

A MOOC on Effective Engineering ‘Teaching’

Traditionally, college teachers are not trained to teach professional courses. The lack of training leads to a less than satisfactory learning experience^[1] for most students, unless the teacher has a natural orientation to teaching. To address the above gap, a 10-hour massive online open course (MOOC) on “effective engineering ‘teaching’ in practice” was designed and offered as a National Program on Technology Enhanced Learning online certification course (NOCC), in association with the teaching learning center, IIT Madras (TLC). This course aimed to introduce the essentials of facilitation (“teaching”) of student learning in an interesting manner to any teacher of professional courses, with a special focus on engineering. Although educational research has produced rigorous, evidence-based knowledge that is useful for the facilitation of learning, the knowledge is not in an easily accessible form for teachers without experience in formal education research. This course also aimed to begin bridging that gap, by appropriately introducing research in education and formal theories to engineering teachers. The book by Wankat and Oreovicz, *Teaching Engineering*,^[1] was used as the reference book for the course.

Ten hours of prerecorded video lectures were made available over 4 weeks in installments of 2–3 hours a week. Participants were expected to learn by watching the videos, and by working on once-a-week, online assignments. They were encouraged to participate in the online discussion forum. Although the course is free and open to all, participants who are interested in the certificate must complete assignments and take a final examination. The three best assignments are 25% of the final score, and the proctored, final, summative examination is 75%. A nominal certificate processing fee is also needed. The multiple-choice examination is offered at many centers across India.

The course began with an inexperienced teacher’s view. In the first video, scenarios of non-ideal and improved teaching of mass balances were acted out to communicate the essentials of teaching practice. The next topic, “From traditional lecturing to helping students learn,” emphasized the learner-centered view. A Bloom’s taxonomy view of better learning was adopted (32 min), and problem-based learning was used as an easy first extension to straight lectures toward improved learning (12 min); problem-solving strategies were also included (23 min). Then, learning outcomes (31 min by Edamana Prasad, TLC), active learning (30 min), cooperative group learning (25 min), and flipped classroom techniques (25 min) were presented. Effective laboratory courses^[2] (40 min), assessment (64 min in two videos by Richa Verma, TLC), and feed-back/reflection (64 min in three videos by Shreepad Karmalkar, TLC) were also discussed. Toward the end, the need for formalized knowledge and theories was discussed, with examples from physics. To introduce participants to formal work on education, the author’s recent work on strategies to improve learning of all students in a class^[3] was first presented in an intuitive fashion followed by a formal view of the same (80 min in 3 videos). Then, formal aspects such as psychological types (13 min), models of cognitive development (15 min), and learning theories (13 min) were presented.

The discussion forum was vibrant throughout the course with content-based discussion. It was explicitly stated a few times that the course significance will be realized only if some strategies discussed are implemented in their classrooms. In that 4-week period, in the discussion forum, six faculty participants reported their experiences of implementing some discussed strategies, and all described positive outcomes.

In its first offering in February-March 2018, 3,067 participants across the world (3,041: India) registered for the NOCC. Among them, faculty comprised 75.3%, students 13.4%, people employed elsewhere 8.9%, and the rest were “others.” Among the participants, 24.1% registered for the final examination. Out of 739 registrants, 627 qualified for certificates: >90% – Gold (6); 60-89% – Elite (436); 40-59% – successfully completed (185). Although the certification course is expected to be offered once a year, the videos are available anytime at <<http://nptel.ac.in/courses/121106012/>>.

REFERENCES

1. Wankat PC, & Oreovicz FS (2015) *Teaching Engineering*, 2nd ed. (Purdue Univ. Press, West Lafayette, Ind.).
2. Suraishkumar GK, & Khilar KC (2002) On Improving ‘Thought with Hands.’ *Chem. Eng. Ed.* 36:292-295.
3. Suraishkumar GK (2018) Strategies to Improve Learning of all Students in a Class. *European J. Eng. Ed.* 43:427–445 DOI: 10.1080/03043797.2017.1384797. □

—G. K. SURAIISKUMAR, INDIAN INSTITUTE OF TECHNOLOGY MADRAS, CHENNAI, INDIA

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