



Student-Centered University Learning

Turning Traditional Education Models Upside Down **BY JULIE SCHELL**

TEACHERS TEACH. STUDENTS LEARN. THIS IS THE dominant paradigm of university education in Latin America. But is this age-old model sufficient to prepare students for tomorrow in a rapidly evolving region clamoring for innovation? More and more, educational reformers are emphasizing that no, it is not. However, student-centered teaching methods, such as Peer Instruction, are gaining popularity in Latin American universities as the region seeks to improve the quality of higher education.

Universities in the region are facing

large increases in the number and diversity of students demanding effective and affordable tertiary education. This influx is the result of well-meaning and successful governmental incentives instituted in the 1990s and the new millennium to improve secondary schooling in the region.

In addition to increased demand or higher education, the rapid expansion of a technology-driven economy has elevated the need for Latin American countries to prepare students for an evolving labor market. The growing size, diversity,

and workforce needs of the Latin American student body is forcing widespread acknowledgement among governments and educational leaders that new, innovative approaches to teaching and learning are crucial to future success.

TEACHER-CENTERED MODEL OF EDUCATION

The dominant model of education in Latin America and across the globe is based on an old paradigm that emphasizes information delivery as the purpose of education. In this model, the teacher

High School physics students in Brazil vote during a Peer Instruction session.

plays the central, active role, standing in front of the classroom, transmitting knowledge to students, who play the passive role of knowledge receptacle. The transmission of information comes primarily in the form of lecture and assigned textbook readings. Students who succeed in teaching-centered models are primarily those who have honed their ability to memorize, recall, and accurately repeat the information delivered to them through lectures and books.

Teacher-centered models had a place in the past. Indeed, before the advent of the printing press, transmitting knowledge through lecture was the sole mechanism for information delivery. In addition, this kind of teaching offered an equalizing effect for Latin America's striated student populations: with lecture, all students are taught the same material in the same manner, regardless of personal demographics.

The purpose of 21st century education in Latin America and elsewhere cannot consist solely of information delivery. For regional advancement, Latin America needs a critical mass of citizens who can do much more than memorize, recall and repeat information transmitted to them en masse. Latin America requires skilled professionals who can assimilate and transfer knowledge from their university classrooms to create, innovate, and solve the region's most pressing problems and to accelerate economic and social growth. Furthermore, despite the equalizing effect of many teacher-centered models, the most recent research on student learning emphasizes that students' academic achievement increases when their learning is customized, interactive, and student-centered rather than standardized, passive, and faculty-centered.

STUDENT-CENTERED MODEL OF EDUCATION

Student-centered models of education incorporate a redefined purpose of

education that features the student as a central and active participant. Instead of experiencing education in the form of information delivery, memorization and repetition, students interact with subject matter and instructors in ways that build capacities that are mapped to 21st century skills and abilities. These abilities include collaboration, problem solving, experimentation, and the capacity to use prior knowledge to solve problems or navigate situations they have not encountered before (i.e. knowledge transfer).

Peer Instruction: A Research-Based, Student-Centered Teaching Strategy. Many student-centered approaches available to Latin American faculty endeavor to transform their teaching and their students' learning. Recent research on faculty development initiatives to improve university teaching and learning in Chile, Costa Rica, and the Dominican Republic suggest that, when provided specific training, university faculty do incorporate student-centered teaching methods into their practice in the hopes of improving their students' learning. Peer Instruction (PI) is one specific, student-centered teaching method that refocuses the purpose of education on knowledge assimilation. Adoption of this method in Latin America is extensive and continuing to grow. Faculty actively use PI in many different disciplines and institutions all over the region, including Brazil, Chile, Costa Rica, Mexico, Colombia, Honduras, Portugal, Uruguay, Panama, Guatemala, Puerto Rico and the Dominican Republic.

What is Peer Instruction? Peer Instruction is a research-based pedagogy developed by Eric Mazur Group at Harvard University in the 1990s. It is an interactive, student-centered teaching method that elevates the role of the student to that of a central, crucial participant in the classroom. By providing frequent feedback to individual students about their understanding, PI also offers more customized approach to learning than more traditional, faculty-centered models.

According to Eric Mazur, PI turns the traditional model of education upside down. Instead of coming into class for the purpose of quietly observing a teacher covering the material, students first cover the material themselves, outside of class. Student-driven coverage is facilitated by a method called Just-in-Time Teaching (JiTT). JiTT facilitates out-of-class activities by providing opportunities for students to engage in information delivery on their own, by reading text or watching a video, and then responding to three questions to warm up their thinking before class meets. These warm-ups are not considered homework and are low stakes: students are graded on effort only, and earn credit for their work.

Teachers still play a critical role; however, their expertise is put to far better use than simply for information coverage. Teachers analyze student responses to the warm-ups before class, using their experience and content knowledge to hone in on trends in student difficulties or misconceptions. The warm-up questions also allow teachers to signal to students the core and important concepts for the course. In addition, the warm-ups give students practice engaging in the 21st century skills of critical reading, analysis and self-monitoring (awareness of what they know and what they don't know). Using PI, teachers then structure in-class time around short conceptual questions, or ConcepTests, which confront the difficulties in learning that emerge from the warm-ups.

In this way, PI leverages the unique expertise of the faculty member in a more effective manner than traditional models allow. It also provides a more customized approach to learning, based on frequent analysis of individual students' needs.

Unlike a traditional lecture, in a PI environment, the focus is constantly shifting among instructor, subject matter, and students. To implement PI, instructors engage in the following process:

Instructors design ConcepTests to engage students in challenging conceptual thinking and to address student difficulties in understanding specific concepts. Instructors give a brief presentation

about the concept that sets the context for the class session; pose a ConcepTest; give the students a few minutes to think; and then require students to commit to their own individual answer to the ConcepTest.

Students respond to ConcepTests using classroom response systems, such as clickers or flashcards. Once the student commits an answer, teachers ask students to find a neighbor with a different response and guide them to try

that is already in the book. I know of several teachers who spend class time just copying the content from the text onto the blackboard. PI on the other hand promotes cognitive and emotional engagement of students in class. It's a much better way to use in-class time," said Araujo.

When asked why he continues to use PI, instead of going back to lecture, he said: "I think when teachers have the

manage the material. The majority take undergraduate statistics courses and the reality is that they do not know or how to manage [statistical] concepts. If you ask [them to describe] a concept, they respond with a formula." Alvarez knew that to address students' approaches to learning statistics, he needed to change his approach to teaching it. He decided to focus on helping students develop conceptual understanding, and PI was a natural fit.

When asked why he continues to use PI, Alvarez remarked about the importance of helping students develop the ability to analyze different situations in order to make competent statistical decisions. "When I use Peer Instruction, students are more comfortable [with]...concepts. For example, if I ask them what kind of sampling [technique] they [might] use in a given situation, they feel free to give their opinion based on concepts and their perception and experience, versus thinking [like] a guru of sampling."

Alvarez also emphasized that students seem to feel more comfortable trying out different opinions and making mistakes in a PI environment. Such experimentation with concepts and ideas is a skill that is essential for future innovators. "Sometimes, students think all the concepts are perfect and there is only one answer for a given situation. With Peer Instruction, they can see the different points of view of a situation."

While Alvarez uses other approaches in addition to PI, he credits the method with leading to positive gains for his students. He said, using PI "was a great experience. The students changed and they are more motivated to learn."

CONCLUSION

An array of studies demonstrates the benefits of Peer Instruction across a range of institutions and disciplines. By changing the model of education from teacher-centered to student-centered, PI facilitates knowledge acquisition and assimilation through active engagement of students and faculty alike. Twenty years of research suggest that PI improves

Students respond to ConcepTests using classroom response systems, such as clickers or flashcards.

to convince their neighbor of their answer. During this peer discussion stage, students get the opportunity to practice persuasion and logical analysis as well as collaboration. They also get to test ideas and make mistakes in a less threatening context, with one or two peers instead of in front of the instructor or the entire class. After a few minutes, teachers bring the students back together and ask them to commit to an individual answer again. At the end of the process, teachers and/or students give explanations of the correction answer.

A CASE OF PEER INSTRUCTION IN BRAZIL

Professor Ives Araujo teaches physics and physics education at Federal University of Rio Grande do Sul (UFRGS) in Brazil. After learning about PI in Brazil and then studying it in-depth for a year as a visiting professor in the Mazur Group, Araujo had a lingering question: How would JiTT/PI implementation work in the context of a major Brazilian university with a small class of 15 students and mixed among physics majors and physical education majors? Araujo chose to use PI because his main goal as an instructor was to drive student learning. "In my personal experiences, I have witnessed the inefficacy of using time in class to expose students, for the first time, to content

experience of seeing students talking enthusiastically and discussing the concepts they are trying to teach, instead of seeing students' bored faces in response to their lecture, they will never come back to traditional, passive teaching. That's my case."

Using a mix of other student-centered teaching methods with JiTT/PI, Araujo observed increases in student conceptual understanding, engagement, and enthusiasm about the subject matter. Araujo plans to continue using PI and is actively working on a project to help Brazilian high school teachers implement PI in their classrooms.

A CASE OF PEER INSTRUCTION IN GUATEMALA

Eduardo Alvarez is a professor of physics and statistics at the Universidad del Valle de Guatemala in Guatemala City. He first heard of Peer Instruction in 1997 and began to use it in introductory Physics courses at his university. After a hearing a follow-up talk by Eric Mazur at his university, he began to think more about PI in other contexts, including his masters-level course, Statistical Analysis. His course has approximately 20 students.

When asked about why he chose to use PI in his graduate course, Professor Alvarez responded, "When I teach my class at the masters level, [it is assumed] that the students already know and [can]

student conceptual understanding, academic performance, student engagement, and perhaps most importantly for Latin American institutions, retention in science, technology, engineering, and mathematics majors.

Over the past two years, in partnership with LASPAU-Affiliated with Harvard University's Initiative for the Development of Academic Innovation, we have trained more than 1,500 faculty across Latin America to use PI to improve teaching and learning in their institutions. Future research is needed to fully understand the conditions of uptake of PI in Latin America and its influence on higher education in the region. However, PI remains a powerful strategy to meet the region's need to invest in student-centered educational models that will better prepare the increasing number and diversity of students to innovate and accelerate regional prosperity.

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University Faculty

Making a Difference in Local Economies

BY NED STRONG

ONE OF MY FAVORITE THINGS TO DO IN THE cold New England months of January and February is to go to Wilson Farm in Lexington, Massachusetts, and marvel at the wide variety of out-of-season fresh fruit. I have always wondered where it comes from, how it made its way to Lexington, and who are the people responsible for it. The labels reveal that many varieties of grapes, berries, apples, peaches, avocados and other fresh fruits and produce come from Chile. Considering the distance between Chile and the United States, the above questions are even more intriguing. It turns out that fruit exports are now one of the top economic drivers in Chile and a model for other countries. But dominance in fruit exports has not just happened by chance. Today's success in this South American

country's fruit exports is the result of a history of wise investments in human capital and long-term successful international collaborations among universities.

In the 1960s very little fruit was exported from Chile. Principally apples were shipped north to New York and Philadelphia fruit markets in relatively small quantities and of questionable quality. Yet great potential existed. Climactic conditions in the country vary from moderate Mediterranean valleys ideal for grapes and wine to temperate zones perfect for apples and similar fruits. The fact that seasons are opposite to those of the northern hemisphere also adds a huge potential for successful international trade. Production grew and the Chile-U.S.

Apples for sale at Wilson Farm