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Preview of Award 1601487 - Annual Project Report

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Cover

Federal Agency and Organization Element to Which Report is Submitted:	4900
Federal Grant or Other Identifying Number Assigned by Agency:	1601487
Project Title:	Comprehensive Integration of Advanced Manufacturing Competencies throughout an Associates Degree and a Stackable Certificate Curricula
PD/PI Name:	David I Spang, Principal Investigator Ratneshwar Jha, Co-Principal Investigator Edem G Tetteh, Co-Principal Investigator
Recipient Organization:	Rowan College of Burlington County
Project/Grant Period:	09/15/2016 - 08/31/2020
Reporting Period:	09/01/2018 - 08/31/2019
Submitting Official (if other than PD\PI):	N/A
Submission Date:	N/A
Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)	N/A

Accomplishments

*** What are the major goals of the project?**

The major goals and Objectives of the project are outlined below:

Goal 1	**To strengthen an Engineering Technology program serving the southern New Jersey region.**
Objective 1.1	*Highlight technical and non-technical (soft) skills across the curriculum; align with industry needs, including student work-based learning opportunities such as undergraduate research projects and internships.*

Objective 1.2	*Develop an applications library (real examples of STEM principles for instructional practices) as a resource for faculty to support relevant curriculum by presenting industry-relevant competencies, techniques and images that meet predetermined learning outcomes.*
Objective 1.3	*Strengthen career pathways throughout, and partnerships between, regional higher education institutions, secondary schools, and industry partners. Activities will include the creation of advisory committees, student work-based learning activities, and job placement support. Focus will be on job placement and recruitment support for graduates and industry partners. Additional emphasis will be on successful job placement for underrepresented student populations.*
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.**
Objective 2.1	*Create a new academic program in Advanced Manufacturing (Associates Degree and a stackable certificate) by developing new curriculum through the adaptation of relevant models from national and regional NSF ATE programs, to support the Engineering Technology (ET) educational needs in the region.*
Objective 2.2	*Establish an Advanced Manufacturing training facility with input from industry leaders and educators to collaborate and produce skilled competent workers for industry.*

As was described in the previous annual report, during this past year's reporting period several stated Objectives have been pursued and accomplished. These have included Objectives under both major Goals of the project.

*** What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?**

Major Activities:

Goal 1: "To strengthen an Engineering Technology program serving the southern New Jersey region"

Applications Database

Program Objectives supporting this goal include Objective 1.2, "Develop an applications library (real examples of STEM principles for instructional practices) as a resource for faculty to support relevant curriculum by presenting industry-relevant competencies, techniques and images that meet predetermined learning outcomes".

Working towards Objective 1.2, the project team has made significant progress in engaging industry partners in developing a framework for the applications database. During the reporting period, a Rowan College at Burlington County (RCBC) faculty and program chair was tasked with coordinating activities among industry partners in developing materials for the applications database. A focus was given to several scientific and technical principles of relevance to the partner's industrial operations, including the Ideal Gas Law, Ohm's Law, and Snell's Law. Materials created include an introductory video, instructor notes, student handouts, and quizzes with solutions.

Building from this work, a matrix has been created which will guide the development of applications for approximately fifteen of the most important previously-identified technical and non-technical skills, the relevant principles, and the applications of these principles.

With relevant input from Advisory Board members, the additional applications of technical and non-technical principles have begun to be developed according to the designed format, with the goal that the applications:

1) Have readily identifiable significance

2) Be summarized and communicated effectively

3) Have significance to an emerging student

4) Follow a sound pedagogical approach

Advisory Board

Program Objectives supporting this goal include Objective 1.3, “Strengthen career pathways throughout, and partnerships between, regional higher education institutions, secondary schools, and industry partners. Activities will include the creation of advisory committees, student work-based learning activities, and job placement support. Focus will be on job placement and recruitment support for graduates and industry partners. Additional emphasis will be on successful job placement for underrepresented student populations”.

Working towards Objective 1.3, the project team has made significant progress in strengthening career pathways and in forming partnerships among and between regional institutions.

Having previously compiled the most important technical and non-technical skills needed by regional advanced manufacturing partners, the project team, working in conjunction with partner institutions, has sought to strengthen the curriculum and gain additional partner input through the creation and operation of a robust Advisory Board.

RCBC’s Engineering Technology Advisory Board, supporting both mechanical engineering technology (MET) and electrical engineering technology (EET) programs, holds combined meetings of the entire Advisory Board, as well as subcommittee meetings to address specific items pertaining to each individual program. During the reporting period, two Advisory Board meetings were held on October 2018 and January 2019, as well as three additional subcommittee meetings, for both MET and EET.

The Engineering Technology Advisory Board, with a roster of approximately thirty, is comprised of members from regional industry, community organizations, secondary school partners, four-year university partners, and from within RCBC. Representative organizations include: Airgas, Biomedicon, Bright Lights US, Burlington City High School, Burlington County Institute of Technology, Centryco, Delran Schools, Denton Vacuum, Holtec, Holy Cross Academy, In Vitro Diagnostics Solutions, Jet Pulverizer Company, Lawrence Mold & Tool Company, Lockheed Martin, MSC Direct, Multi-Housing Depot, New Jersey Business & Industry Association, New Jersey Manufacturing Extension Programs, Palmyra Cove Environmental Education Foundation Radwell International, Rancocas Valley Regional High School, Rowan University (RU), and Vermes Machine Company.

Advisory Board Membership also includes RCBC students and alumni. Additional members will be sought as the engineering technology programs grow.

Minutes from Advisory Board meetings demonstrate how the group’s activities help to strengthen the Engineering Technology program according to Goal 1, by consideration and discussion of such topics as industry involvement in the applications database development, recommendations regarding marketing messaging, scholarship opportunities, and the value and positioning of the programs, for example.

Additionally, the creation of the Advisory Board has strengthened the program by formalizing the feedback mechanism regarding the relevance and usefulness of competencies within the program and as a result has achieved buy-in, and given regional industry partners a stake in the success of the program. This formal feedback

mechanism will be important as RCBC seeks ABET accreditation (Accreditation Board for Engineering and Technology) for the new MET program in the near future.

Additionally, RCBC's Dean of STEM and RU's Dean of Engineering have attended the 2018 ABET Symposium conference in San Diego, CA and have met with ABET representatives to discuss the program accreditation of the AAS and BS degrees in MET.

Specific Objectives:

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."

Project Objectives supporting this goal include Objective 2.1 "Create a new academic program in Advanced Manufacturing (Associates Degree and a stackable certificate) by developing new curriculum through the adaptation of relevant models from national and regional NSF ATE programs, to support the Engineering Technology (ET) educational needs in the region."

During the reporting period, both RCBC and RU have finalized and received New Jersey state approval for MET curricula for an Associate of Applied Science degree (AAS), and a Bachelor of Science degree (BS), respectively. Both institutions have moved forward with marketing the programs and pathway to prospective students, and students are currently being enrolled to begin as freshmen at RCBC in the Fall 2019 semester. *(As of August 2019, 30 students are currently enrolled)*.

The MET programs will be offered by both institutions according to the innovative "3+1" pathway model, whereby students will pursue the affordable pathway of enrolling in RCBC classes, at RCBC tuition for the first three years, and then transition into the fourth year, taught by RU, on RCBC's site. This innovative educational delivery model was the subject of the project team's paper submission and presentation at the American Society for Engineering Education (ASEE) in Tampa, FL in June 2019.

Additionally, RCBC has surveyed Advisory Board members to solicit feedback regarding the most important skills and competencies that should be reflected in one or more certificates related to MET and advanced manufacturing disciplines. As the MET curriculum has been finalized, relevant components of the program will be strategically combined to create the most useful and relevant certificate opportunities for students.

Finally, RCBC will also continue to strengthen and develop pathways into the new MET program from its secondary school partners.

Additional Project Objectives supporting this goal include Objective 2.2, "Establish an Advanced Manufacturing training facility with input from industry leaders and educators to collaborate and produce skilled competent workers for industry"

In support of Objective 2.2, RCBC has pursued and received acceptance of its AAS.MET degree program as eligible for Perkins Career Technical Education (CTE) funding through the state of New Jersey Department of Education. A portion of the college's CTE allocation will be earmarked for purchases that will support the new MET curriculum with hydraulic, mechanical, and pneumatic equipment. It is estimated that approximately $250,000 will be allocated for this purpose.

Additionally, RCBC has assigned and will refurbish a laboratory in the college's Technology and Engineering Center (TEC Building), to house and support the MET program.

Significant Results:

Key outcomes or Other achievements:

*** What opportunities for training and professional development has the project provided?**

Training and Professional Development opportunities have included communications with, and presentations to, the engineering technology advisory committee regarding the development of relevant applications for the applications library.

Additional professional development has included opportunities the project team experienced by attending the annual American Society for Engineering Education (ASEE) conference in Tampa, FL, in June 2019. In addition to presenting the accomplishments of the current project, team members were able to network and acquire a wealth of information regarding similar projects, and possible future project activities.

*** How have the results been disseminated to communities of interest?**

Dr. David Spang (Principal Investigator) and Dr. Edem Tetteh (Co-Principal Investigator, along with other project team members, attended and presented at the National Science Foundation ATE Principal Investigators Conference in Washington DC, in October 2018. At this conference, the project was displayed and described in the showcase session.

Additionally, the project team, led by Dr. David Spang (Principal Investigator) and Dr. Edem Tetteh (Co-Principal Investigator), along with Dr. Ratneshwar Jha (Co-Principal Investigator), submitted and delivered a paper and presentation entitled “An Innovative Mechanical Engineering Technology Pathway Aligned with Industry Needs” at the annual American Society for Engineering Education (ASEE) conference in Tampa, Florida, in June 2019.

Additional dissemination activities included development and posting of information on RCBC’s STEM webpage (http://www.rcbc.edu/stem) and the NSF Microsite (https://atecentral.net/msites/dspang).

Additional dissemination:

Further dissemination and communication regarding the new AAS.MET program have been delivered through a variety of means including: distribution of MET and EET trifold marketing brochures, a National Engineers Week presentation in February 2019, the STEM division’s Science Slam event in May 2019, various STEM Open Houses and ‘Meet & Greet’ events, fifteen high school fairs and community events, classroom visitations by the Dean of STEM, inclusion in the display on the College-wide monitor and video system on campus, and through press releases highlighting the RCBC/RU partnership related to the current project (http://www.rcbc.edu/news/rowan-university-and-rcbc-partner-expand-workforce-opportunities) and (http://rcbc.edu/news/rowan%E2%80%99s-new-engineering-technology-dept-launches-31-programs-meet-industry-demand).

*** What do you plan to do during the next reporting period to accomplish the goals?**

During the next reporting period, work on the following goals and objectives will continue:

Goal 1 (Strengthen the Engineering Technology program), Objective 1.2 (Development of the Applications Library). Fully developed and available applications will be widely disseminated through a web page that will be created to support this function.

Goal 2 (Creation of Programs and Educational Pathways), Objective 2.1 (Certificate Creation). Survey results will be compiled and analyzed in order to develop and offer high-value certificate pathways for students.

The project timeline will be adjusted to reflect the necessary schedule to achieve these two remaining project targets and outcomes.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
RCBC-ATE Year 3 External Evaluation.pdf	External Evaluation Report	David Spang	08/23/2019
ASEE Paper ID 27195-An Innovative Mechanical Engineering Technology Pathway Aligned with Industry Needs.pdf	ASEE Paper-June 2019	David Spang	08/23/2019

Filename	Description	Uploaded By	Uploaded On
Timetable-Adjusted June 2019-8.23.19.pdf	Adjusted Timetable	David Spang	08/23/2019
RCBC Catalog AAS.MET 2019-2020.pdf	RCBC AAS.MET degree	David Spang	08/23/2019

Products

Books

Book Chapters

Inventions

Journals or Juried Conference Papers

Licenses

Other Conference Presentations / Papers

Other Products

Other Publications

Patents

Technologies or Techniques

Thesis/Dissertations

Websites
NSF ATE 1601487 MicroSite
https://atecentral.net/msites/dspang

NSF MicroSite highlighting project materials.

RCBC STEM Website
http://www.rcbc.edu/stem

RCBC STEM webpage, highlighting project outcomes.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
Brochure RCBC 3+1 MET.pdf	Marketing Materials	David Spang	08/23/2019

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked

Name	Most Senior Project Role	Nearest Person Month Worked
Spang, David	PD/PI	1
Jha, Ratneshwar	Co PD/PI	1
Tetteh, Edem	Co PD/PI	1

Full details of individuals who have worked on the project:

David I Spang
Email: dspang@rcbc.edu
Most Senior Project Role: PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: Principal Investigator

Funding Support: NSF-ATE 1601487

International Collaboration: No
International Travel: No

Ratneshwar Jha
Email: jhar@rowan.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: Co-Principal Investigator

Funding Support: NSF ATE 1601487

International Collaboration: No
International Travel: No

Edem G Tetteh
Email: etetteh@rcbc.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: Co-Principal Investigator

Funding Support: NSF-ATE 1601487

International Collaboration: No
International Travel: No

What other organizations have been involved as partners?

Name	Type of Partner Organization	Location
Rowan University	Academic Institution	Glassboro, NJ

Full details of organizations that have been involved as partners:

Rowan University

Organization Type: Academic Institution
Organization Location: Glassboro, NJ

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

What other collaborators or contacts have been involved?

Project participants during the reporting period have included Dr. David Spang (Principal Investigator), Dr. Edem Tetteh (Co-Principal Investigator), and Dr. Ratneshwar Jha (Co-Principal Investigator), as leaders of the project. Dr. Jha has joined Rowan University as Department Head and Professor of Mechanical Engineering.

Additional participants have included the faculty chair tasked with the initial development of the applications database, 6-10 industry partners involved in the development of applications database materials, 6-10 faculty involved in Advisory Board meetings, 3-6 students involved in Advisory Board meetings,10-15 Advisory Board members from industry, approximately 10 faculty and administrators from RCBC and RU involved in curriculum development, approximately 35 survey respondents, and approximately 10 project team members, including grants personnel, who meet on a biweekly basis.

Impacts

What is the impact on the development of the principal discipline(s) of the project?

During the reporting period, the impacts of the project have continued to have farther reaching implications beyond the initially stated Goals and Objectives. While the Goals and Objectives supporting the creation of new curriculum have been met, the broader impact to the accessible “3+1” pathway and the creation of a new Engineering Technology department at RU continue to be significant.

For example, other New Jersey community college’s have expressed interest in pursuing “3+1” programs, and RCBC’s Engineering Technology offerings have served as a model for such delivery modes. Additionally, the activities and accomplishments of the project focused on MET continue to have a positive impact on the EET discipline at both RCBC and RU.

The creation of a robust industrial Advisory Board has had a farther-reaching impact which has included the creation of student internship opportunities, as well as the hiring of students into full-time positions by some industrial partners.

What is the impact on other disciplines?

Activities and accomplishments of the project focused on MET continue to have a positive impact on the EET discipline at both RCBC and RU.

What is the impact on the development of human resources?

It is expected that a direct outcome of the program will include the training, education, and availability of skilled technologists to meet regional employer needs for a skilled employee base.

What is the impact on physical resources that form infrastructure?

The project has made a positive impact on the allocation of institutional resources at RCBC in that RCBC has dedicated existing space in its Technology and Engineering Center (TEC Building) and has allocated available Career Technical Education (CTE) funds, approximately $250,000, to purchase infrastructure and equipment, in support of the new MET program.

What is the impact on institutional resources that form infrastructure?

The project has resulted in the creation of a new degree program that is expected to have a significant impact on future academic resources through enrollment and subsequent tuition revenue, that will contribute to future institutional infrastructure.

What is the impact on information resources that form infrastructure?

The applications database will include applications from each of three academic divisions: Health Sciences, Liberal Arts, and STEM. It is expected that information resources will be created that will benefit students college-wide.

What is the impact on technology transfer?
Nothing to report.

What is the impact on society beyond science and technology?

It is expected that the outcomes of the project will enable graduates to think critically in all aspects of their lives, including technical and non-technical areas, and better understand the integration between these two often disparate functions.

Further, it is expected that a direct outcome of the program will include the training, education, and availability of skilled technologists to meet regional employer needs for a skilled employee base.

Changes/Problems

Changes in approach and reason for change

Dr. Ratneshwar Jha has been officially added as Co-Principal Investigator to the current project. Dr. Jha has joined Rowan University as Department Head and Professor of Mechanical Engineering. Dr. Jha holds a PhD in Mechanical Engineering from Arizona State University, a MS in Aerospace Engineering from Georgia Institute of Technology, and a B. Tech in Aeronautical Engineering from the Indian Institute of Technology. Dr. Jha has been officially added as Co-PI to the project team in the FastLane and grants.gov portal.

Another noted change to the project leadership team is that Leah Arter, Executive Director of the Workforce Development Institute at RCBC, who served as project support personnel, is no longer employed at RCBC. Ms. Arter's role of providing project support by leveraging activities from the Workforce Development Institute (WDI) will be continued by other staff on an as-needed basis. Additional WDI staff that may become involved include Vice President of Workforce Development and Lifelong Learning, Ms. Anna Payanzo Cotton, as well as Ms. Zahira Sabir, Manager of the Workforce Development Board, Administration and Outreach.

Actual or Anticipated problems or delays and actions or plans to resolve them
Nothing to report.

Changes that have a significant impact on expenditures
Nothing to report.

Significant changes in use or care of human subjects
Nothing to report.

Significant changes in use or care of vertebrate animals
Nothing to report.

Significant changes in use or care of biohazards
Nothing to report.

Special Requirements

Responses to any special reporting requirements specified in the award terms and conditions, as well as any award specific reporting requirements.
Nothing to report.