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Effect of Blended Learning on Outcomes of Students Attending a Fundamental Chemistry Course in Higher Education

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Abstract

The blended learning model, when applied to large enrollment introductory chemistry courses, has proven to be a successful method for integrating active learning. By leveraging technology and problem-based learning strategies, the approach not only improves student engagement and understanding but also enhances academic outcomes. The positive feedback from students and the improvement in GPA underscore the model's potential as a viable alternative to traditional lecture-based teaching, making it a valuable tool for large-scale STEM education. Active learning approaches result in improved student learning outcomes compared to traditional passive lecturing. There is a growing need to change the way instructors teach large introductory science courses. Blended classroom modules for large enrollment fundamental chemistry course sequence have been created. Herein is described how student response systems and problem-based case studies have been used to increase student engagement, and how blended classroom modules have integrated these case studies as collaborative group problem-solving activities in 70-100-seat lecture halls. Preliminary evaluation efforts found that the blended classroom modules provided convenient access to learning materials that increased the use of active learning in lecture and resulted in a significant improvement in the course grade point average (GPA) compared to a non-flipped class. These results suggest this approach to implementing a blended class-

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room can act as a model for integrating active learning into large enrollment introductory chemistry courses that yield successful outcomes. The blended classroom is a pedagogical approach that moves course content from the classroom to homework, and uses class time for engaging activities and instructor-guided problem solving. The course content in a first-year level fundamental chemistry course was assigned as homework using MS Teams platforms. In class, students' misconceptions were addressed, the concepts from the video lectures were applied to problems, and students were challenged to think beyond given examples. Students showed increased comprehension of the material and appeared to improve their performance on summative assessments (exams).

Keywords: blended learning model, problem-based learning strategies, active learning approaches