Mexican professor is world leader in Challenge-Based Learning

Dr. Jorge Membrillo, biotechnologist and research professor at **Tec de Monterrey**, is the author with the **highest number** of **articles** on **Challenge-Based Learning** in the **Scopus** database**.**

According to **information** from this **academic source**, he currently has **14 publications** on this subject.

At the age of 6, he faced one of his **first challenges in life** when he decided to **study** to understand the **world.** He wanted to be a **teacher** like his parents and make his **grandmother**, who took care of him, proud of him at the same time.

"I was very curious. *I remember seeing 'The Sleeping Woman' (Iztaccíhuatl) and 'Popo' (Popocatépetl) and asking myself: 'How is it possible that I can be down here without a sweater on and up there it's snowy if it's closer to the sun?'"* he recalls*.*

Feeding that curiosity in his life led him to work at **Harvard**. Now, as a professor at the **School of Engineering and Science**, he collaborates on **space innovation** projects with **NASA**, among other projects.

El profesor del Tec ha orientado su carrera a investigar el aprendizaje basado en retos. width="900" loading="lazy">

His passions: pedagogy and Challenge-Based Learning

Despite a distinguished career as a researcher in the field of **biotechnology**, Dr. Membrillo distinguished himself in **pedagogy**, dedicating his life to the study of **new teaching methods**.

His efforts are reflected in the fact that he is the author with the largest number of **scientific articles on challenge-based learning** to date.

Scopus is the **largest database of citations and abstracts of peer-reviewed literature**: scientific journals, books, and conference proceedings. It provides a comprehensive summary of research results worldwide in science, technology, medicine, social sciences, arts, and humanities.

This database shows that **Tec de Monterrey,** with **75 documents, is the institution with the highest number of publications** on the subject.

Challenge-Based Learning **is one of the pillars** of the **Tec21 Educational Model**, along with flexibility, inspiring professors, and providing students with a memorable experience.

The professor has participated as a researcher since arriving at the Tec seven years ago, where he also designs challenges with other professors for the students in the School of Engineering and Science at the **Mexico City campus**.

"(We want to) use these Challenge-Based Learning techniques to create a model to train students who are going to become engineers for the next NASA missions."

*"Today (at the Tec), **we're designing challenges with someone from NASA** who's in charge of the **curriculum for astronaut training**, such as the **Artemis Mission** whose goal is settling on the Moon. In 2024, the first woman will set foot on the Moon, and then they will go to Mars,"* he adds.

Another of the projects Dr. Membrillo is participating in as a researcher at the **Institute for the Future of Education** is collaborating on a **NASA** program called **NASA STEM Educator Professional Development Collaborative**.

*"We want to **participate in these new missions to Mars**, to bring these Challenge-Based Learning techniques to a teaching and training model for students who are going to become the engineers for **subsequent NASA missions**,"* he added.

What's more, there is already a plan to **create a challenge for the development of space technology** that can be implemented in these NASA projects, he adds.

El profesor ha impartido clases y conferencias hasta en 23 instituciones de educación superior. width="900" loading="lazy">

His grandmother and parents motivated him to strive to be the best

*"Since my parents worked double shifts as teachers, my grandmother took care of me and always told me: 'If I go to your school, it's because **I'm going there to pick up a diploma**.' So, I had to put a lot of effort into school, and the truth is, I liked it."*

Dr. Membrillo remembers the time he spent with his grandmother planting in the chinampas in **Xochimilco** when he was a child.

There were only three types of professionals in Xochimilco: teachers, doctors, and lawyers, says Membrillo, who remembers that it was his **grandmother** who motivated him to **do his best as a student**.

"I would get up at 5 o'clock in the morning. At 7 o'clock, I would enter the teacher training college and I'd leave at 1 o'clock in the afternoon. Then, I would go to high school at 3 o'clock in the afternoon and finish at 10 o'clock at night. That's what it was like every day.

He says he hasn't forgotten working in the **chinampas** and the **example of his grandmother**, as she helped him get ahead.

"There were days when I had 11 exams. (However), that rhythm shaped a lot of my discipline," he said.

"Since my parents worked double shifts as teachers, my grandmother took care of me and always told me, 'If I go to your school, it's because I'm going there to pick up a diploma.'"

Jorge also saw a passion in his parents **for sharing knowledge with others** and the **impact they had on others' lives.**

*"I could see they were having a lot of fun. My father would sometimes take me to his afternoon classes, and I was very glad to see that **people loved him very much**. Here, as in all Mexican communities, teachers are always loved a lot,"* he said.

In this way, Dr. Membrillo remained a constant student until he graduated from the **Biomedical Research** program at the National Autonomous University of Mexico (UNAM).

"The day after I got my bachelor's degree, I was already teaching high school, right there at the UNAM. I started teaching in 1991," he recalled.

El profesor imparte clases en la Escuela de Ingeniería y Ciencias del campus Ciudad de México. width="900" loading="lazy">

Being an outstanding student led him to study in England and at Harvard

Dr. Membrillo says that he received the **Gabino Barreda Medal**, a distinction awarded by the **UNAM** to students with the highest undergraduate grade point average.

After that, he wanted to learn more and understand the **role of oxygen in bacteria**.

*"I saw that the best place to research that topic was in England. So, I applied and won a Conacyt scholarship to study my doctorate degree at **King's College London**,"* he explained.

In addition, Dr. Membrillo was given the "***Young Scientist of the Year Award***" in 1996, after his **doctoral thesis on a bacterium from Xochimilco** was chosen as the best **out of 10,000**

evaluated by leading scientists and the **Royal Society**.

Dr. Membrillo also received offers for two postdoctoral stays, one at the **University of Sheffield's Hans Krebs Institute**, where he stayed for a year, and another at **Harvard University's School of Medicine**, where he collaborated for five years.

El profesor cuenta con aproximadamente 7 años en el Tec de Monterrey, donde ha sido impulsor del apre
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Innovating in education and taking challenges to the next level

Dr. Membrillo has also been a **promoter of innovation in the classroom** to help engage students in science.

For example, one of his projects was to use **augmented reality** with smartphone technology to analyze cells and DNA.

*"As **teachers**, we have to **study**, keep **up to date**, **innovate**, and ensure that students find a place where they can express themselves,"* says the professor.

*"I've always had two focuses in my career, **science and education**, both of which I've worked on throughout my life and have done very well in both. For example, I had the experience of teaching **with challenges** at **Harvard**,"* the professor says.

*"I've really enjoyed designing **challenges at the Tec to help students generate knowledge and skills** in ways that are fun, exciting, and help serve to solve society's problems,"* he concludes.

Other achievements and projects

- He has been a **member of the New York Academy of Sciences** since 1997. He is also a member of the Mexican Academy of Sciences.
- He is **President of the Mexico Section of the International Society for Engineering Pedagogy**. He has also taught at higher education institutions in nearly 25 countries.
- He has **61 publications in indexed journals of disciplinary research and educational innovation** and his work has more than 1,500 citations**.**
- He has also led two **NOVUS research projects** related to Challenge-Based Learning educational techniques.
- He has also been one of the 300 academics from around the world chosen to serve on the jury for the **QS-Reimagine Education Awards**, also known as the "Education Oscars."

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