Evaluation of NetWORKS: Maricopa Advanced Technology Education Center – National Resource Center DUE#0501626

Year Three Annual Evaluation Report March 31, 2008

Prepared by Norena Norton Badway, Ph.D.
Higher Education Evaluation and Research Group

HEERG
Higher Education Evaluation and Research Group

PART I
INTRODUCTION

The Maricopa Advanced Technology Education Center (MATEC) in Phoenix, Arizona has held National Science Foundation Advanced Technology Education grants since 1996. Following a series of grants as an ATE Center of Excellence, and then as a Dissemination Project, MATEC received an ATE grant to form a National Resource Center (NRC), which has been titled *NetWORKS*. MATEC has contracted with the Higher Education Evaluation and Research Group (HEERG) to complete an evaluation of grant activities and outcomes to meet the requirements of the NSF grant DUE-0501626 and to help shape future activities of NetWORKS.

This report focuses on the annual performance of NetWORKS from January 2007 to February 2008, the third year of the current NRC grant. During this time period, NetWORKS operated on an evaluation plan developed by Dr. Ann Igoe that set metrics based on three NetWORKS goals. Those goals, and the section of this document in which evidence is presented, are:

a) Expand involvement of the education community in contributing to national knowledge about technician preparation [*Collect*];
b) Establish unique model programs for creating and broadly disseminating reusable learning material for technician preparation [*Disseminate*];
c) Accelerate the ability of the national technician education community to adapt to changes in technologies and learning needs [*Advance*].[i]

A primary goal of NetWORKS is to collect and make publicly accessible high quality educational resources related to semiconductor, automated manufacturing and electronics technologies. From its inception, NetWORKS framed *mutual benefit* to be a fundamental value of this project: NetWORKS would benefit from the expertise of members of the educational community, while educators would benefit from NetWORKS' dissemination efforts.

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While collection and dissemination of resources are mutually dependent on one another, the project activities for each of those goals are also independent, and for the purposes of this document, are evaluated separately.

In Part II of this report, we evaluate evidence regarding NetWORKS' acquisition of a collection of resources. In Part III, we evaluate evidence about the variety of mechanisms NetWORKS uses to disseminate learning materials, including online formats such as blogs and webinars, and traditional formats such as national conferences. Part IV reports how NetWORKS advances the capacity of educators to adapt as new technologies and/or learner needs change.

Because these three goals have shaped activities and evaluation of NetWORKS, it is reasonable to focus this annual evaluation on existing metrics. However, now that NetWORKS has implemented much of the hardware and software for a national digital library of resources for preparing technicians, it is reasonable to urge NetWORKS to move towards metrics that assess the impact of these activities. To that end, Part V of this report offers recommendations for configuring data collection and analysis to reflect improvements in student, faculty, employer, or organizational learning.

PART II
COLLECTING RESOURCES: ENGAGING THE EDUCATIONAL COMMUNITY IN SHARING KNOWLEDGE ABOUT TECHNICIAN PREPARATION

An emphasis of all NSF Advanced Technology Education Resource Centers (ATERC) is "screening, validating, updating, and broadly distributing exemplary materials, curricula, and pedagogical practices adapted or designed by ATE centers and projects and other appropriate sources."[ii] Appropriately, in its initial proposal for funding as an ATERC, MATEC pledged to "provide the process and criteria for selection of material" and to serve as a clearinghouse for "workforce development tools and materials, skills standards, a college faculty and counselor network, industry-sponsored professional development opportunities, learning strategies, curriculum, links to relevant organizations/ societies, current policies and programs affecting technician education, a guide to good programs and how to influence and take advantage of them, and guides in the use of the clearinghouse resources."[iii] Today, NetWORKS depicts this function as "providing the venues for creating, sharing, and promoting a premier collection of materials, services, and programs for technical training, education, and faculty development."[iv] NetWORKS focuses on semiconductor, automated manufacturing, electronics, and related education and technician training.[v]

Through its initial proposal for NRC funding and subsequent publications, NetWORKS has established a number of benchmarks for evaluating how it collects resources and which resources it collects. Those benchmarks form the evaluative framework for Part II of this report, and are:

- Resources should be contributed by the educational community, including ATE centers and projects and other appropriate sources, thereby expanding the involvement of the education community in contributing to national knowledge about technician preparation.

- Resources should be screened, validated, and updated to assure they merit a "premier" or "exemplary" status.
- Resources should include materials, curricula, and pedagogical practices.

ENGAGING THE EDUCATIONAL COMMUNITY IN CONTRIBUTING RESOURCES

The Faculty Advisory Board members come from populations underrepresented in STEM fields: about one in five FAB members are female, and several are from ethnic and cultural minority groups.

NetWORKS has recently formed a group of 41 faculty leaders from 37 institutions in 21 states to serve as its Faculty Advisory Board (FAB).[vi] The FAB represents expert as well as diverse perspectives. Nine of the institutions from which FAB members come are explicitly "technical," and about three quarters are two-year colleges while the remaining quarter are four-year institutions. At least two of the members are from specialized institutions, an adult skill center and a tribal high school. The Faculty Advisory Board members come from populations underrepresented in STEM fields: about one in five FAB members are female, and several are from ethnic and cultural minority groups.

As an advisory committee, the FAB will identify current and future needs for technical educators to assure student success through materials, curriculum, and professional development activities. Members of the FAB will apply their special expertise to curriculum design by developing and submitting learning units to the NetWORKS Digital Library, as well as acting as a peer-review panel for resources submitted by others. FAB members act as recruiters for other faculty to undertake the functions of peer review, organizational feedback, materials development, and additional faculty recruitment.

ASSURING THE QUALITY OF RESOURCES

To make certain that resources are of "premier" or "exemplary" quality, NetWORKS has developed definitions, writing guides, templates, and rubrics.

Publications define a NetWORKS resource as one that stands on its own, is of a relevant technology field, easily accessible, and either classroom ready or focused on professional development.[vii] Directions for submitting a resource are available online[viii], which guide potential contributors through a process for adding new resources.

Potential contributors are asked to make sure the resource is not already in the Digital Library, and then to title the resource, and to identify its source, including its URL, publisher, and creator. In addition, submitters are asked to describe the type of information contained in the resource, suggestions and audience(s) for using the resource, and keywords under which the resource might be catalogued. Contributors as well as creators of materials are recognized.

NetWORKS has also published writing guides to support potential contributors. These one or two page guides offer elements to be incorporated when submitting a lab or activity,[ix] such as purpose, estimated time, introduction, objectives, safety, attitude and behavior, role of team, types of evidence of successful completion, as well as equipment, facilities, supplies, set-up, and resources needed to complete the activity. In addition, there are guides to sharing presentations[x] and thinking through the analysis/design-develop/implement/evaluate stages of curriculum development.[xi]

NetWORKS has produced at least two templates for resources. One, illustrating the process for Storyboarding Simulations, assists contributors by capturing screen images in hard copy.[xii] A second illustrates the manner in which title and subsequent PowerPoint slides should format graphics and bullets.[xiii]

A resource rubric, "*How Will the High Quality of Material be Ensured?"* identifies five criteria of technical quality (relevance to SAME or a related area or "soft skills," technical quality, innovativeness, adaptability of use for educators, and technical ease of use) with benchmarks for each criteria of Grade A (exemplary), Grade B (high quality), and Grade C (not acceptable).[xiv] The explicit rubric imparts NetWORKS' acknowledgment of the culture of higher education, in which new approaches must be amenable to "reinvention" by local users. Resources that are easily modified to fit local uses are likely to be adopted more rapidly and to remain in use longer than less flexible resources. [xv]

An additional set of Curriculum Writing Expectations and a Resource Checklist have been produced to guide resource development by externs.[xvi] The checklist is used for presentations, media, technical publications, white papers, hands-on materials/visuals, and reference or

textbooks. In each case, externs are reminded to gain permission to use materials produced by others. The checklist allows Networks staff to track how and when permission to use materials has been requested and received.

INCORPORATING MATERIALS, CURRICULA, AND PEDAGOGY

As of March 1, 2008, the NetWORKS Digital Library listed 680 discrete resources.

As of March 1, 2008, the NetWORKS Digital Library listed 680 discrete resources, including resources categorized in five areas of engineering: electrical engineering (369), industrial systems engineering (131), materials science and engineering (65), bioengineering (29), and chemical engineering (30). In addition, under engineering education, 270 resources were listed. Specific computational methods accounted for 6 resources, and professional development accounted for 61 resources.

Table I: Growth of resources by category, 2007-08

Technology/curriculum focus	# resources as of 2/08	Δ since 3/07 report
Electric engineering	369	208
Industrial systems engineering	131	91
Materials science & engineering	65	45
Bioengineering	29	17
Chemical engineering	30	18
Engineering education	270	191
Computational methods	6	4
Professional development	61	44

In some cases, resources are cross-referenced, for example, the U.S. Department of Energy website for tools for students, educators and trainers on its Solar Electricity Technologies Program (photovoltaics) is listed as professional development/career and personal development/global readiness, as well as energy/photovoltaics. The non-duplicated list of resources included 680 discrete items.[xvii]

Developing the technology and a systematic approach to cataloguing these resources in a systematic way that is consistent with other Digital Libraries has been a time consuming task. NetWORKS adopted the Collection Workflow Integration System (CWIS) as the engine to power its resource collection, allowing for future

integration into the National Science Digital Library. By using the Dublin Core schema and the Digital Library Network for Engineering Technology (DLNET) taxonomy, NetWORKS has adopted conventions that allow its resources to interface with multiple websites and other media sources.

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COLLECTING RESOURCES: ANALYSIS

In general, instruction sets for designing resources and templates are presented with step-by-step directions. However, in several cases, they used so much technical jargon that only an individual skilled with that particular instructional technology would be likely to follow the steps. For example, the template for developing Storyboarding Simulations suggests that a number of design features can help facilitate exploration, including pop ups, data entry with response/adaptive feedback (which even the handout admits can get very complex), hyper linking, MouseOvers, and embedded animations. Although the use of these instructional technologies is expanding rapidly, it is likely that the construction of the Storyboarding template assumes too much expertise of potential users.

The many one and two page handouts produced by NetWORKS staff suggest that this ATERC is now ready to develop a substantive Guidebook for Resource Development, incorporating both introductory and more sophisticated use of instructional approaches. This Guidebook would be generally useful, because the skills that externs need to develop learning objects do not differ from those needed by all faculty.

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Now that NetWORKS has established the taxonomy by which items will be catalogued, it is time to pay attention to what appears on the screen for users. Spelling and syntax should be reviewed, as well as the accuracy of descriptors. For example, in some cases the age groups for which a resource is deemed to be appropriate are so broad they are meaningless. A number of resources were described as appropriate for nearly everyone — high school students, high school faculty, 2-year college faculty, 4-year college faculty, and post graduate students — an unlikely designation or one that needs further explanation. In another example, a resource titled *Learning Communities in College*, which notes

mechanisms to combine math and English to improve student performance in both areas, in fact links to a website for Professional Learning Communities among faculty at K-12 schools. These kinds of errors are small in comparison to the very large task of setting a framework for the resources, but as NetWORKS gains maturity they can easily be corrected.

PART III
MECHANISMS FOR DISSEMINATION

NetWORKS has in place a variety of high- and lower- tech modes for disseminating its resources. On the low-tech end, NetWORKS makes presentations, does exhibits, and mails postcards. On the high-tech end, NetWORKS exemplifies the advanced technology for which it is named.

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LOW-TECH DISSEMINATION

Each month, NetWORKS mails about 2,000 postcards featuring a contest to name the visual image related to an emerging technology. The postcards act as "memory-triggers" to remind recipients to think about the resources available through NetWORKS, and as a self-quiz about knowledge of emerging technologies. The postcard connects readers to the @matec newsletter that arrives via email about 2 weeks later with the answer and winner of the image-identification contest, as well as articles about upcoming webinars, recent TechSpectives blog postings, and new resources available in the Digital Library. NetWORKS staff keeps data of resource usage, and have noted that the resources referenced in the @matec newsletter are often among the top ten accessed each month.

Also each month, NetWORKS sends an "email blast" to approximately 17,000 contacts using databases from MATEC, the Engineering Technology Listserv, and Maricopa County Community College District. These emails serve as reminders of upcoming webinars, blogs, and new resources added to the Digital Library.

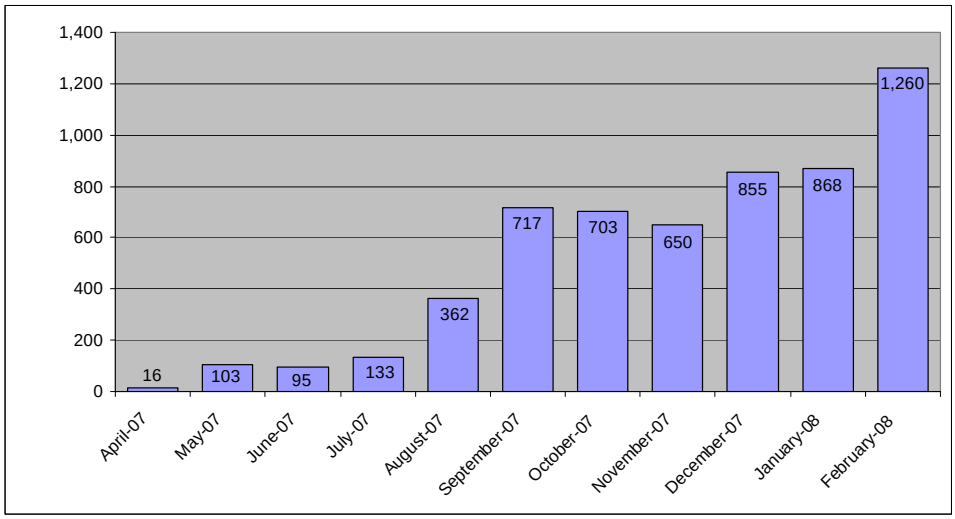
In addition, NetWORKS creates exhibits at high attendance events for community college leaders. In 2007, NetWORKS had exhibits at the American Association of Community Colleges, the National Career Pathways Network, as well as at the Association for Career and Technology Education. In addition, NetWORKS annually sponsors a booth at the ATE National Principal Investigators Conference.

HIGH-TECH DISSEMINATION

Networks is developing a rapidly expanding audience for its high tech online delivery modes. Three examples are illustrative.

Blogs allow an unlimited number of users to asynchronously comment on a topic, in this case the TechSpectives blog features discussions about semiconductor, automated manufacturing, electronics, or related technologies. Access to this blog is through the NetWORKS website. After its creation in April 2007, posts on the TechSpectives blog began slow (under 200 per month), rising to nearly 400 in August and then to about 700 per month for September, October, and November 2007. In December 2007 and January 2008, there were about 800 posts per month and in February 2008 the monthly total was about 1,250. NetWORKS staff attributes this recent rapid rise in blog participation to the topics selected by the operator or requested by the participants.

Figure 1: TechSpectives Visits Per Month

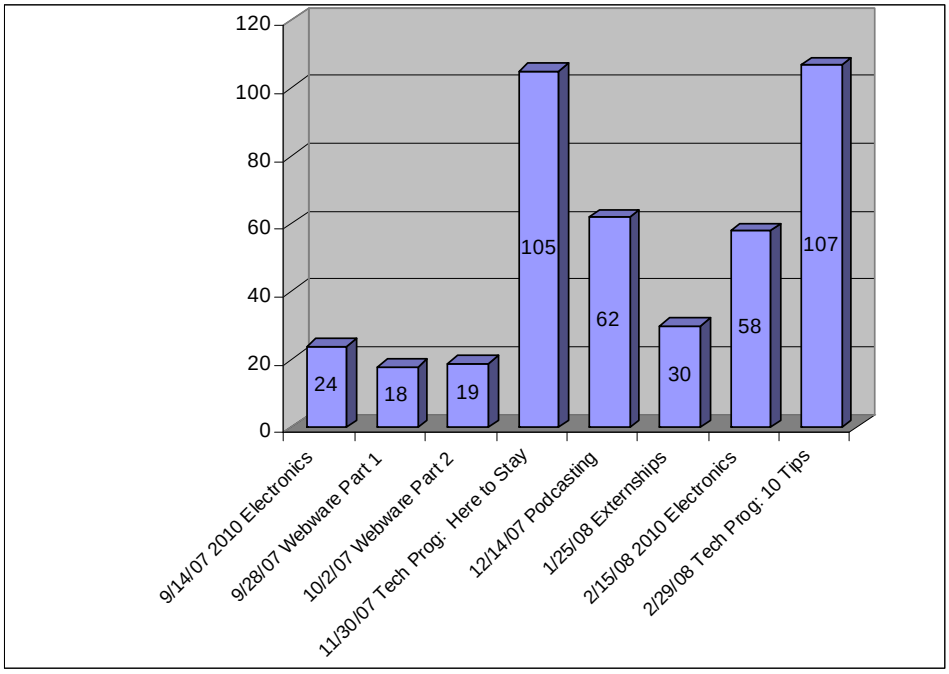


The anonymity of blogs is both a boon for users and a conundrum for sponsors. Any individual can participate in blog discussions without disclosing their name or position. In this way, bloggers can share concerns about learning styles or controversies surrounding new technologies. On the other hand, NetWORKS cannot

distinguish between an individual who makes 10 posts, and 10 individuals who each make one post.

Webinars, or web conferencing, are used to conduct live presentations over the Internet, with each participant at her/his own computer connected to others via the Internet. Webinars at NetWORKS are synchronous, and allow both speaker-to-audience presentation and audience-to-speaker online questions. Webinars are offered the second and fourth Fridays of each month, with topics ranging from technical content — Electronics, drawing 67 registrants, — to programmatic content — The Future of Technical Programs, drawing 13 registrants.

Figure 2: Webinar Registrants

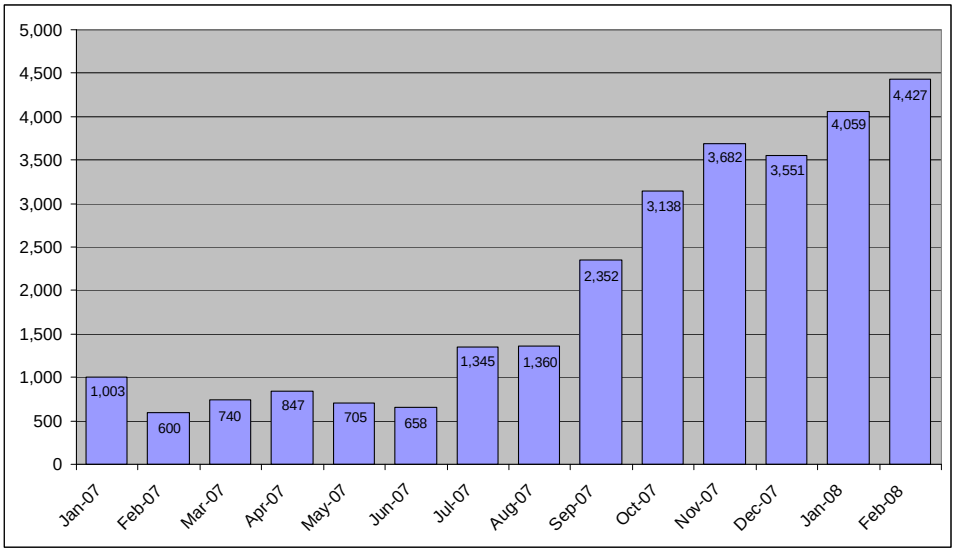


"Hits" on the NetWORKS website have also grown. Whereas there were less than 1,000 hits per month between February and July 2007, in July and August there were approximately 1,400. However, from October 2007 to February 2008, no month has been below 3,200 hits; in February, the NetWORKS website was visited nearly 4,500 times.

True to its advanced technology capacity, NetWORKS is sophisticated about validating website "hits." NetWORKS reports website "hits" as "no bots." Bots are software

applications that run automated tasks, such as web spidering, which contacts and gathers information from websites, making the site appear to have much higher utilization rates than would be possible from human use alone. NetWORKS reports "hits" without "bots," a more accurate practice that may, in comparison with other sites that report all hits (including automated software bots), make it appear less effective.

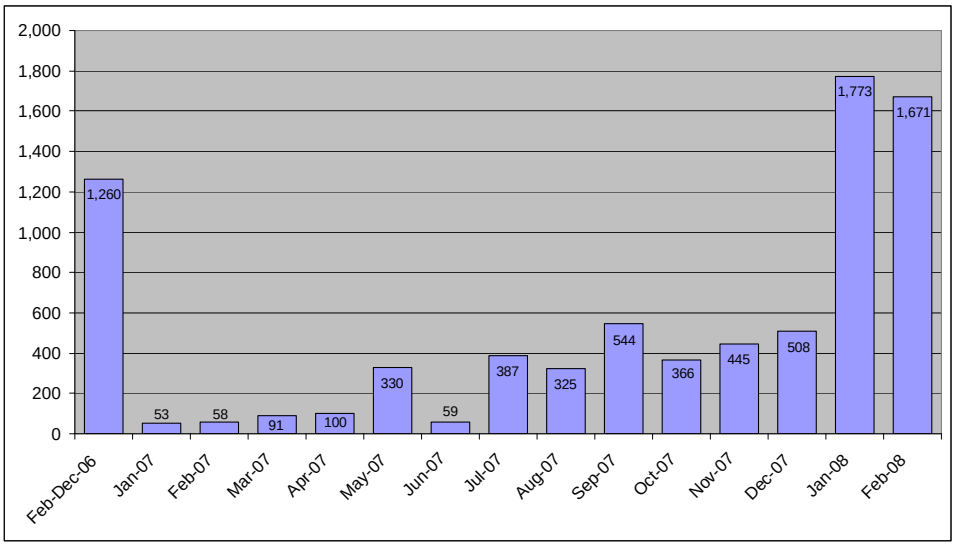
Figure 3: NetWORKS visits per month (no bots)



In addition, NetWORKS distinguishes between "hits" on its website and use of full records. The NetWORKS website is designed so that a non-registered user can search titles of resources, but to gain access to the full resource, a user must log in. For most months in 2007-08, the number of individuals retrieving full records/ resources is somewhat less than half of those who merely access the website. For example, in the highest use month of the NetWORKS website (February 2008), there were 4427 "non-bot hits" on the website, of which about 1700 accessed one or more full resources.

NetWORKS has chosen to collect and report its usage statistics under a protocol that is consistent with ethical principles. Understanding the metrics used by NetWORKS allows a valid and highly positive interpretation of its dissemination performance.

Figure 4: Full record visits per month, 2007-08



In both of these cases, NetWORKS has chosen to collect and report its usage statistics under a protocol that is consistent with ethical principles. Understanding the metrics used by NetWORKS allows a valid and highly positive interpretation of its dissemination performance.

SAME-TEC Conference

From 2004 to 2007, NetWORKS co-hosted and was the primary sponsor of a national event, the Semiconductors, Automated Manufacturing, Electronics — Training and Education Conference (SAME-TEC). Through SAME-TEC, NetWORKS gained direct contact with approximately 300 K-12, community college, and four-year institution faculty, industry trainers, and workforce development personnel. Research by NetWORKS shows that conference attendees largely match the NetWORKS target audience: technical and community colleges (41%), K-12 (25%), industry (19%), four-year institutions (9%), and other (6%).

In addition, attendees come from under-represented populations in STEM careers: 24% are female; 13% are Hispanic; 8% are African American; 2% are Native American; and 10% are Asian.

There is a good deal of synergy between SAME-TEC and the other activities and goals undertaken by

NetWORKS. First, there is cross-publicity. SAME-TEC is promoted as the footer of every email message from any of the NetWORKS personnel, as well as through the newsletters, postcards, and other publications of NetWORKS. The entire conference becomes a dissemination route for NetWORKS resources and expertise, as exhibits and promotional videos highlight the NetWORKS story.

Sessions at SAME-TEC actively engage attendees in exploring the NetWORKS website and Digital Library to find classroom ready materials and professional development resources. At the same time, conference attendees are introduced to the process for submitting self-created resources to the NetWORKS Digital Library. Each conference presenter brings her/his content to be added to the NetWORKS collection, and during other workshops, attendees actually submit their favorite resources to the site.

Conference participants in 2007 especially liked "hands-on" sessions, such as the *Toothpick Factory* and *Podcasting, Wikis, and Blogs*. In both cases, attendees commented on their ability to use what was learned during these sessions in their classrooms. Similarly, workshops presented by NetWORKS (*NetWORKS Fully Charged* and *Wrangling Resources with NetWORKS*) were valued for their "hands-on" approach. Conversely, sessions that were mostly "talk" were judged less useful. Perhaps the most popular session, earning rave reviews from participants, was *Bringing Microsystems into the Classroom*. The content was judged useful, the presenters knowledgeable, and the take-home USB memory sticks were a hit! Using the technology of memory sticks to share information about technology again reinforced the advanced technological focus of NetWORKS.

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In a follow-up survey with attendees who had been sponsored to attend the conference by Intel, two themes emerged. The first was the value of conversations related to the future of technology and technology education. One participant noted that he appreciated the opportunity to discuss the interface between schools, colleges/ universities, and industry, noting, "There aren't too many [conferences] with that approach." Another noted the value of solutions that were tailored to the needs of local industry and community colleges.

Intel-sponsored attendees at SAME-TEC 2007 identified improvements in technological content and pedagogy that they were able to implement from knowledge they gained at the conference.

A second theme was curriculum reform — Intel-sponsored attendees at SAME-TEC 2007 identified improvements in technological content and pedagogy that they were able to implement from knowledge they gained at the conference. They reported the number of hours of instruction they would modify, the content and equipment they would improve, and the number of students who would be impacted.

DISSEMINATION: ANALYSIS

Because its data systems are in place, this ATERC can thoughtfully identify trends and reasons for trends in utilization of resources. These elements form a foundation for future growth.

NetWORKS has undertaken a monumental task to collect and disseminate resources using a variety of low- and high-tech modes. Because its data systems are in place, this ATERC can thoughtfully identify trends and reasons for trends in utilization of resources. These elements form a foundation for future growth.

NetWORKS is now able to review and edit errors in its Digital Library table of contents, and to design substantive materials for resource production. Certainly much of that research and development has already taken place; going forward the goal should be to refine these objects into coherent and comprehensive publications.

Careful analysis of SAME-TEC evaluative surveys identified a potential challenge for conference organizers: the disparity of expertise among attendees. Comments reflected beginning knowledge of some technologies, "I needed more background information" or "too many codes (in networked wireless sensor session)", while other comments reflected advanced knowledge "Move the advanced MEMS/NANO sessions up a few notches in complexity" or "I needed technical data not beginner teacher techniques." One attendee summarized this dilemma by saying, "Make the outcomes for each workshop more clear — what is the level of the expected audience?" It may be desirable to offer tracks that are explicitly suited to a particular audience, so that SAME-TEC offers a forum for introduction to advanced technology as well as *advanced* advanced technology.

Overall, the evidence about NetWORKS' dissemination efforts is that its foundation has been tested and found to be sound — by a variety of users and through a variety of modes. Future efforts should focus on expansion and "tweaking" systems of dissemination.

PART IV
ADVANCE

The evidence is that NetWORKS has advanced education and training programs in SAME specialties, at the same time it has advanced a community of practitioners engaged in broader fields of STEM.

As a third aspect of this evaluation, the term *advance* captures nicely the goal of "making something happen earlier than expected." In its original proposal for an ATERC, MATEC set a goal to "accelerate the ability of the national technician education community to adapt to changes in technologies and learning needs." The evidence is that NetWORKS has advanced education and training programs in SAME specialties, at the same time it has advanced a community of practitioners engaged in broader fields of STEM.

ADVANCING SAME EDUCATION AND TRAINING

A critical way in which NetWORKS advances SAME education and training is by identifying resource needs of faculty and attempting to fill those gaps. Through surveys at SAME-TEC, NetWORKS has sought to learn what types of materials and delivery systems are most useful to technology educators.

Instructional resource preferences

Survey results show strong trends in the types of instructional resources preferred by SAME-TEC participants. [xviii] The most desired source of instructional materials is for self-created presentations (77%) followed by commercially prepared textbooks (70%). In addition, the majority of educators use self-created handouts/ course packets (62%) and/or Internet sites (53%). Commercially prepared handouts or course packets have mixed value to educators: 38% report they have high utility and another 38% report they have low or no utility. Similarly, nearly half (48%) of educators reported that commercially prepared presentations have low or no utility; less than 25% found high value to vendors' presentations.

Technology topic preferences

There is also considerable consistency in the technology topics about which SAME-TEC participants seek knowledge. A majority of attendees felt it was very important or somewhat important to gain information

about converging technologies (86%), nanotechnology (85%), electronics (85%), microelectromechanical systems/MEMS (82%), semiconductors (77%), and automation/robotics (71%).

Pedagogy and curriculum design preferences

Reflecting a fairly traditional perspective on teaching, there is considerably less interest in novel pedagogies than there is in novel technologies. While 85% of SAME-TEC attendees were interested in learning theory applied technology education, and 78% in curriculum planning or development, far fewer were interested in the development or use of learning objects (69%), using or locating skill standards (69%), developing skill standards (68%), facilitating self-directed learning (67%), delivering distance learning (58%), using or locating certification programs (52%), or developing certification programs (43%).

Sources for teaching materials or professional development preferences

Traditional sources for gaining material or information to be used in teaching or professional development activities were most preferred. For professional development, conferences (82%) and workshops (79%) were popular, as were conferences (78%) and workshops (75%) used for gaining teaching resources. Trade journals were used by a small majority for professional development (63%) or teaching (58%). Likewise, textbooks were used by a little more than half the group to support their teaching (69%) or professional development (49%). As a teaching resource, newsletters were used by some (42%) but used very little or not at all by 35%. Similarly, as a professional development tool, newsletters were popular with some (45%), but used very little or not at all by 35%.

Relatively commonplace Internet sources were frequently used. Internet search engines were often used to gain material or information to support teaching (89%) or professional development (78%). Internet sites were also popular, with 73% of this group using them to locate material for teaching and 80% for professional development.

On the other hand, more novel modes were less accepted. The majority of the group had little use for webinars for gaining teaching resources (73%) or for professional development (75%). Also, online forums were not used by 64% as a resource for teaching, or by 63% for professional development.

Internship interest was also divided. About half of this group felt internships were useful for gaining teaching resources (53%) or professional development (49%), another 35% believe internships were useful for neither.

In making a decision about which approach would have the greatest advantage, overwhelmingly this group identified cost and time as the two greatest influences. SAME-TEC attendees are concerned about having free time to participate in locating teaching resources or professional development, and the cost was a second major issue.

MATEC services and resource preferences

While a great majority (83%) of SAME-TEC attendees valued the SAME-TEC Annual Conference, agreement on other MATEC services was divided. MATEC workshops had some support (52%), as did the @matec quarterly newsletter (41%), Academic Membership (38%), Work-Ready Electronics Modules (35%), and the SEMI High Tech U Recruiting Program (31%). However, in each case, about the same or more SAME-TEC attendees had a negative opinion of those services. One exception was MATEC Consulting Services, which were either valued low or not at all by 72%.

SAME-TEC survey respondents were interested in receiving information via email (85%) or via the matec.org website (80%), but were not interested to have telephone contact (48%). Postal mail (45%) and face-to-face contact (42%) were less favorably perceived.

ADVANCING CAPACITY OF TECHNOLOGY EDUCATORS

By specifying in its original proposal that the resources in the Digital Library were to be contributed "by the educational community,"[xix] NetWORKS conveyed the value with which it holds technology educators. Rather than solely relying on harvesting existing resources, NetWORKS has published curriculum development guides, professional development activities, and the Faculty

Advisory Board to support practitioner efforts to self-design a variety of forms of learning objects. In this way, NetWORKS builds both the capacity for local curriculum development as well as a collective ability to contribute to national knowledge about technician preparation.

In addition, NetWORKS has implemented an Externship Program through which individual faculty are placed in a SAME company to update their personal and professional skills and to gather materials for teaching. Externs are asked to create one resource for the Digital Library based on their experience in an industry setting. In this way, NetWORKS attempts to leverage the learning of an individual to the benefit of many via the Digital Library. The Externship Program has presented more challenges than NetWORKS foresaw. Interviews with NetWORKS staff identify difficulties in locating appropriate extern opportunities, matching individuals with available externship locations, matching industry and faculty schedules (often during summer months), and encouraging externs to complete a resource at the end of the externship. These observations are similar to the challenges others have experienced when attempting to establish an Externship Program.

Identifying multiple data collection points, and analyzing the data longitudinally, will allow NetWORKS to examine and perhaps revise its approaches over time.

ADVANCING: ANALYSIS

NetWORKS has advanced national knowledge about the types of instructional resources, technology topics, pedagogy and curriculum design, sources for teaching materials and professional development, and MATEC services and resources preferred by technology educators. By collecting data as thoughtfully as it collects resources, NetWORKS has evidence on which to continue and to refine its efforts.

However, this data is collected predominately at a single place and time — at the annual SAME-TEC conference. As such, this data represents a snap shot in time. Identifying multiple data collection points, and analyzing the data longitudinally, will allow NetWORKS to examine and perhaps revise its approaches over time.

At least three aspects of NetWORKS will merit further examination. At the time the current data was collected (June 2006), there appeared to be substantial opposition to webinar and other online forums as

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dissemination and professional development modes. However, in the past six months, participation in NetWORKS webinars and blogs has significantly increased. The survey will again be administered in July 2008 at SAME-TEC. It will be important for the entire NetWORKS staff and its Faculty Advisory Board to examine any changes in preferences for resources or services.

Second, NetWORKS has experienced very common challenges in shaping its Externship Program. It is unlikely the industry component of the Externship Program will change, so NetWORKS might consider alternatives to the present structure.

A third opportunity is for NetWORKS to think carefully about ways to enhance the community of practitioners that is already growing through webinars, blogs, use of the Digital Library, and attendance at SAME-TEC. Finding approaches that build conversations and capacity across technical educators is the essence of ATE.

PART V
SHAPING THE FUTURE OF NETWORKS

NetWORKS has substantially created the groundwork for the goals it set out in the original funding proposal. The Digital Library is a national clearinghouse of readily accessible curriculum, materials, and programs. Criteria for selecting materials are published, and there is a system for organizing and categorizing resources. The Faculty Advisory Board is expected to assist in identifying and validated resources for the Digital Library. The infrastructure is in place. Materials that exist in various places, with no previously organized way for faculty or industry to find them, are not readily accessible.

NetWORKS has begun assembling a set of tools, resources, and models for recruitment, career and education decision-making, as well as program and skill assessment. It is becoming a one-stop shopping place for resources related to semiconductors, automated manufacturing, electronics, and related technologies.

The end of the third year of operation as an ATERC is an appropriate time for NetWORKS to step-back and engage in a formal course correction. NetWORKS is positioned to review its original goals, to determine which goals remain suitable under current circumstances and which need to be revised.

This ATERC is now ready to *refine* its resources and services. The end of the third year of operation as an ATERC is an appropriate time for NetWORKS to step-back and engage in a formal course correction. NetWORKS is positioned to review its original goals, to determine which goals remain suitable under current circumstances and which need to be revised. To that end, the following recommendations are offered to help guide that process.

Recommendation 1: Clarify the NetWORKS brand.

NetWORKS has a number of logos and a creative design team. It would be useful now to establish a limited variety of logos and to affix those to every published product. In addition, publications should be dated and titled to allow for historical document review.

Recommendation 2: Expand capacity for data collection and analysis.

NetWORKS should move from "body counts" to impact to demonstrate the effect of its activities. Currently, NetWORKS collects data at SAME-TEC and from webinars,

blogs, and the Digital Library about the number of people who participate or use services. While that data is critical, it does not provide evidence of how student or faculty learning has improved as a result of NetWORKS activities. NetWORKS staff should set aside time to review each aspect of operations to identify points where data can be collected that reflects improvements in student or faculty learning.

One point where NetWORKS already has in place a way to collect impact data is the follow-up survey of SAME-TEC attendees who were sponsored by Intel. Expanding administration of that survey to a sample of SAME-TEC attendees would be a relatively easy tool for gathering impact data. Working with the evaluator can facilitate this.

Recommendation 3: Add a human face to publications and data.

NetWORKS produces very sophisticated resources, but by their very technology, they lack a human feel. Two alternatives might be considered. First, recognizing contributors to the Digital Library needs to be made more public, so that they become models for others. Finding professional incentives for this group might foster additional contributions. Acknowledging repeat contributors in a way that celebrates their membership in a select group might include co-publishing articles, special name badges at SAME-TEC, or other low cost but high benefit approaches.

In addition, NetWORKS might do case studies of institutions or individuals influenced by this ATERC. These might be thought of as "hallelujah stories" and have the purpose of inspiring possibilities. This is an especially nice venue for supporting under-represented faculty and student groups in STEM careers.

REFERENCES

[i] Igoe, A. R. (2007, March 30). MATEC NetWORKS Year Two Annual Evaluation Report.
[ii] Advanced Technological Education (ATE) Program Solicitation, NSF 07-530, p. 10.
[iii] Project Summary MATEC-NRC, Maricopa Advanced Technology Education Center- National Resource Center Grant Proposal NSF 04-541, p.4.
[iv] Networks Digital Resource Library flyer. nd.
[v] Ibid.
[vi] NetWORKS flyer, Faculty Advisory Board, Membership as of February 14, 2008.
[vii] What is a Networks Resource? www.matecnetworks.org
[viii] <www.matecnetworks.org>
[ix] Insert name of lab/activity. nd
[x] Insert title for presentation here. nd
[xi] Give a basic overview of your plan. nd
[xii] Storyboarding Simulations. nd
[xiii] Presentation Title. nd
[xiv] How Will the High Quality of Material be Ensured? nd
[xv] Rogers, E.M. (2003). Diffusion of Innovation (5th ed). New York, NY: The Free Press/ Simon & Schuster. p.79-84.
[xvi] Curriculum Writing Expectations (nd); Resource Check List (nd).
[xvii] Resource name and creation (March 6, 2008). Data prepared for NetWORKS evaluation by Mark Viquesney.
[xviii] The MATEC 2006 Survey Results.
[xix] Project Summary MATEC-NRC, Maricopa Advanced Technology Education Center- National Resource Center Grant Proposal NSF 04-541, p.3.