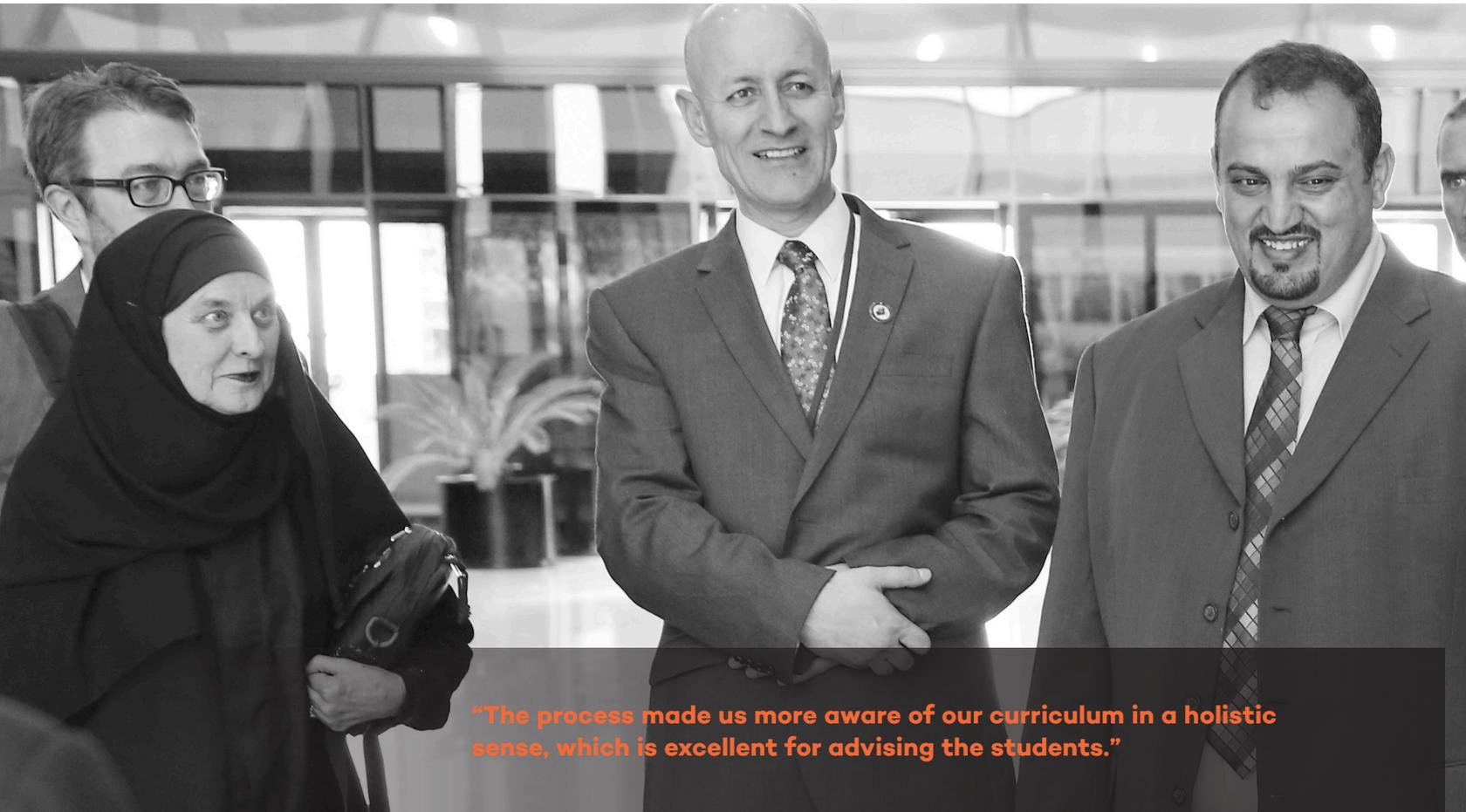




# ABET ACCREDITATION: into Natural Science

**A**BET accreditation has long been the global standard for programs in applied science, computing, engineering, and engineering technology. But recently, programs in disciplines outside of these four main areas have shown interest in becoming accredited. This raises the question: what is the return on investment for programs in the natural sciences?

This issue brief explores the value of ABET accreditation, and, specifically, the value that it could bring to natural science programs, including mathematics. It also presents industry perspectives from the companies that rely on graduates from those programs to populate their workforce. It then explains why ABET is in a strong position to meet the needs of fields and disciplines that would be new to ABET by drawing on the recently successful expansion into accreditation of construction management programs.



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### **Framing the Issue**

Between 2011 and 2012, ABET granted accreditation to programs in petroleum geosciences and applied physics, two disciplines that the organization had not previously accredited. Since that time, other programs ranging from physics, biology, chemistry and geology to mathematics and statistics have expressed interest in becoming accredited. Two are currently being reviewed in the 2015-2016 cycle; by 2018 more than twenty programs are planning to request an ABET evaluation.

As interest continues to grow and the number of disciplines seeking accreditation grows, it becomes important to consider the value that ABET accreditation will provide to these programs. With over 80 years of experience and a scope spanning the applied sciences, computing, engineering, and engineering technology, ABET accreditation could be a good fit to cover all of the STEM fields.

### **What is Accreditation?**

Accreditation is a review process to determine if educational programs meet defined standards of quality. Once achieved, accreditation is not permanent—it is renewed periodically to ensure that the quality and continuous improvement efforts of the educational program are maintained.

In the United States, academic accreditation is voluntary, decentralized, and carried out by non-governmental, non-profit organizations. The process of academic accreditation typically culminates in an external quality review by a team of professional experts from academia and industry. These experts volunteer their time, professional knowledge, and experience to this process of quality assurance and ongoing improvement to education in their disciplines.

### **What is ABET Accreditation?**

ABET Accreditation is the global standard in accreditation for programs in applied science, computing, engineering, and engineering technology. Sought worldwide, ABET's processes are highly respected for their outcomes-based approach, non-prescriptive nature, and responsiveness to industry. ABET is also one of very few accreditors in the U.S. to have achieved ISO 9001 certification of its accreditation processes.

The accreditation process is guided by one of four general criteria (applied science, computing, engineering, or engineering technology) plus the specific program criteria that have been developed by one of ABET's member professional societies. For instance, the Society for Mining, Metallurgy, and Exploration (SME) is the Lead Society responsible for developing the program criteria for geological engineering programs.

ABET criteria are inherently non-prescriptive and focus on meeting general standards. Covering students, curriculum, faculty and student outcomes (learning) among others, each criterion is meant to confirm that a key dimension of a solid education is in place while leaving full latitude to the program in deciding how to comply with the criteria. Consider Criterion 4: “The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the continuous improvement of the program. Other available information may also be used to assist in the continuous improvement of the program.”

Criterion 4 requires a program to have processes in place to assess how well the goals of the program for student learning are matching what the students have actually learned; however, the method and all of the



particulars are left to the discretion of the program. The only requirement is that programs have processes in place to evaluate how effectively they are meeting student outcomes.

The evaluation is a highly peer-based exercise. ABET Program Evaluators (PEVs) are selected by the same member societies that develop the program criteria. This ensures that a program is being evaluated by an expert in the field—someone with the specialized knowledge to identify whether a program is meeting not only the general criteria but program (discipline-specific) criteria as well.

With ABET accreditation's uniquely rigorous, but flexible process, students, employers, and the society we serve can be confident that a program meets the quality standards that produce graduates prepared to enter a global workforce.

### **Why Now?**

When it comes to getting a good job, a quality college education is more important than ever before. But concerns have never been higher that students might not be getting their full return on investment from their years and dollars spent at university. As a result, higher education as a whole is seeing broad demands for accountability and calls to prove academic quality. As a third-party review system with an established global presence and a history of success in technical education, an unprecedented variety of programs are finding ABET accreditation uniquely suited to meet those growing needs.

Technical and professional societies have been discussing solutions to meet these demands and guarantee quality for years. But with many believing the answer is to create their own credentialing, certification,

or accreditation system from scratch, these solutions are all still under development.

Meanwhile, programs in petroleum geosciences and applied physics have already turned to ABET and, by 2018, programs in agriculture, geology, biology, mathematics and physics are likely to apply.

### **Getting a Physics Program Accredited: The Kettering University Case Study**

For the applied physics program at Kettering University, seeking ABET accreditation was an easy decision. Housed in engineering, the program has students spend one-half of each school year working off campus to gain real-world experience. Unlike many physics programs, Kettering offers a very hands-on approach.

Kathryn Svinarich, the program's Department Chair, says the goal of ABET Accreditation and the mission of her department are completely aligned, "producing graduates that are prepared to go out and get a job."

And that's exactly what they did when they got accredited nearly four years ago, becoming the first program of its kind to receive ABET accreditation. For Svinarich, ABET accreditation made her even more confident in the quality of the education she is providing her students. "It pulls the department together to look at the curriculum as a whole and forces us to look outside the department and be aware of courses across campus. The process made us more aware of our curriculum in a holistic sense, which is excellent for advising the students. And in the end, ABET didn't just say, 'hey these are nice.' They are very close to industry and know what employers want from graduates," she concludes, adding that the process is labor-intensive but very worthwhile.

A number of disciplines are already talking about ABET accreditation but with varying degrees of receptiveness.

The mixed responses to the idea largely come from established misconceptions, the biggest being ABET accreditation as having rigid prescriptive requirements. Twenty years ago they would have been right, but in 1997 ABET began the process of transforming from input-based accreditation to outcomes-based accreditation—a transition from measuring what students are taught to examining what students actually learn.

Some believe that the push may come from state departments of education, which in some states require that every collegiate course undergo an external program review. Accreditation can often be used to satisfy this requirement.

### **When External Review is a State Requirement: The Arkansas Case Study**

The University of Arkansas at Little Rock, (UALR) faced a different situation. As any institution of higher education in the state, it is required by state law to

conduct reviews of each one of its academic programs. According to the Higher Education Coordination Board, each program needs to be reviewed by at least two evaluators, and at least one needs to come to campus for a site visit. In addition to submitting a self-study report, programs take on the burden of organizing and implementing the entire process.

“All kinds of questions arise: Who are these out-of-state reviewers? How do we know they are qualified? How do we vet them? How much do we pay them?” explains Nickolas Jovanovic, associate professor of the systems engineering and applied sciences departments at UALR. “If you make it up and start from scratch, in the end you get nothing but compliance with state law,” he adds. “If you go for ABET accreditation, you and the administration won’t get involved with picking the evaluators and, if all goes well, you will get accredited status. If you are going through it anyway, why not get the public recognition?” he ponders.





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### **Expansion Case Study: CMAA and What ABET Accreditation Brings to the Table**

Two years ago, the Construction Management Association of America (CMAA) began steps to establish ABET accreditation for Construction Management programs. Within that short timeframe they have created specialized ABET criteria for their discipline, recruited a force of Program Evaluators, and seen over a dozen programs become accredited.

“We wanted to do it. Our basic position is that we are the organization that defines the profession, including a distinct body of knowledge people have to master. It is critical to have an educational pathway everyone agrees on,” says John McKeon, CMAA’s Senior Vice President. “Most of our members come from industry, along with a number of academic members. We wanted to involve our people and elevate programs against our standards and practices. We made a point of getting Certified Construction Managers as Program Evaluators (PEVs).”

Between the fall of 2013 and today, CMAA has worked with ABET’s Applied Science Accreditation Commission (ASAC) to recruit and train 70 new discipline-specific Program Evaluators. Over that same period, CMAA developed specific program criteria to ensure that the accreditation reflects the needs of their field; those criteria were approved by ABET’s Board of Directors in October 2015. In just two years, 14 construction management programs have achieved ABET accreditation under the general criteria, and in 2016 seven programs will be evaluated under the new construction management program criteria.

Some may be surprised, but according to McKeon, the demand for ABET accreditation originated in academia, with a number of universities seeking it. “From an academic standpoint, ABET accreditation signifies commitment to quality and helps attract both students and faculty.”

But if the demand started in academia, it was followed by a strong industry response, as the feedback McKeon has received from CMAA’s membership has been very positive. “We put on a call for PEVs and got 80 responses in the first few days. We were lucky in the beginning because we responded to existing demand, so it was fertile ground,” he says with a mix of enthusiasm and caution. “As we get past that in two years, we will be in a different position. We got a lot of interest, but had to slow down a bit. We wanted to make sure that the PEVs we recruited would be used,” he explains.

Even before joining ABET as the lead society for construction management, CMAA was working together with government and industry to define the profession. Over the last five years, CMAA has been actively working with the Army Corps of Engineers and the Office of Personnel Management (OPM) to advocate creation of a new federal series: construction management. “We put together a detailed proposal for OPM and one of their first questions was, is there an accredited educational path for CM? We want to differentiate construction management, so ABET accreditation works for us because we needed a respected third party to evaluate our programs,” McKeon adds. Though awareness of ABET accreditation is still limited in the construction management industry, he is confident that this is likely to change as more programs see the advantages brought by ABET accreditation.



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But construction management is not the only area where ABET has strong industry engagement. In the areas that ABET already accredits, employers commonly require their new hires to be graduates of ABET-accredited programs. Large global companies such as Boeing, Caterpillar, DuPont, IBM, Raytheon, and UPS prefer graduates from ABET-accredited programs and place great faith in the process. That is why more than 30% of our program evaluators come from industry—they “walk the walk”.

### **Conclusion**

The natural sciences are searching for solutions to demonstrate transparency and prove the effectiveness of their educational programs. As a proven vehicle for normalizing the standards of a field in education without homogenizing the unique educational systems that deliver them, ABET accreditation can meet those needs.

There is a clear demand for some form of quality assurance among these disciplines, and many natural science programs are interested in ABET accreditation. Thousands of STEM programs around the world already use ABET’s accreditation process to be confident in the education that they deliver. And just as it has with CMAA over the past two years, ABET can adapt and produce a suitable accreditation solution for university programs in the natural sciences.

ABET accreditation is a process that has been developed, honed and improved over more than 80 years of diligent consideration, application, and refinement. ABET’s collective experience and track record position the organization as uniquely able to provide standards of quality to the natural sciences.



Interested in accreditation for your natural science program?  
Contact Amanda Reid at [areid@abet.org](mailto:areid@abet.org)