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## Student Centered Active Learning Environment with Upsidedown Pedagogies

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How do you keep a classroom of 100 undergraduates actively learning? Can students practice communication and teamwork skills in a large class? How do you boost the performance of underrepresented groups? The SCALE-UP Project has addressed all these questions. Classes in all the STEM areas plus many in the humanities are currently being offered at more than 250 institutions around the world.

Educational research indicates that students should collaborate on interesting tasks and be deeply involved with the material they are studying. We promote active learning in a redesigned classroom for 100 students or more. (Of course, smaller classes can also benefit.) Classtime is spent primarily on “tangibles” and “ponderables”—hands-on activities, simulations, and interesting questions. There are also hypothesis-driven labs. Two or three teams of three-student teams sit at tables that are specially designed to facilitate collaboration. Instructors circulate and engage in Socratic dialogues. The setting looks like a restaurant, with lively interactions nearly all the time. A study of physics learning in the space found:

- Female failure rate is 1/5 of previous levels, even though more is demanded of students
- Minority failure rate is 1/4 that seen in comparable, traditionally taught courses
- At-risk students are more successful in later engineering courses
- Conceptual learning and problem solving are improved, with same content coverage

This talk will describe the changing demographics and technical background of today's students and how we modified instruction to account for and even take advantages of changes.

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