

New Efforts to Bring Acoustics Standards into the Curriculum

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Ask anyone around you to provide their perspective on a sound. Their answers are as unique as they are individuals. What might be perceived as a sound by one person could arguably be defined as noise by another. Ultimately, it's all about our individual processing of acoustics. Yet how do we facilitate a foundation for the understanding and practical application of sound and acoustics? One answer is through the development and maintenance of an accredited body of standards touching all aspects of the acoustics field.

The fact is that acoustics standards matter because they touch so many components of our common humanity, from underwater acoustics to sound in quiet protected natural and residential areas to classrooms and much more. For example, most people think of a classroom as a learning environment (Brill et al., 2018). A noisy classroom, however, can make hearing and understanding difficult. That noise or those sounds are composed of many factors, from the location of the classroom to outdoor sources.

The Acoustical Society of America and Classroom Acoustics and Health Care

Since mid-1997, the Acoustical Society of America (ASA) has led the way in developing a series of classroom acoustic standards (Nelson et al., 2002). These standards help school planners and architects provide good acoustical criteria, design requirements, and guidelines for learning spaces in which speech communication is an important part of the learning process.

A second key example of an acoustics standard in action is the ASA/American National Standard Institute (ANSI) S12.70, *Criteria for Evaluating Speech Privacy in Healthcare Facilities* (see bit.ly/3Twl6Gr). This standard provides a relationship between speech privacy descriptors and speech privacy expectations for various enclosed and open-plan health-care spaces including treatment rooms, pharmacies, and waiting areas. When visiting a

health-care provider, for example, you have the expectation and have become accustomed to confidential discussions between yourself and your provider while in the examination room. What many may not realize is that the often-muffled sounds you hear between exam rooms happens by design. ASA/ANSI S12.70 provides design criteria for achieving acceptable speech privacy.

Acoustical Society of America Standards

ASA Standards help frame the acoustic field's consensus on the study and practical application of sound. They also help identify discourse and provide industry solutions that frame a sustainable world that began in 1930 when the Society formed the ASA Committee on Standards (ASACOS), the organization's primary vehicle for promoting the practical application of acoustics (Blaeser et al., 2006).

ASA Standards also are the link to safety and the preservation and restoration of acoustical environments, harmonizing compatibility among a global network of products. Moreover, an ASA core value states, "Attraction, development, encouragement, education, and mentoring of current and future generations of acousticians from diverse backgrounds (acousticalsociety.org/policy-statements/)."

Led by Stephen J. Lind, ASACOS Chair and ASA Standards Director (and an expert in environmental acoustics who worked with Trane Air Conditioning in its La Crosse, Wisconsin, acoustics lab for 21 years), ASA's standards span disciplines represented by 14 ASA Technical Committees. This includes work on both American national standards and international standards in acoustics, mechanical vibration and shock, bioacoustics, animal bioacoustics, and noise.

The Need for Standards

Companies, organizations, and government agencies rely on standardization to meet their goals. By participating in standards development activities, stakeholders streamline

processes, reduce costs, and maintain market relevance and value. ASA's program exists to help people in various technical competencies align the way they do things in an environment where science and practitioners approach things differently but combined have the potential to create synergy and consensus-driven solutions. "The fact is industry relies on previously standardized technologies and terminologies to allow cross-border interoperability through compliance on products and systems manufactured in one country while sold and used in another," said Stephen Lind.

Ultimately, ASA's mission and continued work connect in a fundamental way to the missions of college and university curricula in acoustics and related fields. The development of industry standards, the cornerstone for the academic curricula of engineers, researchers, and future leaders, lays the groundwork of critical skills required for professional advancement plus a solid understanding of economic and technical impact of shared principles and practices globally.

For instance, postsecondary engineering students learn about quality management systems (QMSs) that lead to International Organization for Standardization (ISO) 9001 certification (see bit.ly/3pN5W1J), a program developed in support of ISO 9001, an international standard for creating QMSs published by the ISO. ISO 9001 is critical because it sets out the requirements for a QMS to help organizations be more efficient and improve overall customer satisfaction.

As a part of the ASA acoustics standards process, every standard has requirements to develop uncertainty allowances to aid in the validation and verification of acoustic measurements. When considering whether a product is contributing noise to the work environment, the engineer or acoustic technician making the measurements must know if the measurements are within specifications. In the acoustics realm, those measurements all start with a microphone and a calibrator.

To this end, faculty and practitioners need to be aware of acoustic standards that apply to their measurements (e.g., jet noise measurements, underwater ship noise, audiometric assessments) and then be capable of using that guidance correctly. Academic programs that teach students about the role standards play and incorporate them into curriculum will ultimately be preparing students for work in

the real world where standards are viewed as lynchpins for safety, improvement of the human condition, and the preservation and restoration of acoustical environments.

Standards Education

ASA Standards believes education and advanced training of the next generation of standardization professionals are also vital for the United States to remain competitive in global markets. The first step in this endeavor is educating the acoustics community about the importance of standardization, including the application of the standards. At the same time, receiving postgraduate professional development training and certifications are equally valuable. When combined, they provide an understanding plus the "how" and "why" around implementation and adherence to the best practices in the field.

"I've learned about standards by working with professional colleagues who have been proactive in standards development," says Donald Peterson at Northern Illinois University, DeKalb (see bit.ly/3wK2XLh) and chair of ASA Standards Working Groups 39 S2 and S3, Human Exposure to Mechanical Vibration and Shock. "Standards didn't really exist in my undergraduate or graduate education in the classroom and lab. And that's the biggest challenge. If we look at faculty today, they're not likely going to use standards unless it's something they're already comfortable with, which is not common because many of them may not have had much to do with standards. They may not have developed a solid standards background from their own educational experiences."

A recent survey conducted by The American Society of Mechanical Engineers (ASME) project, Vision 2030, concluded that "almost 50% of early career engineers lack standards knowledge (see bit.ly/3CA0mXW)." Still, technical standards are used to establish consistent engineering or technical criteria, methodologies, processes, and best practices. The challenge is that standards are referred to but have not necessarily been a part of educational learning systems for several reasons including: lack of access and limited budgets or because the faculty may not necessarily be savvy when it comes to international and national standards application; that is, they are educators whose roles are different from those in the field who are applying such standards.

With more exposure to and training in the use of acoustical standards, undergraduate and graduate students likely

STANDARDS IN ACOUSTICS CURRICULUM

would be able to accelerate their preparation in launching their professional careers. “As it stands now, a young engineer starting out in a job will typically focus on a handful of standards most pertinent to their industry role,” says Derrick Knight, acoustic engineer with Trane Technologies and vice chair of Working Group S12, Noise. “As their expertise deepens, they will typically begin to wonder why certain parts of the standard are written the way that they are. They will develop opinions about how the standard might be clarified or improved to reflect new techniques, materials, or equipment. At this point, the engineer is ready to contribute to standards development where they can discuss the smallest details and biggest ideas with other professionals in their field to make improvements.”

Increased discussions and partnerships have begun to emerge within colleges, universities, and professional societies as well as discussions with the Accreditation Board for Engineering and Technology (ABET), all of which understand the value in including standards as an integral part of the learning continuum. Most recently, ASTM International was among the sponsors of the 2022 Capstone Design Conference (see bit.ly/3CQfwsa), which took place June 6-8, 2022, at the University of Texas at Dallas. This conference provided a forum for faculty, staff, students, and industry representatives to share ideas about improving and/or starting engineering capstone design courses.

In addition, the ANSI education programs and resources continue to bring awareness to the importance of standards and conformity assessment to academia, students, and the public. Through their initiatives, ANSI has been successful at bringing together expertise from across the standards community, and through these initiatives has also supported implementation of the education-related aspects of the United States Standards Strategy (USSS), a guide on how the United States develops standards and participates in the international standards-setting process (see bit.ly/3e8sqaU).

Strategic Framework

All told, ASA Standards has spent the last two years examining its standards development program from business models to organizational membership, dues structure, benefits, and membership recruitment to leverage the growing need for acoustics standards with ever-evolving technologies and methods in the marketplace. Since then, and with the support of volunteers, ASA Standards has placed an emphasis on the value and reach of the ASA brand from launching

a new website (see asastandards.org) and a standards storefront (see bit.ly/3RmTEJO) to greater conference visibility and brand outreach through social media platforms. With the combined efforts of volunteers, organizational members, educators, technical experts, and governance and as the result of rigorous discussions during the May 2022 ASA Standards meetings held in conjunction with the 182nd meeting of the ASA (see bit.ly/3B7Shlf), ASA Standards is excited to develop a framework for providing resources and developing partnerships aimed at exceeding educational and vocational objectives that reinforce knowledge and skills as university students and practitioners progress through their educational aspirations.

“Our goals at ASA Standards are to create new partnerships with educational institutions, national standards bodies, and other professional organizations to add value in supporting education of new generations of acousticians,” said Stephen Lind.

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