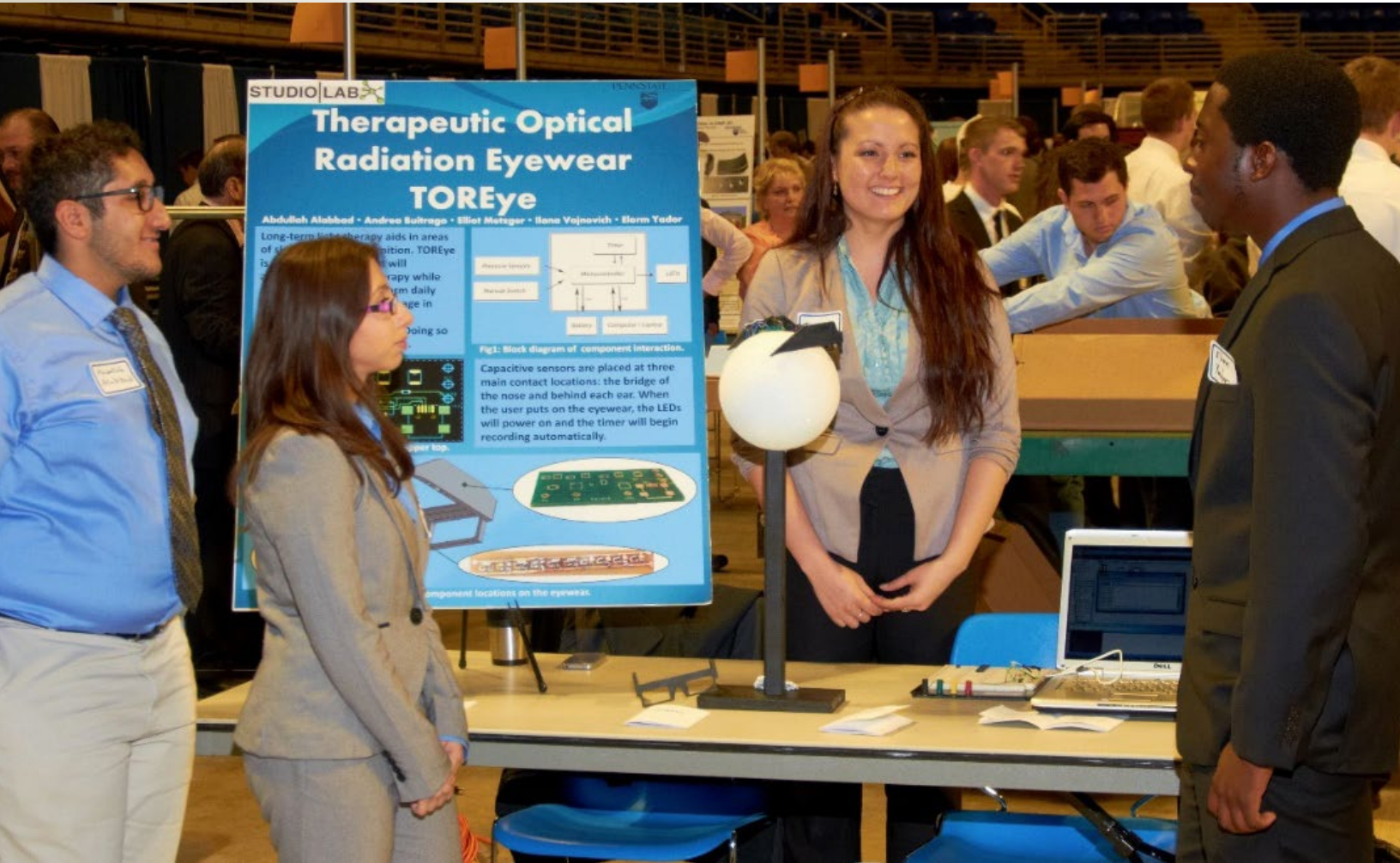




PennState



CICEP

INNOVATION AND ECONOMIC PROSPERITY UNIVERSITIES AWARDS PROGRAM

CASE
STUDY
2015

IEP CATEGORY • INNOVATION

Bernard M. Gordon Learning Factory

The Bernard M. Gordon Learning Factory’s mission is to bring the real-world into the classroom by providing senior undergraduate engineering students with practical, hands-on experience through industry-sponsored and client-based capstone design projects. The Learning Factory is both a state-of-the-art prototyping facility and a unique learning experience at Penn State.

INNOVATION

The Learning Factory provides a University-Industry partnership where student design projects benefit industrial clients, and industrial sponsors interact with students and faculty to create world-class engineers. Clients range from large businesses to entrepreneurs to anchor institutions such as hospitals.



Project teams involve one or more disciplines in engineering; often the Learning Factory partners engineering students with students in disciplines such as Arts, Business, and Information Sciences & Technology (IST) to develop a complete solution for the company-identified issue or innovation need.

Global capstone design teams consist of Penn State and international students collaborating to complete a project. In 2015, the partner universities were Shanghai Jiao Tong University (SJTU) in China and Chalmers University in Sweden. “The experience mimics a real life project at a global company, with two teams working in two locations,” said Francesco Kuranapatabendige, a Penn State mechanical engineering senior working on a team with Chalmers University.

Teams of engineering students tackle problems identified by industrial clients, challenging students to apply the knowledge and tools acquired during their undergraduate education to solve engineering problems. The Learning Factory provides a unique opportunity for industry sponsors to partner with Penn State to help educate the next generation of world-class engineers using state-of-the-art equipment for design, prototyping, and fabrication.

For small companies, these teams are the only engineering workforce. For larger companies, Learning Factory teams are helping develop new ideas or improving current practices.

The ideal project is the design of a product, process, or service that involves technical analysis, financial justification, and prototyping. The required project work is handled within one semester (15 weeks).

Examples of recent Learning Factory projects:

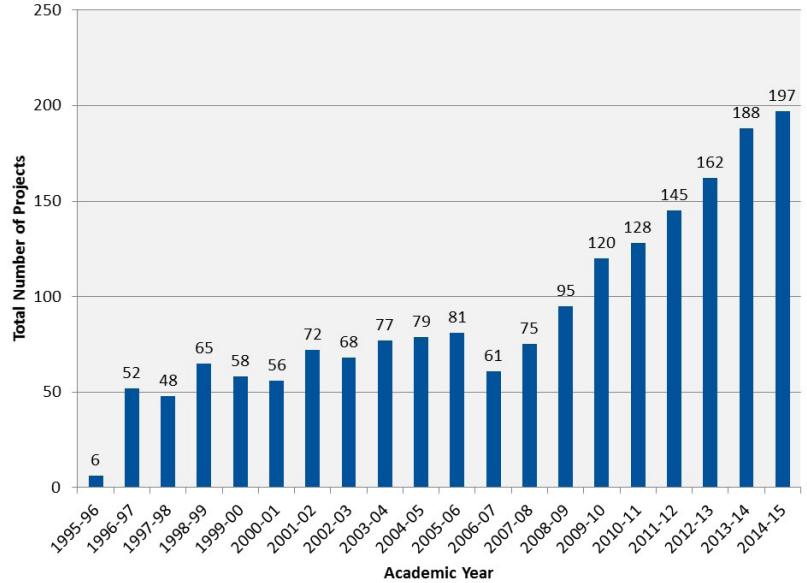
- The Boeing Company—Unmanned Ground Vehicle
- General Motors—Active Vehicle Grille

- Lumax Lighting—LED Industrial High Bay Light Fixture
- Penergy Solutions—Biodigester and Methane-Fueled Heat

IMPACT

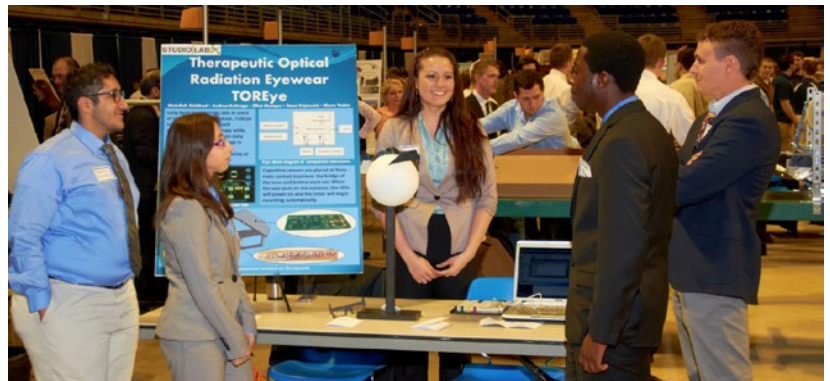
Since its inception, the Learning Factory has completed more than 1,800 projects for more than 500 different sponsors. Nearly 9,000 engineering students at Penn State University Park participated in the projects. In Spring 2015, the Learning Factory had 127 projects, and in Fall 2015 about 80 are expected.

Through these projects, Learning Factory has provided students with practical experiences. Many students have never seen the inside of a manufacturing plant or engineering lab until they visit their Learning Factory project sponsor. Learning Factory students grow their leadership and project management skills by working directly with their clients.



COULD IT HAVE HAPPENED WITHOUT THE UNIVERSITY?

Only entities with the resources as broad and deep as Penn State could manage an undertaking like the Learning Factory. Networks of sponsors to supply and fund projects are critical to the success of the Learning Factory. Industry sponsors cite the multidisciplinary nature of the Learning Factory as a major benefit to working with Penn State.



The College of Engineering at Penn State graduates nearly 1500 Bachelors of Science engineers each year; more than half experience a hands-on capstone design project through the Learning Factory.

The Learning Factory helps coordinate 200 senior capstone design projects from industry sponsors and professional clients each year within the Colleges of Engineering and Earth & Mineral Science. The Learning Factory is also the hands-on prototyping and design laboratory for students across the College of Engineering.

BARRIERS

Funding for small and medium-sized companies has been a barrier. However, private and state funding has now been leveraged to offset the cost of the projects.

Company expectations are sometimes a barrier. The Learning Factory has developed a checklist that requires all project sponsors to acknowledge that they understand they will be working with a student team, not professional engineers with a list of deliverables. The student teams work hard and conscientiously, but sometimes the semester ends before the project does.

Each project will typically involve a team of 3–5 students over a 15-week semester. This equates to approximately 400 hours of effort devoted to the project. Results from student teams are highly dependent on the nature of the project, the innate team capabilities, the amount of client interaction and support, and other variables. No guarantees can be made, other than the students will give it their best effort. Often, a project provides direct and immediate benefits to the sponsor. Sometimes a good concept is developed, but further work is required.

Learning Factory faculty are instructor-mentors who help guide student teams through the design process. Instructors hold weekly meetings with their teams and review each team's accomplishments using weekly progress reports. Instructors also encourage their teams to share reports with their sponsors and make sure that their teams are in regular communication with their sponsors.

WHY SHOULD PEOPLE CARE ABOUT THIS?

Penn State engineers are the product of a rigorous education in engineering fundamentals and practice and are highly sought after by companies in the U.S. and world-wide. Industry-based design projects are essential to provide engineering students with the opportunity to apply their technical knowledge to actual problems. The experience helps students bridge the gap between academic and professional careers by exposing them to the technical demands, potential pitfalls, and professional expectations of practicing engineers.

Newly hired Penn State Engineering graduates are better trained as a result of their Learning Factory project experience. The company liaison, often a junior engineer staff member who oversees the project, also gains valuable project management and leadership experience. Networking with other companies through Learning Factory events and cross-promotions are always encouraged and valuable. Learning Factory projects also give industry partners and alumni opportunities to give back to the University and influence the education and careers of students.

The Learning Factory demonstrates Penn State's economic engagement efforts in innovation and entrepreneurship, by moving from knowledge creation to knowledge transfer and application in ways that are useful and relevant to society.