Adaptive Learning Strategies for Introductory Classes

Christopher Brown
Georgia State University

Author Biography
Chris Brown is a senior lecturer in GSU's Political Science Department, a founding officer of the World Affairs Council of Atlanta, and the creator/director of the Robinson Country Intelligence Index, a unique teaching and research tool developed at Georgia State. Since 2016 he has been part of a project, funded by the Gates Foundation, seeking to bring adaptive learning to GSU classrooms. Brown also leads a study abroad course to Ireland. From 1994 until 2009, he was research director at the Southern Center for International Studies. He received his M.A. and Ph.D. from UGA and his B.A. from Sewanee.

Adaptive learning (AL) courseware holds promise for helping break down barriers students face as they steer their way through college. It is broadly meant to adjust to students' abilities; offer personalized feedback; allow students to self-pace through course modules, build competency, and seek mastery; give students agency over their grade; and prepare students for face-to-face (F2F) class time and higher-level learning strategies. My colleagues and I at Georgia State have long worked to address the challenges of a high-volume introductory class, Global Issues (GI), and viewed AL courseware as another possible tool in the toolshed.

GSU's GI course has many large, 120-student sections, over 2,700 students annually, and 10-14 rotating instructors per semester (including many GTAs; see Table 1). While sophomores are the largest cohort, there are also significant numbers of freshmen, juniors, and seniors. We have repeatedly found that while many of these students perform well, others do not complete class assignments even if quizzed on it, and sometimes they do not even purchase the book. A handful of students rarely if ever comes to class. Students taking GI classes generally have significantly divergent levels of prior knowledge and overall preparedness for college. The result of such challenges has been that a persistent proportion of students come poorly prepared for class, classes have lower-than-desired student performance, satisfaction, and engagement, students do not have enough agency over their own time and grades, and professors are less able to use higher level learning activities.

Table 5: Global Issues Totals Fall 2017-Spring 2019

No. Online Classes	No. F2F Classes	No. of Students Online	No. of Students F2F	No. of Classes Taught by Faculty	No. of Classes Taught by GTAs	Average No. of Students per Class	No. of Classes with ≥ 100 Students
10	41	1756	3458	28	23	97.68	28

In 2016, GSU received a grant from the Gates Foundation to embed adaptive learning in large, introductory classes. Given the promise of AL and the challenges of Global Issues classes, in 2016-2017 we developed an AL GI course, and then implemented it across 51 classes and more than 5,200 students during the 2017-2018 and 2018-2019 academic years. In spring 2018, we also initiated a four-group study (adaptive versus non-adaptive in F2F and online). Based on previous research in the field (see, for example, Bailey, et. al., 2018), our study included four control variables (Pell Grant eligibility, high school performance, first generation students, and first-year students).

A course using AL courseware has a "black box" of triggers and impacts (see the promises noted above), and our course was certainly unique to our own creative work, academic landscape, and the adaptive

platform we used (Realizeit). Our AL sections used the full functionality and content—primarily an online text, open educational resources, and a dynamic data literacy tool—of the course we built. This foundation allowed students to self-pace through granular, adaptive, mastery and agency focused pathways and lessons. Instructors used the courseware's analytics to find where there were holes in student understanding which needed to be addressed in the classroom. The non-AL students were taught in a more traditional way, with students being assigned an online text chapter and other materials to cover each week, and online quizzes assessing formative knowledge. Of course each instructor, whether online or face-to-face, used the either adaptive or traditional course delivery method as a base, and then added their own pedagogic strategies and skills to achieve the common course learning outcome goals and push their classes to higher level learning.

Anecdotally, instructors in AL sections reported better overall class preparedness and engagement, as well as being able to move to higher level learning strategies, applying course concepts. Professors could quickly check for student knowledge of the basics (what are the main UN organs? what are the different "generations" of human rights?) and then engage more readily in active/cooperative learning and other approaches. Note, three instructors taught both an adaptive and non-adaptive section.

Our quasi-experiment yielded more evidence of AL's positive impact. In each semester during the two academic years, except spring 2018 when half the sections used non-AL courseware, all sections of the course were taught using the AL courseware. Across these AL sections and on every question in a survey of student perceptions, students gave highly positive ratings of the AL courseware (see Figure 1).
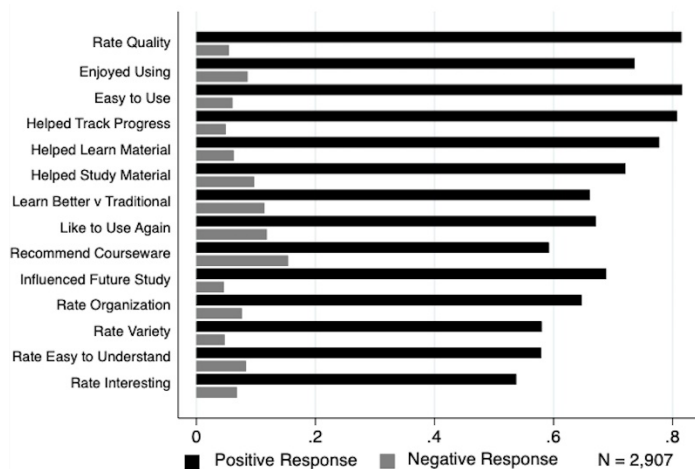

Figure 13: Aggregate Survey Question Responses (Four Semesters)

In the spring 2018 assessment of the AL courseware as compared to a non-AL course, the perceptive differences between the adaptive and non-adaptive sections were statistically significant on every question except "Rate Organization" and "Rate Easy to Understand." However, our hypothesis that students would have similarly significant positive perceptions in both F2F and online classes was not supported. While both cohorts had positive perceptions of the courseware, only among the F2F students was the difference between the AL and non-AL sections statistically significant. This result goes against the research findings of others (Yarnell, et. al., 2016) and provides impetus for future investigation.

We also looked at the performance differences between adaptive and non-adaptive cohorts using common test questions administered throughout the spring 2018 semester. For F2F students, the performance improvement between AL and non-AL classes was statistically significant, while in online sections the students in the AL section scored higher, but the difference did not reach significance. Across all sections,

the performance difference between AL and non-AL classes was statistically significant and substantively translated to students in AL sections scoring roughly two points higher across the common questions.

When controlling for student characteristics that we anticipated may drive perceptive and/or performance results, we found that only first-year status informed the results in any way. Performance improvement with respect to using the AL courseware was found primarily among freshmen as opposed to upperclassmen. However, first-year status did not inform the positive student perceptions.

It is also important to note that the average DFW rate in spring and fall semesters fell as the AL courseware was introduced. The mean DFW rate from 2013-2019 in non-AL courses was approximately 16%, while in AL courses it was 12% (see Figure 2). This difference is statistically significant. Furthermore, in the spring of 2018, in which both adaptive and non-adaptive courses were offered, the DFW rate in adaptive courses was 9 percentage points lower than in traditional courses (21% vs. 12%).
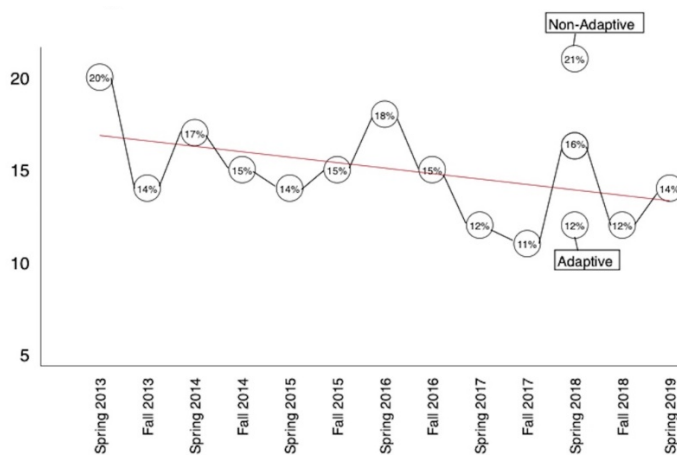

Figure 14: Global Issues DFW Rates 2013-2019

Overall, our promising findings support the case that AL courseware can provide a useful foundation for student progression, success, satisfaction, academic confidence, and performance. Surveys of student perceptions show strong evidence of the broad ability of the adaptive course to improve student engagement and enjoyment. Student performance improvements vis-à-vis traditional courses point to possible better student class preparedness and the use of higher-level learning strategies in the classroom. A decline in DFW rates indicates that gains in student learning and confidence may lead to quicker progression through college.

Author's note
The study that serves as the basis for this essay represents a significant effort by a team of people, including my co-authors on a forthcoming paper: Jeannie Grussendorf, Michael Shea, and Clark DeMas. Also, Jeannie Grussendorf and I, two of the eight faculty listed on GSU's Gates grant, have received compensation for our creative efforts on this project.

References
Yarnall, L., Means, B., & Wetzel, T. (2016). Lessons learned from early implementations of adaptive courseware. *SRI International.* Retrieved from
https://www.sri.com/wp-content/uploads/pdf/almap_final_report.pdf
Bailey, A., Vaduganathan, N., Henry, T., Laverdiere, R., & Pugliese, L. (2018). Making digital learning work: Success strategies from six leading universities and community colleges. *The Boston Consulting*

Group. Retrieved from: https://edplus.asu.edu/sites/default/files/BCG-Making-Digital-Learning-Work-Apr-2018%20.pdf