

Advancing an International Teaching Model: Evaluating Adaptive Equity-Oriented Pedagogies on Student Outcomes through Randomized Control Trials

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Abstract

Our experimental studies evaluated an adaptive equity-oriented pedagogy (AEP) that synthesizes evidence-based teaching practices (e.g., universal design for learning, weekly formative-assessments, game-based instruction) to address students' diverse learning needs (i.e., their strengths, interests, and areas for growth). Multivariate regression analyses suggest that students learning through AEP outperformed active-learning control conditions by a full letter grade and scored on average 13 percentage-points higher on final assessments (n=3121). Students experiencing AEP demonstrated greater improvements in positive psychosocial outcomes (e.g., motivation, reduced stereotype threat, growth mindset, self-efficacy), when controlling for GPA and intersectional identities (e.g., race, gender, sexual orientation, income, disability, immigration status). We triangulated data from multiple viewpoints (e.g., instructors, students, researchers) and collected identical measures in AEP and control conditions: validated surveys, interviews, observation notes, anonymous course-feedback forms, and formative/summative assessments. This study advances the conference theme by contributing adaptive equity-oriented pedagogical strategies that equip instructors to address and leverage the strengths of the changing student demographics in today's classrooms.

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Introduction

Many higher education institutions, especially the university classrooms in our studies, have experienced academic achievement gaps for historically underrepresented minority (URM) students (Martin et al., 2017). Poor academic achievement, especially for URM, can impact students' sense of self-efficacy, persistence, retention, and professional trajectories (Peters, 2014). Recognizing that higher education faculty can have a direct impact on student learning and achievement, we have designed and evaluated an adaptive equity-oriented pedagogy (AEP) (Phuong, Nguyen, & Marie, 2017a). AEP synthesizes high-impact teaching practices (e.g., universal design for learning, weekly formative-assessments, game-based instruction).

Description of Adaptive Equity-Oriented Pedagogy (AEP)

Instructors employ AEP to help diverse students surpass rigorous course objectives by addressing their learning needs (i.e., their strengths, interests, and areas for growth) (Phuong, Nguyen, & Marie, 2017b). This pedagogical approach includes instructors' use of weekly formative assessments and student-interest surveys to adjust classroom instruction in the service of helping all students meet rigorous course outcomes. Applying AEP, instructors use weekly student assessment scores and surveys on teaching to adjust how they model key skills and strategies needed for the final. Instructors use student data to develop engaging ways for students to practice key skills in class.

Instructors provide weekly feedback and adjust their instruction to provide activities where students practice problems that align with the rigor of the final. The steps for problems are listed, linked to definitions of concepts, provided in written formats, and modeled for students with reference to the rubric. To increase opportunities for academic success, instructors help students incorporate weekly feedback during deliberate practice activities. Based on subsequent student data, instructors modify deliberate practice activities that promote scientific thinking and provide project-based learning opportunities for students to apply concepts to a novel and meaningful context. Instructors also integrate a game-based model in AEP, allowing students to redo assessments (similar to their re-attempting a video game level). To reduce stereotype threat, instructors encourage students to validate and affirm their own and each other's skills, identities, and classroom contributions.

Methods

AEP has been scaled within humanities, STEM, and social sciences courses. In our research we have compared AEP treatment courses and non-adaptive control courses using design-based, quasi-experimental, and randomized control trial (RCTs) methodologies. In treatment conditions, instructors adhered to all tenants of the AEP model. In control conditions, the same instructors did not have access to weekly student data and did not adjust instruction based on student-learning data. However, control conditions still employed exemplary active learning strategies (e.g., dynamic lecturing, discussion, collaborative learning). We triangulated data from multiple viewpoints (e.g., instructors, students, and researchers) and collected identical measures in both conditions: validated surveys, interviews, observation notes, anonymous course-feedback forms, and formative and summative assessments.

Results

After instructors adjusted instruction based on feedback and weekly assessments, we documented improvements in academic achievement. Multivariate regression analyses suggest that students learning through AEP outperformed active-learning control conditions by a full letter grade and scored on average 13 percentage-points higher on final assessments (n=3121). Students experiencing AEP demonstrated greater improvements in positive psychosocial outcomes (e.g., motivation, reduced stereotype threat, growth mindset, self-efficacy), when controlling for GPA and intersectional identities (e.g., race, gender, sexual orientation, income, disability, immigration status).

Based on survey and interview responses, students in the treatment reported performing highly because they received weekly feedback and the instructors adjusted their instruction to provide activities where students practiced problems that aligned with the rigor of the final. These students appreciated how the steps for specific problems were broken down, linked to definitions of concepts, were provided in written formats, and modeled for them with reference to the rubric.

Students said that they were engaged when instructors related course content to their interests, offered opportunities for pursuing self-designed projects, and highlighted real-world application of course skills. Students reported positive psycho-social outcomes (e.g., resilience, greater sense of self efficacy) as they developed a strong growth mindset and took creative risks. These students reported a greater sense of belonging and self-efficacy as they validated and affirmed their own and others' backgrounds, skills, and classroom contributions. Students reported that AEP's multimodal strategies cultivated a supportive learning community where they could expand their preferred modes of learning. As a result, students had increased opportunities to practice new ways of demonstrating knowledge that helped them build real-world skills.

Students reported that AEP reduced stereotype threat and barriers to equity, emphasizing that clear expectations, weekly feedback from low-stakes assessments, high-impact projects, the supportive classroom community, and opportunities to redo assignments positively impacted their success and perceptions of their identities. Students indicating less stereotype threat recognized that success was not predetermined by perceptions of their identities, but influenced by 1) their effort and engagement with course material and 2) support and validation from peers and instructors.

Adaptive Equity-Oriented Pedagogy (AEP) in Multiple Contexts

We applied AEP to coach a science teacher on enhancing her STEM pedagogy at Piedmont Middle School, a Title I school in Eastside San Jose. We documented student behavior issues and frequent referrals from 175 special-education and mainstream students. After implementing AEP, we observed significant improvements in student behavior, engagement, and achievement. We have presented our findings and consultation at instructional development trainings, conferences, and social justice summits. We were invited to design UCB pedagogy courses. We have taught these courses, consulted with faculty, published research, and led faculty development programs on AEP. With multiple stakeholders, we are partnering on launching programs and incentives (e.g., grants, awards) for AEP. Our goal is to raise a profile on AEP instructors and champions, recommending favorable review, tenure, and promotion for their commitment to student equity and success.

In the spirit of this conference's mission, we are now collaborating with an non-governmental organization (NGO) in Ghana, Education Redefined for All (ER4ALL), to apply AEP internationally. ER4ALL is a NGO located in Prampram, which provides life-long support to students from Ghanaian public schools to access quality education. This NGO is embedding AEP into its curricula and programs to improve student achievement, persistence, pathways, and retention. This international collaboration will provide our research lab, the Design for Equity Lab, the opportunity to assess the impacts of AEP in a wider variety of settings.

Conclusion

We seek to advance an international pedagogical model that attracts, supports, and enables all students, especially URM, to thrive and grow as scholars and professionals. Through these efforts, we strive to diversify the perspectives that respond to social injustices within underrepresented communities. By disseminating and scaling AEP, we seek to eradicate educational disparities and to diversify the faces of success in academia and our workforce.

This work is necessary in various global contexts since the K-16 pipeline can feel like a maze without a map, especially with limited support from home. By helping students navigate academic discourse through AEP, we seek to restructure the maze of higher education into a highway towards greater access and equity so that all students can thrive.

References

- Martin, N. D., Spenner, K. I., & Mustillo, S. A. (2017). A Test of Leading Explanations for the College Racial-Ethnic Achievement Gap: Evidence from a Longitudinal Case Study. *Research in Higher Education*, 58(6), 617-645.
- Phuong, A. E., Nguyen, J. & Marie, D. (2017a). Evaluating an adaptive equity-oriented pedagogy: A study of its impacts in higher education. *The Journal of Effective Teaching*.17 (2), 5-44.
- Phuong, A. E., Nguyen, J., & Marie, D. (2017b). Conceptualizing an adaptive and data-driven equity-oriented pedagogy. *Transformative Dialogues: Teaching & Learning Journal*, 10(2). 1-20.