UACM
Universidad Autónoma de la Ciudad de México
NADA HUMANO ME ES AJENO

UACM 25 2001-2026

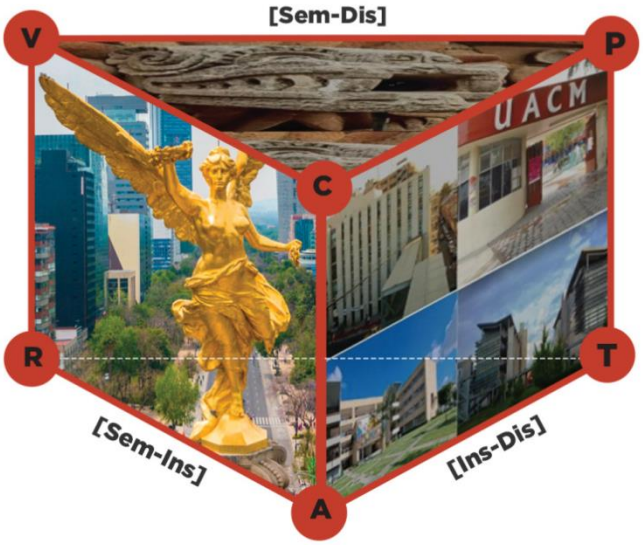
ÉTM9

México 2026

Noveno Simposio sobre el Estudio del Trabajo Matemático

Neuvième Symposium d'Étude sur le Travail Mathématique

Ninth Symposium on the Study of Mathematical Work



1 al 5 de junio de 2026

https://www.uacm.edu.mx/etm9

Cinvestav Matemática Educativa

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PROGRAMA GENERAL

WELCOME

La Universidad Autónoma de la Ciudad de México (UACM) y el Comité Nacional de Organización del Noveno Simposio sobre el Estudio del Trabajo Matemático (ÉTM9) les dan la más cordial bienvenida.

Sean bienvenidos a México, un país de gran diversidad cultural, histórica y geográfica, cuya cocina tradicional ha sido reconocida por la UNESCO como Patrimonio Cultural Inmaterial de la Humanidad.

Sean bienvenidos a la Ciudad de México, erigida sobre la gran Tenochtitlán.

Y sean bienvenidos a la Universidad Autónoma de la Ciudad de México, que este año celebra con orgullo su primer cuarto de siglo. Esta casa de estudios es una institución de educación superior pública, gratuita e incluyente, comprometida con la formación académica, la investigación y la construcción de alternativas educativas para amplios sectores de la población.

En este simposio nos reunimos investigadores de Argentina, Canadá. Chile, Francia, Italia, México y Turquía. Confiamos en la consolidación, el crecimiento y la articulación de redes de colaboración en esta comunidad, en torno al aprendizaje y la enseñanza de las matemáticas.

Sean cordialmente bienvenidos,

Comité Nacional de Organización

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1. Organizing Institution

Universidad Autónoma de la Ciudad de México

2. Scientific Committee

Philippe R. RICHARD, Université de Montréal, Canada.
Co-President of the Scientific Committee

Laurent VIVIER, Université Paris Cité, France.
Co-President of the Scientific Committee

Alain KUZNIAK, Université Paris Cité, France

Assia NECHACHE, CY Cergy Paris Université, France

Avenilde ROMO, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV-IPN), México

Elizabeth MONTOYA DELGADILLO, Pontificia Universidad Católica de Valparaíso, Chile

Fabienne VENANT, Université du Québec à Montréal, Canada

Fernando HITT, Université du Québec à Montréal, Canada

Inés M. GÓMEZ-CHACÓN, Universidad Complutense de Madrid, España

Jorge GAONA PAREDES, Pontificia Universidad Católica de Valparaíso, Chile

Judith HERNÁNDEZ, Universidad Autónoma de Zacatecas, México

Konstantinos NIKOLANTONAKIS, Université de la Macédoine Ouest, Grèce

Michela MASCHIETTO, Università degli Studi di Modena e Reggio Emilia, Italia

Patrick GIBEL, Université de Bordeaux, France

Rosa Elvira PÁEZ, Universidad Autónoma de la Ciudad de México, México

Steven VAN VAERENBERGH, Universidad de Cantabria, España

3. Local Organizing Committee

Rosa Elvira PÁEZ, Universidad Autónoma de la Ciudad de México.
Presidenta del Comité Nacional de Organización

Avenilde ROMO, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV-IPN)

Carmen Liliana RODRÍGUEZ, Universidad Autónoma del Estado de México

Heidy Cecilia CHAVIRA, Universidad Autónoma de Ciudad Juárez

Juan de Dios VIRAMONTES, Universidad Autónoma de Ciudad Juárez

Judith HERNÁNDEZ, Universidad Autónoma de Zacatecas

Magally MARTÍNEZ, Universidad Autónoma del Estado de México

Ricardo RICO, Universidad Autónoma del Estado de México

4. Symposium format

ÉTM meetings are international symposia organized around thematic working groups based on participants' contributions. This symposium format promotes exchanges among participants and supports the building of a community of researchers with shared interests.

Discussions among participants will take place during general plenary sessions and within one of the three thematic working groups:

- **Theme 1.** Theoretical and methodological perspectives on the study and development of mathematical work.
- **Theme 2.** Tasks, situations, modelling and artifacts: interdisciplinary dimensions and effects on mathematical work.
- **Theme 3.** Genesis and development of mathematical work: the role of the teacher, the trainer, the group, and interactions.

Two cross-cutting themes are proposed for discussion due to their didactic potential and the questions they raise. These will be addressed within each of the three main themes and synthesized during the final days of the symposium.

i. *Quality of mathematical work.* The question of the quality of mathematical work, which arises in one form or another for all of us, was discussed during ÉTM8 and helped to open a broader debate. Without aiming to pass judgment or to evaluate mathematical work against a fixed standard, this transversal theme seeks instead to pursue the discussion and refine the notion of quality in mathematical work so that it becomes a meaningful didactic concept.
ii. *Technological artifacts and artificial intelligence.* This transversal theme aims to specify the distinctive features of innovative

technologies, and more particularly of artificial intelligence. How is mathematical work evolving in the current technological context? Should we adopt a specific form of vigilance? Is there truly added value in integrating AI into mathematical work? This last question is crucial, given the ethical and environmental issues raised by such technologies.

5. Planning

MONDAY: June 1st	TUESDAY: June 2nd	WEDNESDAY: June 3rd	THURSDAY: June 4th	FRIDAY: June 5th
9:00-9:30 Registration	9:00-11:00 Workshops in parallel session 1	DIA LIBRE JOURNÉE LIBRE DAY OFF	9:00-11:00 Workshops in parallel session 2	9:00-11:00 Session 5 Synthesis Parallel topics
10:00-10:30 Inauguration				
10:30-11:45 Conference: Mathematical work and artificial intelligence	11:00-11:30 Coffee Break		11:00-11:30 Coffee Break	11:00-11:30 Coffee Break
11:45-12:00 Photo	11:30-13:30 Session 3 Parallel topics		11:30-13:30 Session 4 Parallel topics	11:30-12:30 Poster[1]
12:00-12:30 Coffee Break				
12:30-13:30 Session 1 Parallel topics				12:30-13:30 Conference: Mathematical work and APOS
13:30-15:00 Lunch	13:3015:00 Lunch		13:30-15:00 Lunch	13:30-15:00 Lunch
15:00-17:00 Session 2 Parallel topics	15:00-16:30 Conference: Quality of Mathematical Work		15:00-16:30 Panel Discussion: Mathematical Work and Artificial Intelligence	15:00-16:30 Summary and Future Directions
	16:30-17:30 CS meeting		16:30-17:30 ADRETM General Assembly	16:30-17:00 Closing Ceremony
17:00-17:30 Presentation of the association: ADRETM				
			17:30-18:30 CS meeting	
18:00-19:00 Welcome meeting hosted by ADRETM			19:00-21:00 Social dinner "Each guest pays their own bill"	

Auditorium: 2nd Floor	Auditorium Lobby: 2nd Floor	Topic 1: Isoptic Room. 3rd Floor	Topic 2: A201. 2nd Floor	Topic 3: A202. 2nd Floor	Lunch: Cafeteria, 1st Floor
Aula de Autoacceso 1: 3rd Floor Workshop: Computer Programming: A Tool for Teaching Math in the Classroom?		Aula de Autoacceso 2: 3rd Floor Workshop: Paradigms in a Mathematical Working Space and the role of categories of analysis		Sala Isóptica: 3rd Floor Workshop: Exploring mathematical work with artificial intelligence: instrumented situations and analysis of technological counterpoint	

[1] The posters will be on exhibition starting Tuesday

6. Conference

MONDAY 01, JUNE: CONFERENCE

TITLE

Mathematical work at the interface of artificial intelligence: between technological counterpoint and the reconfiguration of engagement regimes

SPEAKER

Philippe R. Richard - Université de Montréal - Canada

ABSTRACT. The recent rise of artificial intelligence systems, particularly large language models, introduces a profound transformation in the conditions of mathematical work. Beyond the commonly emphasized assistive effects, these systems contribute to a more structural reconfiguration of the interactions between subject, milieu, and digital artefacts.

This lecture proposes to analyse these transformations within the framework of the Theory of Mathematical Working Spaces (ThETM), by introducing the notion of technological counterpoint to characterise the relationships between human activity and AI systems. Far from a harmonious or substitutive perspective, this counterpoint highlights tensions between different regimes of engagement and renews the question of epistemic control and idoneity in mathematical work.

Based on the analysis of instrumented situations, critical moments will be identified — system errors, bifurcations in problem solving, and shifts in control — revealing both the limitations and the potential of human–AI interactions. These analyses show that AI does not replace mathematical work, but rather transforms its conditions by redistributing responsibilities for validation, interpretation, and structuring.

The lecture thus aims to propose an analytical framework for understanding contemporary forms of mathematical engagement at the interface of artificial intelligence.

TUESDAY 02, JUNE: CONFERENCE

TITLE

The quality of mathematical work and the development of mathematical work in a school context

SPEAKER

Assia Nechache - CY Cergy Paris Université LDAR - France

ABSTRACT. We will present a model for analyzing quality, structured around three interconnected levels: the product of mathematical work, the organization of mathematical work, and the control of mathematical work. Each level is examined using specific criteria that allow for the evaluation of: the conformity of the process and the accuracy of the work's results, the implementation of work controls, as well as the completeness and consistency of the mathematical work. This model enables researchers to evaluate the quality of the work according to a set of criteria and to identify levers for influencing this work.

We will illustrate this approach through empirical studies conducted in school settings, showing how intrinsic factors (students' cognitive repertoire) and extrinsic factors (tasks, the teacher's role, the instructional environment) influence the quality of the work.

FRIDAY 05, JUNE: CONFERENCE

TITLE

Mathematical Work and APOS: Reflections from the infinity

SPEAKER

Asuman Oktaç - Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional- México

ABSTRACT. Infinity is a concept that permeates various domains, and its understanding constitutes an important part of the education of university students in scientific fields. In this talk, by examining contexts involving infinity, I will explore potential connections between the mental structures and mechanisms of APOS Theory (Action—Process—Object—Schema) and the activation of different dimensions of the Theory of Mathematical Workspaces in the construction of mathematical knowledge. Both theories emphasize the individual's interaction with mathematical content; linking them may enrich our reflection on the learning process.

7. Panel discussion

THURSDAY 04, JUNE: PANEL DISCUSSION

TITLE

Panel discussion: Mathematical Work and Artificial Intelligence

COORDINATORS

Silvia Soledad López – Universidad Viña del Mar – Chile

Yasna Solar – Université Paris Cité – France

Saul Van Acker – Université de Montréal – Canada

8. Workshops in parallel

TUESDAY 02 AND 04, JUNE 04

TITLE: WORKSHOP 1

Computer Programming: A Tool for Teaching Math in the Classroom?

SPEAKER

Fabienne Venant - Département de mathématiques, Université du Québec à Montréal - Canadá

ABSTRACT. Computer programming education is gaining momentum in schools. In Quebec, for example, the Digital Action Plan for Education and Higher Education published by the government in 2018 includes the expansion of computer programming as an educational tool in schools among its key initiatives. In this workshop, we will examine whether writing computer programs can contribute to the development of algebraic knowledge and, if so, how. We will work with participants on an exercise involving the generation and solving of equations in a playful context, using the Scratch programming platform. We will analyze the mathematical work involved and how it relates to computer science and algebraic tasks.

INFORMATION: If you plan to use your computer, please install Scratch. https://www.scratchfoundation.org/tools

TITLE: WORKSHOP 2

Paradigms in a Mathematical Working Space and the role of categories of analysis

SPEAKERS

Jorge Gaona - IMA-PUCV - Chile, Alain Kuzniak – UPCité - France, Elizabeth Montoya Delgadillo - IMA-PUCV - Chile, Assia Nechache – CYU-France, Laurent Vivier – UPCité - France

ABSTRACT. The theory of Mathematical Working Spaces considers the notion of paradigms in relation to different mathematical domains. Paradigms, among other aspects, make it possible to characterize mathematical work in relation to MWS. In this workshop, we will show how these paradigms can be operationalized and used to analyze various forms of solving the same task. We will also develop the theoretical foundations that contribute to their definition and the methodological tools that enable their study.

INFORMATION: Please, have a Gmail account so that you can use spreadsheets and Python Colab.

TITLE: WORKSHOP 3

Exploring mathematical work with artificial intelligence: instrumented situations and analysis of technological counterpoint

SPEAKER

Philippe R. Richard - Université de Montréal - Canada

ABSTRACT. The introduction of artificial intelligence systems into situations of mathematical work cannot be reduced to a simple assistive effect. It transforms interaction dynamics, modes of problem solving, and forms of epistemic control.

This workshop proposes to explore these transformations through instrumented mathematical work situations involving AI systems. Participants will be invited

to analyse episodes of problem solving marked by system errors, bifurcations in reasoning, and shifts of control between human and machine.

These analyses will be connected to the framework of the Theory of Mathematical Working Spaces (ThETM) and to the notion of technological counterpoint, in order to identify tensions, points of fragility, and conditions of idoneity in mathematical work within such environments.

The workshop aims to support a concrete appropriation of these conceptual tools by articulating situation analysis, collective discussion, and a broader reflection on the challenges associated with the use of artificial intelligence in mathematical work.

9. Topic Work

Theme 1: Theoretical and methodological perspectives on the study and development of mathematical work

Coordinators: ***Alain KUZNIAK****, Université Paris Cité, France;* ***Assia NECHACHE****, CY Cergy Paris Université, France;* ***Jorge GAONA*** *PAREDES, Pontificia Universidad Católica de Valparaíso, Chile*

SESSION 1: monday 12:30-13:30 h

Functioning of the group, introduction and presentation of participants

CO : La qualité du travail mathématique et le développement du travail mathématique en contexte scolaire

Assia ***NECHACHE***

C Y Cergy Paris Université, France

SESSION 2: monday 15:00-17:00 h

CO: Skill-oriented curriculum and the reconfiguration of the reference mathematical working space: Functions in Turkish upper secondary curriculum

Abdulkadir ***ERDOGAN***

Anadolu University, Türkiye

CO: El Espacio de Trabajo Didáctico Idóneo: una trasposición del Espacio de Trabajo Matemático Idóneo a la Didáctica de las Ciencias

*Paula **BRAVO-VALDÉS** [1] and Claudia **REYES-AVENDAÑO** [1]*

Pontificia Universidad Católica de Valparaíso, Chile;

CO : Raisonnement géométrique sans figure : Espace de travail mathématique et type d'appréhension

*Emel **ÖZDEMIR ERDOGAN** [1] , and Leyla **AYDURMUS** [2]*

[1] Université d'Anadolu, Türkiye ;

[2] Ministère de l'Éducation Nationale de Türkiye, Türkiye

SESSION 3 CROSS-THEMATIC: tuesday 11:30-13:30 h AUDITORIUM

CO : Sur la consistance du travail mathématique au temps de l'Intelligence Artificielle

*Alain **KUZNIAK***

Université Paris Cité, France

SESSION 4: thursday 11:30-13:30 h

CO: Integración de herramientas de inteligencia artificial generativa en el aprendizaje del álgebra lineal: Efectos en el espacio de trabajo matemático personal

*Yasna **SOLAR-MUÑOZ***

Université Paris Cité, France

CO: Elección y uso de IA y artefactos digitales para resolver tareas abiertas

Jorge Gaona [1], Catalina Palacios [2] y Juan Pablo Vargas [3]

[1] Pontificia Universidad Católica de Valparaíso, Chile;

[2] Universidad de Atacama, Chile

[3] Universidad de las Américas, Chile

CO: La interdisciplinariedad desde la modelización matemática: la función y el Movimiento Rectilíneo Uniformemente Acelerado

*Claudia **REYES** [1] y Silvia **LÓPEZ** [2]*

[1] Pontificia Universidad Católica de Valparaíso, Facultad de Ciencias, Valparaíso, Chile;

[2] Universidad Viña del Mar, Formación Transversal, Viña del Mar, Chile

SESSION 5: friday 9:00-11:00 h

Mathematical operations and cultural differences: Influencer or influenced?

*Kübra **ALAN** [1], and Elif **ERTEM AKBAŞ** [2]*

[1] Hacettepe University, Türkiye;

[2] Van Yuzuncu Yıl University, Türkiye

Theme 2: Tasks, situations, modelling and artifacts: interdisciplinary dimensions and effects on mathematical work

Coordinators: ***Elizabeth MONTOYA DELGADILLO****, Pontificia Universidad Católica de Valparaíso, Chile;* ***Laurent VIVIER****, Université Paris Cité, France;* ***Philippe R. RICHARD****, Université de Montréal, Canada*

SESSION 1: monday 12:30-13:30 h

Functioning of the group, introduction and presentation of participants

Poster: Aprendizaje Basado en Problemas ¿Cuánto mide el pez?

Juan Manuel ***SÁNCHEZ-SOTO*** *[1], Magally* ***MARTÍNEZ-REYES*** *[2] and José Macario* ***LÓPEZ-BALDERAS*** *[3]*

[1] Universidad Intercultural de Tepetlixpa, México,

[2] Universidad Autónoma del Estado de México, México

[3] Asociación Nacional por la Inclusividad Educativa en México, México

SESSION 2: monday 15:00-17:00 h

CO: Caracterización del Trabajo Matemático Colectivo en una Secuencia Didáctica Interdisciplinaria sobre Púlsares Mediada por Herramientas Digitales

Ignacia BENITO-CISTERNA [1] y Claudia REYES-AVENDAÑO [1]

[1]Pontificia Universidad Católica de Valparaíso, Chile

CO: Argumentos que construyen futuros profesores de matemáticas al resolver problemas geométricos empíricos

Guadalupe ***CABAÑAS-SÁNCHEZ***
Universidad Autónoma de Guerrero, México

CO : Démêler le rôle de l'IA dans le travail mathématique : Modélisation, contrepoint technologique et contrôle épistémique

Philippe R. ***RICHARD*** *[1], Saül* ***VAN-ACKER*** *[1]*
[1] Université de Montréal, Canada

SESSION 3 CROSS-THEMATIC: tuesday 11:30-13:30 h AUDITORIUM

CO: Contrapunto tecnológico entre IA generativa e IA simbólica en el espacio de trabajo matemático personal de futuros profesores para abordar tareas de geometría tridimensional

Fabiola ***ARÉVALO-MENESES*** *[1], Elizabeth* ***MONTOYA-DELGADILLO*** *[2] y Philippe R.* ***RICHARD*** *[3]*
[1,2] Pontificia Universidad Católica de Valparaíso, Chile;
[3] Universidad de Montreal, Canadá

SESSION 4: thursday 11:30-13:30 h

CO: Construcción de funciones asintóticas en un ambiente con tecnología digital interactiva

Rosa Elvira ***PÁEZ-MURILLO*** *[1] y Mónica* ***ARNAL-PALACIAN*** *[2]*
[1] Universidad Autónoma de la Ciudad de México, México;
[2] Universidad de Zaragoza, España

CO: Covariación en revistas de educación matemática: una revisión sistemática bajo el lente del Espacio de Trabajo Matemático

Catalina ***PALACIOS-BEZAMA*** [1,2]

[1] *Universidad de Playa Ancha, Chile;*

[2]*Universidad de Atacama, Chile*

CO : La triade « discret-dense-continu » et les fonctions exponentielles pour les futurs professeurs de mathématiques

Elizabeth ***MONTOYA-DELGADILLO*** [1], *Laurent* ***VIVIER*** [2]

[1] *Pontificia Universidad Católica de Valparaíso, Instituto de Matemáticas, Chili*

[2] *Université Paris Cité, LDAR, France*

SESSION 5: friday 9:00-11:00 h

Poster: El andar de una hormiga como actividad lúdica para el concepto de función

Magally ***MARTÍNEZ-REYES*** [1], *José Macario* ***LÓPEZ-BALDERAS*** [2] *and Juan Manuel* ***SÁNCHEZ-SOTO*** [3]

[1] *Universidad Autónoma del Estado de México, México;*

[2] *Asociación Nacional por la Inclusividad Educativa en México, México*

[3] *Universidad Intercultural de Tepetlixpa, México*

Theme 3: Genesis and development of mathematical work: the role of the teacher, the trainer, the group, and interactions

Coordinators: ***Fabienne VENANT****, Université du Québec à Montréal, Canada;* ***Patrick GIBEL****, Université de Bordeaux, France;* ***Fernando HITT****, Université du Québec à Montréal, Canada*

SESSION 1: monday 12:30-13:30 h

Functioning of the group, introduction and presentation of participants

SESSION 2: monday 15:00-17:00 h

CO : Rôle de l'enseignante dans la genèse sémiotique de la classe : des connaissances expérientielles aux signes mathématiques

Valériane ***PASSARO****, Mireille* ***SABOYA*** *et Fabienne* ***VENANT***
Université du Québec à Montréal

CO: Patrones de uso de las preguntas del profesor que soportan la argumentación colectiva en Cálculo

Ángel Javier ***VÁZQUEZ-CHALE*** *and Guadalupe* ***CABAÑAS-SÁNCHEZ***
Universidad Autónoma de Guerrero, México

Poster: Dificultades de los futuros profesores de primaria para la enseñanza de fracciones

María del Carmen ***FAJARDO*** [1]*, David* ***BLOCK*** [2]
[1] *Departamento de Investigaciones Educativas CINVESTAV, México;*
[2] *Investigador emérito independiente, México*

SESSION 3 CROSS-THEMATIC: tuesday 11:30-13:30 h AUDITORIUM

CO: From 'embodied genesis' to AI dialogue: Defining the MWS-E framework for mathematics teacher education

Annamaria ***MIRANDA***
University of Salerno, Italy

SESSION 4: thursday 11:30-13:30 h

CO : Étude d'un projet de recherche collaborative visant à coconstruire des situations didactiques favorisant la qualité du travail mathématique des élèves

Patrick ***GIBEL***
LAB-E3D, France

CO: Proyectos STEAM con artefactos físicos programables en la formación docente inicial: tareas interdisciplinarias en contextos educativos

Gessure Abisaí ***ESPINO-FLORES***
Escuela Normal Superior, plantel Hermosillo, México

Poster: Favorecer la toma de decisiones en el aula para el aprendizaje matemático: Aportes de una revisión sistemática sobre professional noticing

Andrea ***GUTIÉRREZ-OJEDA*** [1], *Guadalupe* ***CABAÑAS-SÁNCHEZ*** [1]
[1] *Universidad Autónoma de Guerrero, México;*

10. MAPA DEL LUGAR

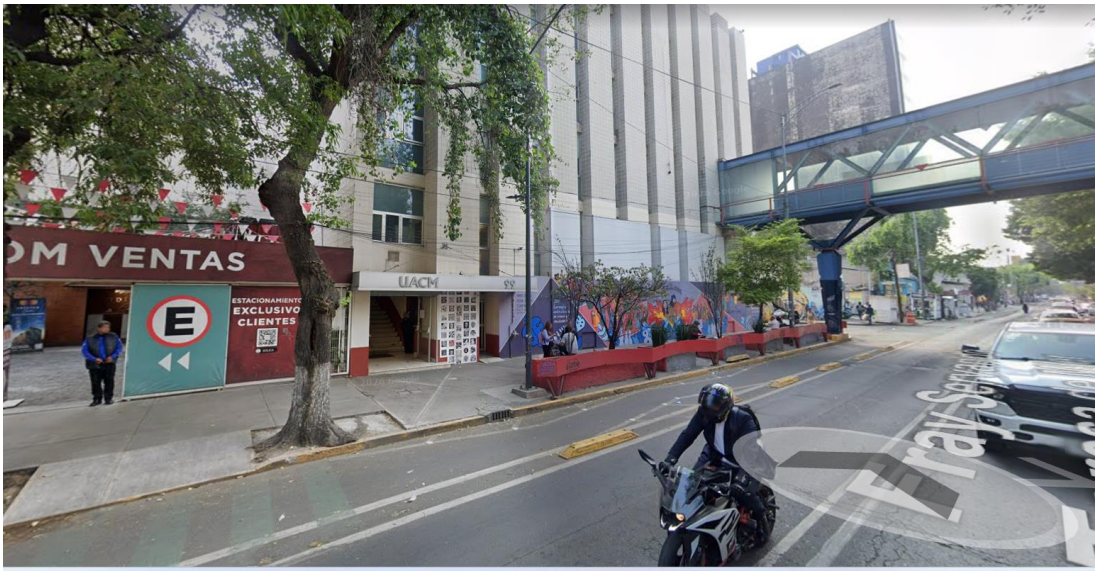
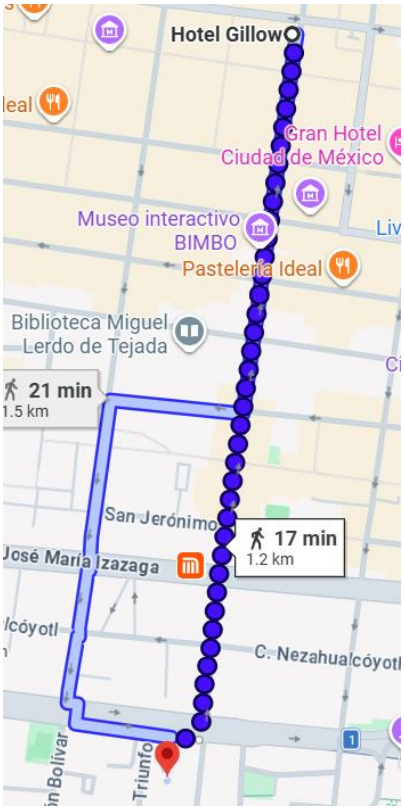


IMAGEN SELECCIONADA DE GOOGLE MAPS

IMAGEN DE NUESTRO PORTAL: HTTPS://UACM.EDU.MX/PLANTELES_Y_SEDES/CENTRO_HISTORICO

EVENT VENUE ADDRESS

Ave. Fray Servando Teresa de Mier 99
Col. Obrera, Alcaldía Cuauhtémoc
C.P. 06080 Ciudad de México, México

ROUTE FROM THE GILLOW HOTEL TO THE UACM HISTORIC CENTER CAMPUS

https://maps.app.goo.gl/2R26ZMRQok6Wah6x5