# **Employing the Rio Grande Basin as a Resource for Encouraging Hispanic-Americans to Pursue Engineering Education Work in Progress**

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Thomas Soto is a Ph.D. student in the Teaching, Learning, and Culture program with a focus on STEM Education at the University of Texas at El Paso UTEP. He is also a Certified Medical Simulation Educator and Operations Specialist under the Society for Simulation in Healthcare, currently working as the Administrator for the William Beaumont Army Medical Center. Previously, Thomas served as a Combat Medic with a tour to Iraq as part of the 1rst Armored Division.

Thomas began his work in Medical Simulation as an Instructor Course Developer in 2012, creating a program that provided education to deploying military personnel on initial life-saving measures for casualties. He continues his work in Simulation and has demonstrated strong leadership skills as the Administrator for the WBAMC Simulation Program at Ft Bliss. Under his leadership, the organization achieved accreditation in Teaching and Education from the Society for Simulation in Healthcare. He also played a crucial role in establishing the center as a designated testing site for Fundamentals of Laparoscopic and Endoscopic testing through the creation of memorandums of agreement between academic institutions and the military.

During the Covid-19 pandemic, Thomas facilitated educational opportunities in austere environments and clinical settings for the resuscitation of emergent patients with coronavirus. He presented his findings on the training exercises to the Defense Medical Modeling and Simulation Office, which was seeking education solutions at the time. Thomas also served as the Administrator Representative for the Army's Central Simulation Committee Executive Council.

At UTEP, Thomas facilitates dialogue between the medical simulation program and military stakeholders to create student learning opportunities. He has also represented UTEP to external academic organizations such as Texas Tech University of Health Sciences Center. In addition to his work, Thomas is also contributing to a book on creativity in classrooms with a simulation chapter and conducting research in Medical Simulation. Currently, he is developing his dissertation proposal on mixed reality.

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## Abstract

This paper describes a project wherein engineering education focused on investigation of the Rio Grande Basin and its impact on Hispanic-Americans is supported by consolidating resources from diverse collections within the Library of Congress, university libraries, and other trusted sources, into a centralized web module. The designated module will offer an extensive range of educational resources, organized to encourage investigation of the Rio Grande Basin from an engineering perspective: Using these resources highlights the history and impacts of the Rio Grande Basin upon the lives of Hispanic-Americans, and is bolstered by our university's educational technology resources designed for serving Spanish-English bilingual audiences. Additionally, a bilingual user-friendly interface will provide convenient access to the Rio Grande Basin web module resource areas, specifically tailored to advance our users' academic abilities and their engineering problem-solving acumen. The resources will eventually be made available to all university students and faculty in our system, but will be initiated and developed at one university during the initial stage of this project, so that improvements can be implemented prior to a system-wide rollout.

## Keywords

Hispanic-Americans, Rio Grande Basin, first-generation college students, Library of Congress, virtual portal, engineering education

## Introduction

The University of Texas at El Paso (UTEP), an R1 institution and America's most predominantly Hispanic-serving Institution (HSI), supports a student population wherein over 80% identify as Hispanic, with around half of them being first-generation college attendees. Our university has established a reputation for leveraging its strategic location within the Rio Grande Basin and along the Mexican border, so as to foster educational resources highlighting the achievements and history of Hispanic-Americans. Within this context, the current project's aim is supporting investigation of the Rio Grande Basin and its impact on Hispanic-Americans by consolidating significant resources from diverse collections within the Library of Congress and elsewhere into a centralized web module. The module offers an extensive range of engineering-related resources, specifically designed to cater to the investigation of the Rio Grande Basin and its impact on Hispanic-Americans [1]-[4].

This virtual portal, designed for serving university students and faculty as well as anyone else interested in Rio Grande Basin, will eventually be made available to all university students and faculty system-wide throughout the state, but will be initiated and developed at a single institution during the initial stages of this project, so that improvements can be implemented prior to a system-wide rollout [5]-[7]. This project highlighting the history and impacts of the Rio Grande Basin upon the lives of Hispanic-Americans, and the engineering education opportunities therein, is boosted by the lead institution's prior role as a state school of mining and metallurgy, and the advanced educational technologies now available for serving bilingual learners [8][9].

The current paper will describe our project design, technical operationalization, and predicted outcomes for the web module, which is presently at an early stage of development. Planned future publications pertaining to this project will describe selection and development of project content, and the strategy for involving students and faculty as users of this system during implementation. As this project becomes further developed, mixed methods assessment will determine the impacts from providing this learning experience to students and interested community members, and in particular the effectiveness of integration of the project resources into undergraduate and graduate courses at our university, and eventually throughout our statewide system.

#### **Project Design and Anticipated Outcomes**

The primary deliverable for this project is an educational web module that supports engineering education examining the Rio Grande Basin. This project will contribute to advancing equitable representation of the legacy contributions made by America's Hispanic communities, and within that context this project has four main areas of contributions: (1) foster MSI connection by establishing channels for collaboration and interaction between our university and the Library of Congress, (2) optimize HSI educational opportunities and resources by ensuring that HSI students access and benefit from the wealth of educational materials and research opportunities offered by the Library, (3) advance cultural preservation by unifying material from diverse collections into a module that showcases the multifaceted impacts of the Rio Grande Basin on Hispanic-Americans, and (4) provide opportunities for engaging Blog discussions about the topics presented in the web module.

All materials for this project investigating the Rio Grande Basin will be copyright cleared, and obtained by consolidating the digital resources from diverse Library collections into a streamlined web module featuring content relevant to supporting engineering education activities, including: (1) Socio-cultural resources related to the Rio Grande Basin such as <u>Mexican-American</u> <u>Music</u>, The El Paso Herald Newspaper (1901-1931), Music and Culture of the Northern Rio Grande, <u>Celebrating Mexican-American</u> Contributions, <u>Hispanic Heritage Primary Sources</u>, and <u>Teaching with Library Primary Sources</u>. (2) Scientific and mathematical resources related to the Rio Grande Basin such as <u>Latinx in STEM</u>, <u>Hispanic Americans in Science and Technology</u>, <u>Minorities in Science and Technology</u>, <u>Latinas Making Their Mark in STEM</u>, and <u>Science Blogs</u> Web Archive. (3) Useful organizations related to the Rio Grande Basin such as <u>National Society of Hispanic Physicists</u>, <u>Latinos in Science and Engineering</u>, <u>Latino STEM Alliance</u>, <u>Minority Science and Engineering Improvement Program</u>, Windows to the Universe (in Spanish and <u>English</u>), and <u>SACNAS</u>. (4) Additional resources repurposed from our university's collection of Hispanic-related rare books, including recorded oral histories and literary Chicano collections, numerous dissertations and theses, and related multimedia including audio, photos, and videos.

Our anticipated timeline for this project is -- *Month 1:* Initial team meeting. Initiate recurring meetings to align with course learning objectives from selected instructors. Deliver project development plan detailing major activities and milestones, semi-annual status updates, and regular review by Library personnel. *Months 2-9:* Begin developing web module and landing page employing Application Programming Interface (API) to access Library of Congress resources. *Months 3-9:* Engage students, instructors, and other LOC awardees in live and virtual participatory workshops to gather insights for improving the web module interface and resources so as to better support courses along with general use by the larger community. Conduct user testing during feedback sessions so as to make any additional improvements to the web module.

During *Month 6:* Deliver two-page report describing project activities, challenges and their resolutions, as well as expenditures including if needed descriptions of any changes to the spending plan. *Months 8-9:* Finalize web module interface design, while incorporating user feedback and insights gained from *We The People* projects and their lead personnel, while continuing to refine content. *Months 10-11:* Delivery of completed web module, including launch of the digital web module making it publicly accessible. Conduct promotional outreach to encourage use of the web module. *Month 12:* Share project results via distribution of reports, presentations, and publications. *Additionally, during months 1–12:* We will also produce peer-reviewed publications providing qualitative and quantitative descriptions of activities undertaken and results achieved, along with a comparison of actual accomplishments to the goals and objectives from the project plan (and reasons why goals were not met if needed), as well as a discussion of the challenges encountered.

The project will be directed by three faculty members: An associate professor in educational technology will lead this initiative, and be responsible for technical and instructional aspects of the web module development, as well as coordination of the project team's responsibilities. He has more than twenty years of professional experience in development and implementation of innovative STEM learning environments presenting dynamic visualizations and information modeling. A professor and past President of the National Association for Bilingual Education (NABE) will provide bilingual education and Hispanic culture expertise. A history and library sciences expert will ensure the use of accurate and authentic materials while guiding the project's overall direction. Additional engineering and engineering education consultants will provide guiding expertise at best practices for employing innovative pedagogy grounded in learning sciences. This team's proficiency at implementing projects involving linguistic, cultural, historical, and technological components, along with the support of two graduate assistants, each serve to support this project.

#### **Operationalization of the Web Module**

The operationalization of the web module will involve the collaboration of history and technology students, guided by faculty with expertise in developing innovative educational resources for bilingual, history, and STEM courses at the undergraduate and graduate levels. Together, the team will collect, categorize, and arrange pertinent materials, including those for both formal and informal educational purposes, into a robust web module. Faculty with support from graduate students will collaboratively investigate and jointly create a web section that repositions an array of inspirational narratives and classroom-friendly materials from the Library of Congress into an organized and integrated module of the Library's digital platform employing best practices from constructivist and cognitive load learning theories [10]-[14]. The resources will also be designed to serve usefully in courses taught by university faculty, including those specializing in history, Hispanic studies, and STEM fields pertaining to the understanding and sustainable maintenance of crucial river-systems.

The project will also integrate resources from our university's esteemed collection of rare books, including recorded oral histories and literary Chicano collections, numerous dissertations and theses, and related multimedia including audio, photos, and videos. This module will feature search functionality of the resources provides, as well as Guided Tours catering to individual interests such as highlighting the mathematics and the history of the content shared. The seamless integration of the new web module with the existing Library of Congress website will facilitate effortless navigation and linking between the module content and the Library's extensive collection of existing materials, so that both qualitative and quantitative research assessing project effectiveness can eventually be accomplished [15]-[17].

This integration will be achieved through the use of Application Programming Interfaces (APIs) and record identifiers: The new module will provide users with advanced search and retrieval capabilities, allowing them to access and interact with the vast collection of digital resources maintained by the Library. To ensure smooth integration, the development team will carefully select APIs that align with the Library's existing infrastructure and security protocols. The chosen APIs must provide the necessary functionalities to interact with the Library's databases and resources effectively. Authentication mechanisms, such as OAuth 2.0, will be implemented to ensure secure access and user privacy. The web module will rely on a standardized data schema and format to communicate with the Library's systems. The team will define a clear data structure that includes essential metadata fields, such as title, author, publication date, and record identifiers.

The Library of Congress website uses unique record identifiers for each digital resource within its collection. These identifiers play a crucial role in ensuring data integrity and consistency during the integration process. The development team will establish a mapping mechanism to link records from the new module with their corresponding identifiers in the Library's database. The new web module will feature a robust search and retrieval system, allowing users to explore the Library's collection with precision. Utilizing APIs, users will be able to perform complex searches based on specific criteria, such as subject, format, language, or publication year. Search results will be presented in a user-friendly and informative manner. Considering the vastness of the Library's digital resources, the web module's integration must account for efficient data retrieval and loading. Pagination techniques will be implemented to manage large datasets effectively, ensuring optimal performance during search operations. To provide a seamless user experience, the development team will implement robust error handling and validation mechanisms. This includes proper handling of invalid queries, graceful degradation of services during system outages, and helpful error messages guiding users in case of input errors.

The new web module will be designed with mobile responsiveness in mind. It will adapt to various screen sizes and devices, ensuring a consistent and user-friendly experience for all users, regardless of their preferred platform. The user interface will be carefully designed to integrate seamlessly with the existing Library of Congress website's layout and branding. The new module will adhere to accessibility standards, ensuring it is usable by all visitors, including those with disabilities. Security will be of paramount importance throughout the integration process. The development team will conduct thorough security assessments to identify potential vulnerabilities and implement robust encryption protocols to protect sensitive data. A comprehensive testing and quality assurance process will be conducted to validate the seamless integration of the new web module. This includes functional testing, load testing, performance testing, and cross-browser compatibility testing. Clear and comprehensive documentation will be provided for both internal development teams and end-users. This documentation will include API usage guidelines, data schema details, and step-by-step integration instructions. The seamless integration of the new web module with the existing Library of Congress website using APIs and record identifiers will empower users with advanced search capabilities and enhance access digital resources.

#### Conclusion

This paper has described the project design and anticipated outcomes, as well as the technical operationalization of the web module, for an undertaking which is currently at an early stage of development. Future publications from our project team will focus on the selection and

development of the project content, as well as our implementation plan for involving students and faculty as users of this system. When the project is more fully developed and thereby assessable via mixed methods research, it will facilitate a comprehensive learning experience for students and interested community members, and will include integration into multiple undergraduate and graduate courses at our university and potentially within our system, including: EDT 4300 Educational Technology, EDT 5374 Pedagogy in the Technology-Rich Classroom, and EDT 5375 Technology, Assistive Tools & Issues of Access; BED 5300 Bilingual Education Capstone, BED 5331 Foundations of Bilingual Education & Teaching, BED 5332 Literacy Development in Spanish, and BED 5334 Teaching Content & Literature in Spanish; HIST 1301 History of U.S. to 1865, HIST 1302 History of U.S. Since 1865, and HUMN 4309 Special Topics in Humanities.

The projects multidisciplinary design benefits participants by expanding their geographic horizons, cultivating cross-disciplinary critical thinking skills, and immersing them in a web module that examines the complexities of the Rio Grande Basin and it's impacts on Hispanics in the USA from an engineering perspective. In addition to being incorporated into engineering education, history, library sciences, educational technology, teacher preparation, and bilingual studies courses, this project will also be beneficial across other university courses with similar learning goals. Community members throughout the U.S Southwest and beyond will also derive substantial benefits from the cohesive categorization and presentation of Library digital collections pertaining to the Rio Grande Basin and its impacts on Hispanic-Americans, and Blog inclusion will foster increased sharing opportunities for participants to contribute insights.

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