MatEdU Collaborative Internship Model

A case study of MatEdU’s Collaborative Internship Model for Education and Industry

This brief report is a practitioner’s HOW TO guide to the model industry internship MatEdU has developed and disseminated.
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MatEdU Collaborative Internship Model

A CASE STUDY OF MatEdU’S COLLABORATIVE INTERNSHIP MODEL FOR EDUCATION AND INDUSTRY

Overview of MatEdU

MatEdU, the National Resource Center for Materials Technology Education, a National Science Foundation Advanced Technological Education funded center, builds upon numerous public and private initiatives, including other NSF-funded centers and projects, through strong partnerships with higher and secondary education, professional groups, and industry. The Center is a respected and trusted source of materials science technology educational products and services. MatEdU effectively leverages activities, key partnerships, and projects in ways that are reciprocal and beneficial to diverse stakeholders. These partnership models and best practices are being disseminated by MatEdU nationally.

The mission of MatEdU is upheld by its four major goals:

Goal 1: Expand the online collection of high-quality instructional resources including competency-based modules, presentations, labs, and demonstrations.

Goal 2: Introduce interactive online resources to the MatEdU website via social media to improve access to instructional resources, expertise, and professional development.

Goal 3: Disseminate strategies to promote increased website awareness and online engagement, support strategic partnerships, and expand professional development opportunities.

Goal 4: Leverage partnerships to achieve strategic scalability of MatEdU resources, while investigating strategies and alternative revenue streams.

Through development and dissemination of the core competencies and other robust resources, MatEdU has shown it can be a major contributor to enhanced quality of education in manufacturing processes as well as engineering design. Active partnerships with other organizations have allowed the Center to impact and integrate materials information in diverse areas. The more technicians understand the relationships between materials properties and production processes, the better the quality, productivity, and competitiveness of the technical workforce. With rapid changes and new developments in nanotechnology, nanoscience, corrosion, and green and composite technologies, as well as the more traditional areas of metals, plastics, and composites, it is imperative for industry to have qualified and educated technicians to keep the United States globally competitive in materials and advanced manufacturing.
Development of Collaborative Internship Model and Partnership with Boeing

As a National Resource Center, MatEdU is keenly aware of the ongoing and pressing challenges in the field of materials science technology:

- The current workforce lacks advanced skills to develop new products and infuse legacy products with advanced manufacturing practices using cutting edge materials and technologies and advanced industrial processes;
- The current aging workforce is retiring at a time when the number of technical jobs is increasing;
- New workers must be attracted and must develop skills to flexibly meet continuously evolving manufacturing industry demand.

Given these significant challenges, MatEdU, Edmonds Community College, and The Boeing Company together proactively developed a Collaborative Internship Model as a strategy for addressing the need for skilled technicians in the aerospace workforce.

Research by The Boeing Company looked at the following kinds of needs assessment questions:

- How many engineers, scientists, and technicians do we need in our foreseeable future?
- What skills and knowledge will they need?
- How do we attract the next generation technical workforce that possesses a much broader multi-disciplinary and systems engineering perspective?
- How should we enhance our technical educational system?
- How do we attract and retain a student population reflecting the demographics of our diverse society?

To address the needs identified in the research findings, a pilot program was designed and developed in collaboration with academic (MatEdU and Edmonds Community College, Lynnwood, WA; Department of Materials Science and Engineering, University of Washington, Seattle, WA) and industrial partners (The Boeing Company, and Boeing’s Materials and Process Technologies division, Seattle, WA) and implemented with a two-year community college in the professional technical division. Known as the Educational Experiential Learning Exposure Internship (EELEI), the program was targeted at closing the technician workforce gap. With the increasing use of advanced composite materials in the design, testing, and repair of products like the 787 Dreamliner, Boeing has a constant need for qualified and experienced materials science technicians to replace a specific segment of its aging technical workforce. The Collaborative Internship Model supported and complemented the Materials Science Technology (MST) program, a 2-year Associate of Applied Science-Transfer degree focused on materials science technology at Edmonds Community College.

Since 2008 approximately 74 students have successfully completed the internship program. About 45 interns have been hired full time. About 10 interns have gone on to a 4-year institution – five of those are still with Boeing. Prior to 2015 most of the interns worked part time by having their summer internships extended until graduation, working part time about 20 hours per week. Upon graduation
The students were hired as contractors and then after approximately 6 months were converted to permanent employees.

The Collaborative Internship Model has been piloted, refined, and improved. It has become an integral part of the academic program by allowing students to acquire valuable hands-on skills while providing context and relevancy that strongly supports their academic experience. The beauty of this model is that even if The Boeing Company isn’t in your backyard, the model is adaptable to varying education and industry partners.

The following perspective, offered by Dr. Dianne Chong, (retired) Vice President of Research and Technology, Engineering Operations and Technology at Boeing sums up the mutually beneficial nature of collaborative internship models:

The Boeing-Edmonds Community College Internship Program was very valuable to the Materials and Process organization. It helped us identify and train potential employees for a variety of jobs at Boeing. It also played a role in helping us determine what our future workforce could be doing as we worked to maintain current practices and develop new technologies for the future. My role in the program was helping to initiate it and providing support. I also briefed upper management on the importance of this program and the relationship with Edmonds.
Stakeholder Benefits of the Collaborative Internship Model

Firsthand perspectives from former interns:

Dr. George Parker, Technical Fellow at Boeing, asked past interns from the program to share their reflections, experience, and what it meant to them – from the time they were students to the opportunities they have received since being hired as part of the Boeing workforce and family. Here is what they said:

Rick Stilwell  
Technical Analyst, Boeing  
One of the first interns in the program – currently working for Dr. Parker in BR&T

When my internship at Boeing began, I was finishing up my first year in the Edmonds Community College Material Science Engineering Technology program. I was excited to spend the summer of 2005 working at Boeing and getting experience in the aerospace industry and applying my new knowledge of material science. To my surprise, at the end of my summer session I was offered a fulltime job with Boeing as a technical technician, where I was able to continue my position doing mechanical testing of materials. I was able to work a regular shift at Boeing and take my second year of classes in the afternoons. And if that wasn’t enough, Boeing also paid for my tuition and books through the Learning Together Program. I graduated from Edmonds in 2006, and since then I have enjoyed over 13 years of technical and engineering work at Boeing. During this time, I have had multiple promotions, learned many new skills, and have been involved in many exciting projects and programs that are truly world-changing in Commercial Airplanes, Defense and Space, and in Research and Development. I am Boeing’s resident technical expert in residual stress analytical techniques, the only one in the company! And I have also been fortunate to teach and mentor student interns from the same college through the “Boeing Edmonds Educational Experiential Learning Exposure Internship program (ELEIP)” from where I graduated, Edmonds Community College Material Science Engineering Technology.
Yonas Behboud
FAA Tech Center, Boeing

Through the Boeing-EdCC internship program, I was given the opportunity of a lifetime to visit various laboratories at Boeing and learn from industry experts. Going from the classroom setting to the state-of-art facilities at Boeing was an unparalleled experience. Not only did we get to put our recent studies to the test, but we also got to see how materials science was used on a daily basis and wet our appetite for additional hands-on work. Now, as a Boeing employee in the flammability group, I have had the pleasure of continuing my scientific pursuits as part of a rewarding career. I have attended national Federal Aviation Administration (FAA) conferences as a representative of The Boeing Company as we work to improve fire safety test methods. We collaborate with the FAA on ensuring that the flying public continues to have a safe and comfortable journey aboard our airplanes. My family and I are eternally thankful for the existence of the Boeing-EdCC internship program and recommend it to any current or prospective future students as an extraordinary opportunity bundled as a 2-year degree.

Dr. Parker adds: Yonas is now a certified FAA AR (authorized representative) Test Witness Only Boeing Rep, which is significant because it’s very difficult to obtain that classification status. Yonas is one of five FAA fire certified AR within Boeing to be a part of this very elite group. He is extremely dedicated to his job.
Jason Simoneaux

Test Laboratory Technician, Boeing

My experience with the EdCC & Boeing Internship program was exceptional and gave me the tools I needed to be successful in a material science field. I participated in two internship programs with Boeing during my two years at EdCC while going through the Material Science Technology program. The first internship program took us through a series of test labs, composite layup, structural bonding, flammability, analytical chemistry, photo microscopy, and mechanical properties.

For me, visiting each of these labs was a wonderful experience because it opened my eyes to all the different processes a material goes through in its lifecycle, from layup to destructive testing and everything in between. The experience helped to solidify the concepts we were learning in the classroom and provide us with real world experience once we graduated from EdCC.

For the second-year internship we could choose one of the labs mentioned above and spend the entire summer working in that lab. I ended up choosing the mechanical properties lab because I got to perform destructive testing on composite materials. The lessons I learned from the previous internship and visiting multiple labs helped me immensely when problem solving for why a material failed a certain way. The internship program gave me a large base of knowledge to pull from and how each step in the lifecycle affects the overall final product.

Today I have worked my way up from being a lab technician to running a test lab for The Boeing Company. I contribute much of this success to the EdCC program and the mentors I met along the way during my internship program with EdCC and Boeing.

The Company also benefits:

- A low initial investment.
- A positive corporate image among the student interns and college community.
- Interns can become great ambassadors from the company back on campus via positive peer-to-peer advertising.
- Interns – even at low experience levels – can do real work if given to them. Offering interns real work to do is a key element to a successful program – morale soars, the interns learn a lot, and the company benefits.
- A process that provides a pool of qualified laboratory technician candidates ready for potential hiring for which the employer has the advantage of selecting the most qualified and promising students to fill open positions.
- Creates a technician pipeline focused on meeting workforce needs and produces well-prepared workforce candidates.
- While the need for technicians, such as illustrated at Boeing, continues to grow over time, permanent employee headcount can be stabilized via process improvements, mechanization of routine work, and strategic asset utilization and consolidation. Stabilization of the workforce against normal attrition allows beneficial continuous recruiting independent of the business cycle and makes employee development an “investment” rather than a mere “overhead cost.”
- An effective instructional tool which can be used to increase the technical competencies of today’s workforce.
The Collaborative Internship Model strengthens programs, colleges and curricula

- Having local or regional industry partners strengthens and enhances the program.
- The internship experience can increase the number of certificates and degrees awarded by the program as a retention incentive.
- Having direct industry input within the structure of a professional technical degree program.
- Providing students with a robust, real-life, hands-on experience while continuing their academic studies.
- Providing students with options of a 2-year degree and/or certificate.
- Serves as an important tool for active recruitment of prospective students as well as retention of current students.

Luan (Bobby) Hoang
Engineer, Boeing

The internship program was a very unique experience, where I was exposed to various technologies such as Mechanical Testing, Non-Destructive Testing / Non-Destructive Examination, Flammability, Metallurgy / Photomicroscopy, Composite Repair and Layup, Thermal Analysis to name a few. The summer of my first year in the program I was offered an opportunity of a lifetime, a summer technician internship in the interiors group, where I learned a lot from great people about materials and how they are used to build airplanes and about life. I learned that it requires collaboration and dedication to build such great products like the Boeing airplanes. I was also able to work in several locations as an intern and later after graduating with my AA - degree in Materials Science Technology, I was hired as a fulltime technical technician in the interiors group. After 3 years my status changed from a technical technician to an engineer and I was promoted to a lab lead position in the flammability lab.

I am proud to work for The Boeing Company as an engineer and I am grateful for the internship program and Dr. George Parker who created the Boeing-EdCC Educational Experiential Learning Exposure Program. Without the program, I wouldn’t be where I am today working major airplane programs in the Everett plant as an engineer.

Seema Mahajan
Engineer, Boeing

EdCC internship program was a great introduction to various materials science research and development fields at Boeing. It helped me learn from some of the best technical brains. I found a great mentor in George Parker (Boeing focal for this program) who worked tirelessly to ensure the EdCC interns succeed in their endeavors.

The internship experiences helped me significantly in getting a job at Boeing. For me, the internship opportunity was a career milestone, helping me getting on a path of a Boeing career. I believe that the Boeing values exhibited by various technical lead engineers and managers during this program ensured that Boeing was a company of choice for me.

Dr. Parker adds: Seema also has a PhD in material science (Chaudhary Charan Singh University) from her native country India.
Replicating the Collaborative Internship Model

Each internship program developed will have its own unique and defining characteristics to benefit its stakeholders. There are key steps or components common to the development process of such an internship. The following list of “identification” steps and examples from the MatEdU-Boeing-EdCC partnership may help guide the adaptation and replication of the Collaborative Internship Model.

1) Identify a need/desire
   a. Example: MatEdU and Edmonds Community College sought to increase enrollments in their Materials Science Technology program through the addition of an engaging, interactive internship program.
   b. Example: The Boeing Company sought to address the shortage of qualified workforce in science, engineering, technology, and project management in the aerospace industry.

2) Identify industry partners (e.g., work with Program Advisory Committees)
   a. Understand which industry partners are the “best match” for the program

3) Identify complementary industries, partners, collaborations
   a. Understand which supporting partners might also play a role in the program

4) Identify the specific goal/purpose of program
   a. Example: Work with a local two-year community college to develop a formal materials science technology curriculum and an educational experiential learning exposure internship program that would enable students to intern at Boeing Materials & Process Technologies laboratories.
   b. Example: The program would provide a potential pool of qualified 2-year Associate-degreed technicians with the basic skills, knowledge, and interest to work in the aerospace industry or
Materials & Process Technologies organization. Internships provide students with a foundation in materials science, laboratory skills, analysis, testing, and operations.

5) Identify the structure, sequence, and duration of program
   a. Example: The Materials and Process Technologies unit identified fourteen laboratories that would be participating in the internship: Composite Layup; Composite Repair; Structural Bonding/Adhesive; Non-Destructive Investigation/Non-Destructive Examination; Interiors; Flammability; Metallography; Mechanical Properties; Photomicroscopy; Paints; Fuels and Lubricants; Adhesive Bonding; Elastomers/Sealants; and Analytical Area (Thermal Analysis, Chemical).
   b. Example: M&PT also developed a laboratory plan which included input from each of the Technical Lab Leads participating in the program. The Leads provided the interns with information that covered: 1) Training in basic laboratory operating procedures; 2) Test methods to include specification requirements and basic laboratory test methods; 3) Operating procedures that pertained to their lab; and (4) Synergy/collaboration with other labs.
   c. Example: In the first year, students explore the technologies and laboratory areas covered during a 10-week internship course (8 hours per week), including hands-on experience in a high technology manufacturing environment rotating through the various participating laboratories.
   d. Example: In the second year, successful candidates/students are assigned to one lab where they gain in-depth experience, expand their level of education and training, and increase the number of technically difficult and challenging work assignments.
   e. Example: Contract internship program positions are limited to the number of available positions. As a result, second year opportunities are competitive and based on academics, successful completion of year 1, and lab experience.

6) Identify inherent challenges
   a. Example: Intellectual property and proprietary information issues with student access to company labs, materials, processes.

7) Identify formal requirements for admission and program completion, as well as procedures for students to apply to become interns.
   a. Example: Students must successfully complete a background security check by the company.
   b. Example: Students must be enrolled and in good standing in the academic program.
   c. Example: Students must be US citizens.
   d. Example: Students are required to attend an orientation and training overview session at the facility covering corporate policies and general new employee safety training orientation.

8) Identify strategies for implementation, including marketing and advertising the opportunity.

For complete details of the original Collaborative Internship Model format, see white paper referenced on page 13.
MatEdU Collaborative Internship Model

**Flexibility is Key for Continuous Improvement**

Throughout the development and implementation of the Collaborative Internship Model, several valuable lessons were learned. The lessons guided the refinement and continuous improvement of the program over time.

It is important to be flexible and open to change and new understandings. Here are a few examples of how the program was improved from the time it was launched:

- 2 courses initially combined proved too daunting for students, so with input from the Program Advisory Committee, the two courses were separated and taught as originally designed (not combined). Mid-course corrections like this were made based on experience with the content and pace of the internships. This change worked out well for the program, industry, and the interns.

- A formal on-line application process to the internship was implemented to give students some real-life experience researching and applying.

- Facilitating contact with students who participated in the program. This has assisted with program follow up, employment information, student/mentor opportunities, and the collection of feedback from students for potential ways to strengthen the program.

- The Materials Science Technology degree program was ultimately integrated into the Engineering Technology degree program at Edmonds Community College. The Collaborative Internship Model was then adapted and adjusted to the new academic structure.

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**Boeing BR&T NDE Overview for EdCC**

Presentations by Boeing technicians at BR&T NDE facilities at the Developmental Center Campus 9-101, Building, Lab LB74.
Conclusion

The need for well qualified advanced manufacturing technicians continues to be a critical challenge for industry across the board. Education and industry can work together to construct meaningful internship opportunities for students in technical education programs. Connecting students to real-life workplace experiences enhances student interest in the field, skill development, and understanding of available career pathways. Implementation of the Collaborative Internship Model is a productive strategy to both engage new and continuing students, and produce the skilled technicians required and valued by industry.
Resources


For more information

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