### Evaluation of

### Rowan College at Burlington County’s

### *NSF-ATE*

***Comprehensive Integration of Advanced Manufacturing Competencies throughout Associates degree and Stackable Certificate Curricula Grant***

**Year 2**

### June 1, 2017 - May 30, 2018

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**Background**

The *Comprehensive Integration of Advanced Manufacturing Competencies Throughout Associates Degree and Stackable Certificate Curricula Program* is a three-year $768,272 grant from the National Science Foundations’ Advanced Technological Education (ATE) program. The full three-year grant period is from September 15, 2016 to August 31, 2019.

## The grant focuses on the education of technicians within the high-technology mechanical engineering and advanced manufacturing fields. The motivating rationale for this project stems from direct observations and experiences supporting the fact that there is a tremendous regional and national need for graduates to possess the skills and competencies valued by industry. This project leverages past NSF-funded work as well as new workforce development initiatives to emphasize the critical skills and competencies needed to support advanced manufacturing curricula and industry. The grant seeks the involvement of industry as a partner to guide and promote improvement in the education of engineering technicians at the associate and baccalaureate levels. Specifically, the grant supports curriculum development; professional development of college faculty and secondary school teachers; and career pathways from secondary schools to two-year colleges and from two-year colleges to four-year institutions.

Rowan College at Burlington County is the lead institution and is partnering with Rowan University to provide seamless transition from the associate to baccalaureate degree. Collaborators also include high schools throughout Burlington County as well as the advanced manufacturing businesses in the region.

The project has two primary goals:

## Goal 1: To strengthen and expand an Engineering Technology program serving the southern New Jersey region.

Goal 2: To serve as a conduit for the creation of programs and educational pathways that address unmet training needs and the needs of emergent high growth industries, both in the region and nationally.

**Evaluation Scope, Approach, and Methodology**

While Year Two of the grant is from September 1, 2017– August 31, 2018, this evaluation covers the period June 1, 2017- May 30, 2018. This evaluation period picks up from the Year 1 evaluation report and take into account the June 14, 2018 Annual Performance Report deadline.

During the second year of the grant, the evaluator focused once again on program implementation activities and progress in meeting initial outputs. For Year 2, activities included a four-day technology conference, curriculum planning, website development (Microsite), outreach to faculty and students, program approval, and equipment purchases. The evaluator worked remotely with the PI and project coordinator and conducted an April 25, 2018 evaluation site visit.

Below are the evaluation questions for Year 2.

* Has the project made sufficient progress in completing Year 2 activities?
* Has the program successfully engaged faculty in the process?
* How has industry interacted with the college?
* What influence has industry participation had on the development of the MET curriculum?
* Has the program had any impact on other disciplines within the STEM Division?

Accomplishments/Major Activities

The evaluator found that the college has made sufficient progress in implementing the activities and tasks outlined in Year 2 of its revised grant timeline. Faculty are engaged and meeting to revise curriculum and identify applications. Industry collaboration and influence is evident and although the program is still under development, it appears that the project is beginning to have a positive influence on the STEM Division. Below are the major activities and accomplishments for the year.

* ***Technology Conference*** - RCBC held its first Technology Conference from July 17-20, 2017 with 59 participants representing full time and adjunct faculty and administrators from two and four-year partner institutions as well as secondary education teachers and middle school teachers from throughout the county. During the conference participants discussed reform of the mechanical engineering technology program with a focus on advanced manufacturing and were tasked and were tasked with redesigning college curriculum to align with the recommendations identified during the industry forums. Participants created a new curriculum framework and began to identify strategies that address the concerns identified in the June 8th business forum. Participants spent the better part of three days addressing the combination of 1) technical hard skills and industry requirements, and 2) soft skills and work based learning, that should be included in each course. Following the conference participants were asked for feedback. A total of 37 of the 59 participants completed the evaluation form. For those who did, participants were positive and reported that the conference effectively identified critical curriculum concerns in MET field and believed that their input was valuable. Moving forward they stated that it was important to have a good relationship between industry and MET staff and they wanted to see the college continue to evaluate MET curriculum as the field evolves. They also recognized that incorporating soft skills into the entire curriculum, not just MET courses was important for the STEM division. Below is a summary of responses to evaluation.



## ***MET Program*** ***Approval*** - Following the conference, faculty worked to update curricula align texts, and develop pre-requisite pathways that would support continuity between the secondary, two-year and four-year educational partners. The result was a new degree in Mechanical Engineering Technology, with a concentration in advance manufacturing that emphasizes the practical hands-on application of engineering principles. The program also includes more writing, along with curriculum designed to foster creativity, active listening, and mathematical and mechanical competencies. The academic program is a two-year associate of applied science degree designed with discrete stackable certificates that will be transferrable to a B.S. in Mechanical Engineering Technology. Note that Rowan University is developing a bachelor’s degree in mechanical engineering that will articulate with the approved associate degree. The MET degree was formally approved by the Presidents’ Council on April 14, 2018.

* ***ATE Microsite created*** - Using ATE Central’s Microsite Service, RCBC developed a website that supports student outreach efforts and helps to connect all of its collaborators.  The site is up and running and is being used to share documents, report on the progress of activities, publish curriculum materials, and announce events.
* ***Industry Collaboration and Advisory Boards-*** Through the development of the MET program RCBC has significantly changed the way industry interacts with the college.

Over the two years the college has collaborated with over 17 industry representatives and associations. These include Holtec, Lockheed Martin, Centryco, Multi-Housing Depot, Biomedicon, MSC Direct, New Jersey Business & Industry Association, Airgas, New Jersey Manufacturing Extension Programs, Denton Vacuum, Lawrence Mold & Tool Company, Jet Pulverizer Company, Vermes Machine Company, NWL, Parts Life, Radwell International, MTD Cabinets. These interactions, (through forums, Advisory Boards and site visits) are ensuring that the updated program will accurately reflects the industry skill standards most important to the manufacturing base in the region. Note that while specific technical skills are being discussed, industry representatives have also recommended embedding more soft skills into curriculum.

The reaction from industry has been very positive. Following the June 8, 2017 Advanced Manufacturing Forum, the evaluator asked industry representatives for their feedback. Specifically, they were asked how much they agree or disagreed with the following statements. Note that ten industry representatives who attended the first forum shared their responses. As the table below indicates, participants walked away from the meeting feeling that forum was a valuable experience.

|  |  |
| --- | --- |
| Forum Evaluation Responses | **Score** |
| Overall, today's forum effectively identified critical curriculum concerns in mechanical engineering and advanced manufacturing education.  | 4.6 |
| I believe that my input and contribution will help the college update and enhance its mechanical engineering curriculum and I feel the day made good use of my time.  | 4.6 |
| The breakout sessions were organized and resulted in productive recommendations.  | 4.8 |
| I believe that the results of this curriculum review effort will be a win-win for my employer and RCBC. | 4.8 |
|  Scale: (5) Agree; (4) Somewhat agree; (3) Neither agree nor disagree; (2) Somewhat disagree; (1) Disagree |  |

In addition to the initial forum, the college held a follow-up forum in conjunction with National Engineering Week and Black History Month. The half day program provided industry representatives as well as college faculty with the status of the new MET A.A.S. degree program. Participants learned about the curriculum, the infusion of soft and technical skills, labs and the development of student internship opportunities. A guest speaker, Dr. Elizabeth Brooks, former Director of Admissions for Jefferson Medical College also discussed how to guide underrepresented student populations into STEM careers.

Dr. David Spang-PI, and Dr. Edem Tetteh-Co-PI conducted four industry site visits to meet with workers and learn more about the manufacturing processes on each site. The competencies identified through the site visits, forums and other collaborations are being incorporated into the curriculum with the goal of maximizing the degree to which employees have the set of skills most valued by employers.

The collaborations with industry have also been formalized under a new Advisory Board structure. While the college has always had advisory boards, they were more ad hoc with little structure and a focus on accreditation rather than industry needs. The new board structure is based on recommendations from ABET. It is more professional and meets more often with a results-oriented agenda. The Board has bylaws and is chaired by an industry representative. Advisory Board Members include ten representatives from industry (including two alumni), two industry association members, eight RCBC faculty and department members, three workforce development representatives, faculty from two universities, and a representative from the vocational technical high school. The Advisory Board’s purpose is to advise, assist, support and advocate for the Mechanical Engineering Technology program on matters that will strengthen instruction and expand learning opportunities for students. This includes curriculum and program assessments based on current practices and the viability to industry.

The college used the structure it was creating for the MET Board as the lead for other programs. As a result, there are now three volunteer advisory boards under engineering technology - the MET Board, the EET Board and the Computer Science and Cybersecurity Board. All three Advisory Boards meet together to discuss common agenda items and then break into program specific meetings. These meetings focus on curriculum and specific industry competencies. They also address scholarships, internships and apprentices. The initial meeting of the full board was held January followed by a second meeting on April 25th. At the April 25th meeting, the industry chairperson of the MET Advisory Board called for a subcommittee meeting to discuss plans for the applications library and marketing of the new MET program. The subcommittee meeting was held on May 23rd and included assignments for advisory board members representing industry.

Additionally, on April 27th, the MET Board was invited to a RCBC Workforce Development Institute program on "*How to Build an Apprenticeship*”. Attendees heard from two organizations (The Metal Building Institute and Thomas Phoenix International) that have built a nationally-recognized Registered Apprenticeship Program in partnership with the U.S. Department of Labor.

* ***Outreach -*** As soon as the MET program was approved by thePresident’s Council, the college began working on marketing materials and training staff. Marketing was done through all social medial channels, the website, traditional press releases, emails to existing students and outreach to high school partners. In addition, the program was advertised on 4/22 as part of the RCBC’s Campus Wide Science Slam, open to all students and the community. It was also advertised as part of the Philadelphia Science Festival, which took place on 4/29 on the Benjamin Franklin Parkway in Philadelphia.
* *Training and Professional Development* Dr. David Spang-PI, Dr. Edem Tetteh-Co-PI and Dr. Eric Constans -Rowan University attended the 24th National ATE Principal Investigators Conference in Washington DC on October 23-25, 2017 and presented at a showcase session.

Plans for the Next Reporting Period

* ***Student Enrollment*** - For the remainder of Year 2, the college will be recruiting and enrolling students into the new MET and revised EET programs. The first cohort of students will be admitted in fall 2018. Students in both programs will take the same set of courses the first semester and will have the option of moving between the two programs at the second semester without losing credits. All students who select MET and or EET as a major will be advised by a special advisor who will work with the students throughout the full four years. The position will be funded jointly by both Rowan University and RCBC.

In addition to the AAS programs, RCBC and Rowan University faculty and staff are finalizing a “3 plus 1” path for both programs, which will allow students to complete their third year at RCBC and matriculate to Rowan to complete the senior year. Once the program is finalized students who already possess an AAS MET or EET degree from RCBC will have the option of taking their junior year courses taught by RCBC faculty and their final year courses taught by Rowan faculty, with courses for all 4 years taught at RCBC’s campus.

At least two alumni have expressed an interest in the program. Other community college graduates will be examined on a case by case basis to determine if the courses at their home community college align.

* **Data Collection -** The college has provided a clear pathway for students who want to major in either MET or EET, and are prepared to do the work, but the program does not address students who may need developmental education. Mathematics, in particular can be a major factor in a student’s inability to master the first-year. Students testing into developmental math will not be prepared for pre-calculous or chemistry and will fall into an alternative pathway. The MET advisor will become critical. Because there is an emphasis on students moving from high school into the MET program, the evaluator will use Year 3 to track students as they enter and move through the college program and will examine course retention and annual student outcomes assessment data.
* **Applications Database** – Over the next year the college will concentrate on honing and finalizing the applications database. Faculty will be given time to further develop, research, identify and use applications that will directly impact the delivery of curriculum. The principals-based library will supplement application of learning by adding specific simulations, case studies, and /or new technologies. The college will train faculty and secondary teachers and host an industry forum as a way to review the content. The college will report on the actual use of library applications in each course.

***Summary/Program Impact***

Although the program is still under development, it appears that the development of the MET program has had a positive influence on STEM programming at the institution. Specifically,

* Freshman clinics in engineering have been changed and now include two semesters rather than one, resulting in more contact hours, more group projects, more presentations, more engagement between faculty and students and more infusion of identified skills.
* The MET program was a catalyst in strengthening the Advisory Board Process and has resulted in a far more engaged community of advanced manufacturing professionals.
* The program has also helped to engaged STEM and non-STEM faculty in collaborations aimed at improving student communication skills and effective interactions.
* The new MET program embeds more communication and soft skills into all courses and will be a model for other STEM programs.
* The MET program has provided clear career pathways that will allow students to earn stackable credentials and will also be a potential model for other STEM programs.

Based on the college’s activity to date, the evaluator does not see any concerns regarding its ability to complete the project on time and as planned.