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Guest Editorial

Welcome to the first issue of the American Society for Engineering Education's new online Journal: *Advances in Engineering Education (AEE)*. When the Board of Directors of ASEE decided in 2002 to focus the *Journal of Engineering Education* on research in engineering education, it also recognized a need for another vehicle to address the publication of important advances in the application [1] of this research. It was decided that an electronic publication would offer the most effective and efficient way to get results quickly into the hands of engineering educators. This format would also allow ASEE to easily engage our growing population of international educators and their students as both contributors and readers. It is the Board's anticipation that in the years to come *AEE* will develop into a quality, peer-reviewed journal as highly regarded as *JEE*.

There is no doubt that fundamental, innovative changes are needed in engineering education. Using the same poetic license with spelling that gave us the three R's—reading, writing, and arithmetic—I would suggest that changes in engineering education are needed to address the three N's: **numbers, needs,** and **knowledge**.

By some estimates, 25% of the current engineering workforce, most of whom were educated right after the Sputnik era of the late 1950s, will be eligible for retirement in the next five years. There is also clear evidence that U.S. engineering education programs are falling short in attracting and retaining those who should form the vanguard of the next generation of engineers. This evidence includes declining interest in engineering education from U.S.-born students and a perception by many women and underrepresented minorities that our programs do not welcome them. Although the enrollment of women at most universities is now approaching 60%, the enrollment of women in engineering programs is about 20% and according to some data is decreasing. Exacerbating the numbers problem is the fact that more engineering graduates are going into non-engineering fields such as finance, medicine, and law.

Changes in the practice of engineering are creating the **need** for modifications of the content of engineering programs—what students are to learn. Much of the structure of the current educational system was set in the 1950s when the practice was very different. It is obvious that engineering is now conducted on a global scale. Industrial practice is heavily oriented around teamwork; at the same time, many engineering professors discourage cooperative work by labeling it as "cheating."

Recent scholarly research and proven practice has identified new **knowledge** regarding how to improve the pedagogy and learning environments for engineering students. To quote John Dewey [2], "Teaching and learning are correlative or corresponding processes, as much so as selling

and buying. One might as well say he has sold when no one has bought, as to say that he has taught when no one has learned." Learning is a process that can be measured and improved. The old "sage-on-the-stage" lecture mode is one of the least effective and most widely used methods. It is clear that we must make a shift from a *teaching-based* paradigm to a *learning-based* paradigm.

The three N's define the **why**, **what**, and **how** of the changes. Making change happen, however, is something that you, the reader, must accomplish. I hope that you enjoy the four articles in this inaugural edition of *AEE*, that these articles spike your interest in making innovations in your programs, and that you will consider submitting articles for future issues of this exciting new publication.

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REFERENCES

[1] See scholarship of application in *Scholarship Reconsidered*, Boyer, Ernest, Carnegie Foundation for the Advancement of Teaching, 1990.

[2] *How We Think*, Dewey, John, pp. 29, D. C. Heath & Co., New York, 1910.