

A Possible Route to Reverse Declining Trend in Student Performance at First-year University Physics Course

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A high failure rate is becoming a common occurrence in university physics courses for the first year students. Will there ever be a way out? Here we report a case study of a first-year physics course (with a class size of fifty) at College of Nanotechnology, KMITL. The course has been designed to bridge the gap between basic physics at high schools to advanced physics concepts in materials science and nanotechnology. “Physics concepts before maths” has been adopted as the central philosophy, in correspondence with Alan van Heuvelen’s US case study and UK GCSE physics. A question on “What is Physics?” has been used as an example to realign the students to the learning method to focus on skills and concepts, rather than memorizing details and formulae. Multiple measures have been implemented concurrently, rather than an emphasis on one aspect, including small group teaching, practical demonstration, inquiry methods, regular assignments, customized course design, active learning, pre-mid-term practice test, and a coherent class schedule in the mathematics course. The pre- and post-test results, with a written exam format (no multiple choice), show a significant improvement in the class average from below 30% to above 60%. The same results have been obtained for three consecutive years. One possible key aspect on the course management that may lead to this improvement is that only a small number of “concepts and skills to take home” are emphasized in each three-hour weekly lesson.

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