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Editorial

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A "Flipped Classroom" Reality Check

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ABSTRACT: Some observations about the advantages and potential practical challenges of the "flipped classroom" approach in a general chemistry course are presented.

KEYWORDS: *General Public, First-Year Undergraduate/General, Curriculum*

Increasing students' participation in their own learning has been a goal of educators, including those in chemistry, for a considerable time. Thus, a 2014 metastudy about active learning, published by Freeman et al. in the *Proceedings of the National Academy of Sciences*,[1] analyzed 255 different studies across different disciplines. The Editor commented about that study in a previous *JCE* editorial:[2]

> *[I]n summary and to put it bluntly, everyone should be taken off the control (i.e., traditional lecture) and switched to the treatment (i.e., carefully considered active learning methodologies).*

One of the active learning strategies involves the "flipped classroom", a pedagogy in which the traditional lecture and homework are replaced by preclass activities, typically viewing short videos, and class time is devoted to interactive activities and discussions. A series of communications has been published from the ConfChem Conference on Flipped Classroom,[3−11] including discussions on student engagement, a topic to be discussed here.[3,6,9] Weaver and Sturtevant[12] present research data from a three-year study concerning a flipped approach for a chemistry major's general chemistry class: improvements of ca. one standard deviation are reported. Ryan and Reid[13] report research data from quantitative studies involving parallel traditional and flipped classroom sections and observe significant effects showing benefits to the bottom-third of the class. Just considering these representative examples from a growing literature[14] suggests that the flipped classroom approach warrants our attention.

Your Editor and some of his colleagues in the general chemistry program at University of Georgia (UGA) were appropriately inspired by the potential benefits of the flipped approach and made a transition to that pedagogy starting in fall 2013. We continue to use a traditional curriculum (i.e., set of topics)—along with a commercial textbook available in paper and digital forms, videos assembled from PowerPoint slides with voice-over annotation, electronic homework and self-assessment—to teach legions of students, most of them the sons and daughters of Georgia seeking STEM undergraduate degrees and professional careers related to science, engineering, and medicine. Like students across the United States (and perhaps worldwide), their behavior has been established by their secondary school experience. Even though the large-enrollment, first-semester general chemistry course has its reputation that ranges from challenging to near-impossible, the students' adjustment of their "habits of mind" to meet the demands of a university-level course is mixed. Their high school "plan of action" evolved from what they did to be successful there. In spite of suggestions (and often pleas) from the instructors, students do not always make the adjustment, given the handful of assessments (i.e., one 35-minute and four 75-minutes examinations) here at UGA by which they are evaluated and which they can use to formulate their approach to learning. It would be fair to say that the students employ a range of methods to try to achieve success in general chemistry.

How can those of us who teach them improve their learning? With what could we or should we motivate them? And why is there such a need for self-motivation? The literature is clear about it: the active learning approach requires engaged students. Why would a student read the book or view the videos before class, especially if there is no reward? UGA students like "points"; human nature suggests that many individuals would follow a pathway that seeks the smallest effort for a given set of rewards. I have not and will not use the word "lazy" because that is not the correct characterization. There are many demands on student time, not all in the academic category. That means that we have individuals who have developing habits of mind coupled with variable abilities to manage their time. The result is a set of frustrated students who are not achieving at their expected level, often not willing to make the adjustments suggested by the instructor; those suggested changes require an even larger time commitment and include strategies with which students have no experience and perhaps no confidence.

At the same time, faculty members are frustrated because students do not seem to want to read the book or view the videos before class and prefer to look up answers to clicker questions or online homework or assessments rather than struggle with the task. (If your students are not all performing beyond your expectations, you can list your own favorite student shortcomings in this general category.) Learning is challenging, and frankly, so is teaching, especially when you are actively trying to help students learn. After 35 years in academia, your Editor can make the brash claim that lecturing in general or organic chemistry is easy. Doing the things to make sure everyone in one's class learns is far more challenging. This is neither an affirmation nor condemnation of the flipped classroom approach because it is based on a series of personal observations. (Any evidence coming from studies in progress

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will be forthcoming at a later time.) Students may believe that achieving success at their level of expectation is their challenge and goal. Getting students to think critically and solve problems is the challenge for chemical educators. We expect students to put in the effort to meet their aspirations. We want them to try harder. It should be no different for us, the instructors. Flipping the classroom sounds easy. Making it work for all of our students is the bigger challenge. Making sure we have the optimal environment for optimal student learning is our duty.

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Notes

Views expressed in this editorial are those of the author and not necessarily the views of the ACS.

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