Universidad Autónoma de TAMAULIPAS

Unidad Académica Multidisciplinaria Reynosa-AZTLÁN

XR-UAT

IMPACT · FINAL JUDGE SUBMISSION

Measured learning signals, curricular continuity, student formation and external engagement

ANUIES 2025 recognition | Institutional award presentation

Primary-school outreach | Supervised immersive activity

Current XR-UAT evidence from the Unreal Engine ecosystem. Figures are labelled as native captures, documentary records or explanatory diagrams.

QS Reimagine Education Awards 2026

Immersive Experiential Learning · Academic – Early Stage · Scalability pathway

Universidad Autónoma de Tamaulipas · UAM Reynosa-Aztlán · Mexico

Evidence reviewed through 10 August 2026

1. Direct responses to the QS Impact questions

The counts and interpretations below use the strongest auditable denominator available and preserve the limits of the current data.

Q1. QS criterion response

How does your project address the identified problem(s) for your intended audience, and why is this approach effective?

Engineering students often work with expensive or safety-sensitive equipment after receiving mostly theoretical training, with limited opportunities to practice in a controlled setting. XR-UAT helps address this gap by allowing students to practice procedures, interpret results, recognize errors, and explain their decisions before or alongside supervised laboratory work. Repetition, a consistent interface, different data-quality conditions, and instructor rubrics provide a safe way to practice and assess performance without replacing laboratory training.

Early results are encouraging. We analyzed 131 PRE and 131 POST responses across 35 technical items, with overall performance increasing from 77.1% to 89.4% (+12.3 percentage points). Since PRE and POST responses could not be individually matched, these findings should be considered descriptive rather than causal. Five signed curricular records confirm repeated implementation. The next cycle will use matched identifiers and include observed performance, critical errors, and supervised transfer to laboratory work.

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Q2. QS criterion response

How many learners or participants have engaged with your project to date, and what has been the level and quality of engagement?

To date, 131 students have participated in the project, completing PRE and POST assessments covering 35 technical items. Although the available data do not allow us to match individual PRE and POST responses, all 131 students took part in the assessment process.

Engagement has been active and sustained. Students completed the full technical assessment, and five signed curricular records—REVIPRO, REACTWIN, PLANTWIN, PetroLand, and UAT-XR Laboratory—document repeated implementation during 2024–2025. The project has also supported thesis work, supervised demonstrations, and outreach activities at the elementary school, high school, and university levels, including CETIS No. 131, UAM Río Bravo, and Sor Juana Inés de la Cruz Elementary School.

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1. Direct responses to the QS Impact questions · continued

Q3. QS criterion response

How is your project contributing to positive learning, skills development, employability, or institutional outcomes for its intended audience?

XR-UAT is helping students develop practical skills that can support both their laboratory training and future engineering work. The available results show an average performance of 77.1% in the PRE assessment and 89.4% in the POST assessment across 35 technical items, an increase of 12.3 percentage points.

Through the project, students practice following procedures, checking data sources, identifying errors, and making decisions based on evidence. XR-UAT has also supported student research, including a thesis on an immersive chemistry laboratory and a professional examination approved unanimously with honorable mention in July 2025. Five curricular records further show that the project has been used repeatedly within the institution. The next stage will assess changes in learning, observed performance, critical errors, and how well these skills transfer to supervised laboratory practice.

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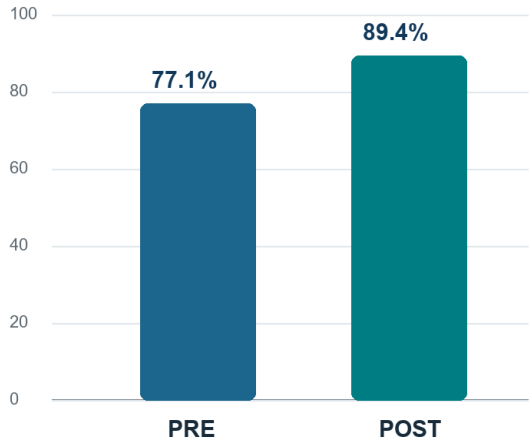
Evidence strand	Current denominator	Interpretation
Learning summaries	131 PRE + 131 POST response records across 35 items	Aggregate signal; individual PRE-POST matching has not been verified
Institutional use	Five signed curricular records	Shows repeated implementation, not a direct measure of learning gains
Controlled next cycle	Approximately 16 learners across three practices	Data collection is underway; results will be reported after the dataset is finalized

2. What the learning evidence shows



Aggregate reconstruction of the available PRE/POST Forms summaries. The denominator is response records, not verified unique or paired learners.

A total of 131 PRE and 131 POST response records were analyzed. Across the 35 technical items assessed, the average score increased from approximately 77.1% PRE to 89.4% POST, representing a difference of 12.3 percentage points. These results provide an encouraging indication of improved learning and highlight the potential of XR-UAT as a tool to support students' practical training.

The next stage will strengthen this evidence through a more comprehensive evaluation that includes student identifiers, observed performance, critical errors, and the transfer of skills to supervised laboratory practice. This will allow us to assess changes in learning more accurately and better understand the educational impact of the project.

3. Repeated curricular implementation

Reynosa, Tamaulipas a 17 de febrero de 2025

A QUIEN CORRESPONDA.
PRESENTE.-

El que suscribe, **COORDINADOR ACADÉMICO** de la carrera de **INGENIERO QUÍMICO** de la Unidad Académica Multidisciplinaria Reynosa-Aztlán de la Universidad Autónoma de Tamaulipas.

HACE CONSTAR

Que el **M. I. JUAN ROBERTO DE LA TORRE ESCAREÑO** presentó ante esta Coordinación Académica el recurso multimedia (**SOFTWARE**) desarrollado con objetivos educacionales, basado en un Tutorial nombrado **REVIPRO: Realidad Virtual para la Simulación de procesos**, dentro de la asignatura: **SIMULACIÓN DE PROCESOS**, en el periodo 2024-1 para su uso con los alumnos del **OCTAVO (8º)** semestre del grupo C de la Carrera de Ingeniero Químico de esta Unidad Académica.

Se extiende la presente constancia a petición del interesado a los diecisiete días del mes de febrero del año dos mil veinticinco en la ciudad de Reynosa, Tamaulipas.

ATENTAMENTE
"VERDAD BELLEZA PROBIDAD"

DR. RUBEN SANTIAGO ADAME
COORDINADOR ACADÉMICO DE I.Q.

UNIDAD ACADÉMICA MULTIDISCIPLINARIA REYNOSA - AZTLAN COORDINACIÓN ING. QUÍMICA REYNOSA, TAM.

Signed curricular implementation record

Cd. Reynosa, Tamaulipas a 05 de diciembre del 2025

A QUIEN CORRESPONDA
PRESENTE

El que suscribe **Coordinador Académico de la Carrera de Ingeniero Químico** de la Unidad Académica Multidisciplinaria Reynosa Aztlán de la Universidad Autónoma de Tamaulipas,

HACE CONSTAR

Que el C. **M.I. JUAN ROBERTO DE LA TORRE ESCAREÑO,** desarrolló y empleó el **SOFTWARE** titulado "PETROLAND" para la Materia: **DISEÑO DE REACTORES** utilizado por los estudiantes del grupo de **7ºC** en el período **2025-3** de la carrera de **Ingeniero Químico** de esta Unidad Académica.

Se extiende la presente constancia a petición del interesado a los cinco días del mes de diciembre del año dos mil veinticinco en la ciudad de Reynosa, Tamaulipas, México.

ATENTAMENTE
"VERDAD BELLEZA PROBIDAD"

DR. RUBÉN SANTIAGO ADAME
COORDINADOR ACADÉMICO DE
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UNIDAD ACADÉMICA MULTIDISCIPLINARIA REYNOSA - AZTLAN COORDINACIÓN ING. QUÍMICA CD. REYNOSA, TAM.

Historical Petro Land curricular record

Examples of signed Spanish-language curricular records. English descriptions are reviewer translations; the signed originals control.

Five records link the development and use of XR-UAT to university courses and project cycles: REVIPRO (2024-1), REACTWIN (2024-3), PLANTWIN (2024-3), PetroLand (2025-3), and UAT-XR Laboratory (2025-3). Together, these records show that the project has been used across different academic periods and has continued to support project-based learning rather than being a one-time activity.

The curricular records provide evidence of implementation and student participation, but they are not intended to measure learning gains. For this reason, learning results and evidence of institutional use are presented separately.

4. Student research and capability formation

Universidad Autónoma de Tamaulipas

Acta de examen Profesional

No. Acta 2282

En Cd. Reynosa, Tamaulipas, siendo las **12:00 horas** del día **18 de julio de 2025,** reunidos en la **Unidad Académica Multidisciplinaria Reynosa-Aztlán**, los integrantes del Jurado calificador los CC. **MIGYP. Juan Roberto De la Torre Escareño**, en su calidad de presidente, **M.D. Enrique González Rodríguez,** en su calidad de secretario y **M.D. Sandra Elena Acosta González,** en su calidad de vocal, con el fin de proceder solemnemente a tomar protesta, por haber cumplido con la modalidad de **Tesis "DESARROLLO DE UN ECOSISTEMA VIRTUAL INMERSIVO PARA LA SIMULACIÓN DE LABORATORIOS DE QUIMICA A NIVEL SUPERIOR"**, como opción de titulación establecido en el artículo 57 del Reglamento de Estudiantes de Educación del Tipo Medio Superior y Tipo Superior, de esta Institución Educativa, al sustentante:

C. JESUS ALEJANDRO REYES GONZALEZ

Lo anterior, derivado a que el sustentante reúne los requisitos para la titulación del programa educativo de **Químico Farmacéutico Biólogo**, tal como lo establece el artículo 56 del Reglamento de Estudiantes de Educación del Tipo Medio Superior y Tipo Superior de la Universidad Autónoma de Tamaulipas, por lo que una vez que el Jurado realizó los cuestionamientos para evaluar el grado de conocimiento del sustentante, y concluidos éstos, procede a la deliberación reservada y libremente, concluyendo que el resultado es: **APROBADO POR UNANIMIDAD DE VOTOS CON MENCIÓN HONORÍFICA**, suscribiendo y dando fe de la presente acta los que en ella intervienen.

MIGYP. Juan Roberto De la Torre Escareño
Presidente

M.D. Enrique González Rodríguez
Vócal

M.D. Sandra Elena Acosta González
Vocal

Unidad Académica Multidisciplinaria Reynosa Aztlán

VERDAD, BELLEZA, PROBIDAD

Universidad Autónoma de TAMAULIPAS

UNIDAD ACADÉMICA MULTIDISCIPLINARIA

REYNOSA-AZTLÁN

DESARROLLO DE UN ECOSISTEMA VIRTUAL INMERSIVO PARA LA SIMULACIÓN DE LABORATORIOS DE QUIMICA A NIVEL SUPERIOR

TESIS

PARA OBTENER EL TÍTULO DE
QUÍMICO FARMACÉUTICO BIÓLOGO

PRESENTA:

JESUS ALEJANDRO REYES GONZALEZ

Professional examination record | **Immersive laboratory thesis**

Professional examination and thesis evidence connected to the immersive laboratory research line.

The project has supported student work that progressed from course activities to formal academic research. This includes a thesis on an immersive virtual chemistry laboratory and the corresponding professional examination, which was unanimously approved with honorable mention in July 2025. A related research line focuses on an intelligent bioreactor and robust control. Together, these outcomes show how XR-UAT has supported students in developing technical skills, conducting research, and presenting their work for formal academic evaluation.

These results are reported within the scope of the available evidence. The thesis demonstrates research training for the students involved, but it does not imply that every participant completed a thesis or that the use of immersive technology alone produced these outcomes.

5. External educational engagement

Documented recognition and supervised outreach contexts. Image permissions were confirmed by the project team.

The evidence shows that XR-UAT has been used beyond the university classroom. It includes documented activities and invitations involving CETIS No. 131 in Reynosa, the UAM Río Bravo context, and Sor Juana Inés de la Cruz Elementary School, with activities reaching both high school and elementary school students. These experiences show that the project can be adapted to different educational levels and that facilitators can adjust the depth of the explanations and activities to suit each group.

Photographs provide evidence that the activities took place, but they do not establish participant numbers. For this reason, we do not report institutional participant counts without attendance records or similar documentation. In future outreach activities, we will keep a more complete record, including permissions, photographs, date, group size, activity duration, facilitator notes, and a short learning check appropriate to the students' age.

6. Recognition and dissemination

ANUIES 2025 provides direct recognition of the project, as the certificate specifically identifies the immersive ecosystem. FECIT 2023, ExpoCiencias 2024, ExpoCiencias Tamaulipas, and other science and engineering activities are included as part of the development of the individual projects and student teams that contributed to the current ecosystem. When an award or activity predates the current six-realm structure, we report it as evidence of the project's development rather than presenting it as recognition of the entire ecosystem.

Conference participation, classes, the public website, and the two-minute video also help make the project accessible to others and support future collaboration. Through the website, reviewers can explore the 3D Separation Processes Laboratory and see the difference between demonstration telemetry and authorized MQTT connectivity. These materials provide evidence of dissemination, access, and project development, while learning outcomes are reported separately.

Reviewer route	Reference
Public project site	https://xr-uat.com.mx/?lang=en
Two-minute project video	https://www.youtube.com/watch?v=1PaMAztioVk
Recognition convention	Direct ecosystem awards and component-lineage awards are labelled separately.

7. Current three-practice evaluation

Practice	Decision task	Measures	Current status
Pozo 08	Sequence, coupling and hazard reasoning	Matched PRE/POST, observed performance, transfer task	Approximately 16 learners; controlled collection underway.
Petro Land refinery operations	Trace line-up and justify safe start-up	Entry/practice/exit measures, manual and log scoring	Instrument and replication packet prepared.
Fractional distillation	Trace system, verify source, interpret and decide	0–20 rubric, modality, source verification	Implementation dossier and collection structure prepared.

The workbooks are currently being used as data collection tools, and will only be treated as results once the completed records have been checked and finalized. The controlled evaluation will maintain anonymized student identifiers and record attendance, learning modality, completion, critical errors, technical incidents, and evidence of how skills are transferred to supervised practice.

8. Outcome framework

Outcome	Indicator	Evidence standard
Learning	Matched change in technical items or rubric score	Anonymous paired ID, scoring rules and missing-data report.
Performance	Safe sequence, rationale and critical-error count	Observer rubric, inter-rater check and timestamped session record.
Transfer	Application during supervised physical practice	Equipment context, instructor judgement, safety sign-off and debrief.
Engagement	Invited, started, completed and analyzed	Participant-flow record rather than photographs alone.
Institutional	Validated practices and prepared instructors	Versioned guide, curriculum mapping and acceptance checklist.

Employability is understood here as the development of practical engineering skills and behaviors, including following procedures carefully, interpreting information, verifying data sources, explaining decisions, and applying skills safely in practice. We do not use employability to claim job placement or employment outcomes that have not been directly measured.

9. Evidence chain and conclusion

ID	Evidence
IMP-01	PRE/POST Microsoft Forms exports and summaries: 131 response records in each summary and 35 technical items.
IMP-02	Five signed curricular implementation records covering 2024–2025.
IMP-03	Thesis and professional examination documentation; intelligent-bioreactor research line.
IMP-04	Institutional outreach, conference, class and recognition records.
IMP-05	Pozo 08, Petro Land refinery operations and fractional-distillation guides, rubrics, checklists and collection instruments.

Language and evidentiary convention

Institutional records issued in Spanish remain the controlling originals. English titles, captions and summaries in this submission are faithful reviewer translations. Photographs establish that an activity occurred; learning and reach claims are made only from countable records or identified assessment files.

Impact conclusion

XR-UAT has already been used across multiple academic activities and has supported student research, external engagement, and practical learning. The available results also show a positive overall learning signal. At this early stage, the project presents its evidence carefully and does not make claims beyond what the current data support. The next evaluation cycle will provide stronger evidence by tracking participant progress, observed performance, critical errors, and the transfer of skills to supervised practice. Together, these steps will help demonstrate the project's educational impact more clearly and reliably.