

Introduction:

Centers of Excellence are flagship institutions that build and sustain Washington State's competitive advantage through statewide leadership. Each of the 10 Center's focuses on a targeted industry that drives the state's economy and is built upon a reputation for fast, flexible, quality education and training programs. A targeted industry is identified as one that is strategic to the economic growth of a region or state. The centers are then guided by industry representatives to lead collaborative and coordinated statewide education and training efforts that build a competitive workforce in a global economy.

The core expectations behind the Centers of Excellence include:

- **Economic development** focus in which the centers serve as partners with various state and local agencies, regional, national, and global organizations to support economic vitality and competitiveness in Washington's driver industries
- **Industry sector strategy** focus in which the centers work to collaboratively build, expand and leverage industry, labor and community and technical college partnerships to support and promote responsive, rigorous, and relevant workforce education and training.
- **Education, innovation and efficiency** focus in which the centers leverage resources and educational partnerships to create efficiencies and support development of curriculum and innovative delivery of educational strategies to build a diverse and competitive workforce.
- **Workforce supply/demand** focus in which the centers research, analyze and disseminate information related to training capacity, skill gaps, trends, and best practices within each industry sector to support a viable new and incumbent workforce.

At the Center of Excellence for Aerospace and Advanced Manufacturing, we are invested in creating a better skilled labor workforce in manufacturing, including aerospace and manufacturing jobs in Washington. Our state has been at the forefront of the global aerospace industry. What began in 1916 in a single red barn in Seattle has grown to the largest and most robust aerospace cluster in the world, employing more than 132,500 people working in more than 1,350 companies located in 35 of the state's 39 counties (Washington State Aerospace Industry Strategy, 2014 Update).

Timeline: How We Got Where We Are Today:

In November, 2012 Boeing approached the Center of Excellence (COE) to relate future workforce needs for entry level candidates/technicians with the knowledge, skills, and abilities in metrology or measurement science. During our monthly ACAT (Aerospace Curriculum Alignment Team) meeting in November, a representative from Boeing made a presentation to representatives from the state's community & technical colleges, workforce development councils, labor, and government and other industry leaders relating this need and the KSA's involved.

Throughout the months of January – March, 2013, the COE and Boeing worked together to set up a tour of the Boeing Metrology Labs for community & technical college faculty and deans. As always, these industry tours proved to be valuable for faculty as they had an opportunity to see what is actually happening on the factory floor. We also arranged for Boeing to take a tour of three community & technical college labs focusing on electronics and machining. The three colleges, North Seattle College, Olympic College and Lake Washington Institute of Technology, had an opportunity to showcase their programs for these industry SME's. Also, it provided an opportunity for industry to learn about these programs and to see the individual lab equipment available to students. During this time, our industry SME's also had an opportunity to review the current curriculum and speak with instructors from these three colleges to find out where an entry level, three-five credit course might fit within the current program structure.

Beginning in April of 2013, the Center of Excellence identified and contacted other industry partners in the greater Puget Sound region that were seeing future needs within their workforce for entry level positions with basic KSA's in measurement science. In May of 2013 we convened a Measurement Science Technician DACAM (designing a curriculum) utilizing the expertise of 10 subject matter experts from seven industries: Boeing, Lockheed Martin, Puget Sound Naval Shipyard, Fluke Corporation, CimTech, Greysam Industries and Northrup Grumman. This extensive full day workshop not only included our industry SME's but also, as observers, faculty and deans from approximately six community & technical colleges in the region that have manufacturing programs in place and have an interest in expanding their training capabilities in the field of measurement science to align to industry needs and standards.

The following report is what was produced as a result of that DACUM. **(see attached)**

Timeline: How We Got Where We Are Today (cont.):

During the winter of 2014, through our industry partnerships, the Center of Excellence was made aware of the NIST grant and our possible application, focusing on the common course development of entry level courses with an emphasis on electronics and manufacturing. We applied for the grant and received confirmation of the grant approval in the summer of 2014.

Grant Overview:

The basic tenant behind our grant was that there is a distinct lack of standards education in advance manufacturing in Washington State. In fact, no community or technical college offers a certificate or degree in Measurement Science or Metrology. Only a few colleges in the state offer courses at all and those courses are not standardized to common criteria. To meet today's industry needs a curriculum must be developed for courses and stackable certificates that integrate measuring devices, techniques, analysis and plan development. This curriculum will be adopted into college programs throughout Washington State and will become a cornerstone for increased integration of Measurement Science into manufacturing and technology degree programs.

Our grant goals included:

- The development of course curriculum with industry subject matter experts' input that can be embedded into advanced manufacturing/aerospace programs
- The development of a series of courses that can be included in a short term certificate that can be adopted at any of the state's community and technical colleges
- The creation of curriculum that will be easily recognizable (common certificate with course titles/objectives) so that industry hiring managers are able to clearly identify the training when it appears on resumes
- The ability to increase the number of community and technical college students that are qualified to fill job openings in measurement science/precision measurement/metrology within local companies
- The ability to provide professional development opportunities for Design Team faculty to attend industry-led conferences and seminars for exposure to workplace best practices

What We Did:

Beginning in September 2014 we contracted with:

David Cunningham as Education Consultant: Dave was contracted to facilitate the workshops and to connect previous work done in the DACUM to this project's efforts to create a cohesive curriculum that will meet industry needs.

Bob Monroig as Curriculum Designer: Bob, with previous experience in the community and technical college system, was tasked to lead the curriculum design team.

Terryll Bailey as External Evaluator: Terryll conducted the external evaluation which provided an outside, independent analysis of the curriculum development process and final product. The purpose of the evaluation was to promote the successful development and implementation of the project through continuous feedback of data to the COE program manager and project leadership, and assessed the effectiveness of the project outcomes in meeting its stated goals.

A preliminary draft of her initial evaluation results is attached and was presented in Maryland on November 6th. A formal evaluation will be submitted at the end of the month to Erik.

COE staff also met with workforce deans from the following colleges, North Seattle College, Shoreline College, Everett Community College, Olympic College, and Lake Washington Institute of Technology, to identify faculty to be part of the curriculum design team and to reinforce the commitment of their respective colleges in the development of that curriculum.

MOU's were signed with all of the colleges listed above.

In November of 2014 our first Oversight Industry Partner Group (OIPG) meeting was held. Most of our industry partners, Boeing, Fluke Corporation, Puget Sound Naval Shipyard, and Lockheed Martin, that participated in the DACUM almost 2 years previously attended this meeting. The focus of this meeting was:

- Overview of the grant proposal
- Review of the colleges that initially agreed to participate: North Seattle College, Olympic College, and Lake Washington Institute of Technology. A request was made from one of the industry partners that we invite Everett Community College and Shoreline College as they were looking at offering classes in measurement science.
- Terryll Bailey was introduced as our third party evaluator. She spoke about the focus of the project evaluation which would include: the design instruments; were timelines met; is the project on track; how was the program adopted by the colleges; has there been an impact on the CTC system, if so, what was it

- There was quite a discussion around curriculum with focus being on one or two 5-credit classes that are developed and then embedded within existing programs. However, with the development of these one or two classes, we will then develop common curriculum and common numbering, thus making it easily identifiable for industry.
- The idea of a short term certificate was introduced; that will be looked at a later date. We will be focus on the one to two classes during this grant period. We also talked about Phase Two of another grant application in which we look at a short term certificate, the expanding that out to a two year degree or transfer degree with articulation agreements to the four-year universities within the state and an internship-type program.
- Aligning the classes to the ASQ certification was brought up, but deemed that that goal was too futuristic at this time. It was noted that the ASQ requires that employees have five years of experience in the field or a BA degree plus two years of a MA degree plus one year.

Faculty began meeting in November, with Olympic College, North Seattle College, Shoreline College, Lake Washington Institute of Technology, and Everett Community College. With this initial meeting, faculty reviewed the needs and requests of industry and began the process of curriculum development.

Throughout the curriculum development work, our next OIPG meeting was held Wednesday, January 21, 2015. Erik Puskar was in attendance. The focus of this meeting included:

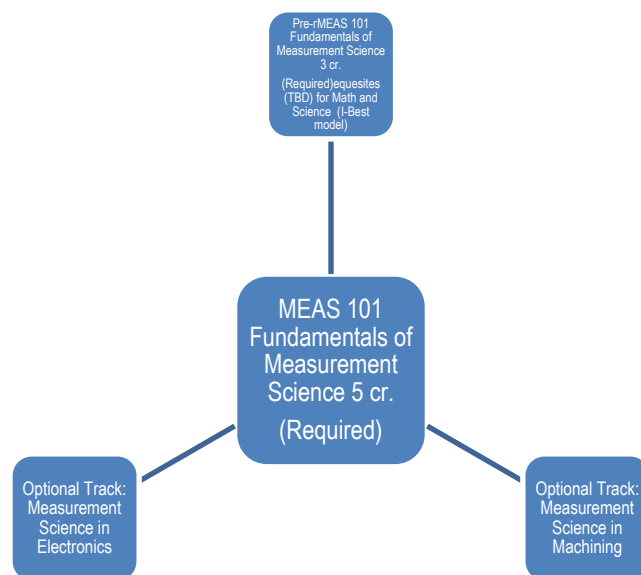
- A recap of the project goals and stakeholders; how did we get where we are so far?
- Discussion was held about nationally recognized industry certification; it was acknowledged that there are no specific industry recognized certifications to date for entry level positions such as technicians.
- The issues of credit for prior learning and military experience or training was raised and agreed upon that those two things would be recognized by the colleges.
- Some questions were brought up about the use of on-line training as an option in the future. An industry partner indicated that the on-line system is very crowded with classes that cost a tremendous amount of money and that using this type of system eliminates the lab experience which is very important.
- Erik Puskar was able to attend this meeting and was pleased with the number of industry partners involved in the project along with the colleges.

In March of 2015, the COE sent two members of curriculum design team, Bob Monroig and Craig Seybold, to attend the Measurement Science conference in Los Angeles California. Both

individuals emphasized that they had a tremendous experience and really got a lot of valuable information out of the trip. Bob shared a flyer about an innovative Air and Space Port proposal that he picked up while in California.

In March, 2015, the COE held another OIPG meeting. Below is a synopsis of that meeting:

- Dave Cunningham presented a copy of his initial Labor Market Demand report dated February 25, 2015. **(see attached)**
- Sue distributed the NIST Grant Six-Month Report (see attached).
- Having reviewed the DACUM report as well as existing related curricula offered within the Washington State Community & Technical College system, the team agreed upon the following approach to a short stackable certificate in Measurement Science: one 5-credit core skills course entitled Fundamentals of Measurement Science, followed by two options for a second 5-credit course (including lab credits) in either Electronics or Machining.



In June of 2015, the COE sent one member of the curriculum design team to attend the regional NCSL workshop in Portland. The following is a synopsis of that workshop by Jeff Purdy, faculty member at Shoreline College. **(see attached)**

Also, in June 2015, the COE held its final OIPG meeting. All but one of our industry partners was able to attend. Erik Puskar was in attendance via phone. Below is a synopsis of that meeting:

- Dave Cunningham presented his third and final Labor Market Report (see attached) along with a Phase 1 report entitled National Institute of Standards and Technology Project, Measurement Science (**see attached**).
- Sue reported on an in-person meeting with Georgia Harris regarding possible next steps for Measurement Science-related funding opportunities. Georgia is interested in offering a week-long training for faculty on Measurement Science with an emphasis on how to teach, test, etc. Our industry representatives are interested in seeing this training occur in Washington State, emphasizing that they feel confident that any of the community and technical colleges involved in this grant have the necessary equipment for training available on campus
- Overviews of the three courses that were developed as a deliverable for this grant were presented to our industry partners (**see attached**). Industry indicated that this is a good start; the next step would be further development of these courses by developing a course syllabi.
- Our representative from Fluke Corp. presented each college and faculty member with a copy of **Calibration: Philosophy in Practice, 2nd Edition**, by the Fluke Corporation
- One of our industry partners would like to see a thread around inspection included in further curriculum development.
- Next steps were discussed that included further local training for faculty; a separate certificate in Measurement Science be created among the participating colleges; syllabi be developed for each of the courses; a listing of pre-requisites be designed for the courses that were developed.

Additional Project News:

- In the Fall of 2015 we were asked to submit an article for the Standards in Engineering Journal. **A copy of that article submission is attached.**
- In October of 2015 one of our industry partners from Boeing attended an exploratory meeting in Cleveland on the topic of a national certification standard for measurement science. After reviewing the more basic “fundamentals of measurement science” approach taken with our CTC’s in a presentation submitted by the COE, the group thought it best to follow a similar course and begin looking at a measurement science certification that could be stacked on (or a prerequisite for) other existing certifications. This meeting included representatives from NIMS and the Association for Manufacturing Technology. Moving forward, the COE is planning on sharing lessons learned and staying engaged to help move this initiative forward.