ANSI STANDARDS: ALIVE AND WELL IN THE GRADUATE AUDIOLOGY CLASSROOM

Sandra Gordon-Salant
Department of Hearing and Speech Sciences, University of Maryland
College Park, Maryland 20742

"ANSI standards are alive and well in the audiology curriculum because they teach students to conform to the highest principles of professional practice."

Audiology graduate curricula are infused with the basic science foundations of the profession of audiology. Virtually all of the work that audiologists do involves presentation of acoustic stimuli to clinical patients, whether during hearing assessment, hearing aid evaluation and fitting, or aural rehabilitation. One fundamental tenet of this work is to ensure that the signal being delivered through the instrumentation (including audiometers, aural acoustic immittance units, and hearing aids) is accurate. A secondary tenet is that the acoustic environment in which tests are conducted, and/or services are delivered to patients (including educational services to students) conforms to minimum requirements for noise and reverberation. Additionally, audiologists may be involved in hearing conservation programs that include noise surveys conducted in the work environment. These surveys must conform to rigorous standards of measurement. Fortunately, the American National Standards Institute (ANSI) provides a range of standards for measuring sound pressure levels, force levels, and reverberation to verify signal accuracy and environmental sound quality. For the most part, standards that are relevant to the work of audiologists are developed by Accredited Standards Committee S3, Bioacoustics that is sponsored by the Acoustical Society of America (ASA).

There are dozens of ANSI standards that are relevant to the practice of audiology, and they are covered in a variety of courses in the typical audiology curriculum. For example, the standards that describe acoustical measurement of hearing aids (e.g., ANSI S3.22-2003: American National Standard Specification of Hearing Aid Characteristics; ANSI S3.46 – 1997, (R 2007): American National Standard Methods of Measurement of Real-Ear Performance Characteristics of Hearing Aids) are usually taught in the sequence of hearing aids courses. The standard on classroom acoustics (ANSI S12.60-2002: American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools) is taught in an educational audiology course. Courses on industrial audiology generally present the standards on measurement of noise in the workplace, as well as the effectiveness of hearing protection. Instrumentation courses and/or courses on hearing assessment include material from ANSI S3.6-2004: American National Standard for Audiometers and ANSI S3.39-1987 (R 2007): American National Standard Specifications for Instruments to Measure Acoustic Impedance and Admittance. How is the material taught and how do students gain access to the ANSI standards? The balance of this report describes my own experience teaching the American National Standard for Audiometers in the course, Basic Hearing Measurement, that is the gateway course for the graduate curriculum in audiology at the University of Maryland at College Park.

Course material about the development of audiometers and physical features of contemporary audiometers segues into the types of audiometers that are currently in use, including standard markings denoting these types. Subsequently, the importance of calibrating audiometers on a regular basis is discussed. Students are introduced to the ANSI organization and the role it has played in establishing national standards. Definitions of technical terminology such as Reference Equivalent Threshold Sound Pressure Levels (RETSPLs) are provided, as well as procedures for calibrating the output levels, linearity, and harmonic distortion of audiometers. Students learn about the tolerances associated with each measurement, and how to determine whether or not an audiometer is in calibration. Tables specifying the standard audiometer types, RETSPLs, Reference Equivalent Threshold Force Levels (RETFLs), Equivalent Threshold Sound Pressure Levels (ETSPLs), harmonic distortion levels, and ambient permissible noise levels from the ANSI S3.6, 2004 standard (American National Standard for Audiometers) are discussed in detail. Classroom demonstrations of these measurements with instrumentation needed to perform the calibration are followed by assignment of a calibration lab.

One prevailing issue over the years that I have taught this course has been how to provide the information from the ANSI standard to students while conforming to fair use of this copyrighted material. In previous years, I have relied on secondary sources (e.g., textbooks and journal articles) that reproduced the relevant tables. Unfortunately, the textbooks and articles rapidly became outdated with frequent revisions of this particular standard. An alternative was to distribute selected tables from the standard to provide the essential information required by students to perform the calibration. Both of these methods of delivery were inadequate for conveying to students the rationale for each of the measurements and the detail of many aspects of the standard. Requiring students to purchase the entire standard (current cost of $150) was an excessive financial burden for students, who were also required to purchase a textbook for the course.

In November, 2005, the ASA issued a press release (http://www.acosoc.org/standards/Educational%20use%20of

Clockwise from upper left: Hallie Plevinsky checks the sound level meter with the pistonphone. Ting Wei attaches earphone to NBS 9A coupler and places 400 g weight on top of earphone. Will Bologna and Julia Rainsford check the sound level meter reading with the ANSI reference equivalent threshold SPLs. Julie Cohen and Danielle Zion note sound level meter readings on calibration worksheet. Center: Sandra Gordon-Salant with Barbara Libbin, who was awarded her AuD diploma at the University of Maryland 2008 graduation ceremony.

%20stds%2011-1-05.pdf) describing a new policy for distribution of ANSI standards for educational purposes. The policy, initiated by then-President William A. Yost, was intended to encourage classroom use of standards by making the standards readily available at a nominal fee. Instructors who are members of the ASA can request a watermarked, downloaded copy of an ANSI standard at a cost of $5/student enrolled in the class.

This new distribution program is the perfect mechanism for providing one or more entire ANSI standards to students at a minimal cost. I have been using this program since fall, 2006, with a high level of success. Arrangements for obtaining educational use of the standard are made through e-mail contact with Susan Blaeser, ASA Standards Manager, (sblaeser@aip.org). The instructor or academic department completes a site license agreement and pays the fee for a specified number of students enrolled in the course. Within 24 hours, a watermarked version of the standard is sent to the instructor as an e-mail attachment in pdf format. I have distributed the standard to students by uploading it onto my course website maintained by Blackboard. Hence, the material on this website is available exclusively to students enrolled in the course.

Student access to the entire standard has short-term and long-term advantages. In the short-term, students can learn more about the development of the standard and all of the detailed information included in the standard, to supplement information covered during class lectures. They have ready access to all of the definitions in the standard and cross-referencing of other standards that are pertinent to ANSI S3.6. More importantly, they develop an appreciation for the comprehensive nature of the standard and its use in clinical procedures. In the long-term, students have a resource that will be used in their professional practice. Whether they conduct calibration on their own or hire a contractor to perform this function, audiologists must know the essential elements of calibration and how to determine if an audiometer fails calibration requirements. They also must be cognizant of the need to update the standard as new versions are published, and how to determine changes in the standard over time. All of these objectives are met by placing the standards in the hands of students early in their educational career.

Another, less tangible, advantage of using the ASA educational distribution program is to model an ethical standard for professionalism. Faculty members are required to follow fair use agreements regarding distribution of copyrighted material for classroom use. This includes reproducing book chapters, journal articles, and other published material in course packets. One function of faculty members is to serve as role models for students to emulate. By informing students of the ASA program to distribute legitimate copies of the ASA standard, the faculty member demonstrates that he or she is conforming to ethical and legal standards in academia.

Students appreciate the opportunity to obtain the ANSI standard during their professional training. They recognize that they will be using ANSI standards throughout their career to ensure precision in stimulus presentation, hearing measurement, and hearing aids. One first-year student commented, "I now understand the importance of having these standards and how calibration can affect daily practice and research" (H. Plevinsky), while a second-year student (K. James) noted that having access to the ANSI standards has been useful because she can consult them whenever she has a question or concern regarding calibration and/or tolerances.

In summary, the ASA educational distribution program for ANSI standards is an invaluable resource in audiology graduate programs. It provides students with the primary source in its entirety, which serves as a reference for the student during individual courses as well as throughout the student's educational career. Ready access to the standards familiarizes students with their importance and promotes their use of essential standards during their professional practice. Use of legitimate copies of the standards in the classroom encourages students to follow ethical principles by obtaining legal copies when they are practicing audiologists. Yes, ANSI standards are alive and well in the audiology curriculum because they teach students to conform to the highest principles of professional practice.AT

Sandra Gordon-Salant is a Professor and Director of the Doctoral Program in Clinical Audiology in the Department of Hearing and Speech Sciences at the University of Maryland, College Park. She has taught a course entitled, Basic Hearing Measurement, for over two decades to first-year graduate students in Audiology. She is a member of the Acoustical Society of America and has served as a member of the National Research Council Committee on Disability Determination for Individuals with Hearing Impairments. She directs an NIH-supported research program on the effects of aging and hearing loss on auditory processes and speech perception.