Tech-Driven Education Reform: A Modal for Simultaneously Improving Student Retention and Performance in STEM Disciplines

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A major overhaul of our higher education system is desperately needed to increase interest and competence in STEM disciplines. Currently only 40% of entering college students that declare STEM majors complete degrees in STEM disciplines. The efflux of students from STEM majors has been attributed in part to the teaching style that has been used in most lower-level science courses, which is a traditional slideshow and lecture format. This style of teaching has persisted even in the presence of convincing discipline-based education research data that other strategies can increase student attainment of learning outcomes. Engaged, learner-focused activities transparently linked to student learning outcomes have been especially effective for improving student learning in large enrollment classes; however, implementation can be difficult because of the significant time needed to conduct such activities while still covering all the required material and because of the difficulty in demonstrating student attainment of learning outcomes.

One way to create the time needed to include engaged learning activities in classroom activities is to make use of recent innovations in technology to flip the classroom. The UNT NextGen course redesign is an outcome-based model that is predicated on the seamless alignment of course objectives with instructional strategies and assessment, which allows for student attainment of course goals to be explicitly quantified. Outcome based course redesign is providing valid quantitative and qualitative measures of student understanding, content mastery and synthesis, the model and best practices for which can be applied to a wide variety of courses to foster institutional change. The model also facilitates identification (and redesign) of areas where student attainment is low. This presentation will use the NextGen redesign of a large enrollment (~200 students) organic course as an example of best practices to improve student performance, retention, and interest in all STEM disciplines. Retention rates as high as 90% have been achieved without sacrificing student performance.

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