Tecnológico de Monterrey | 80 AÑOS

Educational Innovation and Digital Education at Tecnológico de Monterrey

2022 Report

Index

Editorial

Undoubtedly, 2022 has been a year full of challenges and achievements for Tecnológico de Monterrey. As a higher education institution, we have stood out in several international academic quality rankings; we have participated in numerous initiatives not only on teaching-learning but on important advancements in areas like health, business, science, and technology; and we have also collaborated with leading education institutions and organizations to provide and exchange ideas, knowledge, best practices, and success stories in multiple disciplines.

If we could sum up the essence of these achievements in a single word since the founding of Tecnológico de Monterrey in 1943, it would be **innovation**. And, as usual, the reason for our existence: **our students**. For 80 years, the goal of our institution has remained the same: to develop the professional and human potential of each of our students, offering them education, resources, and cutting-edge academic programs of excellence.

For all this, 2022 could not be the exception. In the present report on educational innovation and digital learning, we wish to share the critical aspects of our advancements and achievements this year with the academic community and society.

First, we invite you to learn the impact of **educational innovation and digital education numbers** on our students, faculty, courses, and modalities, each corresponding to high school, undergraduate, graduate, and lifelong learning.

Also described within are the most remarkable **innovative and digital educational experiences in our institution**, offered by the following schools and programs:
School of Architecture, Art, and Design; School of Social Sciences and Government; School of Humanities and Education; School of Engineering and Sciences; School of Medicine and Health Sciences; Business School; PrepaTec; Lifelong Education; and LiFE.

You will also find information regarding the various **institutional initiatives and drivers of digital educational and innovative experiences**, such as adaptive learning; immersive learning with technology; alternative credentials; innovative educational spaces; Biblioteca Digital; CEDDIE; internationalization; TEDU; NOVUS; and Observatory of the Institute for the Future of Education.

Lastly, we share with you the progress of educational innovation and digital education of Tecnológico de Monterrey worldwide through our **publications, certifications, and awards** received throughout the year.

We hope the information condensed in this 2022 report will be a sample and an invitation to keep innovating with us. As an institution, we enrich students' learning as citizens of the world; together, as a society, we are transforming the world, strengthening the foundations, and moving step by step toward that better future we hope to reach.

1.

80 years of educational innovation and digital learning

We will be 80 years old in September 2023! Since its founding in 1943, thanks to the vision of Mr. Eugenio Garza Sada and a group of entrepreneurs, who formed a civil association called Enseñanza e Investigación Superior, A. C., Tecnológico de Monterrey started a journey full of challenges in education, which have now turned into goals met and achievements not just for Mexico, but for the whole world.

Each decade has had its own context, from the aspirations and needs of the students to the availability of educational spaces, methods and pedagogies, teacher training, means of communication, technology, knowledge base, and many more. However, among this endless list of factors that have characterized Tecnológico de Monterrey's 80 years of trajectory, a main thread drives its initiatives and impact: educational innovation to ensure academic excellence.

This educational innovation means being able to offer increasingly better solutions, overcoming obstacles once thought insurmountable. Take the education to distant places? The first class broadcasted through television took place in 1966. Go beyond frontiers? The Virtual University was created in 1997 for campuses and sites in Mexico, Latin America, and worldwide. Go beyond time constraints to access education? In 2000, 100% online and asynchronous education was possible thanks to Tec.com. Increase the maximum number of students in a course? The institution offered its first massive online open course, or MOOC, in 2015.

Ensure academic continuity after a devastating earthquake in Mexico City? In 2017, the Flexible Hybrid Model was designed and implemented in a record time of only two weeks. Multiply the presence of the teacher in local and remote classrooms? The "Professor with holographic effect" started in 2018. Pandemic due to Covid-19? The Flexible Digital Model was created in 2019 and has remained active since then, enriching the learning experiences of our students with the latest technology and pedagogical initiatives.

From face-to-face to digital

To get to know this journey of educational innovation that has brought us to where we are, and that points to a promising future, we share the most outstanding advancements from this incomparable timeline.

1944 The number of students in Tec de Monterrey grows from 350 to 452, while the faculty members, all tenured, go from 14 to 33.

1950 Tec de Monterrey became accredited by the Southern Association of Colleges and Schools in the United States of America (SACS).

1954 The library building is inaugurated, its facade adorned by a mural that has become a Tec symbol.

1960 Tec de Monterrey has 4,458 students from 19 countries in America and all the states of the Mexican Republic.

1963 At the start of this year, the first master's degree was awarded in the field of Chemical Sciences. Twenty years after its foundation, Tec started to venture into two training aspects that will be of great importance in the future: knowledge and use of electronic computers and education via television, launching their first class via this medium in 1966.

1986 The formal creation of Tecnológico de Monterrey as a multicampus educational system with a new organizational structure. It joins the international network of communication between universities called BITNET and launches the satellite telecommunications network.

1989 Satellite broadcasting is used to teach the Master's in Education program with various specializations.

1990 Satellite broadcasts of the master's programs of Administration and Computing for teachers of Tecnológico de Monterrey begin, in addition to three courses on sociocultural values and professional practice.

1997 The Virtual University is created. Tec de Monterrey offers academic and continuing education programs in Mexico and Latin America. The redesign of the teaching-learning process begins.

2000 The institute now offers multiple undergraduate and graduate programs entirely online. Tec.com is born with an educational offer via the internet.

2001 Tec and various national and international organizations and foundations create Learning Community Centers, Corporate Universities, and the Digital Video Library.

2004 Prepanet activities began to offer online high school with several face-to-face activities to people who had not been able to complete their high school studies for various reasons.

2005 A new vision for Tecnológico de Monterrey is outlined for 2015, as well as the Mission statement and the strategies to achieve the newly created Vision.

2013 The new Tec21 Educational Model is revealed, which will allow to develop the competencies for the leaders of the 21st century for new generations. The Model is based on innovative and challenging experiences, spaces for active learning, and inspiring and innovative teachers.

2015 Tec de Monterrey begins its MOOC offers on various platforms, such as Coursera and edX.

2016 FIT (Flexible, Interactive, and with Technology) courses are taught for the first time in undergraduate programs.

2017 Due to the effects of the September 19 earthquake in Mexico City and to ensure academic continuity, the Flexible Hybrid Model was designed and implemented in a record time of two weeks.

2018 QS University Rankings ranks Tec as the best private university in Mexico. The project "Professor with Hologram Effect" begins, as well as the first educational resources using virtual reality.

2020 The new Flexible Digital Model is designed and implemented to ensure academic continuity considering the Covid-19 pandemic.

2022 To continue to transform the learning experiences of our students, in 2022, 313 educational innovation and digital education projects developed by 594 teachers from various National Schools increased by 40% their impact on the number of students, going from 27,000 in 2021 to over 40,000 students participating in more than one innovative and digital experience through 175 Training Units.

Some of the more outstanding achievements this year are: we've reached +561,540 students-course who have taken online courses in high school and undergraduate programs; +36,470 students who have taken an online graduate program; +532,410 professionals who have extended their knowledge with our online certification programs; and +2,157,800 people who learned with our Massive Open Online Courses.

Digital Education Strategy

As a result of these nearly 80 years of experience in higher education and over 30 years designing digital learning experiences, at Tecnológico de Monterrey, we are convinced that digital education must ensure significant and lasting learning for our students, through the application of innovative pedagogies based on the growing use of digital media and technologies, throughout the various moments of their learning journey in the institute.

This student journey is designed to enrich each stage of their training. To transcend, the training of our students is all-encompassing. An interest is fostered in the student to transform their social, economic, political, and ecological reality on a personal, social, and professional level.

To fully get to know the impact obtained in 2022, we invite you to read the complete information in the following sections of this report.

II.

Impact of educational innovation

Educational Innovation in numbers

To continue to transform the learning experiences of our students, in 2022, 313 educational innovation and digital education projects were implemented. These projects were developed by 594 teachers from various National Schools, increasing the number of students reached by 40% compared to the previous year. From +27,000 in 2021, +40,000 were impacted in 2022, who lived more than one innovative and digital experience in 175 training units.

Next are shown the impact indicators of these educational innovation and digital education projects.

Impact of educational innovation and digital education

313
Projects

594
Participating Teachers

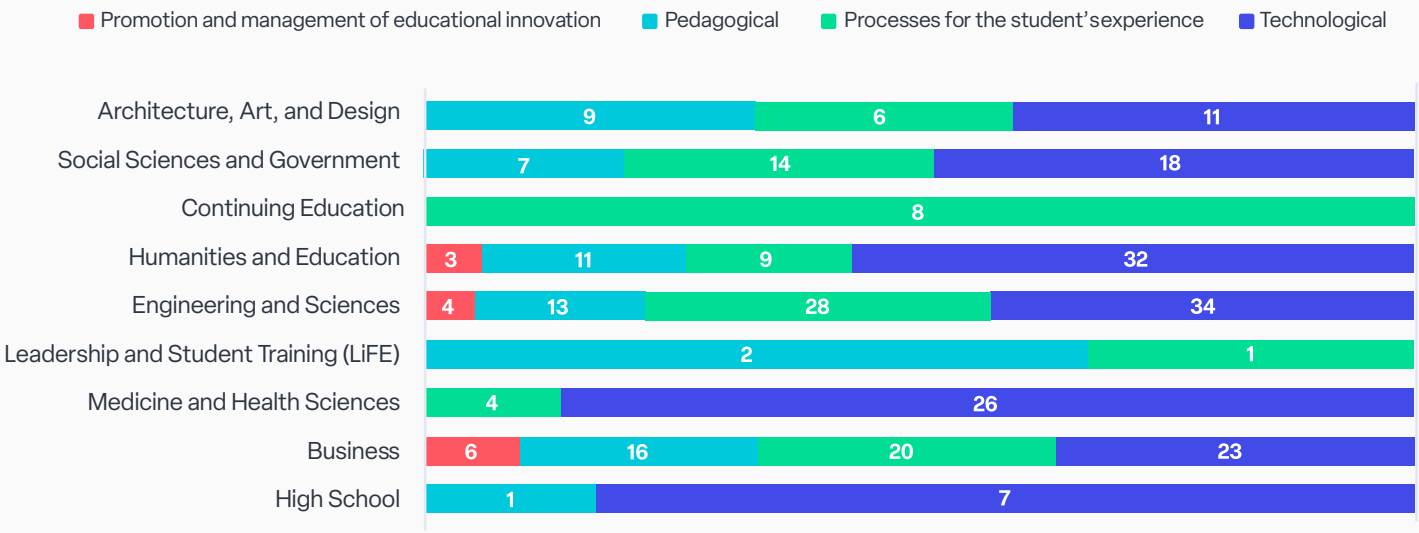
175
Training Units

43,394
Students-course

*Students who participated in more than one innovative and digital experience.

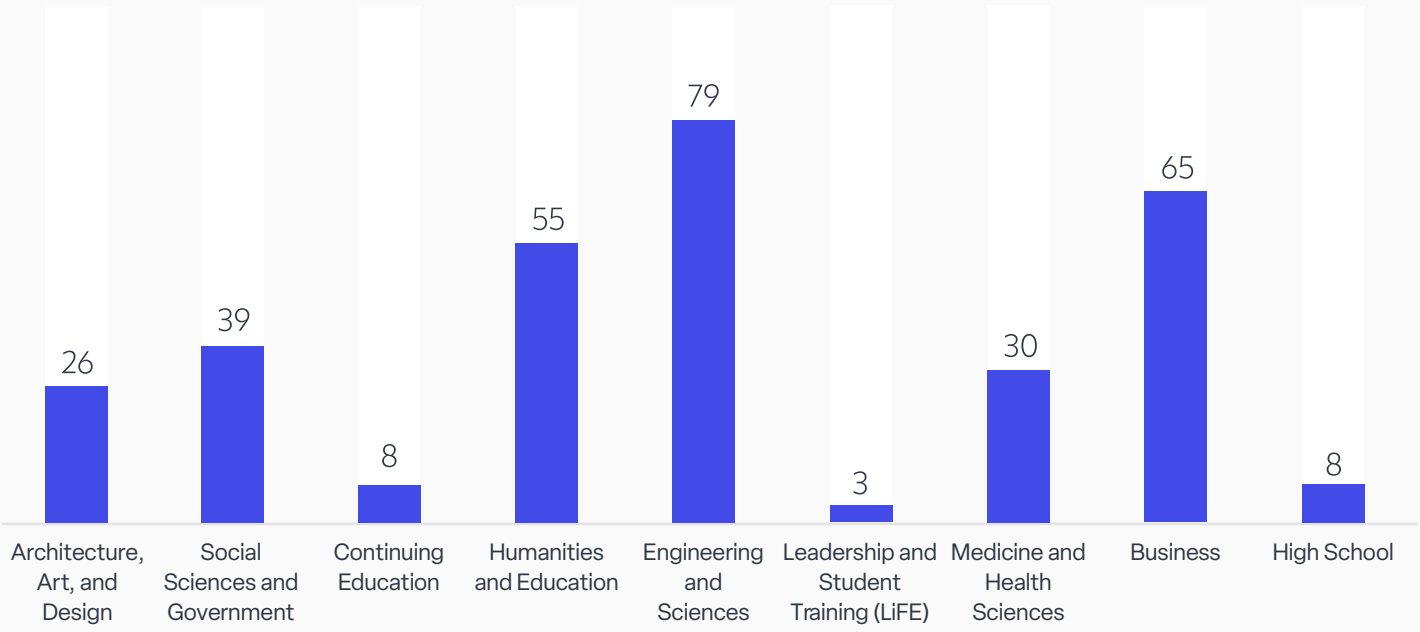
Number of educational innovation projects based on the transformation of the educational experience.

Number of projects per School according to innovation categories



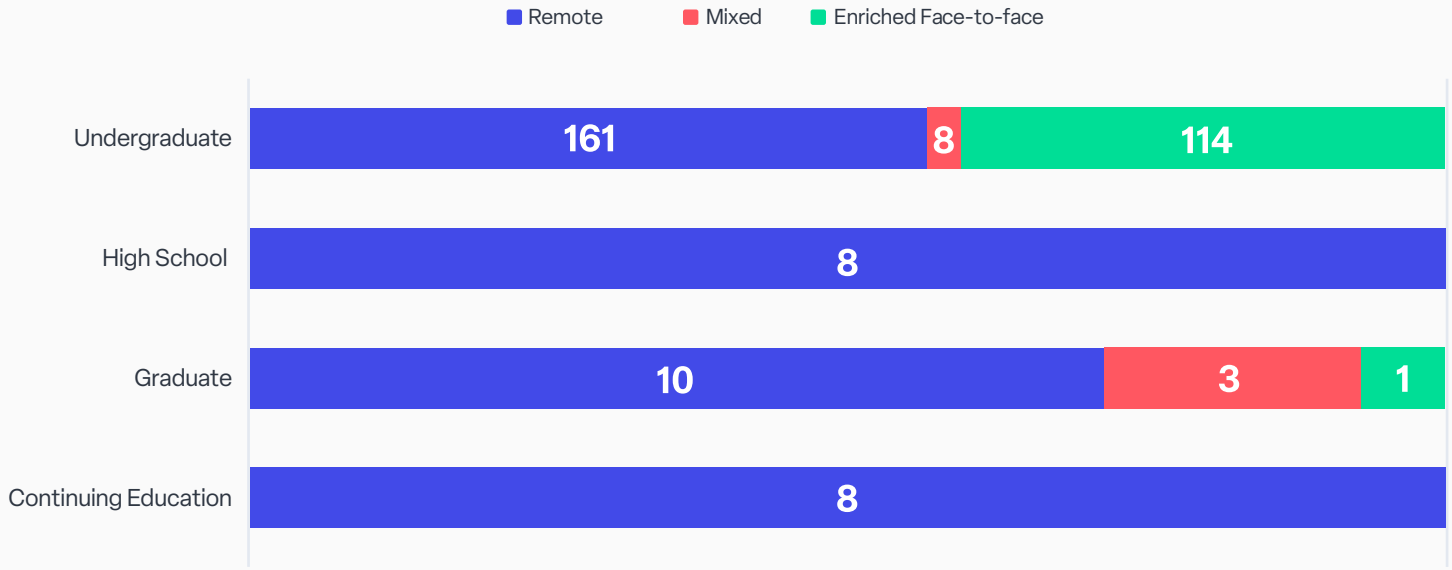
Of the 313 projects developed by the National Schools, 279 are linked to a training unit, while 34 are related to an educational innovation impacting the learning process.

Number of projects of educational innovation and digital education developed by National Schools



As for the educational innovation and digital education projects, 182 were developed under a “Distance” modality, 11 under a “Mixed” modality, and 120 under an “Enriched face-to-face” modality in High School, Undergraduate, Graduate, Continuing Education, and LiFE programs.

Number of projects per academic program and teaching modality



III.

Impact of digital education

Digital education at Tecnológico de Monterrey is an institutional strategy that ensures meaningful and lasting learning for students through innovative pedagogies based on the intentional, systematic, and conscious use of digital media and technologies.

In 2022, digital education was offered in various modalities that enabled significant learning experiences in multiple environments, which are presented below.

DEFINITIONS

Teaching modalities and courses

MODALITIES

The specific way an educational service is offered, considering various elements such as the required infrastructure, the use of media and educational resources, and the time and space in which the interaction between teachers and students occurs, among others. According to Barroso-Ramos (2006), the most accepted classification is divided into three groups: face-to-face, remote (open and distance), and mixed or hybrid (a combination of the previous groups).

FACE-TO-FACE MODALITIES

Traditional face-to-face

DELIVERY MODALITIES

How **a course is offered**, considering the function of the teacher or group of teachers, how the students will participate during synchronic and asynchronous moments, the follow-up on students, and the geographic considerations.

A course designed for a fully **face-to-face experience**, incorporating **essential digital experiences** to comply with the educational model (LMS).

EXAMPLES

Traditional face-to-face course

Enriched face-to-face

A course representing the **evolution** of the face-to-face modality toward **intentionally incorporating cutting-edge technologies** to improve the students' learning experience (e.g., VR, AR, AI, among others).

Face-to-face course enriched with technology

TU: Face-to-face with VR practice factory resource.

DIGITAL MODALITIES

Mixed modality

Blended

A course that intentionally combines a face-to-face element in which supervised learning occurs and a **distance** element over which the student has some control (time, space, route, and pace of learning).

Blended

EEAD Block: Face-to-face challenge and 100% distance modules.

Distance modality

Synchronous distance

A course in which the teacher conducts sessions in real-time using various **technological tools**.

The student has the flexibility of attending these sessions from any location. It can be limited to a single, different, or fully international campus.

MFD
FIT
Remote ELITE

Asynchronous distance

A course that offers students the autonomy and flexibility to study **wherever and whenever they choose**. It can feature guided moments or be entirely self-directed.

Online
Self-directed

Note 1: For the face-to-face or mixed modalities, combining synchronicity and asynchronicity is another variable that will depend on the TU teaching needs.

Note 2: The digital modalities offer contents, resources, and didactic activities specifically designed for a digital environment, which are integrated into the delivery model and over which the student has a degree of control (time, space, route, and pace of learning).

For more information on each of the types of digital modality courses, visit the Educational Innovation at Tecnológico de Monterrey website: innovacioneducativa.tec.mx/es/educacion-digital-tec21/modalidades-y-tipos-de-cursos-digitales

Digital education in numbers

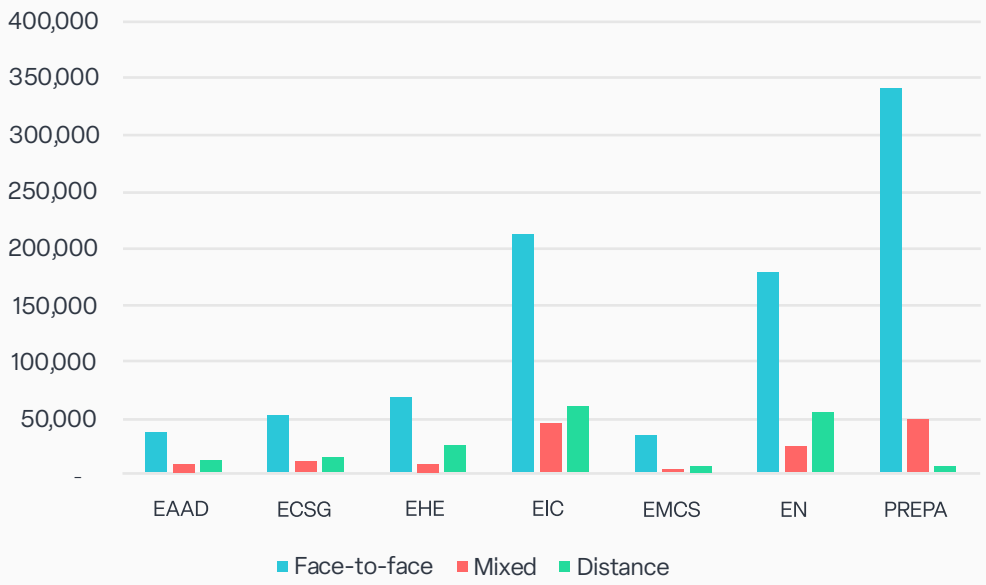
During 2022, Digital Education was consolidated as a relevant institutional strategy that produced positive results by offering significant learning experiences within and outside the classroom.

Below, the data of students-course enrolled in digital modality groups according to study level are presented.

	HIGH SCHOOL	UNDERGRADUATE	GRADUATE	LIFELONG EDUCATION
STUDENTS-COURSE	57,404	266,441	22,380	133,661
GROUPS	2,694	12,568	2,437	

* The group data does not apply to the Lifelong Education category.

Students-course per school and modality, at an institutional level



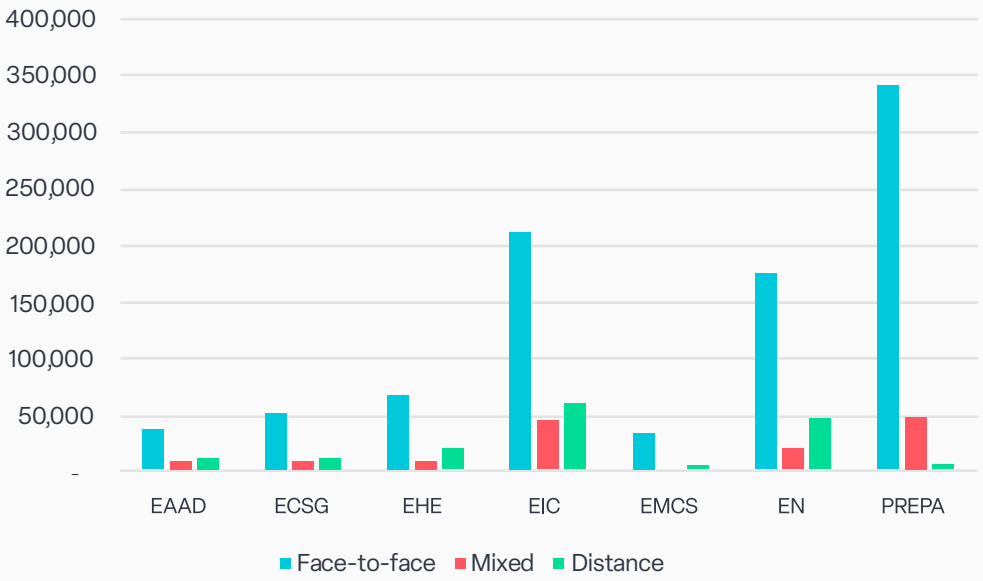
Courses	3,699	78% digital format
Groups 59,458 30%	6,516 hybrid 11,183 distance	11% hybrid modality groups 19% distance modality groups
Teachers	11,613	6% digital modality

Students-course enrolled

26% Distance	74% Face-to-face

Source: SAP BO DWH Escolar. January-December 2022.

Students-course per school and modality, High School and Undergraduate programs

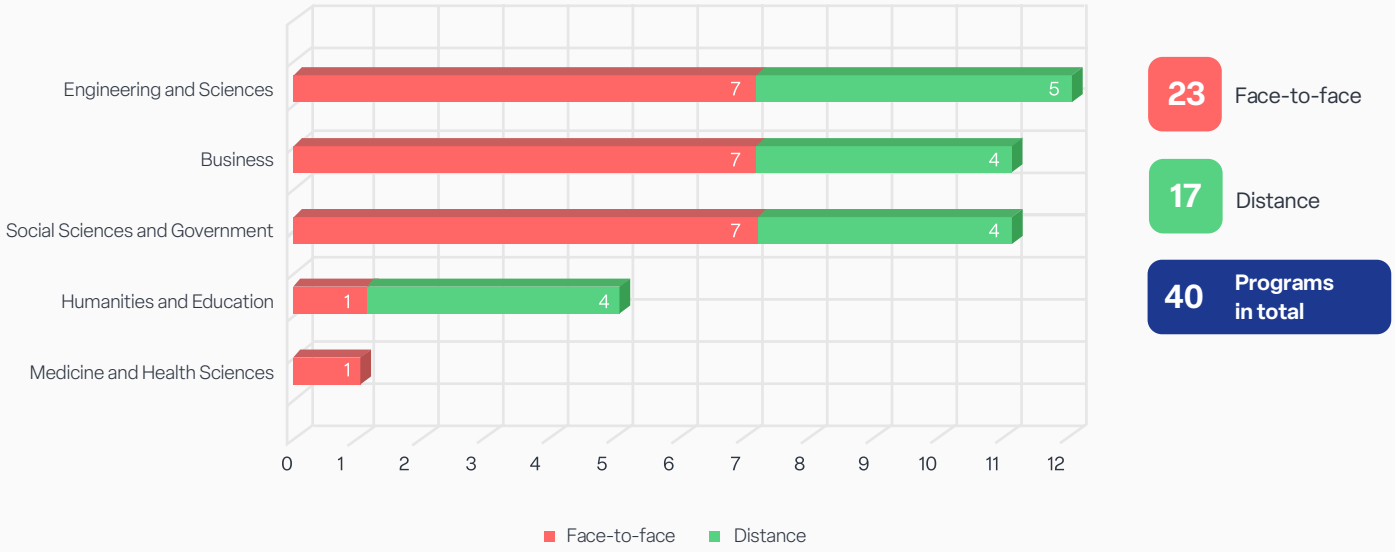


Courses	3,010	78% digital format
Groups	55,153 27%	6,258 hybrid 9,004 distance
		11% hybrid modality groups 16% distance modality groups
Teachers	10,713	4% digital modality

Source: SAP BO DWH Escolar. January-December 2022.

Graduate Programs per teaching modalities

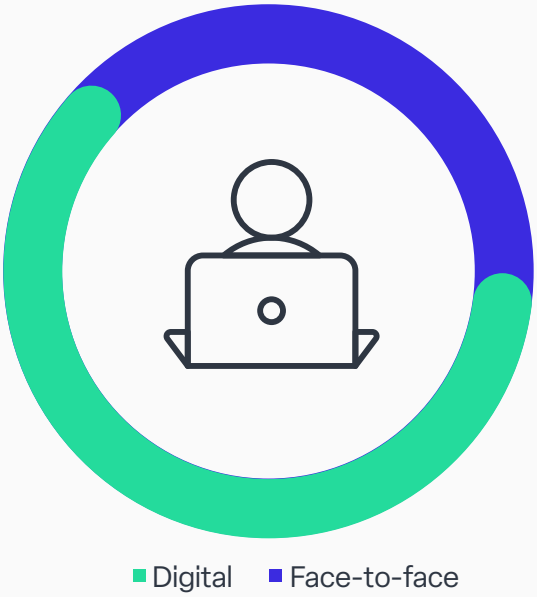
Tecnológico de Monterrey offers a wide variety of complete graduate programs in digital modalities; in 2022, it went from 44 to 40 master's programs, reducing the number of online master's programs of the School of Humanities and Education, the School of Architecture, Art, and Design, and the School of Medicine and Health Sciences. The distribution per school is shown below.



The complete list of distance programs can be found at the end of the report as Appendix 1.

Distribution of graduate students enrolled in face-to-face and digital programs

4,575 (-3%) | **2,773** (+4%)

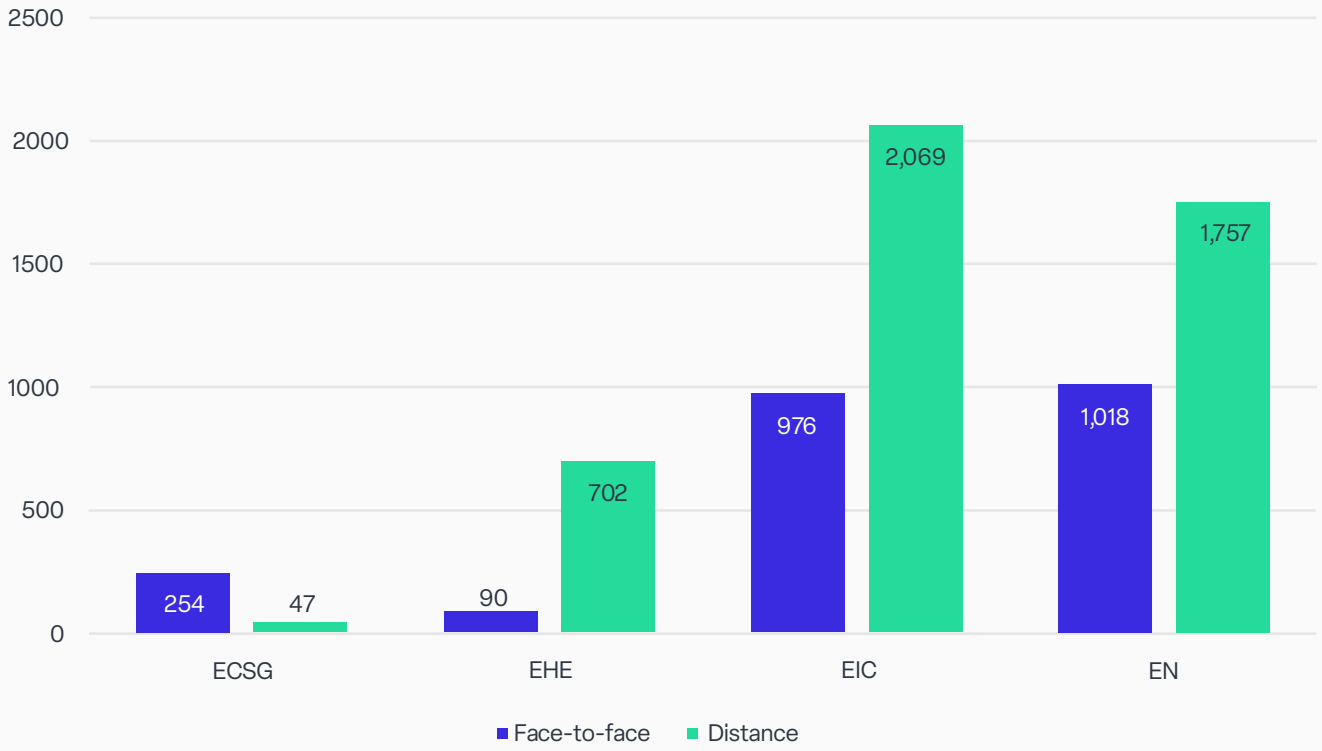


Students enrolled

62%
Distance

38%
Face-to-face

Students enrolled in graduate programs per school



In 2022, 812 digital program students graduated, adding up to 36,712 graduates.

LiFE

In 2022 the LiFE program kept the digital modality in 10% of its groups to students to keep nurturing their well-being and complement their academic training through developing competencies in the seven dimensions of the Integral Wellness Model.

Using digital tools, students had access to varied offers that included artistic, sports, emotional, spiritual, and student well-being activities, as well as leadership and experiential, to attain their self-realization.

16,185 students-course (**13%** of the offer)

923 groups (**10%** of the groups)

35 subjects

25 teachers

Lifelong education in numbers

Lifelong education fosters permanent learning at any time and in every possible way, including structured courses or self-directed education. This constant training of people is instrumental for comprehensive development in every area of life and meeting the challenges of the ever-changing job market.

Below are presented the various programs Tecnológico de Monterrey offers as part of Lifelong education.

Continuing Education

In 2022, the offer of Digital Continuing Education increased with the launch of two full thematic areas (Leadership and Data Science) and the first trajectory of the thematic area of Marketing and Finance. In addition, The Learning Gate, an innovative, high-impact learning ecosystem with a flexible, on-demand model, was launched as a minimum viable product (MVP). For more information about these new programs, refer to the section on the institute's innovative and digital learning experiences, under Continuing education. Below are presented the most relevant data for 2022.

100% of the catalog course was offered in a digital format* **(221)**

30% of students enrolled in catalog courses are EXATEC

85% of the business courses offered were in a digital format **(767)**

83% of the students enrolled in business courses take them in a digital format **(69,050)**

1,241 teachers

80,181 digital certificates granted

86 Net Promoter Score**

*A catalog course is a course open to the public
**Net Promoter Score features a scale of -100 to +100.

Source: Directorate of Planning and Effectiveness of the Vice-rectory of Continuing Education. Data up to September 2022.

MOOC

MOOCs (Massive Online Open Courses) are important at Tecnológico de Monterrey due to their significant impact on universal distance education, as a tool to attract students, and as an alternative continuing education offer, having 160,185 students enrolled to date. Among the distinctive characteristics of MOOCs are the asynchronous format and the ability for the participant to receive a verified digital certificate. Presented below are the most representative data in 2022 of Coursera, edX, and of the general public and Tec community bootcamps, which include students and collaborators of the institution.

Coursera

- **135,267** students enrolled
- **82** active courses
  - of which **19** are new
- **20** specialized programs
  - of which **6** are new
- **94** teachers
- **8.7%** students completing courses
- **4.8** satisfaction index*

edX

- **24,747** students enrolled
- **77** offer options
  - **61** courses
  - **4** micro-masters
  - **12** professional certifications
- **49** teachers

Bootcamps

- **171** students enrolled
- **2** bootcamps

*The satisfaction index is measured on a scale of 0 to 5, where 5 is the highest score.
**In 2022, the edX Essentials platform was available in January, February, and March.
Source: Department of Alternative Credentials. Data up to September 2022.

Social programs

Social programs are intended to promote social inclusion and equality through social impact and transformation, improve the quality of life, sustainable development of communities, and reduce the educational gap in Mexico and Latin America. For this, the following distance social programs are offered at Tecnológico de Monterrey: Prepanet and Virtual Learning Center.

Prepanet

Prepanet is a program that offers high-quality online high school education directed at people in situations of social inequality. Presented below are some of the most representative results of the work carried out at Prepanet during 2022:

- **2,921** students, of which **1,329** are newly enrolled
- **19,650** students-course
- **31** subjects
- **523** groups
- **5,322** graduates since 2019, of which **460** graduated in 2022
- **2,159** undergraduate students participating as tutors as part of their community service

Source: Prepanet National Directorate.
Data up to 2022.

Virtual Learning Center

The Virtual Learning Center is a social program that promotes access to quality education through a virtual learning community; it provides training using free courses and educational resources, as well as through the Learning Community Centers Network (Red de Centros Comunitarios de Aprendizaje, CCA). CCAs are physical spaces where children, youths, and the general community, particularly those from areas that are remote, in development, of limited resources, and lacking in educational resources, go to develop skills and capabilities to continue their academic studies, start a business or join the workforce.

Its web portal (Virtual Learning Center) logged 244,447 visits in 2022, adding up to a total of 14,539,199 from 2020 to date. The Center offers two types of courses: self-learning and with academic follow-up. In the latter, the student receives guidance and follow-up from a tutor-teacher during their learning process. In 2022, 17 teachers and 117 students of undergraduate programs from Tec de Monterrey, as part of their community service, participated, for an added total of 269 teachers and 5,155 students to date.

The Virtual Learning Center scored 93.76 (good and excellent) in the "Global Satisfaction Index" survey and 97.15 (good and excellent) in 2021. Below are shown the most representative results of the work carried out at this center during 2022:

SELF-LEARNING	ACADEMIC FOLLOW-UP
3,197 students Total students from **2020** to **2022**: **469,719**	**110** students Total students from **2020** to **2022**: **258,672**
119 courses	**10** courses
78 students graduated Total graduates from **2020** to **2022**: **2,481**	**51** students graduated Total graduates from **2020** to **2022: 77,523**

Source: Directorate of Education for the Development of the School of Humanities and Education of Tecnológico de Monterrey. Data up to October 2022.

IV.

Innovative educational and digital experiences in the institution

Innovation, like any proposal of improvement and change, requires not only ideas but also their execution through the effort of all the collaborators of this creative process. Sometimes through trial and error, sometimes with unexpected results, we share here the most remarkable educational experiences of 2022 due to their impact on each of the National Schools of the institution, as well as those of High School, Continuing Education, and the LiFE program: from projects related to virtuality, sustainability, and social inclusion, to digital learning initiatives such as the Tec Virtual Campus metaverse and The Learning Gate.

School of Architecture, Art and Design

Educational innovation and digital education in the School of Architecture, Art, and Design in 2022.

- **26 educational projects**
- **19 training units**
- **39 teachers**
- **4,000 students-course**

Based on the projects that have developed naturally at the School of Architecture, Art, and Design, we can't discuss digital education and educational innovation as separate entities. While they have no causality, a close relationship exists between the developed projects.

Technology is not only used to solve challenges but also to strengthen social and student interaction. Likewise, our School's projects have shown an evident concern for social inclusion and our environment. The projects and experiences developed in 2022 by our teachers can be grouped into the following three categories.

1. Virtuality to connect

We learned several lessons from the pandemic, including the ease of distance education and the importance of social interaction in educational experiences. This is why we see a great opportunity in virtual reality and the metaverses that consider those two aspects: fusing physical reality with digital virtuality.

2. Generation of proposals for sustainability

Educational innovation projects show new ways to design products and systems that conserve the environment and consider people's practices.

3. Development of inclusive initiatives

Design and research must consider people's various realities, not only those of the majority. That is why, as part of our practices and challenges, we developed proposals and initiatives focused on including children and people with visual diversity.

Strategic projects 2022

1. Virtuality and educational experiences

The use of virtual reality technology has been an essential factor in this category of projects and experiences that seek to improve learning and facilitate the integration of students. Some of the most representative projects and experiences were:

- **Active Learning Experiences in the Metaverse of Tec's Virtual Campus**
  The teaching of Installations and alternative systems course in a virtual environment.

- **Architectonic design with virtual reality**
  Creation of a virtual reality laboratory where students can better perceive, understand, analyze, and solve their projects during the design phase.

- **Galería Tec**
  Collaborative space to showcase works and presentations for other schoolmates after analyzing and curating a work of art, resulting in a new proposal in relation to its context and to famous painters.

- **Creation of ICRI Method (Ideation, Categorization, and Regrouping of Ideas)**
  Implementation of a method to generate and integrate ideas in work teams online. This method helped to reduce communication barriers, interpersonal conflicts, monopolization from a single team member, and moving away from the main topic.

Participating teachers

Active Learning Experiences in the Metaverse of Tec's Virtual Campus
- Antonio Luis Juárez Negrete

Architectonic design with virtual reality
- Alfredo Mauricio Flores Herrera
- Emanuele Giorgi 0
- Pablo Alberto Rentería Rodríguez
- Pablo Hernández Quiñones

Galería Tec
- Antonio Luis Juárez Negrete

Creation of ICRI Method
- Juan Carlos Márquez Cañizares
- Juan Carlos Rojas López

Project impact

The projects were implemented in the Querétaro, Chihuahua, and Monterrey campuses during the winter and February-June 2022 periods.

9 teachers

2. Proposals for sustainability

Another important category was made up of the projects and experiences looking to generate sustainable solutions for the environment. Some of the more representative projects and experiences were:

- **Ethnographic research for the design of sustainable products for water care**

  Model generation (of products, systems, or services) to prevent discarding fats and oils in Nuevo León's pipelines, considering people's and the environment's needs.

- **Novus | App to promote reflection and sustainable development learning**

  Development of an app mockup to encourage reflection and learning about sustainable development. Its antecedent was the Sostek platform.

- **Immersions in a circular design**

  A proposal to develop circular economy attitudes and skills in children and teens from Zapopan (Jalisco) using circular design immersions.

- **Alternatives to reduce the use of disposable materials in-campus**

  Creation of alternatives and systems that could eliminate or reduce the use of disposable materials in Campus Querétaro, focusing on the interest and commitment of people to change their consumption habits.

Participating teachers

Ethnographic research for the design of sustainable products for water care
- Griselda Esthela Oyervides Ramírez
- Elizabeth Martínez Gaspar
- Mayra Marcela Rendón Olvera

Novus | App to promote reflection and sustainable development learning
- Martha Elena Núñez López
- Daniel Savedra Olivo
- Aura Elena Moreno Guzmán
- Ricardo Aguayo González
- José Eduardo Ferrer Cruz
- Mayra Marcela Rendón Olvera
- Griselda Esthela Oyervides Ramírez

Immersions in a circular design
- Christiam Ivan Mendoza García
- David Sánchez Ruano

Alternatives to reduce the use of disposable materials in-campus
- Rebeca Elizabeth Torres Castanedo
- Rodrigo Vilanova de Allende

Project impact

The projects were implemented in the Monterrey, Mexico City, Guadalajara, and Querétaro campuses during the February-June and summer 2022 periods.

12 teachers

3.Social inclusion projects

Among the projects developed by EAAD, some considered vulnerable populations, such as children and people with visual diversity. We highlight the following projects:

- **Systematic mapping for social innovation**
  Research activity that took on the use of public spaces focused on children and inclusion to address the physical and emotional consequences caused by the lockdown during the Covid-19 pandemic.

- **Design for visual diversity**
  Creating proposals for products, systems, and experiences considering populations with visual diversity.

Participating Teachers

Design for visual diversity
- Mariana Maya López
- Alberto De Icaza Murua

Systematic mapping for social innovation
- Edgar Paul Martínez Ludert Muñoz de Cote
- Baltazar Ernesto Alvarado Zamora

Project impact

The projects were implemented in the Sonora Norte and Querétaro campuses during the February-June 2022 period.

4 teachers

4. Experiences in innovative educational spaces

Professor with hologram effect

In September 2022, the first intercontinental class with hologram effect was held between Tec de Monterrey and Delft University of Technology from the Netherlands. The class was conducted in real-time with students and teachers of Campus Querétaro from the School of Architecture, Art, and Design, as well as students and a guest teacher from TU Delft.

From Tec de Monterrey, the teachers Paola Bárcena and Ernesto Philibert participated; and from the Department of Urbanism of TU Delft, teacher Chris Zevenbergen participated.

School of Social Sciences and Government

Educational innovation and digital education in the School of Social Sciences and Government in 2022.

- **39 educational projects**
- **15 training units**
- **49 teachers**
- **3,900 students-course**

To meet the needs of a society transforming at an accelerated rate, in 2022, the School of Social Sciences and Government offered its students various innovative and digital experiences led by a faculty of excellence. It focused on putting analytic and technological tools at the service of students, the world citizens who will build the solutions to the great political, economic, and social challenges of the future.

Strategic Project 2022

Global Week. Tec Week ELITE - Diversity in a Globalized World

Imagine a course in which our undergraduate students, as part of their curriculum, and having a shared experience with students from all campuses, also have an international experience through the collaboration and participation of teachers and students from various international universities without leaving their own campus. Sessions with guest experts in a synchronous digital format, using technological tools, immersive resources to carry out their activities, work teams, and final presentations, impacting over 100 students per group. All of this revolves around global topics and problems and is aligned with our institutional objectives, such as consolidating the Tec21 Model and improving our students' academic experience. This innovative course is called "Tec Week ELITE – Diversity in a Globalized World."

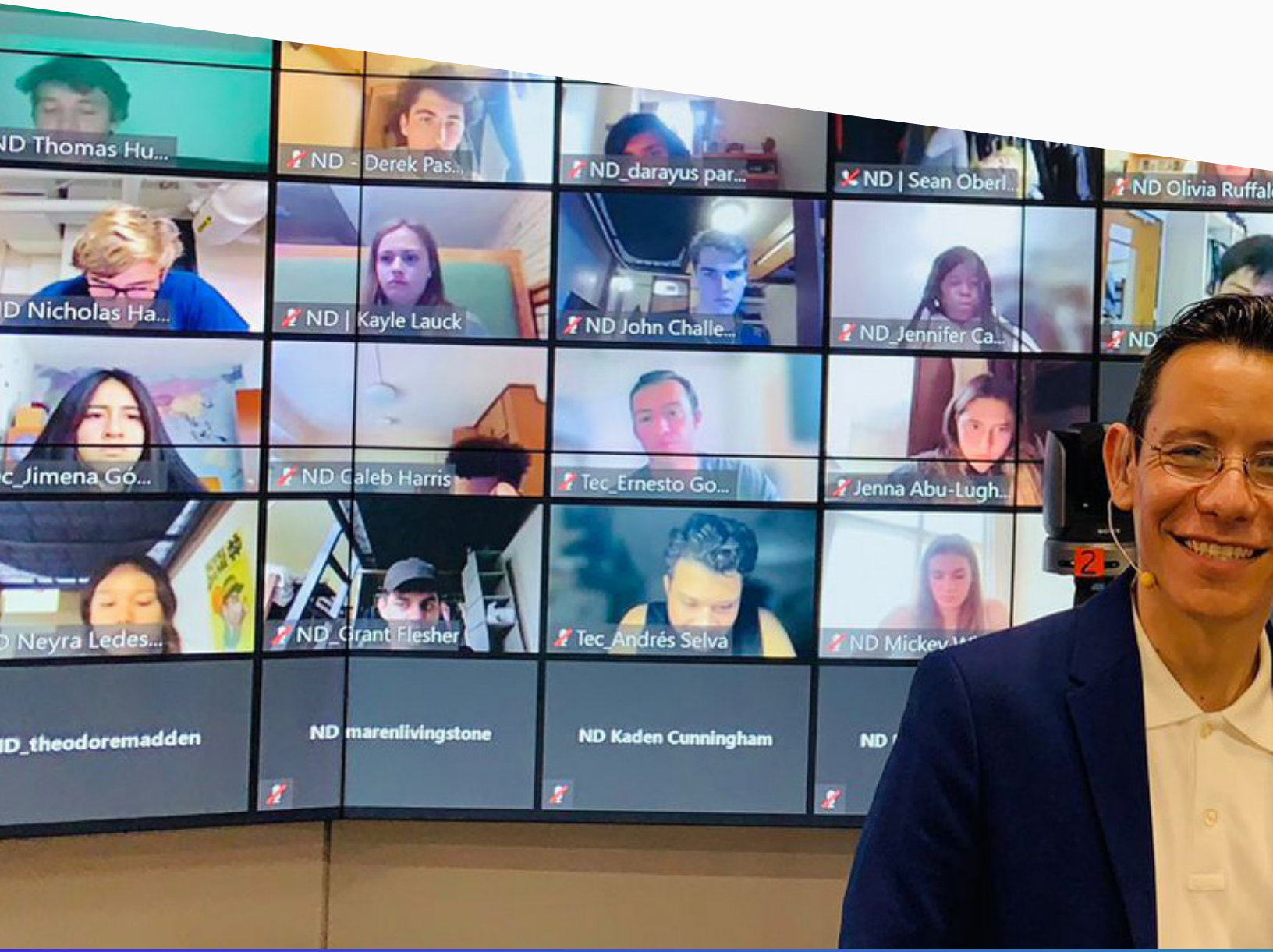
This complete immersion has kept growing, and its impact was evident from the first year of operation. In 2022, Tec Week Elite, with only 8 groups, had an impact on 833 students: 534 from 20 different Tec campuses and 299 from 4 foreign universities (University of Notre Dame, Universidad San Francisco de Quito, Pontificia Universidad Católica del Perú and BINUS University of Indonesia). The course was offered in Spanish and English, and 9 renowned experts in their field participated, as well as 6 guests of various nationalities that shared their worldview: quite a feat. All those involved in its development and execution feel proud of this achievement.

Thus, Tec Week ELITE, Diversity in a Globalized World, has made our students aware of one of the most important problems we currently face: recognizing ourselves as a single humanity, members of a single planet, where despite our different beliefs, preferences, or economic position, we proclaim the equality of understanding, dignity, and human rights.

Other topics covered were gender inequality, migration, discrimination, and the lack of access to opportunities for a significant segment of the global population. Classes are enriched by the participation of various experts such as internationalists, historians, lawyers, economists, and public administrators from Tec de Monterrey and prestigious national and international universities, including some of our most renowned EXATEC.

How did the initial idea of developing a Tec Week ELITE start and what triggered it? It was born to solve the high demand for specialists to teach the Tec Week of Global Vision. It evolved into a high-impact project of inclusion and an immersive international experience.

Tec Week ELITE, designed, developed, and implemented by the teacher Susana Peña Parás, is an example of how our institution identifies problems and generates innovative solutions, always based on improving students' experience and academic quality. It is also an



example that highlights creative possibilities by converging ideas, commitment, and teamwork.

Tec Week of Global Vision is the result of the added talents and efforts of the teams of Digital Education, Educational Innovation and Digital Learning, the Vice-rectory of Internationalization, and the School of Social Sciences and Government, in addition to the technological tools the Tecnológico de Monterrey makes available to its academic community.

In the Hall Immersive Room (HIR), it is impressive to witness the sessions with hundreds of students connected worldwide, listening to master lectures, and developing immersion activities that allow them to make the acquired learnings their own. Testimonials from students, such as "[...] I feel like I'm on a class from the future [...]," fill us with energy to meet the challenge of the next edition, renewing our desire to keep innovating on the courses and academic experiences of our students.

School of Humanities and Education

Educational innovation and digital education in the School of Humanities and Education in 2022.

55 educational projects

31 training units

91 teachers

7,600 students-course

At the School of Humanities and Education, in 2022, we continue working on the consolidation of the implementation of the Tec21 Model and of the innovation within it in the following areas:

- Promoting the professionalization of the creative and cultural industries through a comprehensive offer of concentrations, professional and research internships, as well as the design of new topics for Tec Semesters.

- Impact on the humanistic education of students at Tecnológico de Monterrey to support the development of critical thinking skills, language and code management, ethical and civic commitment, and social intelligence by expanding general education subjects.
- Development of citizen laboratories to promote sustainable development education and to carry out social innovation projects of ethical and civic commitment from our students.

Some of the most successful innovation activities were the organization of Tec de Monterrey's first national short film festival, in which over 300 students and 50 teachers from the 18 Creative Studies entrances participated; the extended design of 20 concentrations: 11 disciplinary and 9 transversal, as well as the design of the general education subjects: Cinematographic Analysis, from Lumière to Netflix; Ecofeminism and environmental humanities; Inclusive leadership and diversity; and World Travelers: narratives, maps, and frontiers, all of which incorporate to the total subjects offer in 2023; three during the FJ23 period and three during the AD23 period.

Another significant challenge was the rethinking and integration of pedagogical approaches and of the use of multiple technological tools into digital educational activities, not only as part of solutions to the impossibility of face-to-face meetings but to ensure a flexible and differentiated education where we can include digital and remote tools and methodologies to our everyday learning processes, formal or informal.

In 2022, the School of Humanities and Education offered 44 groups in the Digital Education, Online education, and FIT areas. These groups included courses for Tec21 plans (38 groups) and courses for previous plans (6 groups), in which 6,946 students participated.

Likewise, 2022 was a year of technological preparation to return to classrooms and laboratories, where practices and potency have increased due to the possibilities afforded by the remote and on-site uses of software and the face-to-face advantages of teams and material resources. Starting next year, the search of the School of Humanities and Education for the integration of the best practices, tools, and methodologies of digital education will continue, not as a potential complement to the training of our students but as an essential part of learning for life required by a more demanding reality. This way, we will increase the number of courses and groups offered in a digital format to reach more students.

Strategic Projects 2022

Short film festival

Tec de Monterrey's short film festival aims to generate a space of exhibition and recognition for the best audiovisual narrative projects made by students from several courses of their academic programs, as well as to reward student projects from our high schools, special projects of other initiatives of the school such as gender equality in this first edition, as well as to honor a national film personality, as was the case of the documentary filmmaker Juan Carlos Rulfo.

Leader teacher

- Juan Carlos Olmedo, Regional Director of the Department of Media and Culture in Mexico City

Project impact

The project was implemented in the **18** campuses with the Creative Studies entrance during the February-June 2022 period.

- **50** teachers
- Over **300** students
- **43** short films nominated at a national level from the five regions
- Over **150** short films in the local and regional phases
- **7** award categories:High School; Entry, Focus, Fiction, Nonfiction, Concentrations, and Gender equality.
- A jury made up of **24** personalities representing the film industry, international film festivals, and the world of literature and culture, among others.
- **3** strategic allies of the festival: Toronto International Film Festival® (TIFF), Fundación FEMSA and Cineteca de Guadalajara.
- Juan Carlos Rulfo was recognized with an award for his trajectory.
- Keynote lectures and TIFF's Filmmakers Lab sessions.

Editathon: women from my region

The project focused on providing visibility to outstanding women from various disciplines through composing or editing Wikipedia profiles with a gender perspective. Men usually perform the editing process on this platform, so we sought to increase the participation of women editors.

Participating teachers

- Lilia Ortega
- Liliana Tello
- Vanesa Serrano
- Fernando Mora
- Gabriela Silva

Project impact

The project was implemented in the Chihuahua, Aguascalientes, Guadalajara, Sinaloa and Sonora Norte campuses during the February-June 2022 period.

108 students

Video poetry and video essay contest on the play "The lost children" by Valeria Luiselli

Interpretation of the play "The lost children" by Valeria Luiselli in video poetry format. The three best videos were awarded prizes at the Cineteca Sonora. They were also presented during the Binational Concert at the Border Wall of Naco, Arizona, and Naco, Sonora.

Participating teachers

- Fernando Adrián Mora Dávila
- Ana Lourdes Álvarez Romero

Project impact

The project was implemented in Campus Sonora Norte, during the August-December 2022 period.

60 students

School of Engineering and Sciences

Educational innovation and digital education in the School of Engineering and Sciences in 2022.

79 educational projects

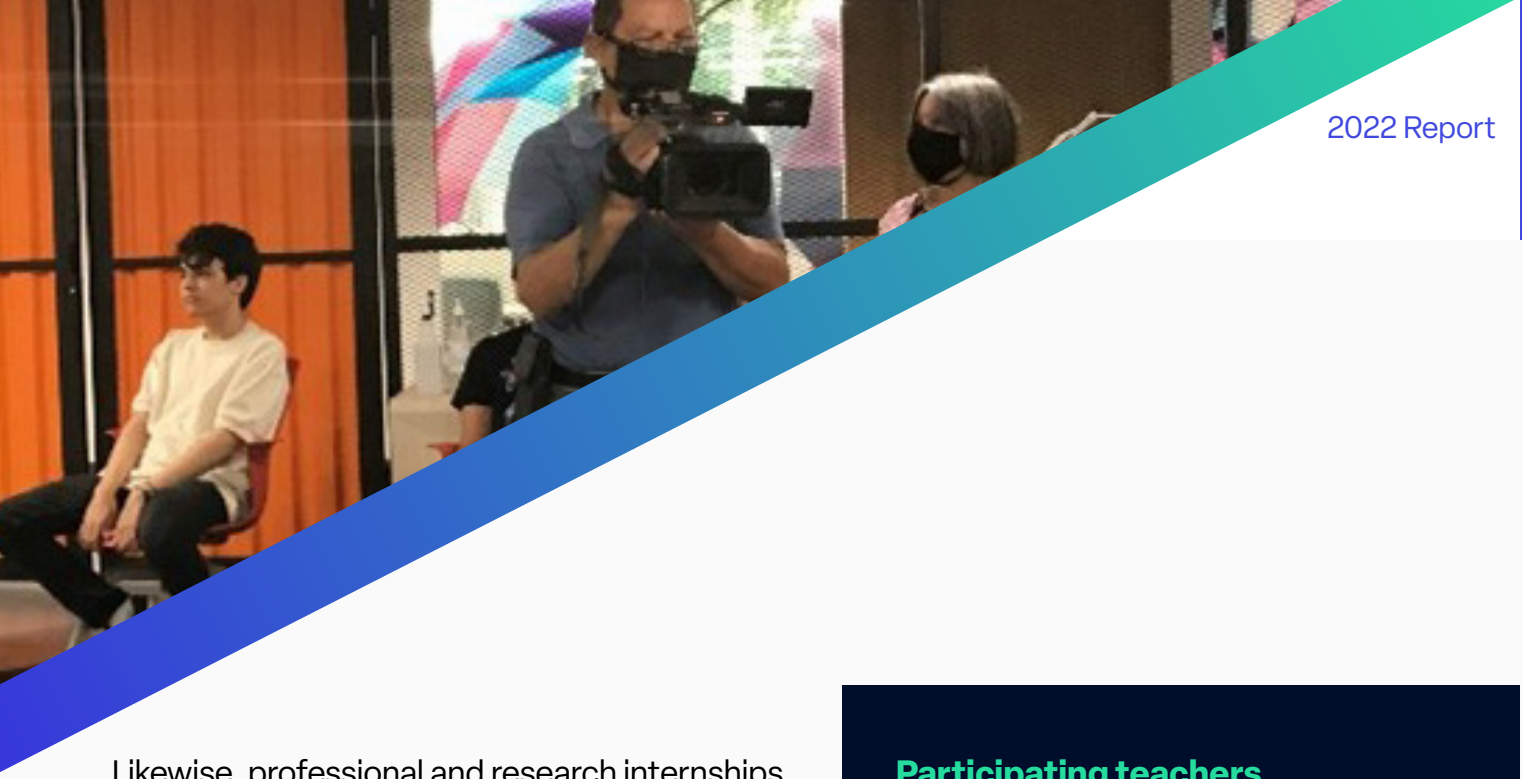
48 training units

142 teachers

8,600 students-course

Educational innovation is already part of the School of Engineering and Sciences DNA. This year, among the multiple innovations generated, we would like to highlight those related to artificial intelligence, drones, and technological platforms that help students generate competencies and teachers in their invaluable work.

Thanks to the use of artificial intelligence and the help of technological platforms, the School of Engineering and Sciences focuses much of its innovation on adaptive learning, allowing students to progress at their own pace.



Likewise, professional and research internships have been increasingly promoted so that students can participate in this educational innovation experience.

As part of the digital learning strategy, in 2022, Elite classes continued to be promoted, allowing the School's students to be in contact with specialists from different locations.

Strategic projects 2022

TEC Time Travelers

This immersive resource is used as part of the adaptation process of the first-year students at the School of Engineering and Sciences, and it offers them a journey in time through the history of the Tecnológico de Monterrey, its current educational program and its vision for the future, according to the Institutional Strategic Plan for 2030. The journey presents a fictional story and narrative, using storytelling and gamification to increase attention, motivation, and a favorable attitude toward learning. It is guided by an iconic world of science and engineering character who presents the students with their missions and consequences.

Participating teachers

- José Obedt Figueroa Cavazos
- Olga Laura Cantú de la Garza
- José Rogelio Rivas Pimentel
- Mauricio Mojica Irigoyen

Project impact

The project was implemented in Campus Monterrey during the February-June and August-December 2022 periods.

688 students on-site in Monterrey and **+3,500** at a national level

+50 teachers

It was implemented in the Training Unit **F1001B**

Smart evaluation of argumentative tests supported by AI

Evaluating an argumentative text requires interpreting the ideas, basis, and solution processes expected from students. With this goal in mind, the tool of latent semantics analysis LSA, an AI technique to interpret argumentative tests, was applied to the work of 250 students. This tool can evaluate 250 argumentative texts in 5 minutes, which improves the actual review time by approximately 10 and 15 minutes per student. It also identifies each student's terms and the approximate percentage of closeness to the expert's answer used as the basis for the student's evaluation.

For this, a protocol of implementation was established for the review process of the elements that students must use in a written argument, as well as recommendations for teachers to use the tool and develop the feedback and evaluation processes more efficiently.

Argumentative text evaluated with AI tool "smart evaluation of argumentative tests".

Participating teachers

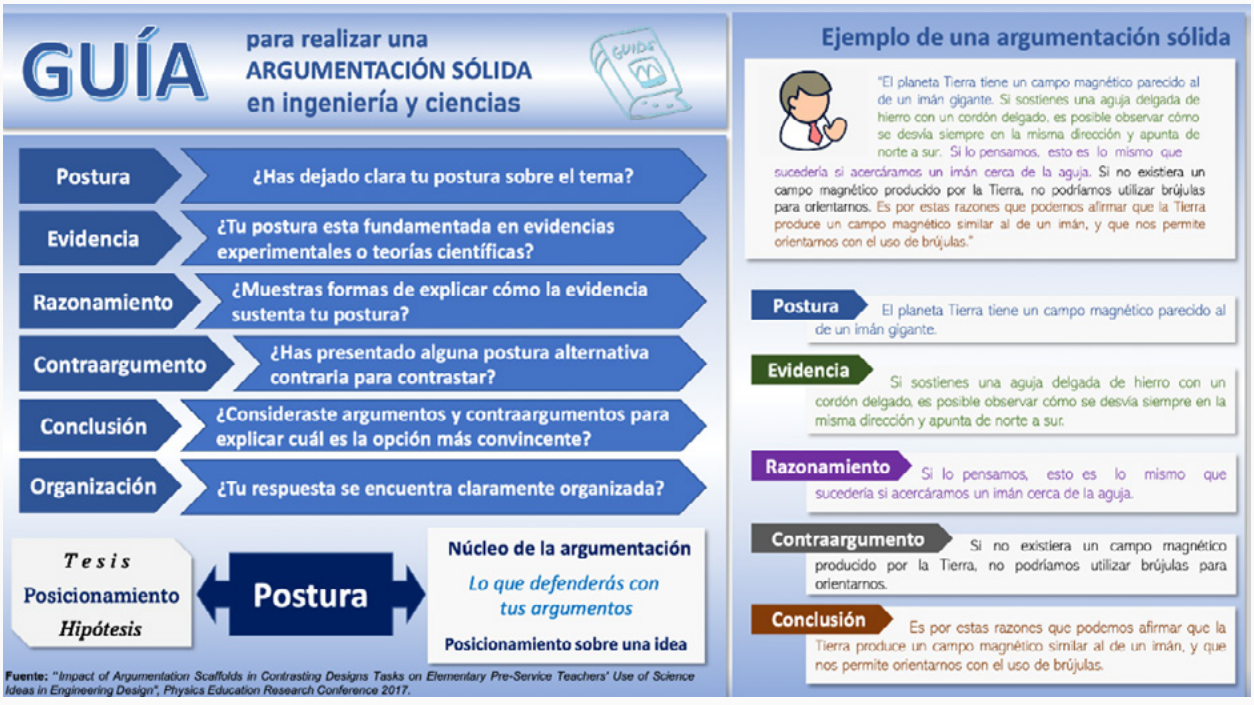
- Omar Olmos López
- Santa Esmeralda Tejeda Torres
- Lilian Aurora Ochoa Ontiveros
- Ana María Mutio Rico
- Eréndira Gabriela Avilez Rabanales
- César Eduardo García Ortiz
- José Manuel Pardo Regueiro

Project impact

The project was implemented in the Laguna, Monterrey, Saltillo, and Toluca campuses during the August-December 2022 period.

250 students in **6** courses of the School's **4** paths

7 teachers



Practice infographic developed for students evaluating argumentative texts.

Biomolecules rally: 3D printing and gamification as a strategy for Biochemistry learning

Gamification-style activity in which, through 3D printed structures, the students were asked to identify biomolecules previously seen during the theoretical portion of the class (including videos and models). Students were able to have a "tangible" understanding of theoretical concepts, appreciating the "real" look of these molecules and achieving a greater understanding of the relationship between their physical structure and their function within the cells. This pilot test was made up of two groups of 25 students each, and the level of experience and learning was compared to that of two control groups. The impact was highly favorable for the students that participated in the rally, as they not only had a better understanding of concepts that are commonly too abstract and complex to understand, but they also enjoyed it more and showed more enthusiasm and satisfaction at the end of the course. The students also rated the experience as very pleasant, entertaining, and highly educational.

Participating teachers

- Luis Eduardo García Amézquita
- Angélica Lizeth Sánchez López
- Francisco Javier Montes Montejo

Project impact

The project was implemented in Campus Guadalajara during the August-December 2022 period.

50 students

7 teachers

Smart Feedback

Technological tool for using pedagogical guides to stimulate learning motivation with affective elements. Through artificial intelligence, emotions involved in the feedback are identified to trigger attitudes to motivate learning in students.

The tool helps identify the teachers' emotions in their written feedback to recalibrate it so they can express the feelings they are trying to convey. Thus, the importance of training teachers capable of using their feedback to stimulate a mind that is socially connected and emotionally secure conducive to significant learning.

Participating teachers

- Lilia Carolina Rodríguez Galván
- Patricia Esther Alonso Galicia
- Eduardo Daniel Juárez Pineda
- José Manuel Velázquez Hurtado
- Mariana Maya López
- Ivo Neftalí Ayala García
- Kenneth William Bauer
- Eduardo Erik Larsen Garza

Project impact

The project was implemented in the Querétaro, Puebla, and Guadalajara campuses during the August-December 2022 period.

445 students in **19** groups

8 teachers

3 international publications

School of Medicine and Health Sciences

Educational innovation and digital education in the School of Medicine and Health Sciences in 2022.

- **30 education projects**
- **20 training units**
- **114 teachers**
- **9,100 students-course**

At the School of Medicine and Health Sciences (EMCS), the use of technology in the teaching-learning process is constantly being updated. Prominent authors have highlighted the advantages of employing technology for content delivery for adopting knowledge, in evaluation processes, or in specialized simulation techniques that enhance the educational experience.

Every innovation starts with the teacher's dream of improving their students' learning. With the institution's support in the design and implementation of the experience, the teachers organize, in a structured manner, the implementation and transference of the technological resources employed.

The use of technologies indicates a process of reflection to establish the appropriate type of specialized resource to facilitate the acquisition or evaluation of the students' knowledge. That is why we extend our gratitude to the teachers who have participated in the innovation processes for the benefit of the students' learning, the use of technologies that benefit the main actors of the teaching-learning process, and the students who benefit from the access to resources designed with well-crafted learning objectives.

At the School of Medicine and Health Sciences, we work to incorporate immersive elements that provide our students with better content for their educational offers.

Strategic Projects 2022

In 2022, the educational innovation projects by the EMCS focused on better use and development of spaces in the institution's metaverse, as well as the use of mixed reality to practice specific processes; lastly, an initiative of adaptive learning was introduced to offer students a variety of contents that facilitates the learning of their training units.

Immersive learning strategy with extended reality

As part of the initiative of immersive learning with technology, a Health Sciences metaverse was created, where students applied and developed knowledge and competencies in real and virtual environments in an experiential, active, and flexible manner, according to their professional and personal needs. The first programs in this initiative were Medical Surgeon (implemented) and Dentist Surgeon (in development).

Participating teachers

- Rosa del Carmen López Sánchez
- Lizette Susana Hernández Cárdenas
- José Carlos Presa Ramírez
- Ernesto Ramos González
- Karen Lucía Reyes González

Project impact

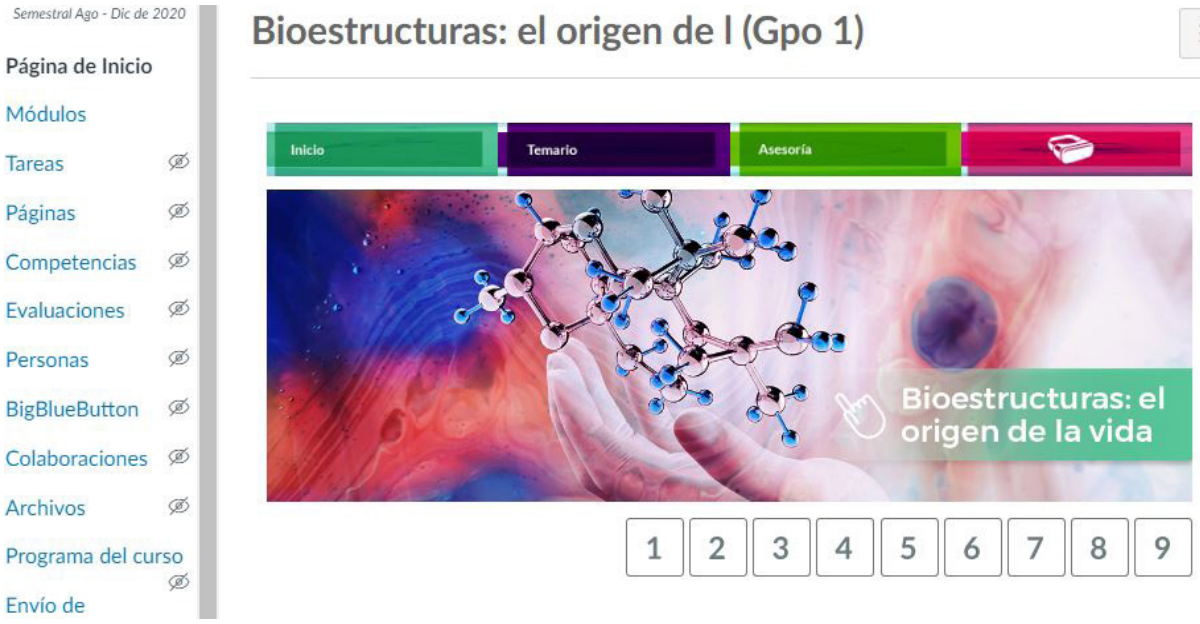
The Medical Surgeon project was implemented in Campus Monterrey.

350 students

9 teachers

Adaptive Learning Strategy

When the implementation of the Tec21 Model started, 2 courses were developed using the adaptive learning strategy: “The biology of the human cell” and “Biostructures: the origin of life.” Taking advantage of the benefits of this strategy in hybrid and online environments, the courses offered students resources in various formats and with learning routes that guided their learning, creating a more individual experience according to their needs and preferences.



Participating teachers

- Lizette Susana Hernández Cárdenas
- José Ascención Hernández Hernández
- Roxana Alicia Rivera Prieto
- Blanca Margarita Bazán Perkins
- Anahí González Mercado

Project impact

These courses were offered in 2022 as part of the leveling process in both courses.

235 students

6 teachers

Business School

Educational Innovation and digital education in the Business School in 2022.

- **65 education projects**
- **37 training units**
- **87 teachers**
- **4,600 students-course**

EGADE Business School and Tecnológico de Monterrey have always been renowned for exploring new and better ways of carrying out the teaching-learning process, with the intent that our teachers integrate various pedagogical techniques into their courses so they can transform their classes into memorable and significant learning experiences, for students to develop their skills and generate real value for the organizations they work for and for society at large.

In 2022, we devoted our efforts to exploring and accompanying our students in the realization of a disruptive process:

- Methodologies of active learning, such as the case method and the collaboration strategy based on the COIL methodology to promote internationalization.
- Class dynamics that integrate engagement techniques such as storytelling and gamification.

We also sought to promote using the Hall Immersive Rooms to improve the teaching experience of some of our online courses.

One of our strategic objectives focused on generating transformative, international learning experiences of excellence. With this challenge in mind, we are designing our educational innovation portfolio with design and support tools so that teachers can create learning experiences conducive to critical thinking and life, immersive and experiential learning.

We have new challenges in 2023, and we will focus on the redesign of our programs based on EGADE's new strategy, and also on reaching new markets, improving our learning experiences with a combination of formats and methodologies to create contents that are more flexible and applied to adapt new proposals to different value segments. To achieve all this, we will take advantage of what digital education brings to the table.

Strategic projects 2022

Game-Based Learning to engage and motivate students

A gamification strategy was used to incentivize the participation of students to increase their motivation through game mechanics in the design of academic content and activities, as well as to create innovative and transformative experiences that would enhance and improve the effectiveness of the teaching-learning process in graduate students.

5 activities with EGADE teachers were considered, including solutions proposals for a Harvard case and a custom case, as well as play activities to solve problem situations posed by the participating teachers.

Participating teachers

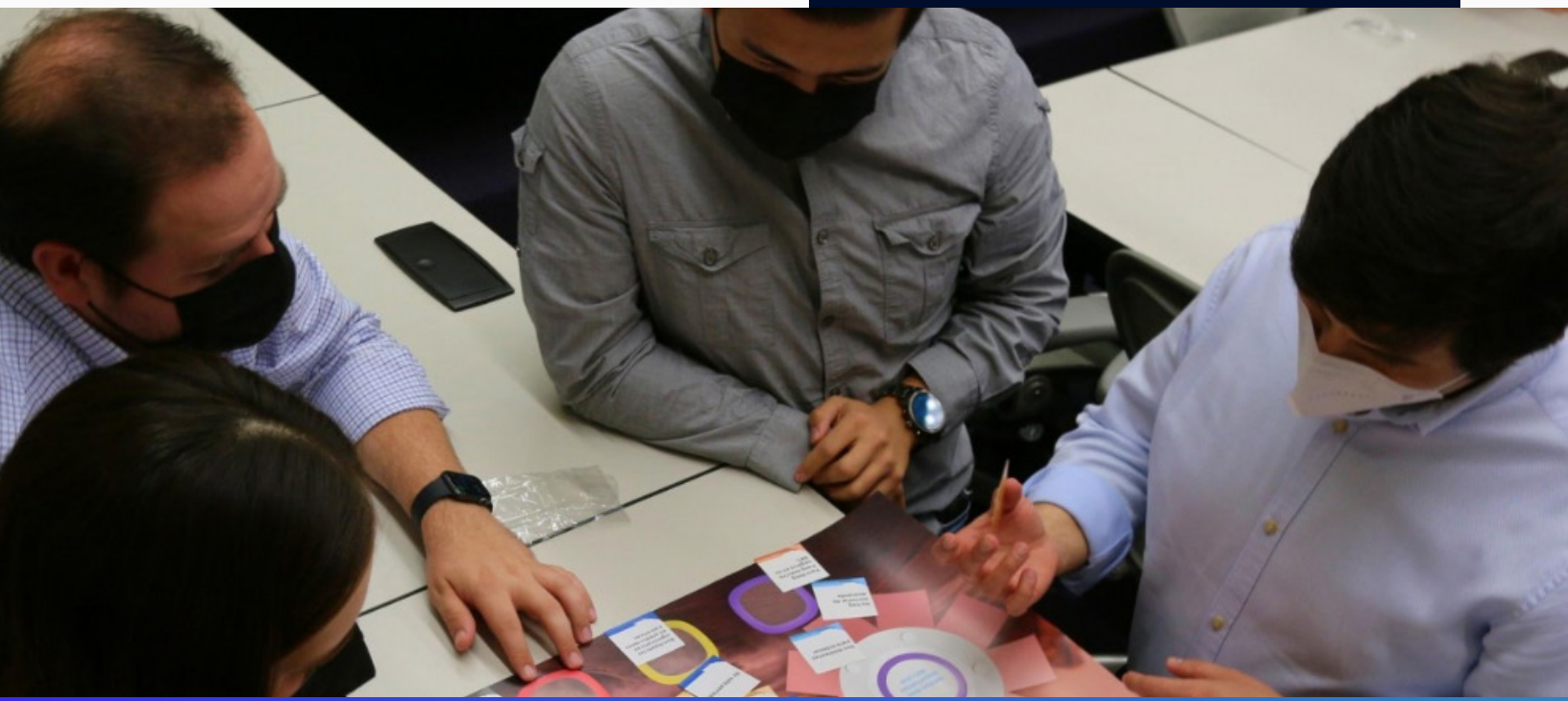
- Federico Trigos Salazar
- Rolando Fuentes Bracamontes
- Claudia Ramos Garza
- Claudia María Quintanilla Domínguez
- Ricardo Ernesto Buitrago Rubiano

Project impact

The project was implemented in the San Pedro, Guadalajara, and Santa Fe campuses during the August-December 2022 period.

141 students

5 teachers



National MBA meeting with gamification

The national MBA meeting was held in Campus San Pedro, Monterrey, on Softskills, with an attendance of 80 students from the San Pedro, Santa Fe, and Guadalajara campuses. The goal of holding the event with gamification was to generate a feeling of belonging and to connect with the values and services of EGADE, in addition to fostering networking and the participation of students through a different and memorable experience. Students had to complete 5 gamified challenges during the event, for which they were provided with a passport with the instructions and a space to place the badges awarded upon completion of each challenge, as well as a ticket to participate in a raffle at the end.

Project impact

The project was developed in the San Pedro, Guadalajara, and Santa Fe campuses during the August-December 2022 period.

80 students

World Online Teams

An EGADE Business School initiative where, through a high-impact virtual practice complementary to regular classes, teachers with similar courses from different business schools can coordinate so their students can collaborate on a specific project, whether a case or a business plan, or a pitch. Its objective is to promote internationalization at home through collaborative activities that motivate the development of intercultural competencies, stimulating the learning process in a virtual environment, and connecting EGADE students with students from international business schools.

Project impact

The project was implemented in the San Pedro and Santa Fe campuses during the August-December 2022 period.

50 students

2 teachers

Hall Immersive Room: learning space with technology

EGADE teachers conducted their online classes using the Hall Immersive Room, an immersive classroom designed for teaching and broadcasting distance courses that, with the integration of video, communication, and interaction technology, is conducive to engagement, thus providing a better experience to students.

Project impact

The project was developed in Campus Monterrey during the August-December 2022 period.

40 students

2 teachers

High School

Educational innovation and digital education in PrepaTec in 2022.

8 education projects

3 training units

76 teachers

4,764 students-course

As part of the innovative and digital strategies developed by PrepaTec in 2022, from June to November, a student-centered learning experience called **Transdisciplinary Project Based Learning** was designed and implemented, which integrated the approaches of Natural Sciences, Mathematics, Computing, Communication, and Social Science, aligned to the objectives of

Sustainable Development. The design was developed in June 2022 with the support of Principled Learning Strategies and 3D Education and with the participation of teacher teams of all the disciplines of the Estado de México, Cuernavaca, and Monterrey campuses. The pilot was launched in the August-December period, with a national implementation coming in 2023.

The objectives of this experience are:

- Developing an interdisciplinary project for all the subjects in which students develop and show their competencies.
- Promoting student-centered learning with a practical project in which they can tackle a global challenge from a local perspective, using their voice and choice.

The design of the experience includes a holistic approach and a trigger question, a field visit, and a milestones calendar. It incorporates a third-semester project with a climate crisis interdisciplinary topic and another for the second semester about peace and wellness, integrating the development and evaluation of competencies from all disciplines.

The project methodology begins with a trigger question, an authentic face-to-face experience conducive to generating questions, and, in turn, the inquiry process. Afterward, a series of milestones must be reached: a written article of scientific dissemination that includes the social component of the climate crisis, a persuasive speech to be spoken before a real audience, a public exhibition where they show their solutions designed for the community and a final reflection that sums up all the students' work and learning.

Below are presented some of the pilot projects developed as part of this learning experience:

- Starina Sanctuary: Autonomous greenhouse located in nursing homes and schools in Monterrey. The project proposes using sensors to control humidity, temperature, and pH conditions.

- Design prototype of a robotic mill that separates solid waste in bodies of water, based mainly on the selection of waste through sensors that detect the physical properties of waste and signs of life, distinguishing between fauna and waste.

- Alternative life: Intending to reduce the consumption of water used in meat production, this project seeks to create a line of vegan food that is freezable, convenient, and economical, based on vegetable ingredients, such as peas, chickpeas, rice, and beets.

It should be noted that this type of transdisciplinary project generates high-value challenges not only for our students, who see connections between their courses and are empowered as agents of change in their community but also for the teachers, who feel energized when leaving their own classroom and discipline to seek holistic, experiential and applied learning in the context of each community.

Strategic projects 2022

Cultural Heritage Museum of Mexico in Multicultural agents and perspectives in its digital education version

To understand and study the characteristics of Mexican culture, students visit the Cultural Heritage Museum of Mexico through an immersive resource. They later visit the page www.cram.com and, as a team, prepare interactive digital cards with the stills of the mural that most attracted their attention from the museum and describe the image according to what was studied in the unit. Once the activity is done, it is shared with their classmates.

Project impact

161 students

5 teachers

Immersion activities in virtual environments

- Poster exhibition in Multicultural agents and perspectives where expressions of urban art, signs, and symbols and their meaning for social change are identified.
- Philosophical Thought Rally with themes according to the philosophical branches.
- Development of models in the field of digital business with innovative products by work teams.

Project impact

951 students

26 teachers

Pinekel Challenge on the topic of Digital Business in its digital education version

To have greater participation in the virtual sessions scheduled during the semester in the online Digital Business course, students participate in the Pinekel challenge, where they can earn mini-rewards through the app. The top 5 places at the end of the semester are granted a final reward.

Project impact

659 students

19 teachers

Virtual supermarket in the Nutrition and wellness topic course, in its digital education version

The activity consists of going to a virtual supermarket, walking through its aisles, seeing the different products offered and, as a team, students simulate buying a product: among the four members of the team, they analyze the products and choose what they consider the best snack. The activity features the updated labeling of food and drinks packaging in Mexico.

Project impact

510 students

6 teachers

Honest poster virtual gallery in the elective course The world through film

Virtual gallery with the Mozilla Hubs tool where students redesign a movie poster and analyze what would happen if movies were honest about their storylines. The virtual gallery is shared at the end of the activity, and students visit the space to interact with them.

Project impact

483 students

8 teachers

LiFE

Educational innovation and digital education in Leadership and Student Training (LiFE) in 2022.

- **3 education projects**
- **2 training units**
- **8 teachers**
- **249 students-course**

As part of their strategy of educational innovation and digital education, the Leadership and Student Training (LiFE) programs designed various courses in 2022 for the self-knowledge process of our students to influence their human flourishing. In coordination with the Department of Educational Innovation, the classes “Internal knowledge and compassion” and “My life plan at Tec” were offered.

Through the “Internal knowledge and compassion” course, the student realizes the relationship between their reality and how it relates to their internal experience and the resulting behaviors from such interaction; it also implements compassionate communication strategies that help them cultivate positive resonance in interpersonal relationships.

Likewise, techniques like breathing, meditation, and reflective writing are employed to help students to clarify their ideas and focus their attention on the here and now.

The course “My life plan at Tec” incorporated contents with adaptive learning so students can define their life purpose, identify their appropriate learning styles and study techniques and implement strategies for their integral wellness.

Continuing Education

Educational innovation and digital education in Continuing Education in 2022.

3 education projects

9 teachers

550 participants

Within the Vice-rectory of Continuing Education, there is constant innovation to continue impacting its public, offering products of the highest academic quality and a memorable experience for all students.

Use of the metaverse in Lifelong Education

To include innovative teaching strategies based on cutting-edge technology that favors social interaction, eliminate the time and space barriers, and create memorable experiences through virtual worlds, this year, the Vice-rectory of Continuing Education integrated the use of the Tecnológico de Monterrey's metaverse, Tec Virtual Campus, in their digital programs.

Tec Virtual Campus is a virtual environment in 3D that allows the expert and the participant to interact, generate content, be part of activities, and create memorable experiences in a free and autonomous manner, both collaboratively and individually, using a custom avatar (previously started in the virtual world); this avatar allows for a sense of community, even when teachers and students are not in the same physical space, which would be difficult to achieve using other tools or platforms.

The **Big Data as a Business Strategy** certification included the Elevator Pitch methodology as part of their teaching-learning strategy, in which participants presented their final projects and received immediate feedback from both experts and their peers within the Tec Virtual Campus.

The activity gathered the participants of the certification in a single virtual space, regardless of their physical location (Mexico, Ecuador, Colombia, Peru, Chile, United States, and Italy, among other countries) who, after presenting the projects, had moments of interaction, reflection, and networking in discussion groups previously set up for this purpose.

In addition to the fact that the metaverse activity was rated as excellent by more than 90% of the participants, significant benefits were observed, among which are: the closeness achieved between peers and experts, the interaction in an environment of trust, the elimination of time and space constraints, and the positive outcome on the digital program indicators, such as an increase

on the Net Promoter Score (NPS) and the terminal efficiency of 6 and 4 percentage points, respectively, compared with sessions that didn't include the Tec Virtual Campus activity.

Lastly, knowing the benefits and how the feeling of belonging of the participant is enhanced with the use of the Metaverse, there is a plan underway to implement it in various programs from different modalities (virtual, digital, or live) to continue being the best option for the participants who entrust their training and updating of professional competencies and skills to the Tecnológico de Monterrey.

Launch of The Learning Gate

As part of the evolution toward Tecnológico de Monterrey's 2025 plan, **The Learning Gate** (TLG) was created, an innovative and high-impact learning **ecosystem** of life-long accompaniment for leaders with immense potential, capable of transforming the organizations in which they participate, their environment and the communities in which they live.

This **flexible on-demand model** is Tecnológico de Monterrey's differentiated delivery of continuing education that seeks to incentivize the acceleration of digital education. The characteristics of this educational model are:

- Generation of key competencies for professional success
- Challenges applied to the work reality of the entrepreneur
- Multimedia resources within an agile and intuitive platform
- 100% online, flexible, custom-made programs
- Constant feedback from experts
- Cutting-edge insights
- Digital badges with blockchain security and certificates endorsed by Tecnológico de Monterrey
- Networking
- Conferences with industry leaders

The Learning Gate began commercial operations in January 2022. Currently, two full thematic areas have been released in **Leadership** and **Data Science**, which represent:

- **6** professional trajectories
- **34** professional competencies
- **96** professional sub-competencies
- **912** learning hours

In the upcoming months, other thematic areas will join the ecosystem: **Finance, Marketing, Sales, Project Management, Excellence, Operations, and Digital Transformation**.

Some of the indicators of note to date are:

- **623** learners enrolled
- **7,542** modules bought
- Final average score of our learners per sub-competency: **90**
- Average test score (**40%** of the total score of the sub-competency): **91**
- Average score of the applied challenge (**60%** of the total score of the sub-competency): **94**
- **100%** of our learners complete the applied challenge on their first try.

Another important aspect of The Learning Gate is its **community**. It comprises professionals and industry leaders, and learners can connect with their peers, experience exclusive events with industry leaders and interact in a digital learning space. Currently, there are virtual communities in the Leadership and Data science thematic areas. There are also monthly online talks and workshops, where trends in each active thematic area are discussed and how they can be applied to today's work environment.

Also, industry leaders participate in **face-to-face networking events**, where they share with learners the direct applications of the topics they study.

Networking events occur quarterly and have been held in Monterrey and Mexico City. In 2022, 4 face-to-face events were held, and in December, the first networking event inside Tecnológico de Monterrey's Tec Virtual Campus metaverse took place.

V.

Institutional initiatives and innovative digital experience drivers

Adaptive learning

Adaptive learning is an education strategy that uses **technology based on data analytics to adapt education** and create a personalized learning route, of which the teacher had previously designed its contents, for it to be effective and efficient for each student. The teachers can then identify gaps in the group's comprehension to establish improvement actions and adjust their teaching practice, thus optimizing the students' performance.

An appropriate application of this strategy contributes to achieving academic success in key training units for students starting their journey in the Tec21 Model.

Some distinct elements of the adaptive learning strategy implemented in the institution are:

- **Support strategies** that promote active learning and the study of short-duration learning resources.
- **Interaction** through a platform focused on adaptive learning.
- **Access to a wide variety of digital resources**, such as videos, charts, articles, exercises, websites, etc.
- **Analytics reports** to show progress and facilitate the decision-making of students and teachers.

The Office of the Vice-Rector for Academic Affairs and Innovational Education designed a pilot program for 4 training units of the School of Engineering and Sciences in the areas of Mathematics, Physics, and Computer Science during the August-December 2022 period: Computational Thinking for Engineering, Fundamental Mathematical modeling, Movement in engineering modeling, and Application of conservation laws in engineering systems.

The educational technology used to apply Adaptive learning was selected from over 20 existing educational technologies in the market; it was chosen using a rubric that considered the needs of the institution's educational model and the education technologies ecosystem. Based on this, the technology best aligned with the strategy was selected.

24 groups from the Mexico City, Estado de México, Toluca, Guadalajara, and Monterrey campuses participated in this pilot program, with a total of 693 students; 12 expert teachers from each training unit designed the adaptive courses and they were taught by 32 teachers from the campuses mentioned above. The pilot program also had the support of the Institute for the Future of Education to conduct research that could measure the level of improvement of the student's learning using this educational strategy.

In 2022, there were also other courses using Personalized learning with adaptive bases, using CANVAS as a technological platform. Learning routes were designed, emulating an adaptive platform. 11 teachers participated, impacting 417 students on 24 campuses.

Adaptive learning in 2022 in numbers

1,110 students from **24** campuses

55 teachers

6 training units

Immersive learning with extended reality

The Immersive learning with extended reality strategy in 2022 focused mainly on 3 key objectives:

- To further develop and advance transversal projects and add to the differentiated offer of digital education. The project's transversality lies in focusing AIRX by design in Training units that all the students from a school intentionally take to add to their learning experience and differentiate the training units of the digital education offer.

- To further improve the definitions of the AIRX strategy; for example, define the teacher empowering process to use various resources in their classes with a single institutional catalog and adapt resources to add to the VR Zone experiences.

- To create pilot programs with different technologies from those previously used to explore their use and document the benefits and processes for their implementation, if applicable.

Among this year's strategic processes, we can highlight the following:

- ***SimulCoffe-Pro (Continuous improvement)***
  Evaluation experience at the exploration stage for all students from the Business School. It is a business simulator that puts the student in the role of a coffee shop owner, and the experience sees them on a journey to grow their business. The improvements that benefited this experience were the creation of a teacher's manual, a student's manual to access the simulator, and the design of appropriate activities and rubrics to evaluate the student's performance accurately. 6 designer teachers participated, and it has impacted 7,719 students to date.

- **Virtual Reality space, Teaching-Learning Space: "Future Exploration" Escape Room**
  This Escape Room seeks to become a new way of teaching-learning the concepts, principles, trends, methodologies, and tools of Strategic Foresight through the design of a virtual space of collaborative learning based on solving conceptual challenges, where the students reinforce content through active learning. The integral experience is conceptualized as a space trip comprising three moments: launch, space station, and landing. The space station is made up of four thematic rooms, each of them an escape room with its specific challenges. Two designer teachers participated.

TEC Time Travelers

Resource used for the Engineering and Sciences Modeling Block as part of the first-semester student exploration process. Through it, the student travels to the past, present, and future of Tecnológico de Monterrey. Storytelling and gamification strategies increase the students' attention, motivation, and positive attitude toward learning. The time explorer is guided by Nikola Tesla, an iconic world of science and engineering character who presents them with their missions and explains the potential consequences of their actions. If they cannot complete the mission, the explorer ends up trapped in time. However, they can repeat the mission until they are free. 2 designer teachers participated, and +3,500 students were impacted.

The sustainability challenge: key competencies and concepts

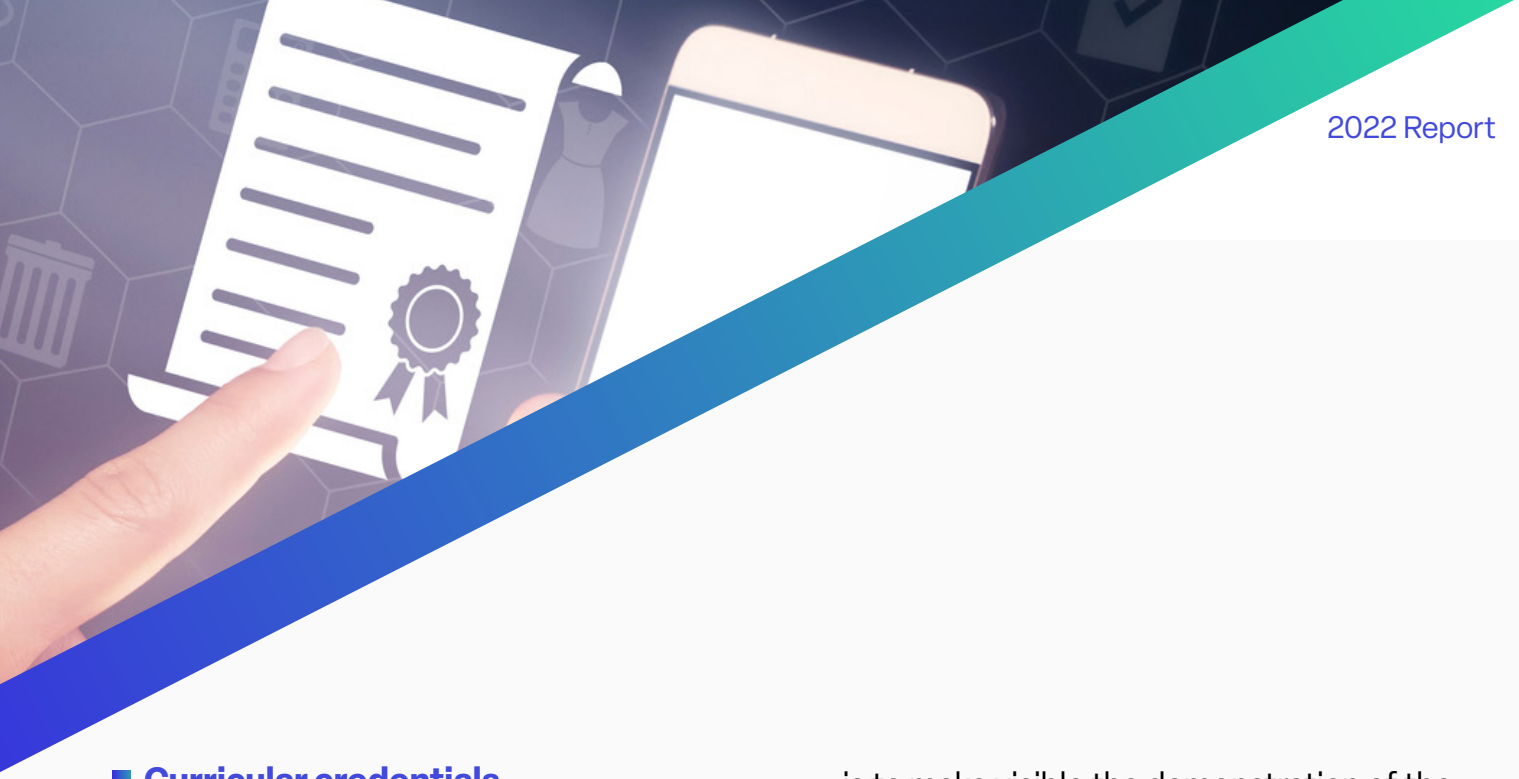
The first book on sustainability published by Editorial Digital with Augmented Reality elements, written in collaboration with teachers from the School of Engineering and Sciences, the Institute for the Future of Education, and the Department of Educational Innovation and Digital Learning of Tecnológico de Monterrey. This e-book integrates elements of augmented reality which contribute to the enrichment of the teaching-learning experiences of the public interested in the subject. 5 designer teachers participated.

Immersive learning with extended reality in numbers during 2022

- **33,953** students
- **422** teachers
- **133** subjects

Curricular and alternative credentials

A credential recognizes the learning achievements, skills, and competencies obtained through training experiences corresponding to a study plan or personal interests for professional development and human flourishing. At Tecnológico de Monterrey, in addition to undergraduate degrees, certifications, and diplomas, two types of credentials have been introduced: **Curricular credentials and Alternative credentials**.



Curricular credentials

They recognize the learning achievements, skills, and competencies obtained through training experiences corresponding to the curriculum of Tecnológico de Monterrey's formal professional degrees and academic degrees.

Alternative credentials

They recognize the learning achievements, skills, and competencies obtained through training experiences complementary to or independent from Tecnológico de Monterrey's formal professional degrees and academic degrees. These credentials explicitly define the expected learning results, the associated workload, and the evaluation processes that guarantee their academic quality for Undergraduate, Graduate, and Continuing Education programs.

In our Tec21 educational model for undergraduate programs, which allows the development of solid and comprehensive competencies that help students solve current and future challenges creatively and strategically, one of the commitments is to make visible the demonstration of the developed competencies; to achieve this, an institutional framework to grant curricular and alternative credentials in the institution has been implemented.

The first generation of graduates of the 2019 study plan received, upon completion of their professional studies and, in addition to their professional diplomas, an acknowledgment of the disciplinary competencies demonstrated throughout their academic stay through digital badges they can share with their employers according to their interests.

In September of 2022, the **Center of Evaluation and Alternative Credentials** was created, a service area that operates as an on-demand systematic process in a digital environment for evaluating and recognizing competencies and managing alternative credentials for undergraduate programs. It operates nationally, working jointly with the deanship of the Schools and Leadership and Student Training to define which and how competencies and alternative credentials are certified, recognizing the innate differences in the disciplines.

Strategic Projects 2022

Creation of the institutional framework of credentials at Tecnológico de Monterrey for Undergraduate, Graduate and Continuing Education programs

This framework defines Curricular credentials for Undergraduate and Graduate programs and Alternative credentials for Undergraduate, Graduate, and Continuing Education programs.

Process to accredit curricular disciplinary competencies

- Definition of the guidelines to grant the disciplinary competencies credentials to undergraduate students of the 2019 plan, which states how the Curricular credential badges will be awarded.
- Construction of a facilitator for the management of the student's achievements.

Regularization and flexibility process for participation in Tec Weeks

Definition of regularization mechanisms

1. Through the evaluation of the regularization.
2. Accreditation for comparable training experiences.
3. Accreditation of equivalence through alternative credentials in Digital Continuing Education programs.

Offer of alternative credentials of Digital Continuing Education

- Seminar on Positive psychology and life purpose
- Seminar on Collaboration and effective negotiation
- Seminar on Introduction to the digital era and big data

Incorporation of alternative credentials in the new Graduate model

At Tecnológico de Monterrey, Graduate programs recognize that students possess knowledge, skills, and experiences that are part of the trajectory before joining the institution. This is why multiple alternative credentials acquired at renowned institutions with academic rigor and enough quality to be turned into academic graduate credits for the enrolled students are validated.

To enrich the student's learning experiences, Tecnológico de Monterrey offers programs such as Certifications and Flexpaths; they are part of a catalog of alternative credentials in which the participant can obtain cumulative credits that can be accredited to Graduate courses. This option opens opportunities to students wanting an introduction to frontier topics with some of the current courses or Graduate-equivalent courses.

The new Graduate models consider alternative credentials as part of their design to be at the forefront of the higher education trends, that is, to open the possibilities to contents that can expand or enhance the graduate profile with institutions with agreements with the Tecnológico de Monterrey.

Teacher development and educational innovation

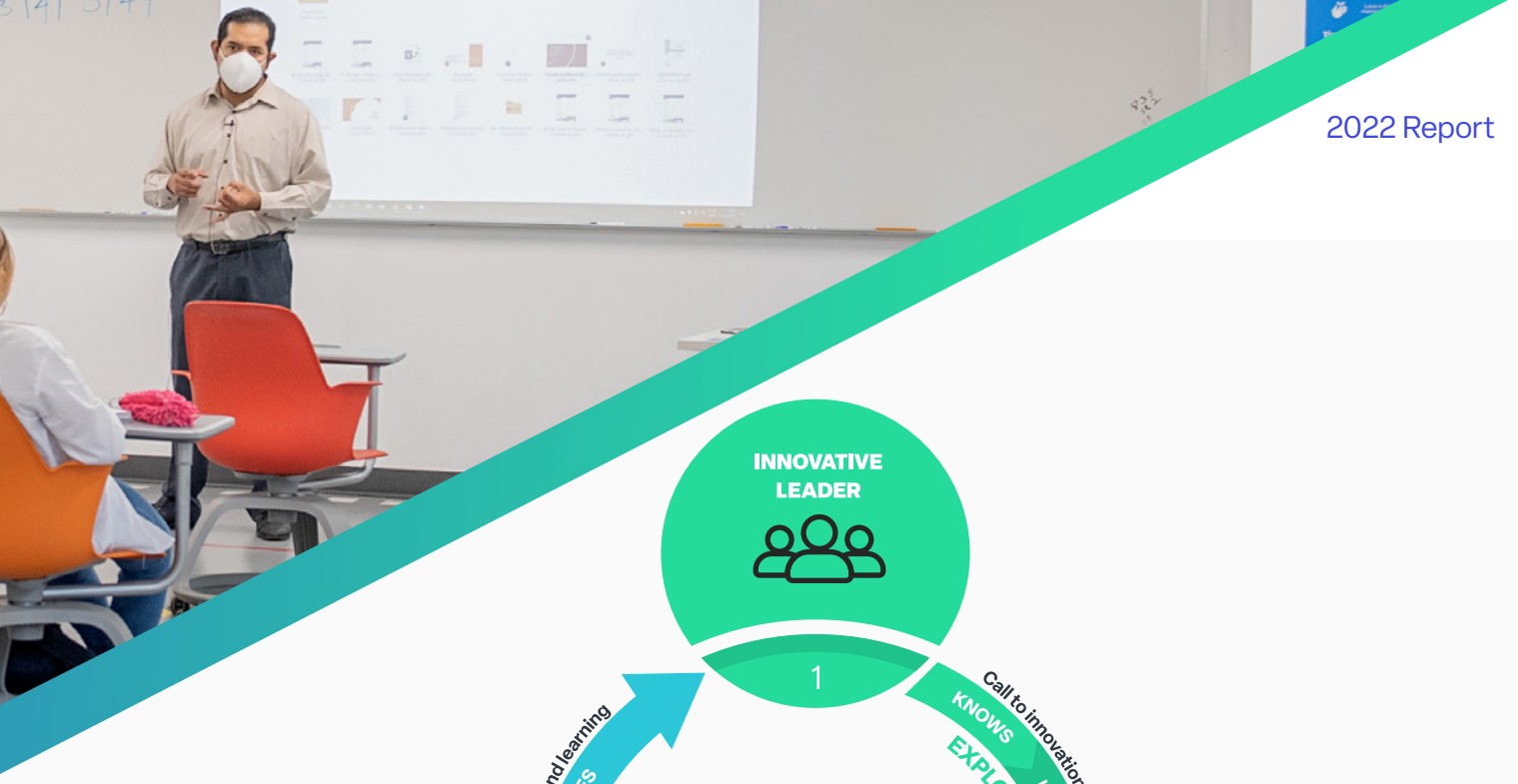
Tecnológico de Monterrey offers an ecosystem that promotes and facilitates the educational innovation of teachers in face-to-face or digital modalities. Below we share the most notable initiatives for the promotion of faculty training and educational innovation in 2022:

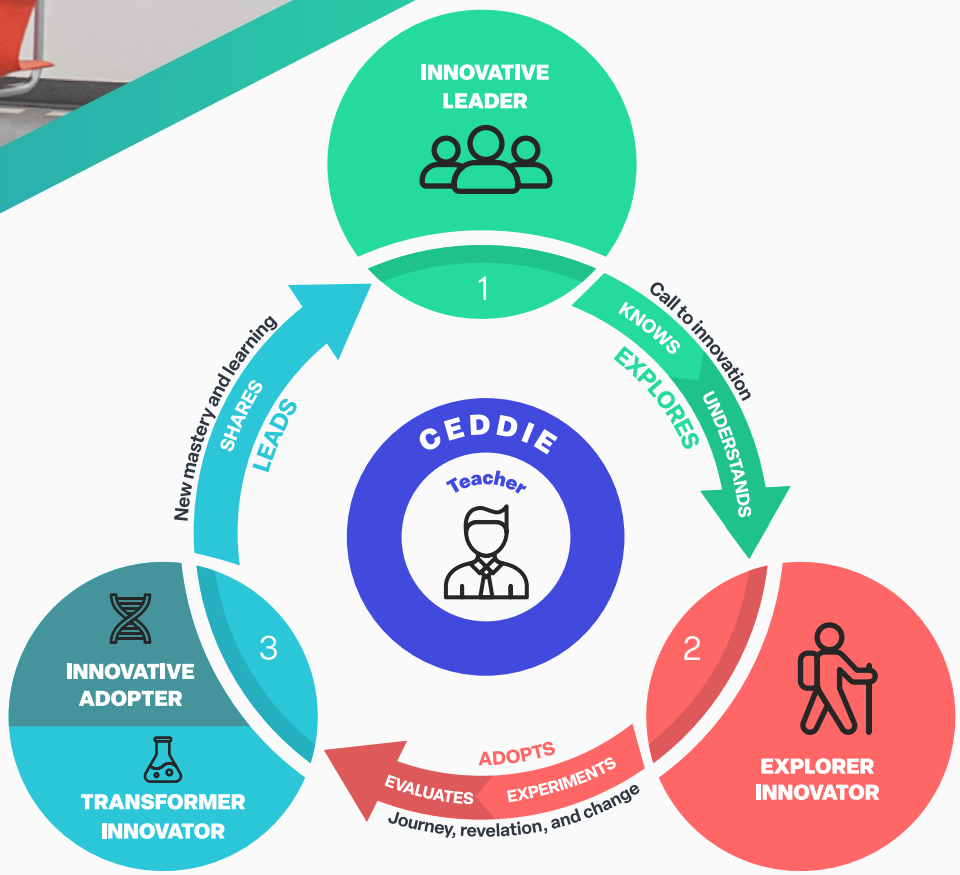
1. Tec Virtual Campus activities

Tec Virtual Campus was promoted as an educational space for innovative activities in a virtual reality environment. The activities were carried out by teachers and experts in various topics; 156 activities were carried out throughout the year, impacting 1,856 teachers.

2. Workshops and talks

156 talks and workshops took place, impacting 2,856 teachers; the main topics were:





- a. Use of technology, teaching strategies, emerging technology, and more.
- b. Design of activities with VR technology.
- c. Use of apps in the Flexible Digital Model.
- d. Documentation of innovation generated in the Digital Model.
- e. App marathon.
- f. Design Thinking.
- g. Communication without talking.
- h. Lego workshop.

International talks were also held to exchange experiences on topics that make value generation possible and a global vision in the education process. This year, 3 international experts participated.

3. Learning from our educational innovation experiences festival

At the National Teacher Meeting, a space was opened to share, celebrate, and recognize the experiences and educational innovation projects to transform our teachers' teaching-learning process. The virtual exposition included 80 projects a group of experts selected as innovative practices. They were presented in 3 different spaces: Virtual Campus during the event, a permanent exhibition on the CEDDIE national website, and the National Teacher Meeting website. The initiatives were categorized under the following thematic areas:

- Pedagogical transformation: the application of new methodologies conducive to a change in the teaching-learning process, such as the launch of new didactic practices, learning strategies, and means of delivery.
- Education technologies: the incorporation or implementation of technologies applied to transforming and improving educational experiences.
- Student experience management: implementing processes for the student experience, proposing efficiencies in the design, operation, or management of educational experiences, such as relationships with training partners.

4. Certification in Innovation and Educational Entrepreneurship

A certification in Innovation and Educational Entrepreneurship was offered for the first time, so teachers could successfully implement their own innovation and educational entrepreneurship project at the functional prototype level during an academic semester through personalized training and accompaniment on Design Thinking. A team of experts in entrepreneurship and innovation, jointly coordinated by the InnovactionGym team and CEDDIE Center-South Region, provided personalized accompaniment to the 25 teachers that participated. 15 of them complete the certification.

5. Innovation Bootcamp

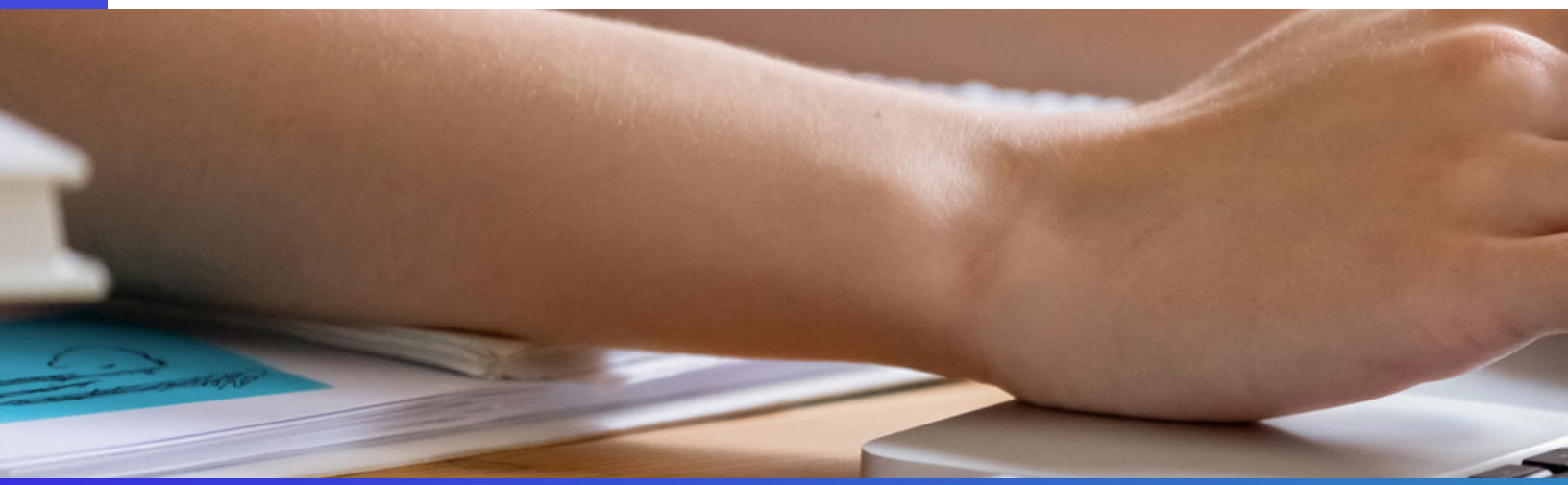
The Innovation Bootcamp was held in the summer; its methodology combined agile principles and ideation techniques for designing prototypes of educational innovation. The objective of the bootcamp's practical activity was to get to know the current educational landscape and then create student-centered solutions to be activated during the following semester. Throughout a week, 23 teachers worked in 6 teams that presented and documented their educational innovation proposals in an elevator pitch format to a qualified jury that offered suggestions for improving and implementing their projects. Leaders in innovation from Y&E and Walmart México and Central America guided the experience.

6. i Register update

i Register is a platform to document educational innovation experiences. A new version was launched in 2022, including functional improvements to facilitate documentation. During the Learning from our educational innovation experiences Festival, 129 teacher proposals were selected and registered. Currently, i Register is used to offer advice and generate documentation of educational innovation evidence to participate in the classification process of new experiences.

7. Promotion of teacher participation in institutional initiatives

As it does every year, CEDDIE carried out dissemination activities and supported teachers to participate in open calls of educational innovation, such as NOVUS and CIIE. To promote teacher participation in the CIIE conference, CEDDIE designed and imparted 12 workshops, with an attendance of 120 teachers.



8. CEDDIE national website 2022-2023

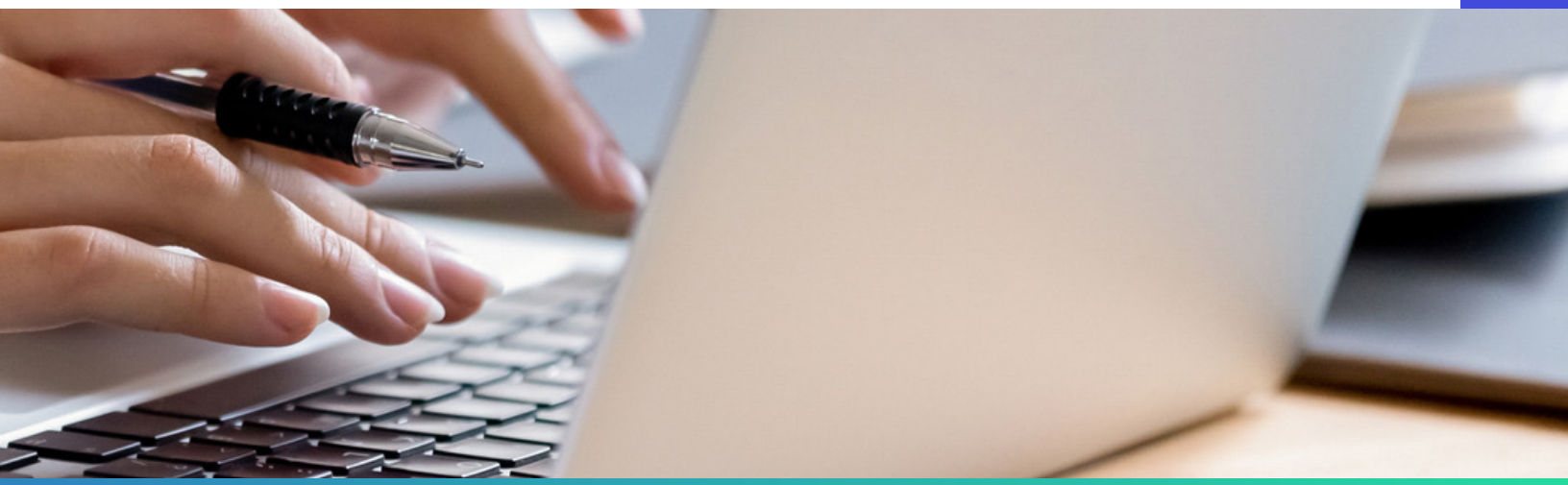
During the 2022-2023 period, CEDDIE's national website had an important role in the accompaniment of the faculty concerning their teaching practice and educational innovation processes in several moments:

- Promotion of innovation tools, conferences, and methodologies via the News section.
- Dissemination of the "Learning from our educational innovation experiences festival" during the National Teacher Meeting.
- Dissemination of the podcast "Sintonía CEDDIE," which provides an in-depth exploration of the critical topics of academic management and innovation.
- Dissemination of the program "Bienestar docente CEDDIE" as a support to the national well-being program through 4 focus areas that directly impact the teachers' experience: (A) Emotional balance in the classroom, (B) Stress management, (C) Optimal time management, and (D) Financial foresight.

This has resulted in a 300% growth compared with the previous cycle (9,300 users), reaching 28,000 users and 51,000 sessions during the January-November 2022 period*.
*Data up to November 14, 2022.

9. Teaching Hub

Teaching Hub is an educational website that integrates various digital education resources and successful practices for course design and to improve students' learning experiences. These resources guide the teacher through the steps to create their courses, from doing didactic planning and designing educational content to configuring Canvas and carrying out the course's final review. It also integrates various collections of didactic resources, which provide a wide variety of ideas, examples, and recommendations, with search filters that help to quickly find what the teacher needs to design and teach memorable



learning experiences. The collections' didactic resources were developed or curated by pedagogical specialists with the support of teaching colleagues.

The collections available in this space are:

- Evaluation and feedback strategies
- Didactic strategies
- Experiencias en *Tec Virtual Campus*
- Tec Virtual Campus experiences
- Evaluation instruments

This space has received over 1,000 visits during the August-December 2022 period. If you are a Tecnológico de Monterrey teacher, you can access this hub through this link: tecmx.sharepoint.com/sites/teachinghub

10. Support plan for the design of digital courses

Given the need for teachers to continue preparing their digital courses as best as possible, especially in Campus Monterrey, the campus' faculty was offered in August 2022 a support plan to enrich their digital classes, which consisted of:

- Three workshops for learning in a digital context about:
  - What a teacher must know to apply collaborative learning
  - Socio-emotional tips for connecting with students
  - Fun learning! Design of escape rooms for the educational context
- Advice on instructional design to teachers of digital courses.
- Strategy and resource guides for the design of digital courses (Teaching Hub, phase 1).
- Educational spaces such as the Hall Immersive Room and Professor with hologram effect, among others.

This support plan was offered to Campus Monterrey's teachers of over 300 courses.

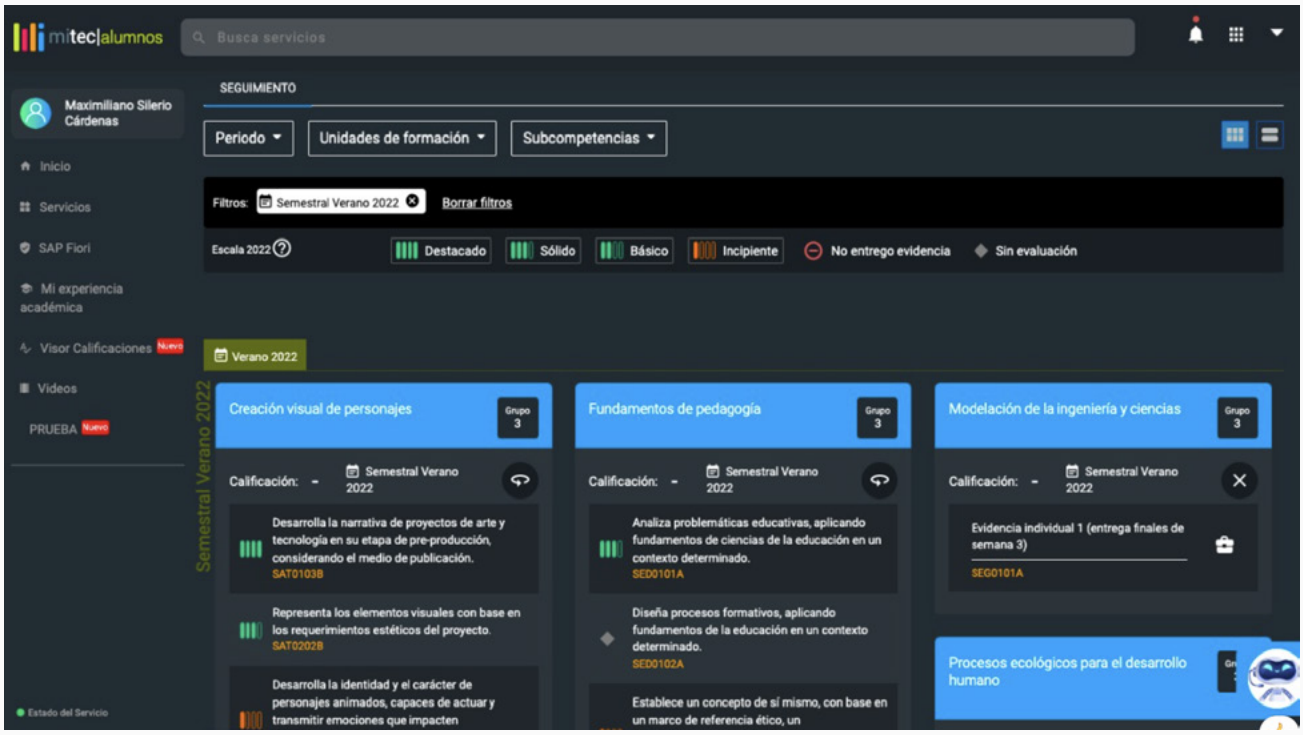
Ecosystem of educational technologies

To carry out the teaching-learning process of the Tec21 educational model, starting in 2019, an ecosystem of educational technologies was enabled, with the primary objective of offering students an ecosystem of flexible and personalized learning experiences, as well as offering teachers an integrated space in which to design their teaching experiences, provide feedback and evaluate evidence that could determine the level of competency achieved. In 2022, 2 strategic initiatives aimed at moving toward the personalization of the teaching-learning process of this ecosystem were implemented, benefiting over **55,000 students and 7,000 teachers**.

1. Redesign of sub-competency assessment

In the summer of 2022, the evolution of the sub-competency assessment model was implemented, ensuring that 100% of the training units could apply the new evaluation scheme; the sub-competency analytics for both teachers and students were also redesigned, and access to the information of previous periods using the previous assessment model was provided.

The main objectives of this initiative were to enable a lean and agile process to improve the integral experience of sub-competency assessment in the training units and to bring clarity to the student evaluation and feedback by replacing the dichotomous scale with a scale of four degrees of achievement.



2. Analytics for personalization of learning

The project Analytics for personalization of learning was launched, which seeks to provide valuable information, establish behavior patterns and generate personalized recommendations for students by leveraging the data generated during the teaching-learning process and using Artificial Intelligence to improve their academic success.

In its first phase, descriptive analytics have been used to identify the progress of the Tec21 competencies in students and academic leaders to provide follow-up to their educational programs. With these analytics, actions were taken to support the development of competencies of 55,000 students of the Tec21 Model.

Inicio

Seguimiento de subcompetencias
Escuela:

Unidades de formación
Total
12
Departamentos
3

Grupos
Total
15

Región
Regiones
2
Campus
2

TEDU
Tecnologías para la Educación

Descarga reporte subcompetencias

Alumnos

	Subcompetencias (SC) evaluadas	Calificación	
Atendidos **232**	+1 SC evaluada	Promedio	Mediana
Alumnos escuela **98**	+1 SC sin evaluar	%Reprobados	Sin calificación

Subcompetencias

Total	Evaluadas	Unidades de formación	Grupos	
31	**29**	**11**	**15**	Ver más
	Sin evaluación	Unidades de formación	Grupos sin evaluar	Grupos sin instrumento
	8	**5**	**6**	**0** Ver más

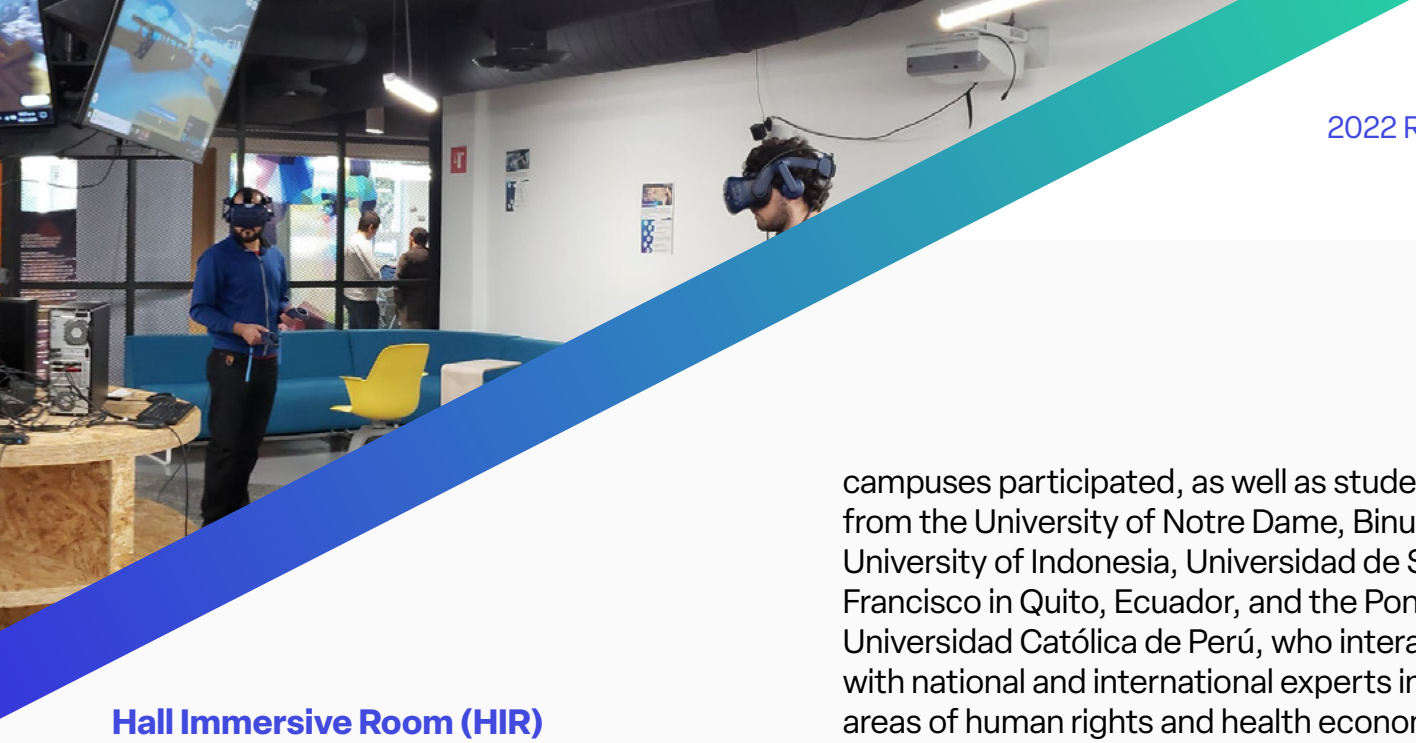
Innovative educational spaces

Immersive learning classroom (AIRX)

The AIRX classroom aims for students to learn through innovative educational experiences that help ensure, create, and promote academic quality. This space was designed to favor the interaction between teachers and students during immersive classes with simultaneous dynamics. The virtual reality resource is integrated into a reviewable activity, making the student participate in their learning process and impacting the change of the current teaching model.

AIRX classroom in numbers during 2022

- **2,250** students
- **24** teachers
- **21** subjects
- **16** immersive resources



Hall Immersive Room (HIR)

In 2022, the Hall Immersive Room continued favoring the teacher's proximity with their students in distance courses, impacting 66 teachers and 5,135 students of undergraduate, graduate, and continuing education levels, as well as over 500 international students from Tecnológico de Monterrey's partner universities.

As an additional impact, and according to the focus on globalization of the pedagogical model of this learning space, this year, "Diversity in a globalized world" Tec Week was held under an Elite modality, with an internationalization component. Over 500 students from 19 Tecnológico de Monterrey's campuses participated, as well as students from the University of Notre Dame, Binus University of Indonesia, Universidad de San Francisco in Quito, Ecuador, and the Pontificia Universidad Católica de Perú, who interacted with national and international experts in the areas of human rights and health economics.

The intensive course held during weeks 6 and 12 of the February-June and August-December 2022 periods integrated multicultural collaboration spaces in which teachers, students, and experts of the various participating universities developed effective communication. By designing digital activities and resources, they motivated students to participate in their learning experience actively.

Hall Inmersive Room, Versión 2.0

As an evolution of the Hall Immersive Room, this year version 2.0 was designed in Campus Guadalajara, consisting of a hybrid room for the Business School's Habitat Project.

	Undergraduate level	Graduate level	Continuing Education
Number of training units	37	11	9 (courses)
Number of scheduled sessions	246	60	11
Number of participating teachers	35	7	10
Number of impacted students	4,361	457	628

Professor with Hologram Effect

Starting in September 2022, the Professor with Hologram Effect classes resumed in 5 campuses (Monterrey, Querétaro, Saltillo, Laguna, and Estado de México), impacting 329 students, 13 teachers, and 7 training units of the undergraduate level.

Also, in June 2022, Tecnológico de Monterrey and Delft University of Technology in the Netherlands signed a collaboration agreement to exchange classes with experts, research, and conferences between both universities by implementing the Professor with Hologram Effect initiative.

The first intercontinental class with hologram effect between the two universities was held on September 27, with the participation of 2 teachers from the School of Architecture, Art, and Design from Tecnológico de Monterrey's Querétaro Campus and 1 teacher from the TU Delft's Department of Urbanism.

The following events with global impact carried out with Professor with Hologram Effect technology stand out:

- Keynote lecture with Isabel Allende at Monterrey International Book Fair on October 10, 2022.
- Agreement signing. Participation from Juan Pablo Murra, Rector of Undergraduate and Graduate programs, in signing an agreement of research and innovation on cyber-physical learning with Singapore University of

Technology and Design during the National Technology Enhanced Learning event.

- Dr. Sergio Fajardo gave the conference "Leadership to change the world" for the Monterrey, Estado de México, Laguna, Saltillo, and Querétaro campuses on November 9, 2022.
- International conferences by Tecnológico de Monterrey experts through Professor with Hologram Effect technology.
- "Statistics applications: Three research projects," given by Dr. Elvira Rincón at the Universidad Técnica Particular de Loja, Ecuador, on July 21.
- "Educational innovation at Tecnológico de Monterrey," given by Dr. Joaquín Guerra at PUC Campinas, Brazil, on October 25th.

Professor with Hologram Effect in numbers in 2022

329 students

13 teachers

7 training units

5 campuses

1 foreign university:
TU Delft (Netherlands)

Tec Virtual Campus

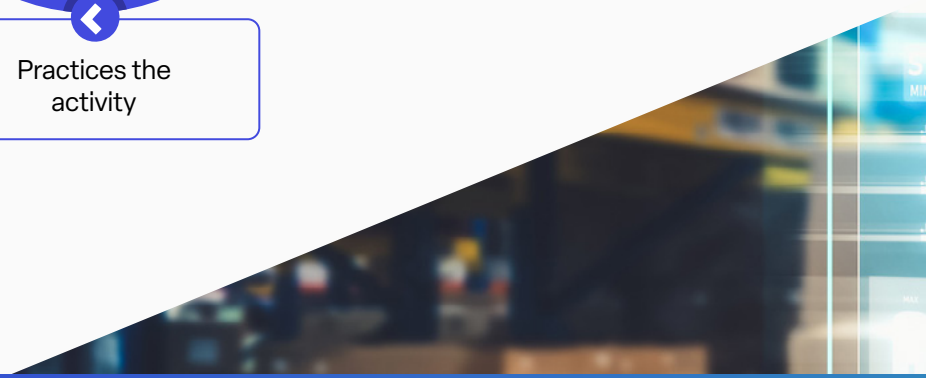
The student's experience evolves toward development and coexisting alternatives beyond the physical campus. With that in mind, it is necessary to create virtual or hybrid experiences as a new normal, in this way personalizing university life. Tec Virtual Campus, an academic metaverse of Tecnológico de Monterrey, in 2022, has allowed 12,047 students to participate in 148 academic activities, inspiring 258 teachers to train in activity design. These experiences are added to the previous ones in 2021, for 25,758 student attendants to 381 activities to date.

Tec Virtual Campus is a philosophy and not a platform. The lessons learned, the experiences designed, the interactions generated, and the openness of the Tec community to use the metaverse are what is truly valuable. That is preserved and transferred to the appropriate educational technology.

The learning benefits of the use of Tec Virtual Campus are:

- Active learning: the students become participant agents of the learning process.
- Social presence: allows the creation of spontaneous groups of people with common interests.

Design model of academic activities in Tec Virtual Campus



- Autonomy: grants the students a sense of independence and decision in their activities.

In January, the first class fully set in the metaverse was taught to students of the Civil Engineering and Architecture programs. The students worked in various spaces according to the pedagogical moments designed by the teacher. Classes were also taught jointly with Latin American institutions such as Universidad Católica de Colombia, Universidad de San Sebastián in Chile, and Universidad Norbert Wiener in Perú.

The academic experience has been joined by the offer of student services such as Tec Services, Tec Media, and Biblioteca Cervantina, which provide attention on a national scale, increasing the possibilities of interaction in this digital space.

Also, 3 articles related to the experience of students and teachers in Tec Virtual Campus were published in indexed journals.

Tec Virtual Campus in numbers in 2022

12,047 students

148 academic activities

258 teachers

Virtual Reality (VR) Zones

Virtual Reality (VR) Zones are educational spaces with virtual reality technology for immersive learning in campus libraries. In 2022, 4 new VR zones were inaugurated in the Chihuahua, Saltillo, San Luis Potosí, and Toluca campuses, for 11 VR zones (Mexico City, Estado de México, Guadalajara, Monterrey, Puebla, Querétaro, and Santa Fe campuses).

VR Zones in numbers since 2019

+600 academic activities

+43,000 student attendance

+450 teachers implementing activities

11 campuses with VR Zones serving **80%** of the students at a national level

Use cases in the VR Zone

EXPLORATION

Students explore to learn about the technology and contents.

STUDY

Students study a topic or seek information as part of the research.

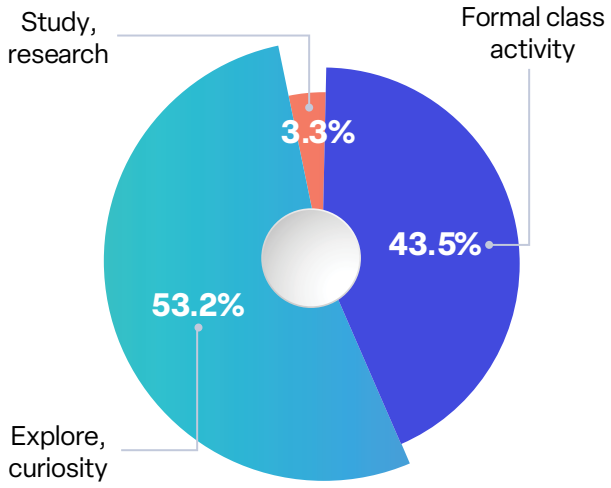
ACTIVITY

Students carry out an activity or homework designed by their teacher.

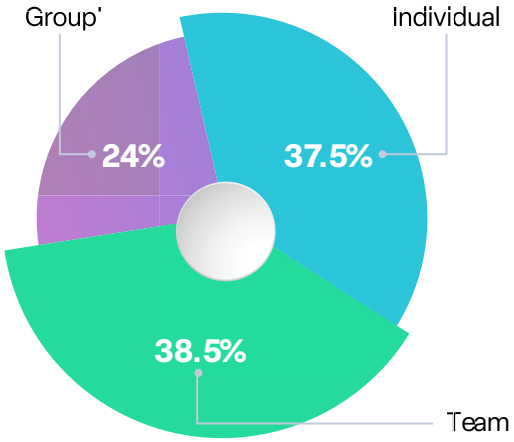
GROUP

The teacher assists during the class with the group to work in teams or explain a topic.

MOTIVE



MODALITY



Internationalization

Thanks to the Global Shared Learning (GSL) model, student internationalization allowed educational continuity with international relationships for students and teachers from Tec de Monterrey and its international partner universities. Although there were numerous opportunities for face-to-face internationalization, online internationalization was the most requested variant.

Tecnológico de Monterrey's leadership and innovation made possible evolving and enriching this model to transform it into the Global Shared Learning initiative, with the GSL Classroom and GSL Week models being a standout. The impact of both GSL models made the institution the recipient of an award from Consortium U21 and was mentioned as a success case in a UNESCO report.

The GSL initiative also offers micro-credentials, this year focusing on Sustainable Micro-Internships and Global Citizens, as well as the offer of courses through Virtual Exchange Programs (VEP).

In addition to these opportunities, the doors were also opened to undergraduate and graduate students to participate in virtual international contests.

GSL Classroom

It aims to connect a Tecnológico de Monterrey course with one or more courses from an international partner university in a digital environment. It uses technological tools to connect students in collaborative activities that promote learning in multicultural environments.

151 GSL collaborations
Undergraduate courses
classroom

GSL Week

It is part of the Tec Week offer for students in the Tec21 educational model in two moments of the academic semester: week 6 and week 12. Tec Week seeks to strengthen the value of a "global vision" while creating an internationalization experience "at home" with significant learning. Two experiences are offered: "Diversity in a globalized world" and "Gender, sexuality, and violence" with international universities through a digital environment.

This year's highlight was the use of Hall Immersive Room technology for national Tec Week groups, multi-university collaborations, and sustained dialogue tables.

12 GSL Week collaborations

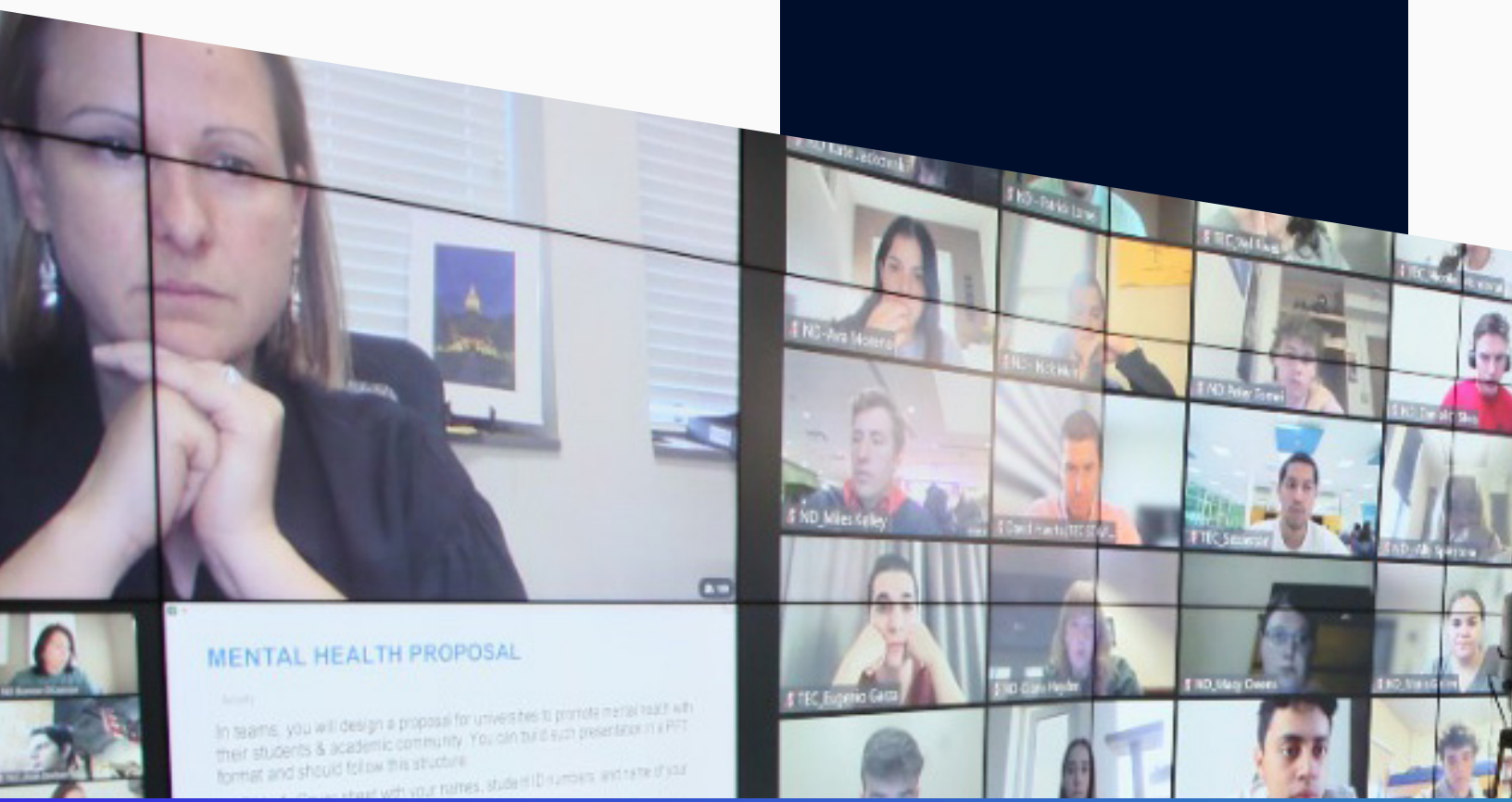
12 international partner universities, from **9** different countries

2,164 students:

- **1,118** from Tecnológico de Monterrey
- **1,046** from partner universities

40 teachers:

- **18** from Tecnológico de Monterrey
- **22** from partner universities



GSL Week at Go Global

Global Shared Learning Week saw two students from undergraduate programs and a collaborator participating in the Go Global Sustainable Development Goals event held by York University.

Impact of the GSL initiative

During the U21 Educational Innovation Symposium, The Global Shared Learning Classroom model received the **U21 Innovation Award**.

GSL Classroom and GSL Week were included as virtual mobility success cases in the Virtual Student Mobility UNESCO report.

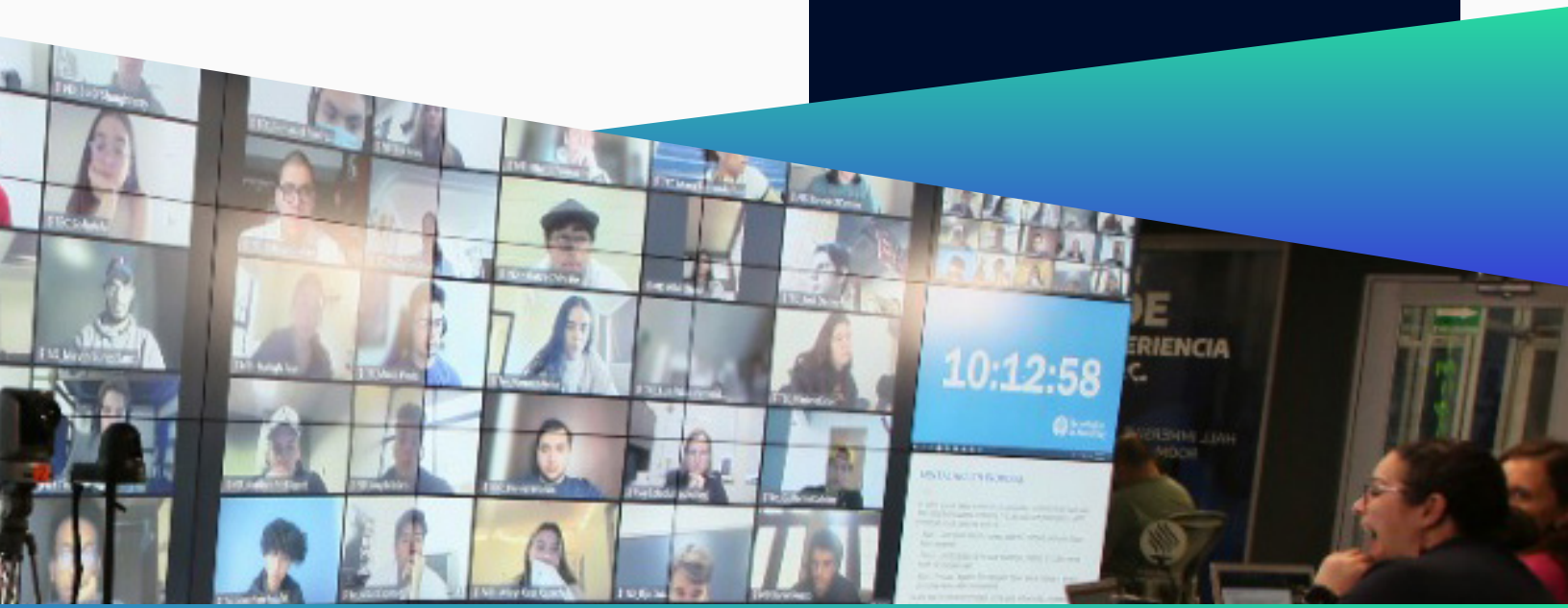
Sustainable Micro-internships

It is a program of virtual professional practices focused on sustainable topics and the design of proposals for the sustainable development objectives of the United Nations, organized by the Universitas21 consortium called U21 Sustainable Micro-internships for students of the Tec21 educational model.

54 undergraduate Tecnológico de Monterrey students successfully completed the program, obtaining their micro-credential from U21 and three points for the International Diploma from Tecnológico de Monterrey.

- **29** students during the first edition (January 2022)
- **25** students during the second edition (March-April 2022)

18 countries from partner universities



Global Citizens

It is a virtual program focused on promoting student leadership. This program is organized jointly by Universitas21 and the Common Purpose global organization. Students learn to develop ideas, skills, and proposals aligned with sustainable development objectives.

62 undergraduate students from Tecnológico de Monterrey successfully completed the program, obtaining their micro-credentials from U21 and three points for the International Diploma from Tecnológico de Monterrey.

20 countries from partner universities

Virtual Exchange Programs (VEP)

This option offers traditional international experiences in virtual formats in English, such as academic exchanges, study abroad programs, professional internships, research internships, and excellence programs.

International Virtual Contests

For the second consecutive year, a group of undergraduate students was awarded **Initiative with the greatest impact** in the **U21 RISE** contest (Real Impact on Society and Environment) (see Conecta article). Graduate students participated in U21 3-Minute Thesis (see pitch in U21) and U21/PwC Innovation Challenge.

Additionally, Chain-ge, the team of Tecnológico de Monterrey, Campus Chiapas students, was one of the **six finalists of the Social Ideas Challenge** contest organized by eMerge Americas and the Hemispheric University Consortium (see video).

Laboratories, software, and digital resources

In 2022, the offer of laboratories, software, and digital resources was strengthened to provide students with a quality academic experience, conducive to active and flexible learning. Below are presented the most relevant strategic initiatives of the year.

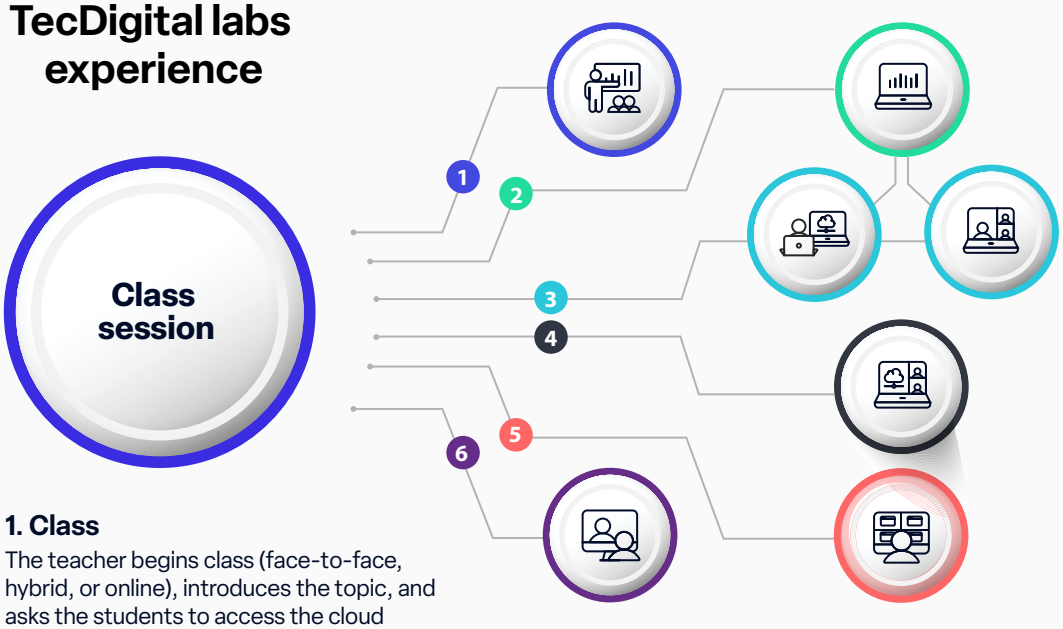
TecDigital Labs

With learning acquired during the pandemic and keeping in mind the future of the educational models of Tecnológico de Monterrey, where a diversity of teaching modalities is already a reality, a digital transformation of the delivery experience of the academic software portfolio was designed. This new experience allows teachers and students to access the software anytime, anywhere, and from standard computer equipment; this is how TecDigital Labs was born. Some of the benefits and characteristics of the project are:

- Accompaniment: the possibility of accompanying and offering advice to students in real-time.
- Flexibility: access at any time and from any place.

- Versatility: support face-to-face, hybrid, and distance models simultaneously.
- Analytics: measurement of the use of specialized cloud software for academic and strategic decision-making.
- Scalability: the capacity to adapt to the demand of specialized software use according to the course schedule of the period.
- Efficiency: savings in computer equipment renovation, adaptations of space, and licensing.

TecDigital labs experience



- **1. Class**
  The teacher begins class (face-to-face, hybrid, or online), introduces the topic, and asks the students to access the cloud software.
- **2. Canvas**
  Access to the software is performed from the course on Canvas.
- **3.** The student opens the app in the cloud from their browser.

  In the teacher's browser, in addition to opening the cloud software, a special console appears with the information and monitoring of the group.
- **4.** The teacher shares their screen of the cloud software to explain and answer general questions.
- **5.** Students work with the cloud software while the teacher monitors each student's progress from the console.
- **6.** When a student has a question, the teacher answers it and takes control of the cloud software to help them.

TecDigital Labs – 4-year migration plan

Redistribution of the service

YEAR 1

87% in the computer lab
13% in TecDigital Labs

YEAR 2

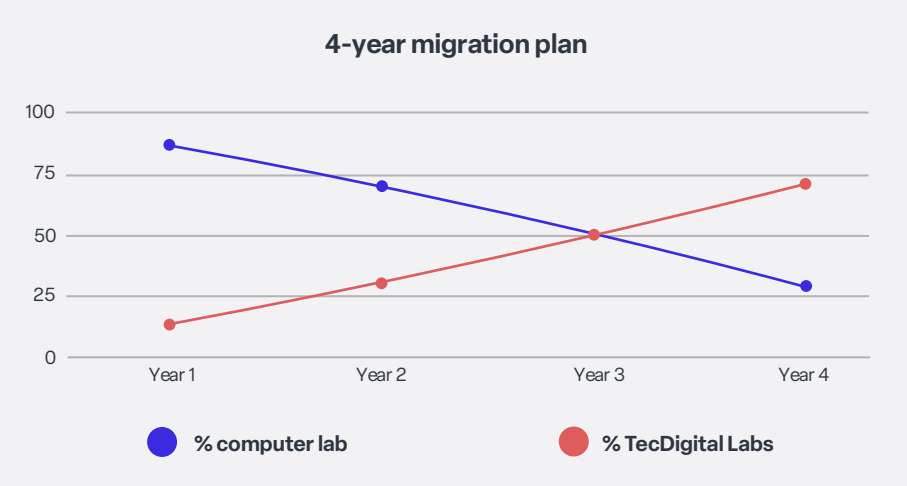
70% in the computer lab
30% in TecDigital Labs

YEAR 3

50% in the computer lab
50% in TecDigital Labs

YEAR 4

29% in the computer lab
71% in TecDigital Labs



Groups with access to TecDigital Labs in the August-December 2022 period

SCHOOL	GROUPS
Architecture, Art, and Design	**195**
Humanities and Education	**30**
Engineering and Sciences	**103**
Medicine and Health Sciences	**29**
Business	**152**
Total of groups	**509**

*Data from TecDigital Labs in August-December 2022

The 8 migrated software packages: SPSS, ArchiCAD, Lumion, Nuke, OPUS, Nvivo, ArcGis* and FluidSim*

	BEFORE THE PANDEMIC	DURING THE PANDEMIC	POST PANDEMIC
Means of delivery of the software	Physical computer labs	Remote laboratories **(VPN)**	TecDigital Labs
Analytics	Without use metrics	Cross-referenced with reservations	Precise use metrics
Use during class hours	No data available	**42** groups reserved (without usage time information available)	**509** groups with **5,137** usage hours
Use outside-of-class hours	No data available	**3,953** hours	**29,652** hours

7X
use of TecDigital Labs vs. Remote Laboratories

"Outside of class" **is greater than** "During class"
Students value using the software on the cloud rather than visiting physical laboratories.

*Data up to November 11, 2022

Portfolio of academic software

The portfolio of academic software in the schools has consolidated as the only catalog of disciplinary applications that support the development of students' knowledge and competencies to facilitate the design of teachers' training experiences.

Following an institutional process, the availability of the necessary software is ensured before each academic period, so students and teachers can have all the required resources to teach their training units.

295 specialized software applications available

+94,000 students

+10,000 teachers

Multiformat Digital Library

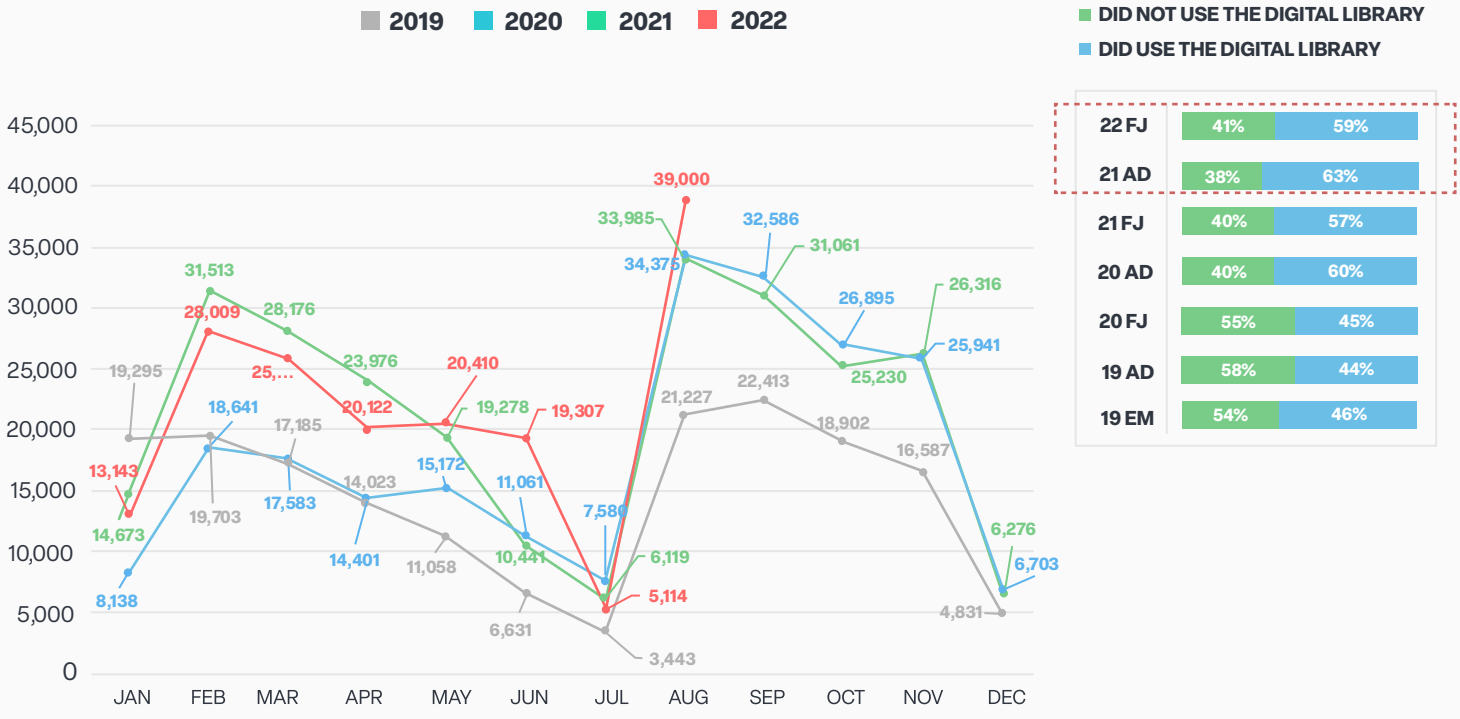
In 2022, the project **"Multiformat Digital Library"** was launched, which offers learning content beyond the textbooks that enrich the students' experience and align with the digital education strategy and the consolidation of the Tec21 Model. Considering there are various learning styles and that there has been an evolution in how students learn and perceive the world around them, the Library seeks to meet those different needs or learning styles through multiformat resources, such as audio, video, immersive, and virtual reality resources, and images.

Library collections

The Library offers access to 8.2 million volumes in its physical and digital collections, 2.1 million in physical and 6.1 in digital formats.

To support the Tec21 Model, a process was enabled for the academic community that favors the bibliography in a digital format; that is why more than **70% of the declared bibliography** was acquired in an **electronic format** for the February-June and August-December 2022 periods.

The use of the digital library in the last two periods (August-December 2021 and February- June 2022) significantly increased, strengthening the process of academic connection with the National Schools and ensuring the best experience for students and teachers to discover the information resources available to them.



In 2022, the **Catalog of Didactic Resources and Strategies** (aimed at teachers) and the **Catalog of Immersive Resources and Experiences** (aimed at students and teachers) were enabled within the library portal; the data is shown in the following tables.

The Catalog of Didactic Resources and Strategies integrates various **didactic resources** to guide the teacher when designing innovative experiences, whether to define an evaluation strategy, enrich synchronous sessions or redesign a course component. Also available are **disciplinary resources** such as charts, lectures, and videos, which can be incorporated into a training unit and thus enhance the students' learning experience.

The Catalog of Immersive Resources and Experiences contains resources in which the **learning experience** allows students to apply and develop flexible knowledge and competencies in **real or virtual** environments in an **experiential, active, and flexible manner**, according to their **professional and personal** needs.

Shared below is the impact of the launch of the new catalogs, reaching more than 8,000 students and teachers.

Communication campaign	**Academic webinar** (April 27 and August 31)	**Analytics** (February-November 2022)
Impact on a community of teachers and collaborators through the Mitec portal, emails, CEDDIE portals, and Library.	Session to induct and instruct in the use of the resource catalogs.	Data obtained from visits to the site.
60 mil students **18.5 mil** teachers and collaborators **3.5 mil** leaders	**177** teachers **51** librarians **56** collaborators	**2,092** new users **2,005** recurring users **4,120** sessions **1.78** pages per session

Among all the notable innovations from 2022, the activity **"BeLIEvers: Is everything real?"** is a standout, a playful and immersive digital learning experience that took place from October 31 to November 4 in an Escape Room format within Tec Virtual Campus as part of the User Instruction service, a student center that offers training courses and sessions, as well as learning resources for students of all academic levels. This year, the center served 14,769 students through 6,694 sessions with a satisfaction score of 90%*.

The objective of this activity was to facilitate the development of information management skills in a complex and disruptive digital ecosystem and contribute to the strengthening of critical thinking and other transversal competencies such as collaboration and cybernetic culture. In one week, 15 dynamics were carried out in teams of 10 students each; each session lasted 50 minutes. For the activity, 150 students signed up, in addition to the Library team that participated in the design and as game masters, as well as the instructional design from IEAD that guided the activity's design.

* A 5-level "smiley scale" measures satisfaction; only the two top levels are considered.

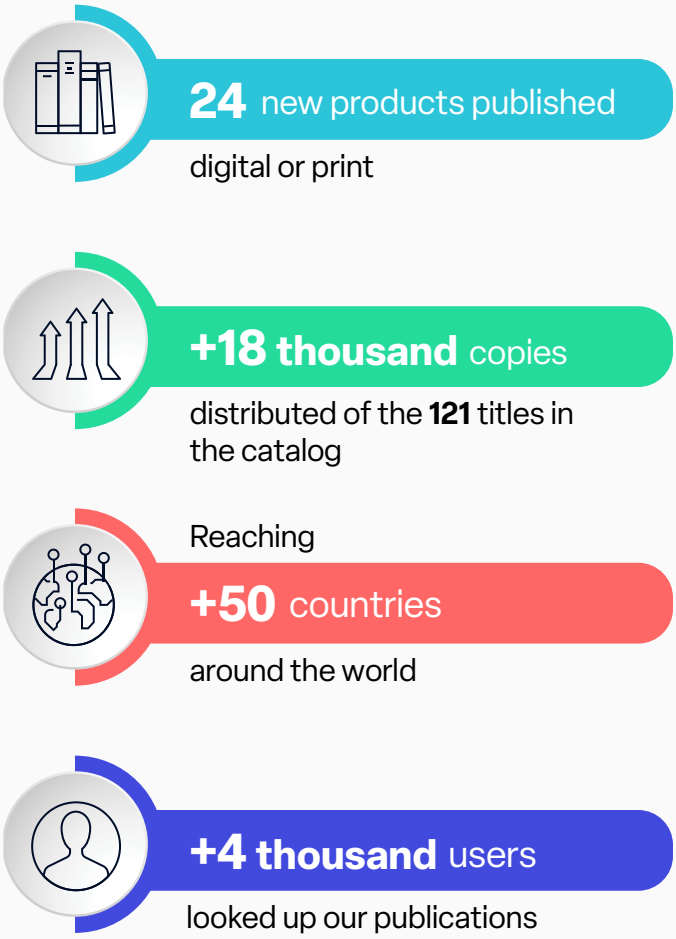
Editorial Digital

The vision of Tecnológico de Monterrey's Editorial Digital is to be a benchmark of prestige that shares with the world the scientific and cultural knowledge created by Tecnológico de Monterrey's teachers, students, alumni, and collaborators to face challenges and achieve human flourishing in the intellectual field. With this publishing house, the institution reaffirms its entrepreneurial vocation and commitment to using technology to benefit student learning.

Thanks to a redesign process, during 2021-2022, Editorial Digital launched four publishing mechanisms that allow co-edition with other commercial publishing houses, such as LID or Tirant Lo Blanch, and with university houses such as UNIANDES and Pontificia Universidad Católica de Chile, among others

In 2022 outstanding works were created, including:

- "The corporate startup," work with licensing rights from Amsterdam.
- "Eugenio Garza Sada. Life and Legacy of a Mexican Businessman," edited in collaboration with the Eugenio Garza Sada Center.
- "Creative industries: innovation and entrepreneurship from Latin American women," the first collaboration with Universidad de los Andes, Colombia.



- "Son of war, man of peace. Bringing nations together in a divided world", first Tríada co-edition (with Universidad de los Andes and Pontificia Universidad Católica de Chile).
- "Research in administrative sciences. Youth in research", first co-edition with UNAM.

NOVUS projects

Instituto para el Futuro de la Educación

NOVUS

Instituto para el Futuro de la Educación — Writing Lab

Instituto para el Futuro de la Educación — EdTech

mostla

High impact educational innovation with high applicability

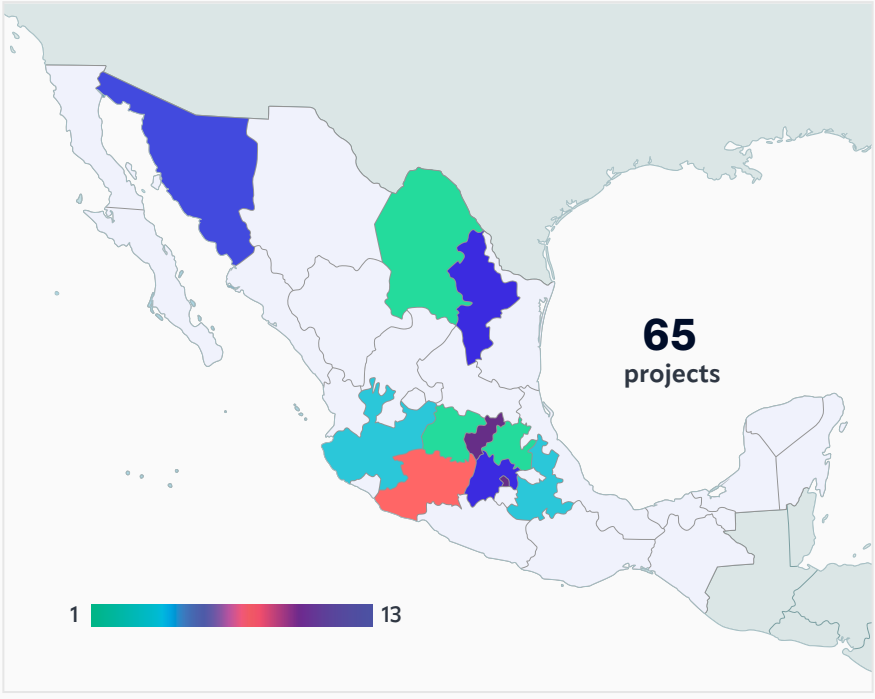
Novus is an initiative from Tecnológico de Monterrey that seeks to strengthen the culture of evidence-based educational innovation in the institution's faculty. For this, the team is focused on three activities:

- Provide funds and methodological support for implementing educational innovations and measuring their impact.
- Promote the dissemination, transference, and scaling of Novus projects.
- Internationalize educational innovation through indexed publications, conferences, and international contests.

In 2022, **768 teachers** from the institution participated by submitting **198 educational innovation proposals**. After an evaluation, selection, and review process, **65 projects were selected**, which comprise the Novus 2022 generation (+5% vs. 2021), which started in January 2023. The 65 chosen projects * majorly belong to:

- Region: 46% Center-South
- School: 63% Engineering and Sciences
- Educational level: 74% Undergraduate

*For more information about the indicators of the Novus 2022 call, please see Appendix 2.



Another highlight of this year was the completion of 50 of the 70 projects of the Novus 2020 generation, surpassing those of the previous year by 15%. The total of scientific publications of these projects is 68, submitted to conferences and high-impact indexed journals, as well as 23 dissemination articles. The impact of these projects amounts to 277 courses and more than 6,000 students. Likewise, the teachers of the 62 projects of the 2021 generation were trained to measure the impact of the educational innovation projects.

Throughout the year, **scientific publications** were made on the management of Novus projects. The following stand out:

- The paper "NOVUS projects: innovative ideas to build new opportunities upon technology-based avenues in Higher Education" by May Iliana Portuguez Castro, Rogelio Vicente Hernández Mendez, and Luis Omar Peña Ortega, published in the Education Sciences Journal (Scopus Q2).
- The paper "Mentoring in educational innovation: systematization in the experience of teachers' educational experimentation and research" by May Iliana Portuguez Castro was presented at the Tenth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM 2022) in Salamanca, Spain. It will be published as a book chapter by Springer Publishing.
- A study on the "Innovative Teacher Profile," with over 550 teachers participating in an initiative to identify the main characteristics of the participants in educational innovation processes, as well as the primary benefits to be obtained from such projects.

To learn more about the scientific publications on the management of Novus projects, see the section "Our educational innovation and digital education in the world."

Additionally, a **research project** was carried out during the February-June semester in collaboration with students from the Engineering, Design, and Innovation program of the Pontificia Universidad Católica de Chile (UC), which highlighted the importance of involving students during the initial stages of the project to facilitate the comprehension of the student experience from the teacher's perspective.

The Novus Tríada call continued, a contest for the three universities that make up La Tríada: Pontificia Universidad Católica de Chile, Tecnológico de Monterrey, and Universidad de los Andes Colombia; its objective is to develop and foster the culture of educational innovation based on evidence in Latin America, as well as to strengthen the collaboration between the three institutions to solve common and relevant educational problems in the three universities. The selected projects in 2022 were:

- Collaborative learning platform to promote and develop innovative pedagogical practices based on integrating socio-scientific controversies with future scenarios.
- Citizen laboratory for developing competencies in favor of world citizenship: a Latin American proposal for the return to face-to-face classes.
- Open repository of cloud-based practical computer laboratories for STEM education.

For more information regarding the selected projects of the Novus Tríada call, see Appendix 2.

The **mentorship** process offered to teachers with a Novus project is a personalized accompaniment on experimentation, impact metrics, and implementation methodology. This process supports disseminating the projects results in non-scientific but informative spaces, such as the Observatory of the Institute for the Future of Education, the Novus seminars, and other means of dissemination. It enables a systemization of the processes and a record of progress in technical sheets that share information about them in a digital format.

TecDigital

Since its foundation, Tecnológico de Monterrey has been an institution in constant evolution and adoption of educational innovations, pioneering and leading in the use of technology for education and learning experiences.

The design of innovative solutions with cutting-edge technology and digital experiences led to the creation of TecDigital, whose objective is to integrate and position digital initiatives and projects focused on enriching learning experiences and student experience to increase their impact on Tecnológico de Monterrey.

The initiative integrates experiences in programs, platforms, and spaces, as described below.

TecDigital Programs

Programs and courses with flexibility for students, such as FIT (Flexible, Interactive, and Technological) courses that allow students to take online classes in real-time from wherever they are, on defined days and times; Elite courses that include academic experts as teachers in their learning experience; hybrid courses that combine face-to-face sessions with real-time online sessions; online courses that provide a more autonomous alternative to take classes, with the contents and activities of the subject available digitally, following an established delivery schedule; and the self-directed courses, focused on high-achieving students, which are distance courses with self-study, flexible and self-paced with the support of a teacher and a virtual assistant.

TecDigital Platforms

Resources, tools, and technologies that allow students to have an enriched learning toward the future, for example, Digital Library, with collections from publishers and bibliographic collections; VideoLab Tec, a digital space with video resources created by the institution's experts; and Tec Digital Labs, a new way of experiencing remote laboratories at any time and from any location, an evolution of the experience that is currently lived in physical laboratories, moving the use of specialized software to the cloud.

TecDigital Spaces

Physical and digital spaces to develop the maximum potential of students and teachers, such as: VR Zones, physical areas within the libraries of each campus, where teachers and students access support resources for their learning through virtual reality; Mostla, a learning space where teachers and students can learn about emerging technologies and experiment with them to innovate in their discipline; Hall Immersive Room (HIR), designed for the teaching and transmission of virtual courses, HIR integrates video technology, communication and artificial intelligence to break the barriers of distance and improve the relationship between students and teachers; Professor with Hologram Effect room, physical space for two-dimensional projection; EVA rooms, physical areas that provide a comfortable environment, isolated from noise to ensure greater concentration

and better interaction with students; AIR Classroom (Remote Interaction Classroom); Hybrid Classroom, spaces equipped for hybrid attendance that enable simultaneous teaching experiences: half of the group are with the teacher in the room and the other half takes the class remotely, both audiences being able to interact with each other.

Regarding emerging spaces, TecDigital Spaces include XR-Room, an area where teachers and students can interact through emerging virtual reality technologies to explore their application in the creation of innovative solutions for the development of their projects, as well as Tec Virtual Campus, a digital space that includes buildings such as the library, classrooms, auditorium, and outdoor areas where students can have learning experiences within the metaverse.

Educational trends and innovative pedagogical experiences

The Observatory of the Institute for the Future of Education is a unit of the Institute for the Future of Education of Tecnológico de Monterrey that promotes the analysis and dissemination of the educational trends and innovative pedagogical experiences that are shaping the teaching of the future for higher education and lifelong learning. Its website (observatorio.tec.mx) offers world-class teachers and professionals several open educational resources to promote the availability of didactic literature free of charge, such as articles, weekly newsletter, interviews, webinars, talk sessions, podcasts, and detailed reports.

In 2022, the IFE English and Spanish websites underwent a complete redesign to improve the browsing experience and content search and to make it more user-friendly.

Observatory IFE website in numbers from 2014 to 2022:

- Pageviews: **20.3M** (+4.0M vs. 2021)
- Users: **11.3M** (+2.5M vs. 2021)
- Subscribers: **225,000**
- Social networks followers: **500,000**
- Average reading time: **5:00** minutes in Spanish and **4:38** minutes in English

Among the notable achievements in 2022, we can highlight the production of 7 educational innovation podcasts with outstanding women in the global educational field on topics of educational innovation, education access, the state of education post-pandemic in Latin America and the world, and equality in the workplace; the broadcast of 8 webinars and panels in collaboration with Universidad Oberta de Catalunya and Pontificia Universidad Católica del Perú; and partnership also continued with national universities (UNAM, IBERO, UdeG, U Anáhuac, BUAP, UANL, IPN, and UAM) as part of the Educational Innovation 360 Network.

VI.

Our educational innovation and digital education in the world

In 2022, Tecnológico de Monterrey consolidated its strategy for creating new knowledge through research, educational certification, and participation in international contests with several projects made by teachers and multidisciplinary teams.

Below are shown the results obtained:

Certifications

In 2022, **Continuing Education** obtained the Certification in agile project management skills from **Quality Matters** (QM), a leading global organization in quality assurance in digital and innovative online teaching and learning environments.

Publications

In 2022, there was a significant production of articles disseminated through indexed journals, book chapters, and international digital media.
These are the results obtained:

- Articles in indexed publications: **11**
- Book chapters: **2**
- Articles in educational dissemination journals: **7**
- Articles in THE Campus: **37**

Besides publications, there were other efforts regarding research on accreditations and other awards in the context of educational innovation and digital education.

Awards

In 2022, relevant actors of the international education community recognized the work carried out in the institution on educational innovation and digital learning. These were the awards obtained:

Quality Matters

Category: **'Outstanding Impact by a Non-U.S. Higher Education Organization'**

Project: **'Quality Matters: Making a Difference for Students'**

Reimagine Education Awards 2022

Reimagine Education is a global conference and competition open to educational innovators from around the world.

Category: **Innovation in Business Education Award**

Award: **Bronze**

Project: **Entrepreneurship Program Innovation Project: The Experience Journey**

Reimagine Education Regional Awards 2022

Category: **Sustainability Education Award**

Award: **Silver**

Project: **SOSTEK: Promoting Sustainable Development in Higher Education**

Shortlist project: **'A new way to practice and develop highly valuated skills by industry; the aid of immersive experiences in higher education engineering courses'**

Virtual Educa

Virtual Educa was created in 2001 to promote educational innovation to favor social transformation and sustainable development, especially in Latin America and the Caribbean.

Award: **"José María Antón" for educational innovation**

Special mention: **'Escape room: future exploration'**

The references to these awards and articles can be found in the Appendices section, Appendix 3. Place the cursor on the DOI link or its corresponding hyperlink to go to the peer-reviewed articles.
To find the dissemination articles from THE Campus, click here.

Credits and acknowledgments

This publication was created by the Directorate of Educational Innovation and Digital Learning of the Vice-Rectory of Educational Innovation and Academic Regulations of Tecnológico de Monterrey.

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Appendices

Appendix 1

III. Impact of digital education

Graduate digital programs during 2022

School of Sciences and Government

Distance programs

MAP-V (T)	Master in Public Administration and Public Policy
MDP-V (T)	Master in Law
MGP-V (T)	Master in Public Management
MPE-V (T)	Master in Prospective and Strategic Studies

School of Humanities and Education

Distance programs

MEE-V (S)	Master in Education
MHD-V (T)	Master in Digital Humanities
MTE-V (S)	Master in Educational Technology
MTO-V (T)	Master in Education Entrepreneurship

School of Engineering and Science

Distance programs

MER-V (T)	Master in Energy Management and Renewable Sources
MIP-V (T)	Master in Engineering with specialization in Quality Systems and Productivity
MID-V (T)	Master in Innovation for Enterprise Development
MNA-V (T)	Master in Applied Artificial Intelligence (April 2022)
MTI-V (T)	Master in Information Technology Management
ENA	Specialization in Applied Artificial Intelligence (April 2022)

Business School

Distance programs

MAF-V (T)	Master in Finance
MBA-V (T)	Master in Business Administration
MBM-V (T)	Business Management
MGN-V (T)	Master in Enterprise Administration

Appendix 2

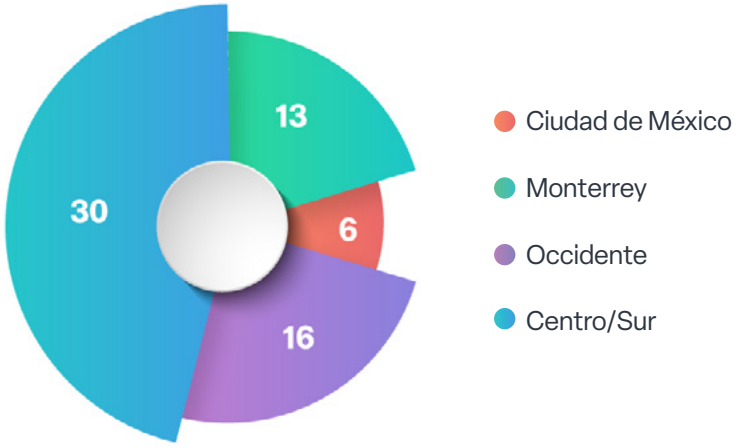
V. Institutional initiatives and innovative digital experience drivers

Novus Call 2022

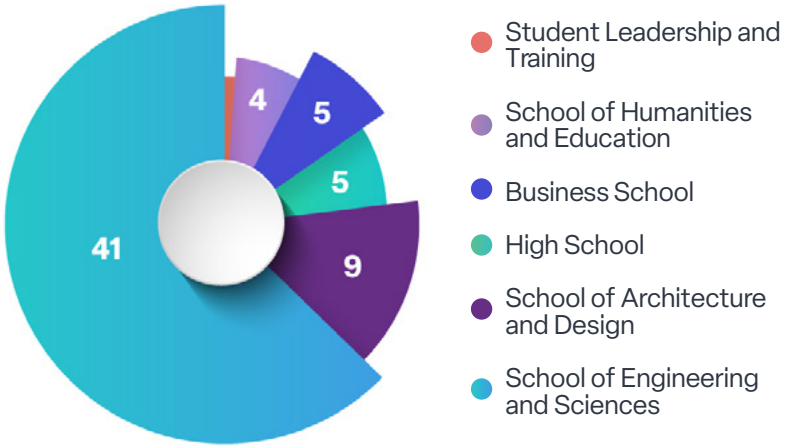
The objective of Novus is to promote experimentation and research on innovational education as a means for the professional development of the faculty, the continuous improvement of their teaching practice, and the construction of the future of education.

After evaluating, selecting, and reviewing the submitted projects to the Novus Call 2022, 65 initiatives were selected for the Novus 2022 generation, which started in January 2023. Below are shown some of its indicators:

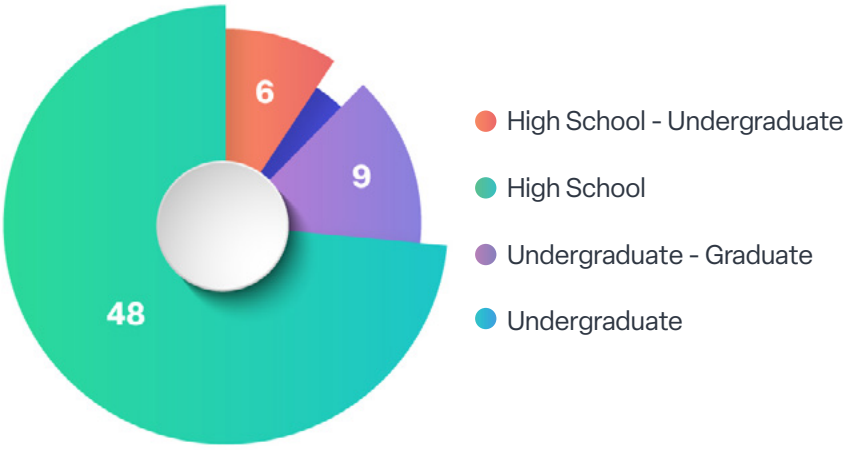
Distribution of projects selected by region



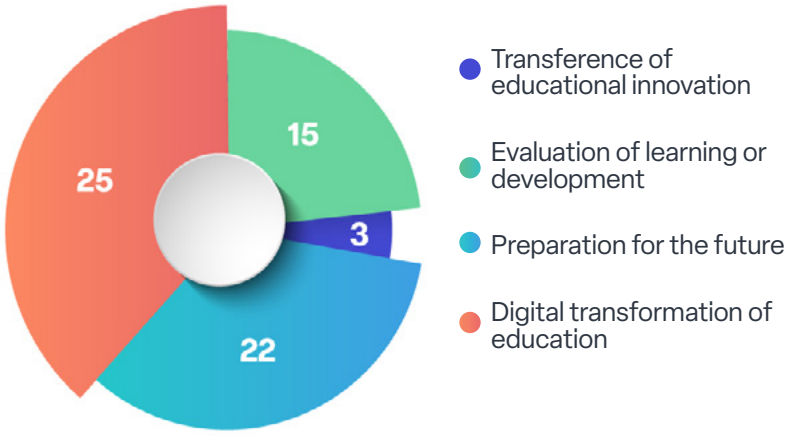
Distribution of projects selected by school



Distribution of projects selected by education level

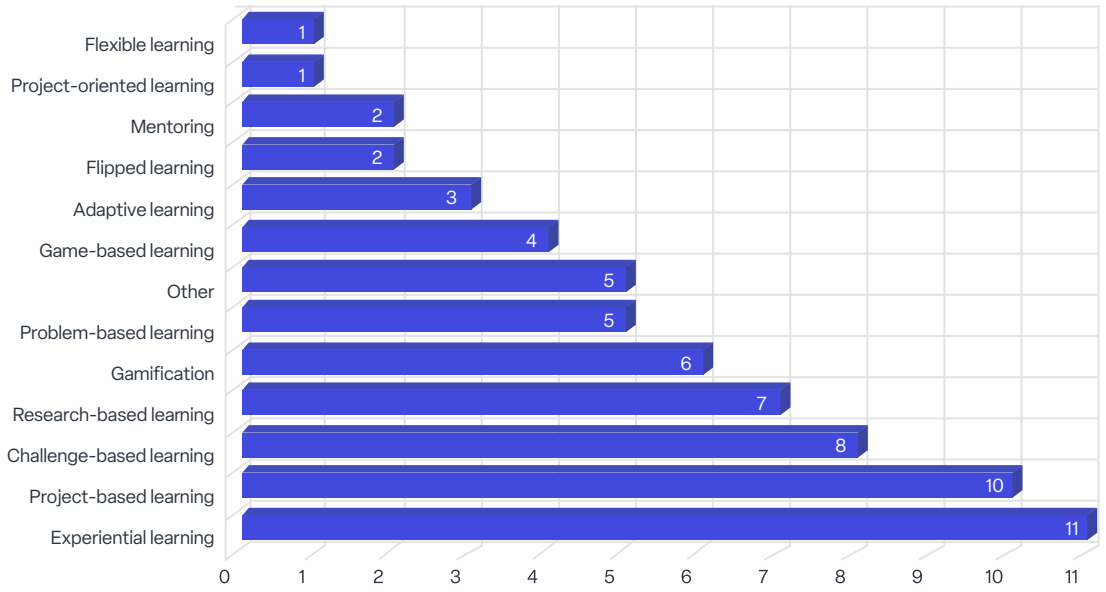


Distribution of projects selected by thematic area



Educational technology to be used in the selected projects

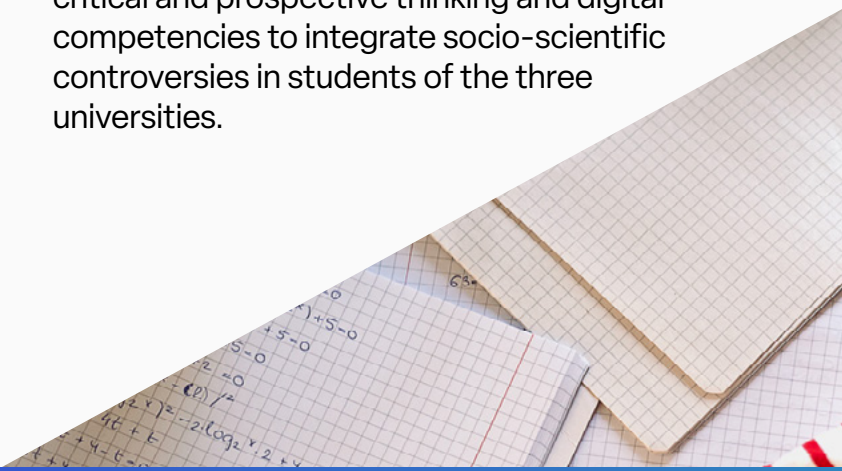
Instructional model or strategy to be used in selected projects



Novus Triada Call 2022 – Selected projects

- **Collaborative learning platform for promoting and developing innovative pedagogical practices based on integrating socio-scientific controversies with future scenarios.**

In the field of education, the team made up of Mario Quintanilla, academic of the Faculty of Education of the Pontificia Universidad Católica de Chile and director of the GRECIA-UC Laboratory; Juan Manuel Fernández, teacher and director of the Master's in Educational Technology at Tecnológico de Monterrey; and Mariana Tafur Arciniegas, professor at the Universidad de los Andes, Colombia. The team seeks to design and implement an interactive platform to promote and develop pedagogical practices that favor critical and prospective thinking and digital competencies to integrate socio-scientific controversies in students of the three universities.



- **Citizen laboratory for developing skills in favor of global citizenship: a Latin American proposal for the return to face-to-face.**

Also, in the area of education, the team led by Patricia Imbarack, professor from the Faculty of Education at Pontificia Universidad Católica de Chile, Ivón Aída Cepeda Mayorga from Tecnológico de Monterrey, and Irma Alicia Flores from Universidad de los Andes in Colombia, proposed to carry out a citizen laboratory to strengthen the training for world citizenship in students of the Tríada universities, in the context of a return to face-to-face, to be carried out between August 2022 and August 2023.

- **Open repository of practical cloud computing labs for STEM education.**

The third winning initiative was an open repository of practical cloud computing labs for STEM education. This project, which could benefit more than 800 students, was led by César Ramírez, a professor at the Institute of Biological and Medical Engineering of Pontificia Universidad Católica de Chile, and María de los Ángeles Domínguez, associate dean of the Faculty of Medicine and Health Sciences of Tecnológico de Monterrey, and Andrés Fernando González, director and associate professor of the Department of Chemical and Food Engineering at Universidad de los Andes.

Appendix 3

VI. Our educational innovation and digital education in the world

Articles in indexed journals

Aguilar-Mejía, J.R., Tejeda, S., Ramirez-Lopez, C.V., Garay-Rondero, C.L. (2022). *Design and Use of a Chatbot for Learning Selected Topics of Physics. In*: Hosseini, S., Peluffo, D.H., Nganji, J., Arrona-Palacios, A. (eds) *Technology-Enabled Innovations in Education. Transactions on Computer Systems and Networks. Springer, Singapore*. https://doi.org/10.1007/978-981-19-3383-7_13

C. A. Glez Almaguer, A. C. Aguirre Acosta and O. R. Román Jímenez, *""Wow" Experience with Immersive Reality: Gamification in the Tec Virtual Campus,". 2021 Machine Learning-Driven Digital Technologies for Educational Innovation Workshop*, 2021, pp. 1-6, doi: 10.1109/IEEECONF53024.2021.9733757.

Chamorro-Urroz, C. D., Mosqueda-Benavides, J. A., & Membrillo-Hernandez, J. (2021). *Self-regulation and Other Learning Dimensions in Hybrid Courses: Which Characteristics Matter in Academic Performance?. Journal of E-Learning Research*, 1(2), 22–31. https://doi.org/10.33422/jelr.v1i2.55

Gándara, G., Rodríguez, AG., Aldape, P. (2022, Julio 6). *Welcome to UR, Athens and Pompeii: A travel Time as an Educational Innovation to transform Citizenship and Democracy Learning Revista educativa Edulearn*. https://library.iated.org/view/GANDARA2022WEL

Hernandez Cardenas, L. S., Castano, L., Cruz Guzman, C., & Nigenda Alvarez, J. P. (2022). *Personalised learning model for academic leveling and improvement in higher education. Australasian Journal of Educational Technology*, 38(2), 70–82. https://doi.org/10.14742/ajet.7084

L. D. Glasserman-Morales, J. A. Ruiz-Ramírez and F. J. Rocha Estrada, *"Transforming Higher Education Using WebVR: A Case Study," in* IEEE Revista Iberoamericana de Tecnologias del Aprendizaje, vol. 17, no. 3, pp. 230-234, Aug. 2022, doi: 10.1109/RITA.2022.3191257.

Molina, C., Ramirez-Vasquez, N., & Cortez-Marquez, R. E. (n.d.). *Learning to escape or escaping to have fun: Do educational escape rooms positively impact students' performance in Business Higher Education? European Conference on Games Based Learning. Retrieved December* 12, 2022, *from* https://papers.academic-conferences.org/index.php/ecgbl/article/view/685

Ramírez-Montoya, María-Soledad, González-Padrón José-Guadalupe. Arquitectura de horizontes en emprendimiento social: innovación con tecnologías emergentes. *Texto Livre: Linguagem e Tecnologia* [en linea]. 2022, 15( ), 1-16[fecha de Consulta 14 de Diciembre de 2022]. ISSN: Disponible en: https://www.redalyc.org/articulo.oa?id=577170677001

Rocha Estrada FJ, Ruiz-Ramírez JA, George-Reyes CE and Glasserman-Morales LD (2022) *Evaluation of a Virtual Campus Adapted to Web-Based Virtual Reality Spaces: Assessments of Teachers and Students.* Front. Educ.7.918125. doi: 10.3389/feduc.2022.918125

Portuguez-Castro, M. 2022. *Mentoring in educational innovation: systematization in the experience of teachers' educational experimentation and research.* DOI:10.13140/RG.2.2.30436.04484/1 *In the Tenth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM '22). Salamanca, Spain.*

Portuguez-Castro M, Hernández-Méndez RV, Peña-Ortega LO. *Novus Projects: Innovative Ideas to Build New Opportunities upon Technology-Based Avenues in Higher Education. Education Sciences.* 2022; 12(10):695. https://doi.org/10.3390/educsci12100695

Book chapters

Chaparro Obregón, María & Herrera, José & Turrubiates, Miriam & Olivares, Silvia. (2022). *Teaching Clinical Skills During Pandemic Times: Online Clinical Simulation.* 10.4018/978-1-7998-8783-6.ch013.

L. Zepeda, L. Quilantán, J. Herrera, M. González, G. Sánchez (2022) *THINKING OUTSIDE AND INSIDE THE CLASSROOM: DESIGN THINKING WORKSHOP UNDER A HYBRID MODEL, INTED2022 Proceedings*, pp. 4869-4875. doi: 10.21125/inted.2022.1272

Articles in THE Campus

Alvarado Ramírez, R. (2022). *Top tips for establishing close relationships with students online. THE Campus Learn, Share, Connect. Retrieved November 28, from* https://www.timeshighereducation.com/campus/top-tips-establishing-close-relationships-students-online

Aguirre - Acosta, A. (2022) *Awaken your students' interest in your online course, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/awaken-your-students-interest-your-online-course-

Benavente, B., & Murrieta, E. (2022, November 17). *Things to consider when designing a self-directed course model. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/things-consider-when-designing-selfdirected-course-model

Benavides, I. (2022) *Six tips on helping your students improve their teamwork skills, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/six-tips-helping-your-students-improve-their-teamwork-skills

Benavides, I., & Molina, A. (2022, *November 17). Tips for organising and Optimising Your Inbox and messaging apps. THE Campus Learn, Share, Connect. Retrieved December 6, 2022, from* https://www.timeshighereducation.com/campus/tips-organising-and-optimising-your-inbox-and-messaging-apps

Benavides, J., & Benavides, J. (2022, *December 1). An introduction to microlearning. THE Campus Learn, Share, Connect. Retrieved December 6, 2022, from* https://www.timeshighereducation.com/campus/introduction-microlearning

Burgos, V. (2022, November 17). *Covid-19 showed that the academic library requires digital evolution. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/covid19-showed-academic-library-requires-digital-evolution

Cáceres, V. (2022) *Instructional designers: How to work well with teachers, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/instructional-designers-how-work-well-teachers

Contrino, M. (2022). *Using technology to revolutionise the way you evaluate. THE Campus Learn, Share, Connect. Retrieved 28 April 2022, from* https://www.timeshighereducation.com/campus/using-technology-revolutionise-way-you-evaluate

Contrino, M. (2022) *Breaking with tradition: 10 creative assessment ideas, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/breaking-tradition-10-creative-assessment-ideas

Cortez, R. and Mendoza, E. (2022) *Eight essential tips for remote interdisciplinary teamwork, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/eight-essential-tips-remote-interdisciplinary-teamwork

Espínola, G., & Elizondo, M. (2022, *November* 17). *Tips on bringing expert professionals to class to support learning. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/tips-bringing-expert-professionals-class-support-learning

Garay, M., & Murillo, B. (2022, *November* 17). *Using empathy in the classroom can have a great impact on learning. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/using-empathy-classroom-can-have-great-impact-learning

González, A., & Mendoza, P. (2022, *November* 17). *Starting from scratch to promote critical thinking in your classes. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/starting-scratch-promote-critical-thinking-your-classes

González, M. (2022, *November* 17). *21st-century assessment: Improve and update the way you evaluate. THE Campus Learn, Share, Connect. Retrieved December 6, 2022, from* https://www.timeshighereducation.com/campus/21stcentury-assessment-improve-and-update-way-you-evaluate

González-Valdepeña, G., Plata-Marroquín, A. and Sánchez, G. (2022) *Enrich your online evaluation practices with this quick guide, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/enrich-your-online-evaluation-practices-quick-guide

Granados, B. (2022, December 6). *Tips for designing activities that tackle cheating in digital environments. THE Campus Learn, Share, Connect. Retrieved December 6, 2022, from* https://www.timeshighereducation.com/campus/tips-designing-activities-tackle-cheating-digital-environments

Hernández Cardona, C., & Banda Martínez, K. (2022). *Recommendations for incorporating and guiding peer assessment in the classroom or online. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/recommendations-incorporating-and-guiding-peer-assessment-classroom-or-online

López, C. (2022, *November* 17). *Discover the nine competencies required to become a researcher. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/discover-nine-competencies-required-become-researcher

Molina, G., & Arriola, D. (2022, *November* 17). *Tips and apps to encourage better interaction with students. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/tips-and-apps-encourage-better-interaction-students

Niño-Pérez, E. and Aguirre-Acosta, A. (2022) *Ideas for using media to connect with students, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/ideas-using-media-connect-students

Ochoa, I., & Rivera, J. (2022, *November* 18). *Build effective rubrics in just five steps. THE Campus Learn, Share, Connect. Retrieved December 6, 2022, from* https://www.timeshighereducation.com/campus/build-effective-rubrics-just-five-steps

Pancardo, B., Reza, P., & Garay, M. (2022, *November* 17). *Traditional exams aren't dead – they just need to be used correctly. THE Campus Learn, Share, Connect. Retrieved December 6, 2022, from* https://www.timeshighereducation.com/campus/traditional-exams-arent-dead-they-just-need-be-used-correctly

Plata-Marroquín, A., & Castaño, L. (2022, *November* 17). *Students are different, so why are you still teaching them all the same way? THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/students-are-different-so-why-are-you-still-teaching-them-all-same-way

Quilantán, L. (2022) *Why interdisciplinarity is just like a fantasy role-playing game, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/why-interdisciplinarity-just-fantasy-roleplaying-game

Ramírez, C., Castaño, L. and Aldape, P. (2022) *Missing face-to-face interaction? try becoming a 'hologram professor', THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/missing-facetoface-interaction-try-becoming-hologram-professor

Ramírez, N., & Rosas, M. del R. (2022, *November* 17). *Challenge-Based Learning: Design and delivery in undergraduate courses. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/challengebased-learning-design-and-delivery-undergraduate-courses

Reyes, M. (2022). *How to plan an online learning-friendly assessment. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/how-plan-online-learningfriendly-assessment

Rojas, L. (2022) *Embrace students' eco-anxiety to spur critical and systemic climate action, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/embrace-students-ecoanxiety-spur-critical-and-systemic-climate-action

Sánchez Castillo, G. (2022). *Answering common questions about immersive experiences. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/answering-common-questions-about-immersive-experiences

Terui, M. (2022) *Three key tips to help balance research and teaching duties, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/three-key-tips-help-balance-research-and-teaching-duties

Toro, J. and Costilla, E. (2022) *Promoting communication skills is just as vital as course content, THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/promoting-communication-skills-just-vital-course-content

Urrutia, J., & López, C. (2022, *November* 17). *Analytics is quickly becoming a crucial teaching tool. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/analytics-quickly-becoming-crucial-teaching-tool

Vega, A., & Castillo, L. (2022). *How to design and incorporate a digital module. THE Campus Learn, Share, Connect. Retrieved November 28 April, from* https://www.timeshighereducation.com/campus/how-design-and-in corporate-digital-module

Villaseñor-Roldán, R. (2022, *November* 17). *WANT students to exercise more? make it part of their course. THE Campus Learn, Share, Connect. Retrieved November 28, 2022, from* https://www.timeshighereducation.com/campus/want-students-exercise-more-make-it-part-their-course

Zepeda Orantes, L. (2022). *Ten useful tips for teaching a hybrid course for the first time. THE Campus Learn, Share, Connect. Retrieved November 28,I 2022, from* https://www.timeshighereducation.com/campus/ten-useful-tips-teaching-hybrid-course-first-time

Zepeda Orantes, L. (2022, *November* 17). *The 7 steps for designing activities in hybrid courses. THE Campus Learn, Share, Connect. Retrieved December 6, 2022, from* https://www.timeshighereducation.com/campus/7-steps-designing-activities-hybrid-courses

Dissemination articles in educational journals

Aguirre, A., & Mosqueda, J. (2022, *July* 22). Fábricas Virtuales creadas para la Educación Digital. *Transferencia Tec.* Recuperado a partir de https://transferencia.tec.mx/2022/07/22/fabricas-virtuales-creadas-para-la-educacion-digital/

Banda, K., & Hernández, C. (2022, *December* 6). Confianza en la evaluación ¿cómo? Evaluación por pares. *Observatorio Tec.* Recuperado a partir de https://observatorio.tec.mx/edu-bits-blog/beneficios-de-la-evaluacion-por-pares/

Cantú González, D. (2022). Experiencias inmersivas en el contexto universitario: reflexiones prácticas desde la indagación. *Revista Educativa HEKADEMOS*, (32), 35-41. Recuperado a partir de https://www.hekademos.com/index.php/hekademos/article/view/42

Cortez, R., & Contrino, M. (n.d.). 10 métodos disruptivos para evaluar el aprendizaje de tus alumnos. *Mosaico Tec.* Recuperado a partir de https://mosaico.tec.mx/es/noticia/10-metodos-disruptivos-para-evaluar-el-aprendizaje-de-tus-alumnos

Hernández, C. (2022, *March*). *El aprendizaje profundo y el aprendizaje basado en drones.* Reforma Siglo XXI. Recuperado a partir de https://preparatoria3.uanl.mx/reforma/reforma109.pdf

Ramírez , C., Castaño, L., Aldape, P., & Zepeda, L. (2022, *December* 9). Cinco pasos para convertirte en "Profesor con efecto holograma''. *Observatorio Tec.* Recuperado a partir de https://observatorio.tec.mx/edu-bits-blog/cinco-pasos-para-convertirte-en-profesor-con-efecto-holograma/

Rodríguez, Y., & Costilla, E. (2022, *August* 31). ¿Cómo avanzar hacia la igualdad de género desde la Universidad? *Transferencia Tec.* Recuperado a partir de https://transferencia.tec.mx/2022/08/30/como-avanzar-hacia-la-igualdad-de-genero-desde-la-universidad/

Certifications

Quality Matters

Continuing Education
"Certification in agile project management skills," from Tecnológico de Monterrey, became the first Continuing Education program in Latin America to be certified by Quality Matters (QM), a leading global organization in quality assurance in digital and innovative online teaching and learning environments.

Awards

Quality Matters

Category: **'Outstanding Impact by a Non-U.S. Higher Education Organization'**
Project: **'Quality Matters: Making a Difference for Students'**

Tecnológico de Monterrey won the 'Quality Matters: Making a Difference for Students' award in the category 'Outstanding Impact by a Non-U.S. Higher Education Organization,' which recognizes institutions or groups outside the United States that have implemented standards, practices, and processes from this initiative to transform student experiences successfully.

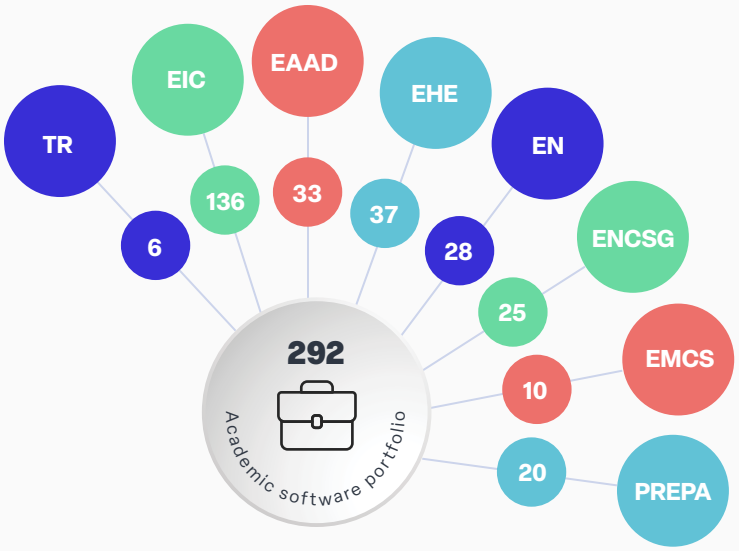
This award recognizes the institution's commitment to aligning its entire offer of 440 digital courses at the high school, undergraduate, and graduate levels to QM quality standards, ensuring quality in all digital education courses offered at Tecnológico de Monterrey. In addition, the institution played a decisive role in translating the 'Quality Matters' rubric into Spanish, a contribution that will impact thousands of students worldwide.

Reimagine Education Awards 2022

Category: **Innovation in Business Education Award**
Award: **Bronze**

Entrepreneurship Program Innovation Project: The Experience Journey

The Experiential Journey for Bachelor in Entrepreneurship (BE) is a multicampus national project that involved a deep redesign of the curriculum to allow students to develop entrepreneurial skills and mindset and apply



the knowledge to a transversal multi-semester project while receiving accompaniment in the process. The LDE program is currently offered at 10 campuses of the Tec de Monterrey and lasts eight semesters. The project focuses on implementing 5 types of innovative interventions within the curriculum design along the 8-semester journey of future entrepreneurs.

Reimagine Education Regional Awards 2022

Category: **Sustainability Education Award**
Award: **Silver**

SOSTEK: Promoting Sustainable Development in Higher Education

Sostek is a project from the Novus initiative of Tecnológico de Monterrey, which aims to promote a culture of sustainability in education. Learn more about Sostek here. Shortlisted project: 'A new way to practice and develop highly valuated skills by industry; the aid of immersive experiences in higher education engineering courses'

With the project 'A new way to practice and develop highly valued skills by industry; the aid of immersive experiences in higher education engineering courses,' the developer teaching team and the experts from Digital Experience for Professionals: Engineering, Humanities and Architecture; Production and Creative Design; Pedagogical Design and Architecture; and Innovation of Learning Experiences, continue to stand out for this virtual reality experience, having been shortlisted for the semifinals in the most recent edition of the 'QS Reimagine Education' awards.

This project is about an industrial plant called 'Duck Toys,' a virtual reality platform dedicated to learning industrial engineering, available 24/7 and without restrictions of any kind in its manipulation and observation processes, unlike a real plant, which is restricted by hours, accessibility of areas, and geography.

Virtual Educa

Award "José María Antón" for educational innovation
Place: **Special Mention**
Project: **'Escape room: future exploration'**

With the virtual reality project 'Escape room: future exploration,' members of the Innovation and Learning Experiences teams, as well as Production and Creative Design, obtained the special mention awarded by this important contest, in which they competed against 106 projects from participants in 13 countries.

This immersive experience allows students to playfully reinforce the content learned in the "Megatrends for the future of business" class, where, through collaborative work, they must solve a series of challenges to reach the landing zone and, in this way, accomplish the mission.

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Vice-Rectory for Academic Affairs and Innovational Education | Tecnológico de Monterrey

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innovacioneducativa@servicios.itesm.mx

Or visit our digital space:
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