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Study: Improving STEM Equity With Helpful Syllabus Content

An evaluation of introductory biology syllabi from just under 100 colleges and universities finds the syllabus is often focused primarily on content and less likely to offer evidence-based practices for academic success.

By [Ashley Mowreader](#)



Inclusive strategies in the classroom, such as sharing resources and guidance in the syllabus, can help address equity gaps in STEM programs.

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A course syllabus serves as a road map for navigating the upcoming term and content that will be covered, but researchers believe it could support students'

self-directed learning as well.

A November study published in the *Journal of Research in Science Teaching*, authored by a team of faculty from Auburn University and the University of Alabama at Birmingham, shows few introductory biology syllabi engage students in effective study habits or encourage help-seeking behaviors, instead favoring content.

The research highlights opportunities to address the hidden curriculum of higher education and support success for historically marginalized students.

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What's the need: Some college students lack effective study habits, and these gaps are often a piece of larger equity concerns for marginalized groups, highlighting limited opportunities or resources for underprivileged communities.

Introductory science, technology, engineering and mathematics courses, in particular, often serve as gatekeepers, limiting which students can pursue these degree programs and resulting in less diverse STEM degree attainment.

Today's college students also demonstrate less college readiness in their academic skills, due in part to remote instruction as a result of the COVID-19 pandemic.

Often, colleges or universities will create co-curricular interventions such as workshops to teach these skills or introduce best practices in a first-year seminar course. While these can be effective, institutions may lack the resources or time to deliver the interventions, which researchers say underscores a need for alternative strategies that reach students.

Researchers theorized that embedding within the syllabus explicit instruction to promote three skills—study behaviors, metacognitive evaluation or academic help-seeking—could impact student success.

Methodology: Researchers evaluated 115 introductory biology syllabi from 94 unique institutions, including 48 percent research-intensive institutions, 29 percent minority-serving institutions, 72 percent publics and 61 percent with enrollment over 10,000 students.

A Deeper Look at STEM Syllabi

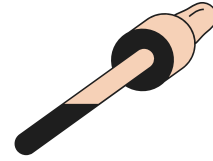
A Worcester Polytechnic Institute study found instructors could help create a more inclusive learning environment in STEM courses through tailoring their syllabus to feature elements like materials from diverse scholars and accessibility statements. [Read more here.](#)

One engineering professor at the University of Massachusetts at Amherst redesigned her syllabus as a zine, or miniature magazine, to promote student engagement and build community in the classroom.

Syllabi were categorized by having the presence of study behaviors, academic help-seeking and metacognition suggestions; the type of suggestions of those three factors; and the quality of these recommendations (effective or ineffective).

Further syllabus analysis covered four factors to gauge how learner-centered they were, including having clear and appropriate learning goals and objectives, aligned and define assessment activities, a logically sequenced course schedule, and a positive and organized learning environment. Each syllabus was awarded between zero and 48 points, with higher scores indicating they were more learner-centered.

The findings: Among the 115 syllabi evaluated, only 14 percent earned a score of at least 31 to be considered learner-centered. Around three in 10 syllabi were considered “content-centered,” earning a score of 16 or less. Researchers theorized faculty may lack time or interest when creating their own syllabi, instead relying on templates from the institution or previously generated documents.



Under the Microscope

An evaluation of 115 introductory biology syllabi

14%

of syllabi were considered “learner centered,” compared to content centered.

18%

of syllabi provided a list of help-seeking resources, encouragement and instructions to use them.

29%

of syllabi recommended only evidence-based study habits.

42%

of syllabi recommended effective and ineffective study habits.

3.5%

of syllabi showed evidence of possibly reducing equity gaps in STEM courses.

Design by Ashley Mowreader

Only 3.5 percent of syllabi showed evidence of reducing opportunity gaps in STEM courses, which researchers defined as de-emphasizing course rules, encouraging the use of external resources for continued learning outside the classroom and emphasizing the role of students in their own learning.

“Most of the syllabi in our sample provided learning resources but focused primarily on course policies and did not address students as engaged learners,” according to the study.

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A majority of syllabi did offer suggestions for study behaviors, metacognition or approaches for academic help-seeking (61 percent), although the greatest share of these only addressed help-seeking (45 percent). When the syllabus did share advice to seek help, many just provided a list of resources, and fewer encouraged students to utilize them.

“Only 17.9 percent of syllabi provided a listing of academic help-seeking resources, encouragement to use those resources, and an explanation on how to use those resources,” researchers wrote, with the explanation piece critical for addressing equity gaps and the hidden curriculum of higher education.

Of the syllabi that provided recommendations for students’ study behaviors, a significant number gave students unhelpful advice or shared practices that are not affirmed with research.

“We found that most biology syllabi endorsed effective study strategies such as self-testing and spacing,” researchers wrote. “However, we also found that syllabi recommended strategies that have been described as ineffective for long-term learning (e.g., re-reading textbooks and re-writing notes).”

Twenty-nine percent of syllabi recommended only effective, evidence-based study habits. A greater share (42 percent) offered both effective and ineffective techniques, and 24 percent only offered ineffective behaviors.

Just because the syllabus was lacking details on how to study or practice metacognition doesn’t mean it was absent from the class entirely, researchers noted, as instructors may discuss these topics in class or provide additional resources with this information. This presents an opportunity for instructors to make themselves more aware of evidence-based practices to close equity gaps and bring the syllabus into better alignment with their pedagogy, according to the study.

Do you have an academic intervention that might help others improve student success? Tell us about it.

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