Fostering Creativity

Arthur T. Johnson

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In this issue of the *Bulletin* appears the second of two articles by Dr. Paul Fagette about partnering with museums to give students experience with creative projects. Paul has in the past, shared stories about reverse engineering Willem Kolff's original hemodialysis machine and building reproductions of historic medical equipment. Paul's efforts are to be commended.

Engineering and science are not equivalent, as most of you realize. Engineering is first and foremost a creative profession, intended to solve problems of importance by using scientific knowledge to control outcomes in ways for which science is not primarily intended. Once the idea has been formed, science can be used for implementation. So, scientific knowledge is the means to the end of creating something real from an inspiration.

Look at engineering curricula. They are filled with physics, chemistry, mathematics, and engineering science courses. All of these courses are intended to establish and reinforce logical and rational thinking patterns in the minds of future engineers. These courses impose discipline on the unfettered creative mind.

Where in typical engineering curricula are the courses to exercise creative thinking, the courses that teach how to avoid limits, the courses that show how to recognize self-imposed box walls and to find means to think outside those walls? We have a few of these: capstone design experiences are meant to serve this purpose, as are

underclass design projects. But are these really enough—can we begin to produce better engineering graduates if we put more emphasis on fostering creative spirit?

There are those who would argue that creativity is innate, and one major result of schooling from kindergarten through college is to substitute rules for creativity. Indeed, some of the most creative students cannot thrive in the engineering curriculum. The list of legendary drop-outs includes some of the most successful inventors, businessmen, and artists, topped, perhaps by William H. Gates. The list also includes far more people who have never achieved success. I do know, however, that some of my best communicators and imaginative students struggled in my courses. They went on to become lawyers and business leaders. Their talents did not match well with logical and rational thinking.

Like most of you who are faculty members in bioengineering or biomedical engineering, I have students in my classes who are capable of very high achievement. However, they seem to be more capable at researching and retrieving information than in generating it. They grew up in an environment where everything they wanted to know is available somewhere in the webosphere, and so they can write papers and lab reports that are superior to anything students could produce even a decade ago. Nevertheless, they can't distinguish between the shapes of the curves given by $e^{-t/\tau}$ and $(1- e^{-t/\tau})$, and I think that's because they haven't developed the ability to visualize information. This, to me, is a very real shortcoming for engineers.

Perhaps it is time to look at what talents we should foster in engineering, and to support industrial design, creative writing, sculpture, drama, and dance for our engineering students. Free thinking, by itself, is not guaranteed to solve engineering

problems, but it can start the process. Maybe we should all talk to Paul Fagette and hear what he has to say.