

Accelerated Contextualized Learning

Case Study Report

National STEM
(Science, Technology, Engineering and Math)
Consortium

Anne Arundel Community College
Arnold, Maryland

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Program Overview:

The National STEM Consortium (NSC) is a consortia of ten community colleges in nine states, which came together to develop nationally portable certificate-level programs in science, technology, engineering and math (STEM). Together, they built a national model for multi-college cooperation in the design and delivery of top notch, labor market-driven occupational programs. Targeting regional labor markets, the NSC prepares students for careers in composites, cyber technology, electric vehicle technology, environmental technology and mechatronics. Five technical NSC teams designed an impressive portfolio of innovative one-year certificate programs to respond to industry needs and train workers for high-demand, mid-skill technical careers.

NSC programs helped build a national repository of first-rate technical curricula and curricular materials which are made available, at no charge, to community colleges across the nation. NSC partnered with regional workforce agencies to obtain input on general economic conditions, growing industry sectors, and employer workforce needs. Workforce agencies assisted NSC colleges with recruitment, screening of participants, and facilitated placement services to NSC program graduates. With an eye on sustaining the work of NSC, the consortium colleges have been providing presentations at national and regional conferences regarding various aspects of the NSC grant, including curriculum development, education processes, and grant management.

Consortium Members:

Northwest Arkansas Community College; Florida State College at Jacksonville; College of Lake County (IL); Ivy Tech Community Colleges– Lafayette, North Central, Northeast, Northwest (IN); Macomb Community College (MI); Cuyahoga Community College (OH); Roane State Community College (TN); Clover Park Technical College (WA); and South Seattle Community College

Key Partners:

Advanced Network Technologies; Aerolab LLC; Alcoa Power and Propulsion; ARINC; Cardinal Health, 200 LLC; Custom Machining Services, Inc.; Enterprise Integration; Ford Motor Company; ITW Switches; Mike Raisor Ford Mazda, Inc.; Oak Ridge National Laboratory; Rogers Pollution Control Facility; Superior Industries International Arkansas LLC; The Boeing Company; Toho Tenax America, Inc.

NSC HIGHLIGHTS:

Type of Grant: Trade Adjustment Assistance Community College and Career Training Grants

Industry Focus: Composite Materials Technology; Cyber Technology; Electric Vehicle Technology; Environmental Technology; Engineering

Period of Performance: 10/1/2011 – 09/30/2015

Grant Amount Awarded: \$19,730,281

Leveraged Resources: Indirect costs, college staff time

Identifying and Overcoming Challenges

Initial Challenge: Developing Interactive Online Courses

The National STEM consortium understood that having interactive online courses would bolster enrollment and could better serve those non-traditional students who needed more scheduling flexibility. This was a massive undertaking given the volume of information, technical skills and industry specific knowledge that had to be integrated.

Overcoming the Challenge: Collaborate with Third Parties

The consortium chose the STEM Readiness course as their starting point for interactive online course development. They worked closely with Carnegie Mellon's Open Learning Initiative (OLI) to enhance interactive features of the course and with the Center for Applied Special Technology (CAST) to ensure accessibility. NSC used this course development process as a learning experience that allowed consortium leaders to identify and address the challenges of creating technical online courses, such as copyright and accessibility. From lessons learned, it was decided that faculty and staff would create course content and that outside contractors would execute the technical aspects of course design.

Initial Challenge: Preparing Students to Learn Online

Historically, additional instruction time is needed to elevate the computer skills of some students to a level sufficient for college level STEM courses. This was especially relevant for those TAACCCT students and other adults coming to NSC certificate programs from jobs that did not require computer competency.

Overcoming the Challenge: Pre-Screening Computer Abilities

Though computer remediation is not built-in to the STEM Readiness course, the consortium recognized the need to ensure student success in online and hybrid learning platforms. By pre-screening students' computer abilities, each consortium college could identify those students who might need extra support and address their needs at the local level. Some colleges already had computer readiness courses in place. Others referred students to partnering workforce centers for computer training.



Initial Challenge: Filling-in the Gaps

The STEM Readiness Course is one-third math training and was carefully designed to include the specific skills needed for NSC program pathways. Approximately 75% of incoming students required extra developmental math instruction to bring their skills up to compulsory levels.

Overcoming the Challenge: STEM Readiness Course

Students performed better on mathematics elements embedded in technical courses when overall math deficiencies were addressed early-on. For this reason, the math portion of the STEM Readiness course was delivered up-front, allowing students to begin the certificate program with the skills and confidence needed for success. A math placement test was developed to allow those students with proficient skills to test-out of redundant math lessons.

Activity Analysis: How activities can impact the outcomes and deliverables of your grant program

Activity: Build a STEM Readiness Course

Working with industry partners, the diverse colleges in this consortium combined knowledge and experiences to create a robust STEM readiness curriculum. It focuses on the development of critical key skills identified by each technical team. The course refreshes critical skills in: *Math* – Arithmetic, Measuring Systems, Quantifying Data, Pre-Algebra, Algebra, Triangles and Cartesian Plane; *Workplace Communication and Critical Thinking* – Written Communication, Oral Communication, Teamwork/Conflict Resolution and Critical Thinking/Problem Solving; and *Professional Skills* – Customer Service, Confidentiality, Organizational Skills and Time Management, Teamwork, The Job Search Process and Professional Image.

Because they were a multi-state collective, NSC was able to build a program that is not only beneficial to students within their institutions, but also relevant across the country. To date, there have been over 4,000 college and high school users of the STEM readiness course nationally.

Activity: Collaborate with Employers

With the primary goal of getting displaced workers back to work, employer partner relationships were central to the National STEM Consortium project development. NSC worked with employers in the STEM fields to create an educational experience that had direct workplace applications. The curriculum was created from research that identified both the needs of the employers and the gaps in occupational and “soft” skills of workers in those industries.

Employers served as subject matter experts who reviewed curricula or became NSC adjunct faculty professors. Industry partners also allowed NSC to use their brand names in course content to underscore the “real-world” relevance of educational assignments. NSC employer partners played vital roles in recruitment and job placement by referring job applicants with insufficient skills to NSC training programs and by hiring NSC program completers. Whenever possible, NSC included an internship component with employer partners. This was not only important for student learning but created inroads for job placement.

Activity: Collaborate with Multiple Colleges

The consortium had six technical teams working on course content, with five pathways beyond the STEM readiness course. The teams have created very robust course content that is “nationally portable”. Knowledge and skills gained are not linked to any one region. Rather, the certificate programs in composites, cyber technology, electric vehicle technology, environmental technology and mechatronics offer national and regional accreditation.

Q: What are some key strategies that you are planning to implement that you think will capitalize on your successes?

A: We are planning an “executive retreat” for our leadership, mainly the presidents and the vice presidents, of our consortium colleges. It will take place at a partner college and should help to secure commitments to sustaining the NSC pathways and STEM Bridge courses within our colleges. Constantly securing that commitment is key and sometimes that can only be done with something like a “retreat” as opposed to the standard monthly meeting.

**Interview with Susan Gallagher, Project Director,
Anne Arundel Community College**

Key Lessons Learned:

- ☑ Plan ahead to streamline data collection across colleges and states.
- ☑ Design and construct databases that are compatible with multiple student information systems and accessible in multiple locations.
- ☑ Accept outside assistance with technical elements of online course implementation. Collaborating with OLI and CAST added the technical expertise to make the courses dynamic and accessible in the online platform.
- ☑ Students may require computer skills training to be ready for online and hybrid learning.
- ☑ Additional math skill instruction might be necessary for students entering STEM field professions.
- ☑ Engage employers and industry specialists to identify learning outcomes and to collaborate with college faculty and curriculum design team.

Strategies for Sustainability:

Strategy 1: The STEM Readiness Course

The STEM Readiness course features critical skill building elements and has built-in learner analytics. The course is programmatically consistent across the five fields and is transferable to non-grant NSC students, to other colleges across the country, to other levels of education (middle and high schools), and to the various industries represented. Industry partners can use the course for employee professional development. The course is also adaptable across disciplines. For example, the “communications and problem-solving” module takes place in the context of an aviation communication command center, but the skills are applicable to environments like hospital emergency rooms or 911 call centers.



Work within each college's technological boundaries to provide a data system to the entire consortium



Strategy 2: Utilizing Open Educational Resources

By the end of the grant period, all NSC course materials will be available as an Open Educational Resource (OER) with a Creative Commons attribution license. Every college in the United States will be able to access course materials and offer the programs created by the NSC. The flexibility of OER curricula allows colleges to adapt curriculum to meet the needs of local and regional employers by adjusting the course content to align with the industry specific skills needed without having to develop entirely new courses.

Strategy 3: Investing in High-End Technology

Using grant money, the colleges within the consortium acquired the high-end technology currently being used by the industry. This was instrumental to fully prepare students to excel in the workplace. By creating state of the art labs with the grant funds, the NSC partner colleges were poised to launch their brand new programs knowing that the courses being taught would be on par with the real world experience. These investments will continue to support NSC programs after grant funding goes away.

Keys to Replication:

Communication is crucial to project success.

Working across nine states, the National STEM Consortium (NSC) and its industry partners designed and implemented certificate programs in composites, cyber technology, electric vehicle technology, environmental technology and mechatronics. This required a strong system of communication. The NSC and its partners found they had to hold weekly management team meetings, bi-weekly grant-wide conference calls, regular technical team calls, quarterly technical team face-to-face meetings, and annual grant-wide face-to-face meetings. All meetings resulted in written notes that identified needed actions. Effective meetings will move grant activities forward quickly and efficiently. Having a numbered system of guidance memos to distribute policy and a system for information sharing is crucial. NSC utilized Microsoft SharePoint to enable all partners to work collaboratively and to access grant documents.

NSC utilized employer partners in each step of program development and implementation.

Engaging employers throughout the process ensures that knowledge and skills gained from your program will be of value to employers and will optimize your students' opportunities for job placement. When creating new programs or considering adopting existing programs, first ask the employers what skills are needed for the jobs that are or will be available to your students. Match course learning outcomes to those specific employer needs. Design lessons and course instruction that provide "real-life" workplace scenarios; this makes the lessons more meaningful to the students and better prepares them for critical thinking on-the-job.

Keep employers in the loop by forming an advisory board.

The NSC Advisory Board kept the consortium grounded to ensure that the most important component – their students – complete certificate programs with skills that will make them productive employees. The Advisory Board, composed of NSC colleges, workforce agencies and employers contributed to all stages of the project - program design, outreach/student recruitment, course content review, and overall project assessment including identification of best practices and ways to improve the programs.

Stay focused on the students and their needs.

Consider creating and supporting a Navigator position. NSC reports that this position is critical to implementation success. The Navigator ushers students, recruitment, application, and admissions. They aide in program retention by addressing academic and personal challenges and also job placement and retention.

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