Building Case Teaching Capability: A Journey, Not a Destination

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Dr. Dennis J. Kulonda has attended several LITEE Workshops. This article was prepared after attending the workshop held March 21-23, 2002.

When Dr. William Wulf, President of the National Academy of Engineering addressed the LITEE workshop and guests at Auburn University, he included a quip about a few bright lights in the darkness that prevails in the time-honored practice of engineering education. That pun did not go unnoticed as I sat spellbound at my second LITEE case teaching workshop, listening to Dr. Wulf articulate the impact of six major trends affecting engineering education today. They are summarized in Table 1 at right.

It was apparent then that my decision to return to attend a second workshop had been a wise use of my time. Although an avid and experienced case method teacher of graduate students and adult professionals, I had struggled with the concept of engaging younger minds in this challenging but effective way to infuse reality into the classroom. It had suddenly dawned on me that I was, at the time, a case learner myself. This workshop included a carefully woven sequence of events, not designed to "sell" participants on the merits of case method instruction for undergraduates, but rather to lead us to that conclusion ourselves as a result of a process of reasoning based on our experiences at the workshop.

The workshop began with Drs. Raju and Sankar sharing the results of a national survey that highlighted concerns expressed by the National Society of Professional Engineers (NSPE) regarding the current state of engineering education. They are summarized rather vividly in Figure 1 to the right.

It is readily apparent from Figure 1 that new engineers are well prepared in math and science but fall markedly short on the "soft" attributes that employers regard as being of equal, if not greater, value. This reality speaks very strongly to the types of learning objectives pursued in the case study approach championed by LITEE.

Armed with this motivation, our workshop leaders encouraged us to discover why we were there and how we could help tomorrow's engineers grow beyond the technical aspects of their chosen profession. To drive us toward that understanding, they did very little lecturing and presenting; rather they involved us in the case learning process. For example, they introduced "ice-breaker" exercises and personality style assessment instruments that we used to form teams to address some case issues for ourselves.

Before embarking on that journey we were further inspired by a vision of engineering education in the future, as developed by Dr. Richard Felder, Professor Emeritus at North Carolina State University. He outlined a new vision that considered how curricula should be developed, how classes should be taught, who should teach and how they should prepare to teach. The essence of his vision

Table 1 Dr. Wulf's Six Emerging Trends and Their Implications

Trend	Implication for Engineering Education
Complexity of the Design Space	Widening range of materials, processes and process capability makes any design issue complex, requiring the expertise of many.
Complexity of the Constraint Set	Cost issues alone are no longer a dominant concern. Environmental, technological, cultural, geographical, health, safety and human concerns all affect design choice.
Illusion of Precision	Sophisticated software provides the illusion of an exhaustive search of possibilities but does not guarantee the predictability of behavior.
Expanded Roles of Engineers	Engineers need to operate in multi-functional teams, alongside experts in marketing, finance and other professionals.
Globalization of Industry	Requires sensitivity to other cultures and individuals.
Changing Pace of Change	Acceleration in half-life of engineering knowledge requires continual learning.

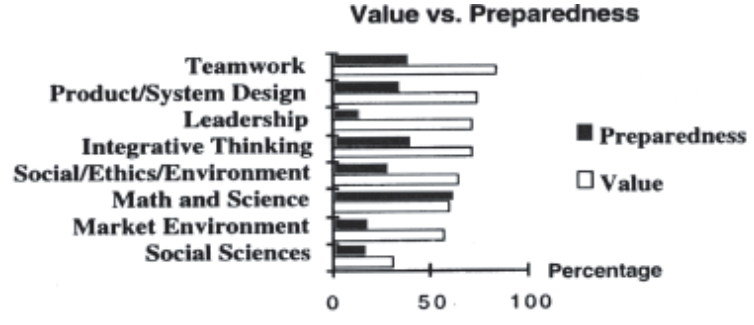

Figure 1 NSPE Survey of New Hires in Engineering

is paraphrased in Table 2. No further explanation is required.

Finally our teams were challenged to show our mettle in the case arena. We dove into written and multimedia materials that described a disturbing situation that occurred at the Della Steam Plant. Our task: recommend the next step in a critical situation where a newly overhauled turbine suddenly began vibrating violently, to the point where it tripped its safety override. In the case study material provided, those responsible for dealing with the situation present conflicting professional opinions on the cause of the problem and the appropriate action to take. The case study team members had to work together to cope with vibration recorder data, alternative theories, and the serious financial consequences of the malfunction, as well as the associated safety issues, all in the course of one afternoon. Only Dr. Wulf's lecture saved us from an eternity of discussion.

Early the next day we were back on the front burner. As a warm up, we were treated to a presentation on Engineering Education Programs at NSF by Dr. Russ Pimmel, then the Program Director in the Division of Undergraduate Education. We learned about NSF's commitment to future thinking. Then Glenelle and Gerald Halpin of Auburn's College of Education shared the very positive outcomes of their assessments of the LITEE case studies in classroom environments. Finally, Sydney Rogers, Vice-President of Nashville State Tech, explained how their consortium worked with LITEE to leverage the efforts of both institutions.

Back to the drawing board. Our teams reformed to assess how the various cases that have been developed by LITEE might be used in our classrooms. We were challenged to develop a lesson plan to accomplish adaptation of a case to a specific course. As each team presented the results of its deliberations, we learned how flexible the case approach can be. This is because of the richness of the ancillary material included with each of the LITEE cases.

No rest for the weary. After our adaptation presentations we reviewed the new EC 2000 criteria and, again in teams, brainstormed on how the LITEE materials fulfill the objectives of ABET.

Another day, another adaptation project. Our teams hit the ground running to develop another adaptation of LITEE materials to a course. This time we hit pay dirt. Russ Pimmel encouraged several of the teams to develop a formal proposal to NSF for consideration as part of their adaptation and innovation program. We left the workshop not merely with an understanding of the future of engineering education, but also with the opportunity to be a part of it. We were not *taught* the case method; we were *immersed* in it. There is much more to learn; some by doing, some by following this concrete experience with reflective observation. But then, that is one of the tenets of case teaching.

This journey began with my musings over the value of attending a second workshop; I have already attended a third.

REFERENCES

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Table 2 Key Points in Dr. Felder's Vision for the Future of Engineering Education

Focus Point	Traditional Approach	Future Approach
How should curricula be structured?	Move from fundamentals to applications. "Trust Me" approach	Integrated Approach: problem-based learning, case studies, guided inquiry, just-in-time coverage
	Emphasize Content	Emphasize: critical thinking, creative analysis, problem solving
	Courses compartmentalized, self-contained, taught by individual instructor	Courses extend horizontally across subjects, team taught
How Should Classes be Taught?	Teaching addresses one learning style	Teaching addresses a spectrum of styles: Visual/verbal Concrete/abstract Active/Reflective Sequential/global
	In-class activity led by instructor	Students meet to brainstorm, discuss, explain
	Design taught in capstone courses	Design permeates the entire curriculum
	Professors lecture; students watch, listen	Interactive tutorials and other technology-based tools
Who Should Teach?	PhD specialized in disciplinary research	Professional with focus on scholarship of discovery, integration, application and practice
How Should Faculty be Prepared to Teach?	No formal preparation	Workshops, mentoring

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