equivalent across players, but a winning baseball team has players that contribute enthusiastically and energetically for their particular responsibility or area of expertise when called upon. We thus tried to do a better job of making sure that we organized MCIT tasks so that everyone could contribute, rather then striving for them to do equal work. Interestingly enough, we seemed to be more productive using this approach, as individuals began to step forward on their own to volunteer to undertake

particular aspects or tasks of the project, or IT training topics, or areas of particular interests, such as women in IT. In essence, to use the baseball analogy again, our team began to "play ball" a bit more effectively when we stopped worrying about whether everyone was making the same number of plays.

Tip 3: Don't forget the value of a good right-fielder!

If you have ever played little league baseball or softball, you are familiar with the typical game for a right fielder. They often stand there in the outfield, being attentive, but not really doing anything until the infrequent time when the ball is hit their way. During that time they become very valuable, and winning the game may well rest upon having a good right fielder. In every project there are "right fielders" and our project was no exception. We had several institutional partners on occasion that would quietly participate, never saying much, and never quite seem to get all the nuances of the MCIT or Working Connections training that we were providing. We enjoyed working with these individuals, often faculty members from various community colleges, but we really didn't expect them to contribute much to the project. Several of these faculty members really surprised us however, and would create a particular case-based learning example, or a new resource for women in IT, or a particular brochure prototype that we might all use. We would also share these successes with the wider group, and the idea or prototype would often spread. As one faculty member mentioned, "If I was struggling with something, It seemed I could always call someone and ask as how they did it". In essence, these "right fielders" were periodically "making plays" when the ball was hit there way, which helped all members of the project team help make MCIT a winning team effort.

Note: Insert a good picture or two of MCITers having fun.

Tip 4: Share the fun as well as the pain and drudgery!

Once our project received initial NSF funding, we received quite a bit of press coverage, particularly since IT seemed to be something of local interest in various areas of a particular community college. For example, events such as the "Build a Computer in a Day" for women, received some nice press coverage. We very purposively tried to involve as many of our site facilitators and lead faculty as possible in these television spots, interviews, and press situations. We also continually tried to acknowledge the wide range of collaborators whenever we were asked to speak about the project at a national conference or local meeting. We were also quick to invite some of the key faculty to join us at national conferences or other events. We quickly realized that acknowledging the importance of everyone's contribution was critical to helping everyone feel a part of the collaborative whole of the project. Several individuals even seemed somewhat "energized" by the attention given, and seemed to increase their overall ownership of various aspects of the project and their related tasks. We also started to try to have more "fun" as we demonstrated or discussed our IT efforts, joking around a bit, and generally enjoying the chance to share our ideas and vision with others. Finally, we always included some social aspects to the quarterly in person meetings, ensuring that there was always a field trip, and dinner together. This was not only

enjoyable, but also helped to build trust within the leaders from the various community colleges, AIM, various key business partners, and the external evaluators.

Tip 5: Learn to listen to the team and external experts.

As the leaders of a complex project with relatively large group meetings, there is a natural tendency to want to overly control the meeting by doing most of the talking. Yet as we got further into the first year, we realized that everyone in the room actually had some excellent insights to share, and some internal experts surfaced among the participating faculty. In fact, one faculty member became an expert in case based learning, and eventually helped many other community colleges and faculty learn about this important strategy. Thus, we found ourselves to be listening more, and talking less, and in the process retrieving a much better set of ideas from the group. In fact, we soon realized that by talking too much, we weren't getting the benefit of those ideas. An old saying that "we have two ears and one mouth, so that we will listen twice as much as we speak", seemed to be very relevant in our meetings. To help accomplish this group discussion process more systematically, we have evolved into making sure that our meetings incorporate some considerable open discussion time for the team, with extended breaks, lunches, and dinners the evening before a meeting. Often, we have been genuinely surprised at just what was contributed during these open discussions, and how well the group interacted during these times.

As a National Science Foundation Regional Center grant, we also were required to have a NSF Visiting Committee. This was a team of external experts to advise us. We recommended a team of seven experts, and they came on a yearly basis to meet with us, and to advise us on possible next directions. They then wrote a report to NSF. We have a wide variety of expertise on the visitation team, with a mix of community college faculty, administrators, other NSF projects, business, and a researcher. Each of these experts had a unique perspective, and it was helpful to receive their feedback in both written and verbal form on a yearly basis. As visitation team members moved to other positions or retired, new ones were invited to participate while the grant was in progress. With the new grant, we are excited to meet with a newly formed visitation team. Although we realize that any collaborative project may not have the funds to bring in external experts, it certainly is a worthwhile and recommended step to engage external experts in other ways, such as by voluntary telecons, or perhaps taking external experts to lunch at a conference, or simply meeting them for a few minutes between conference sessions, each of which we have also done. Sometimes a quick conversation with someone experienced in a common direction can make all the difference for becoming a successful project.

Tip 6: Communicate well before you need to collaborate!

In today's world of the Internet, timelines for addressing important issues that surface usually have very short timelines. Thus, we try very hard to anticipate potential needed collaborations in the future, and contact those people well ahead of any need to officially collaborate. For example, we are now entering our third NSF Regional Center grant. However, and we have formulated a NSF Visitation Team, as mentioned previously and stipulated by the NSF program guidelines for regional centers. When we undertook this important step, we were able to quickly brainstorm and research many

possible members, each of which we had already engaged elsewhere, and that we already had a relationship with from previous interactions. We were also on a pretty short timeline for a first meeting. Luckily, due to our previous interactions, we didn't have the awkward situation of contacting them "at the last minute," before committing to this important role. They already knew us, and trusted that we were worth the effort, and that they might also learning something from being on this significant and voluntary committee. By communicating in advance, we find that we are better able to build trust, and to establish a foundation of communication, before we actually try to collaborate on a particular task with someone. As this trust between individuals and institutions has grown, the institutions themselves appear ready to commit to some level of collaboration on a follow-up proposal to NSF, and several of our interactions have led to spinnoff curriculum efforts, and funded grant proposals. Upon reflection, this initial communication process of a simple conversation or two, or invitation to visit with each other before any discussions of formal partnerships, was an important strategy for us, making new, more formalized collaboration much easier.

Tip 7: Use today's cyberinfrastructure to collaborate!

The Internet is a truly amazing environment, and the cyberinfrastructure as NSF calls the Internet and its many cyberspace-related innovations and supporting organizations, is offering some considerable collaborative opportunities to projects such as our own. Few people would disagree that human knowledge and the technologies supporting such knowledge development are expanding at an amazing rate. The Internet also offers tools for collaboration today that are really quite impressive. We have routinely used collaboration tools such as Google Documents, and we are now moving into a much aggressive "cloud computing" environment for the technical support of our collaboration among the community college partners.

We are seeking to develop now "virtualized educational platform", utilizing a cloud-based environment, to promote increased collaboration and sharing among consortium members in meeting the varied technical training required by employers. This virtualized platform will initially support the implementation of scenario-based learning across the ten community colleges but will also provide a powerful instructional support mechanism that allows all the colleges to leverage the collective resources of the consortium. It will create opportunities for consortia pricing on software and licensing. North Dakota State College of Science, for instance, is in the process of acquiring a Citrix server at a quoted price of $135 each. The consortia price for the server is $19 each. The cloud-based infrastructure is being created in partnership with CoSentry, a local hosting company and service provider in nearby Bellevue, NE. This virtualized platform will provide the connectivity and the interface to participating schools, students and employers to access the MCIT scenarios from any computing device via the Internet, such as an iPad or Smartphone. Maintenance of the environment and assistance with the deployment of the scenarios will be the responsibility of the AIM Institute in partnership with CoSentry.

We are working now on scenarios that will be developed locally at each of the sites and uploaded to the virtualized platform. The scenarios will support both traditional degree coursework as well as short-term IT training. Using a business-driven model, skills competencies will be identified and aligned to the training. The scenarios will strive

to support the creation of entrepreneurial technicians who, with a broad skill base, are prepared to meet regional demand among non-IT employers – especially small employers – that may not have a full-time IT staff but desire personnel with the technical skills to compete in a global economy. Training in the development of the scenarios has already been provided by experts from the Experiential Learning Center at Foothills-De Anza Community College District. The recipient of three NSF-funded projects around scenario-based learning, the Experiential Learning Center is at the forefront of scenario-based learning nationally, and the MCIT colleges were pleased to engage them. Their experience in the development, assessment and delivery of scenarios is proving an invaluable resource to the project, in these next efforts to support institutional collaboration.

Tip 8: Learn to say no nicely when necessary.

As any project becomes more operational, it also becomes more visible to the community, and more requests for collaboration usually surface. Our project has been no exception and we have tried to be careful in not having a "vision creep" as we have collaborated with various partners. Offers for collaboration that are of potential interest are brought back to the wider team for discussion and a collaborative decision is made as to whether the opportunity aligns with the vision. The larger team meeting is usually a great sounding board for many of these decisions. Some offers to collaborate have clearly not been in our best interest, and we have had to politely decline these opportunities. We usually just say that although we were pleased to be asked to be a part of a particular collaboration opportunity, we just can't participate at this time, due to our own responsibilities and goals.

Tip 9: End collaborative meetings and conversations with specific tasks.

As our MCIT project has grown and the team itself has changed and evolved, we have tried to help ensure that our meetings are consistently focused and efficient, ending with specific tasks that need to be accomplished. With so many people involved, we are very aware that our team members could spend a lot of time talking and still not pull together to accomplish our joint long-range goals. Thus, we always trying make sure that we discuss what task each person is working upon, and how that work contributes to the long-range goals and anticipated outcomes of the project. We then review and confirm tasks to be accomplished before the next meeting. This approach has helped us to continue to try to make sure that both the individuals and institutions coordinate effectively, as we continue to collaborate.

Tip 10: "Never, never, never give up"

One of our lead teachers recently quoted Winston Churchill when he was trying to undertake some online scenario development, and was having an issue logging into the system. A colleague saw him working very hard at it and humorously said "give it up!" With a small smile, he calmly replied "never, never, never give up." It many ways, that motto is a good one for any collaborative project, and we have seen its merits of that philosophy surface within our own MCIT project time and time again. True collaboration is indeed challenging and takes some focused work and organization, as these tips try to represent. There are often times when we feel more than a bit

overwhelmed by it all. However, usually if we just stick push forward and pull together, we generally see progress. By never giving up, we are also not giving up our shared vision of what can be accomplished by students and teachers when they have a new exciting way to learn and teach mathematics and science.

A Final Point

Within the MCIT project, we recognize that collaboration is indeed hard work. No doubt, we would all have less work to do if we simply stopped helping each other pull together on this shared project, sent the money back to NSF, and simply continued the more immediate work of our own individual jobs and responsibilities. However, we also know that we would waste a tremendous opportunity to do something truly valuable in the world that can only be accomplished through focused collaboration. We try to remind ourselves that what we are doing collectively is truly important and quite possibly more important than many other things we might be doing as individuals instead. And although we don't know the very final outcomes of this collaborative journey and whether we will eventually fully accomplish our vision, we do know that the trip is still worthwhile and that the community college students may well be along for the ride of their lives that could open new pathways into their professional futures. In other words, we are finding that it truly does "take a village" to raise an IT student and that effective collaboration is perhaps the most important key to making the shared vision of a project an eventual reality.

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