



One of the basic components of virtually every engineering licensure law, standard of professional conduct, and code of ethics is the principle that each of us should always and only practice in those technical areas in which we are legitimately competent. The licensing process is intended to identify those individuals who have acquired sufficient competence through education and experience and then demonstrated it by means of a written examination that covers a specific discipline. However, there is a loophole of sorts: In most jurisdictions, once someone is licensed as a professional engineer, it is up to that person to define his or her own areas of competence.

Of course, most of us probably feel like we have a pretty good handle on this. We think that we can readily discern what kinds of assignments are within our capabilities, and which ones we ought to pass along to someone else or decline altogether. I have said many times that the most important thing for any engineer to know is what he or she *does not* know; the “known unknowns,” as the saying goes.

The truth, though, is that people routinely overestimate their own competence, and do so without ever realizing it. Research has shown that it *requires* competence in order to *detect* competence (or incompetence). The incompetent person is constantly dealing with “unknown unknowns,” and thus remains blissfully ignorant of his or her incompetence unless and until a mistake of sufficient magnitude makes it apparent.

There is a name for this observed phenomenon in the psychology literature: the Dunning-Kruger effect. David Dunning and Justin Kruger were both professors at Cornell University when they published their landmark paper in 1999, “Unskilled and Unaware of It: How Difficulties in Recognizing One’s Own Incompetence Lead to Inflated Self-Assessments” (*Journal of Personality and Social Psychology*, Vol. 77, No. 6, pp. 1121-1134). The importance of their findings, which have been reinforced by subsequent investigations, warrants quoting directly from the abstract:

People tend to hold overly favorable views of their abilities in many social and intellectual domains. The authors suggest that this overestimation occurs, in part, because people who are unskilled in these domains suffer a dual burden: Not only do these people reach erroneous conclusions and make unfortunate choices, but their incompetence robs them of the metacognitive ability to realize it . . . Several analyses linked this miscalibration to deficits in metacognitive skill, or the capacity to distinguish accuracy from error. Paradoxically, improving the skills of participants, and thus increasing their metacognitive competence, helped them recognize the limitations of their abilities.

Notice the additional (and ironic) conclusion mentioned in the last sentence: The only dependable way to help someone recognize his or her incompetence is to increase his or her competence!

The implications of the Dunning-Kruger effect for engineering licensure and practice are potentially quite significant. The most obvious is that it falsifies the widespread – in fact, nearly universal – assumption that I, as a duly licensed professional engineer, am inherently qualified to judge accurately my own competence to carry out any particular engineering task. This is not a matter of an *ethical* deficiency, where

I willfully provide services that I *know* are beyond my range of expertise; rather, it is a matter of a *cognitive* deficiency, where I am quite simply (and innocently) *oblivious* to the inadequacy of my knowledge and/or skills for the situation in which I find myself.

Since our self-assessments of competence are so *subjective* (and unreliable), what we need is an *objective* way to establish competence. Fortunately, such a solution already exists: the discipline-specific examination. Someone who passes the civil, electrical, or mechanical engineering test has (objectively) demonstrated that he or she is (probably) competent to practice civil, electrical, or mechanical engineering, respectively. More importantly to the readers of this magazine, someone who passes the *structural* engineering test has (objectively) demonstrated that he or she is (probably) competent to practice *structural* engineering.

In 2006, NCEES convened a task force of highly competent structural engineers from throughout the United States to review its structural engineering examinations. After considerable study and discussion, this group determined that an eight-hour test – the standard for all other disciplines – is insufficient to establish competence to practice structural engineering; instead, sixteen hours is the appropriate length. The task force also advocated modernizing the examination format and specifications to be consistent with current (and increasingly complex) building codes. NCEES agreed with all of these recommendations, and the new test that resulted is being introduced nationwide in April 2011.

This suggests that at least *some* engineers who passed an eight-hour examination in another discipline *may* be exhibiting the Dunning-Kruger effect when they deem themselves competent to practice structural engineering. Certainly there are many such individuals whose education and experience were heavily concentrated in the design of structures, and thus they have indeed acquired the necessary competence. But given that we are such poor judges of our own abilities, how is a “layperson” – such as a prospective client, a code official, or an ordinary citizen – supposed to tell the difference? The Dunning-Kruger effect thus serves as another arrow in the quiver of the advocate for separate licensure of structural engineers.

More broadly, engineering licensure laws, standards of professional conduct, and codes of ethics probably need to be revisited. Engineers should no longer be expected to evaluate their own competence and practice accordingly; instead, we should be required to remain strictly within the scope of the examination that we passed in order to become licensed. In light of the Dunning-Kruger effect, such a constraint is necessary for us to fulfill our most fundamental responsibility: holding paramount the safety, health, and welfare of the public. ■

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