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Shortening the Gas Laws Lecture for Engineering Students in a Trimestral Chemistry Course

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Abstract: The trimestral system continues to present a challenge between breadth and depth in many courses. In a quasi-experiment involving two sections of about 40 students each, the presentation of gas laws was shortened by beginning with the ideal gas law from which the separate laws involving pairs of parameters were derived. A third section presented the topic in the usual sequence of the individual laws that are then generalized into the ideal gas law. All sections were administered a two-part quiz that assessed conceptual understanding of the relationships and algorithmic application of the laws. Students were ranked by their eventual final grades into: High Pass (4.0–3.5), Moderate (3.0–2.0), Low Pass (1.5–1.0) and Fail (0.0). The experimental group performed better in the course than the control group with 15% vs 5% High Pass and 16% vs 26% Fail. The moderate and low pass ranks are at par for both with a combined 69% distribution each. Scores in the quiz show comparable scores for both control and experimental groups in the High Pass, Moderate and Low Pass ranks, but the Fail rank obtained a 33% lower average score in the experimental compared with control. Analysis of the quiz results by part also showed that the experimental group had more students making a mistake in either part (31% vs 23.9%) across all ranks and more students failing to answer either question (6.2% vs none). Tellingly, in the fail rank, 21.4% of students answered both parts correctly in the control group compared with the 7.4% in the experimental group. Although the experimental group saved about 30 minutes of lecture time compared with the control group, scores in the quiz indicate that the time saved is at the expense of the lower performing students.

Key Words: breadth vs depth, gas laws, chemistry for engineering