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A Cross-Cultural and Bilingual Experience in LIS Education

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Abstract

This paper describes a case study involving the synchronous delivery of portions of an undergraduate course on web technologies taught across three campuses and in the context of a multicultural learning environment. The case study focuses on issues around *internationalization and localization*, one portion of the course where students learn techniques for developing Web content that supports multiple locales, languages, and written scripts. Another important component of the case study presentation will report student experiences in engaging in collaborative work using an array of synchronous technologies such as teleconferencing; synchronous multi-modal virtual meeting rooms and the like. This portion of the course provides experiences that students will likely encounter in their future careers, as they find themselves working in organizational contexts that require collaboration over long distances, across languages and cultures, and across national or continental boundaries. The challenges of distributed collaborative work across three cultures and two languages are presented and discussed.

Introduction

Introduction to Web Technologies is a new undergraduate course, first taught in the fall 2007 semester at the University of Tennessee's (UT) School of Information Sciences (SIS). The course is an elective in a two-year old undergraduate minor, the first undergraduate program offered by SIS, and is an introduction to Internet and World Wide Web technologies and practices. Course topics include the history and development of the World Wide Web and the Internet, standards-compliant markup and tools for creation of markup (e.g., XHTML and style sheets), accessibility, internationalization and localization, as well as introductory Web page and Web site design.

This course has been offered two times with qualitatively different approaches to integrating student projects into the course. The course was taught the first time as an on-campus, face-to-face course in a computer lab with an enrollment of sixteen students. Nineteen students were enrolled he second time it was taught, with students from two other universities integrated into the project work through the use of a variety of information and communications technologies (ICTs). In both semesters, the student projects were situated in the context of actual information needs and student deliverables should contribute to the achievement of the requesting organizations' goals for ICT use.

In both semesters, the students were provided with a list of projects to choose from and were also free to suggest a non-profit/NGO to whom they could contribute. In the first semester, the instructor (Sandusky) brought several real-world Web development projects to the course for the students to engage with and contribute to, three of which were situated in East Tennessee's local Latino community. In the second semester, the instructor (Aristeguieta) organized one project that included students, faculty, and students at two additional universities (University of Wisconsin-Milwaukee and University of Puerto Rico, Río Piedras) and allowed the other groups to identify non-profit/NGO projects on their own. The three community-based projects from the first semester and the multi-university project from the second semester are described below.

First-semester projects

Centro Hispano de East Tennessee (Centro Hispano) is a non-profit community organization founded in August 2005 that seeks to establish a community center in the Knoxville, Tennessee area where it can provide a bilingual information line, referral services and follow up, literacy programs, English classes, and workshops and seminars aimed at improving the standard of living for Hispanics. The goals of the Centro Hispano Web site project included acting as an online brochure to help solicit monetary and in-kind donations, and to provide a tangible (if virtual) presence in the community while the goal of creating a physical center continued. The multilingual Web site would also support information dissemination, calendaring / event notification, discussion forums, a directory of allied organizations, and distinct Centro Hispano member and public content areas.

The *Latino Task Force* (LTF) is an umbrella group comprised of local organizations dedicated to linking Hispanics with other organizations and business in hopes of creating a stronger community. The LTF also identifies and addresses community issues, and nurtures local Hispanic leaders. The goals of the LTF Web site project were similar to the goals for the Centro Hispano Web site: information dissemination, calendaring / event notification, discussion forums, distinct LTF member and public content areas, and delivery of information in multiple languages.

In the *Growing Tennessee: Rural Youth Cultivate Common Ground* (GTN) project, youth aged 11 to 17 from two rural east Tennessee counties and one rural west Tennessee county learn 35mm film photography, black and white darkroom techniques, and digital photography. About half of the youth are Latino children of migrant and seasonal farm worker families and other half are from more traditional rural Appalachian and West Tennessee families. The project was conceived by Telamon Corporation's (http://www.telamon.org/) project development coordinator using Head Start funds, private foundation funding, and a number of volunteers. The Growing Tennessee project seeks to bring youth from different cultural backgrounds together in a shared experience that can help them better understand another culture as well as identify the similarities shared by the two cultures. The project also provides a creative educational outlet for rural youth while promoting cross-cultural awareness, developing self-esteem, improving aesthetic, media, and technical literacy, improving critical-thinking skills, and encouraging youth to continue their education past high school. The Web site offers

information in both Spanish and English, helps promote the project, helps build the youths' self-esteem, and offers potential for youth involvement in information systems design and use. At the time the first section of this course was held, GTN already had a working Web site (http://glaucon.sunsite.utk.edu/drupalsites/growingtn/) based upon the Drupal open source content management system, and sought site design and functionality improvements for the existing site. The Centro Hispano and LTF groups were interested in using the Drupal open source content management system to support their Web sites.

Based upon written descriptions provided by the instructor, which were informed by the instructor's own work with the GTN, LTF, and Centro Hispano projects, the students were asked to form teams of two and perform a small-scale, limited Web site design effort. The students defined Web site audiences, prioritized a limited set of requirements, generated design ideas that met the prioritized requirements, incorporated feedback on their design ideas, and then built a set of standards-compliant prototype Web pages. Their deliverables included a team report, individual reflections on the project, and a set of self-contained, valid Web pages that embodied each team's design ideas.

Second-semester projects

As in the first iteration of the course, UT students enrolled in the second iteration of the course were assigned a final term project in which they were required to design a prototype of a working Web site for a non-governmental organization (NGO) with a community, academic, or environmental focus. At UT, the class of nineteen students was divided into four groups. One of the four groups volunteered to work in conjunction with UWM and UPR to develop a multi-lingual, multi-cultural online reference service prototype for use in a library context. The other three groups were free to identify and select an organization as the site for their project (a non-profit environmental education newspaper, a university-based language club, and a university social organization). In the three-location collaboration, students from UT and UWM were to act as the consultant team and the UPR students as the client team, while the other groups acted as consultant teams designing websites prototypes for their Knoxville-based NGO. Students in the consultant team were required to report, in written form, the process from beginning to end; it was advised that they kept a diary of all project activities from the moment the groups were assembled through the delivery of the Web site prototype at the conclusion of the semester. Final reports addressed the following questions:

- Why did the project team choose the client organization?
- How was the client organization approached?
- How many meetings did the consultant team have with the client?
- What ICTs were used to carry out the meetings and other parts of the process (e.g., telephone, email, voice over IP, instant messenger, text chat, etc)?
- What kinds of information did the client to the project team provide?
- Which audiences are the client trying to reach?
- What are the purpose and objective of the organization?
- Which Web applications and features were requested by the client?
- What are the purposes and objectives of the client organization?
- What difficulties did you encounter in the whole process?

- Which features did you choose to implement in the prototype?
- Which features would you incorporate in a future design?

Course content

From a technology perspective, the course takes a systematic approach to introducing Web technologies and standards-compliant Web development. Students internalize these practices by creating individual pages and small-scale Web sites. Students are guided to use only the "strict" XHTML DTD, and to validate each XHTML page and cascading style sheet (CSS) that they use. The course also covers accessibility and universal design, and emphasizes that standards compliant design itself contributes to universal design without unduly burdening the Web developer. Universal design (UD) is "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Center for Universal Design, 2008; Mace, Hardie, & Place, 1996). Designing for accessibility results in better design for all users, not only producing Web systems that assistive technologies can efficiently interpret but also producing pages that can be rendered by a wide range of technologies, including mobile devices, older browsers, and future technologies that are likely to be optimized for standards-compliant markup (Chapman & Chapman, 2007).

This commitment to UD results in every user having "more choices and control over how they view and use web resources. Users with visual impairments can easily increase font size using the text scaling features of browsers. People who want to view two different web pages side by side can change the widow width of their browser and content re-flows to fit the size of the window. A PDA user can apply a user style sheet to view only the headings of a web page to get an overview of the topics, without having to do endless scrolling through text on a small screen" (Illinois Center for Information Technology Accessibility, 2006). The concept of universal design subsumes and includes the more widely discussed notion of Web accessibility, which concerns specifically making the "Web accessible to people with disabilities" (World-Wide Web Consortium, 2006).

Developing Web systems that can be read by users who prefer other languages or who are more comfortable using systems customized to their cultural traditions and practices is presented in the course as another dimension of universal design. In the context of this course, *internationalization* is defined as "… the process of planning and implementing products and services so they can easily be adapted to specific languages and cultures, a process called localization" (whatis.com, 2007). In other words, internationalization is a means of enabling localization. *Localization* is "the process of adapting a product or service to a particular language, culture, and desired local 'look-and-feel'" (whatis.com, 2005). For example, a site design that is presented in English, but takes into account specific needed customizations for English-speaking audiences across different national and international boundaries (e.g., the U.S., Canada, the U.K., Australia, etc.).[1] Each of the projects described in detail above (LTF, GTN, Centro, and the online reference service) needed to support multi-cultural, multi-lingual communities, and the students

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[1] philips.com is an example of a Web site including extensive and visible localization; go to http://www.philips.com/global/. Accessed 7 February, 2008.

were compelled to consider internationalization and localization from design, technical, and user experience perspectives (accessibility).

Analysis

The online reference service project from the set of second semester projects is the most complex of the student projects. This project required collaboration between diverse students and instructors at three universities and, as the most complex of the many projects run over the course of the two semesters, will be the focus of the analysis presented in this section. This section will analyze this project primarily in terms of the challenges presented by the circumstances of the three location cross-cultural and bi-lingual collaboration.

A number of challenges arose as the collaboration unfolded, which are categorized as organizational, course content, coordination, and cultural challenges. Some challenges applied equally to the UT student groups while others, like the effects of distance upon collaboration, were more problematic for or unique to the group building the multi-lingual / multi-cultural online reference service. Other challenges, such as the organizational challenges, applied more directly to the instructors and then indirectly to the students.

Several organizational challenges presented themselves when the course was offered for the second time in spring 2008. The course had been selected to be part of a campus-wide initiative to encourage faculty to integrate appropriate synchronous learning technologies into traditional face-to-face undergraduate courses at the University of Tennessee, Knoxville. The instructor from the first course iteration worked with colleagues at SIS to reach out to faculty colleagues at the University of Wisconsin – Milwaukee (UWM) and the University of Puerto Rico, Río Piedras (UPR), with whom SIS was already fruitfully collaborating. The goal was to connect the relatively homogenous UT undergraduate population with native Spanish speakers in Puerto Rico and the more diverse, urban student population in Milwaukee. Students from the three sites would work in cross-cultural teams to develop simple Web technologies as part of their class projects. There were also opportunities to augment the skills of the UT students with the language skills and cultural knowledge of the Puerto Rican students in support of the LTF, Centro, and GTN projects described above, although other projects were ultimately substituted in the second course iteration[2]. This necessitated significant course redesign and coordination between the UT, UWM, and UPR instructors to align semester schedules and specific course schedules to support the three-campus collaboration. The faculty needed to adjust

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[2] We recognize, of course, that while both cultures use Spanish as their mother tongue and have many common cultural traditions, the students in Puerto Rico are not from the same cultures as the predominantly Mexican and Guatemalan residents of East Tennessee; indeed, Spanish is not the mother tongue of many of the Guatemalan residents. The instructors themselves come from diverse backgrounds: a native of New York of Puerto Rican descent; a Venezuelan of Basque descent; two U.S. natives of mixed European descent; a Pakistani professor now teaching in San Juan, Puerto Rico; a Korean instructor teaching in Milwaukee, Wisconsin.

their course syllabi and schedules to accommodate the needs of the collaboration, sometimes reordering an established content sequence to ensure that their own students are in position to contribute relevant knowledge at appropriate stages of the project collaboration. Each faculty member also needed to realign or reschedule local class meetings in order to ensure students could attend synchronous events involving more than one site (the courses at the three sites do not meet at the same times). In-class, moderated opportunities for student-to-student interaction are important, particularly when introducing the collaborative, cross-site projects.

Differences between the UT, UPR, and UWM programs and the courses involved in the collaboration were the source of other organizational challenges. The students at UT and UWM were undergraduates in an information studies and technology minor and major, respectively, and the students at UPR were graduate students in a library and information science program. The classes from UT and UWM targeted for this collaboration were similar in their scope and goals (teaching Web technologies to undergraduates), but no similar course was available at UPR. Instead, the collaborating faculty and instructors at the three campuses decided to have the UPR graduate students develop a project idea requiring Web development support and use teams comprised of UT and UWM undergraduates as consultants to meet the requirements for the UPR clients.

The content of the UT course presents a crucial set of technical challenges. The course presents a wide variety of content, most of which is unfamiliar to the students, including the history and development of the Internet and the World Wide Web; the basic tools needed to create and transfer Web content (XHTML and CSS files) including text editors, secure file transfer clients, tools to compress and de-compress sets of files, and on-line validators; standards and the advantages to standards compliance; Web accessibility / universal design; internationalization and localization; JavaScript; basic page and site design; design techniques (e.g., prioritizing requirements; wireframes, etc.); incorporating text, graphic, and time-based media content on the Web; advanced browser techniques and tools for Web systems development; and the basics of Internet protocols, including application protocols such as http (Sandusky, 2007). It is a challenge for the students to keep up with and absorb this much content, and it is a challenge for the instructor to present the material at a pace that accommodates both those students with some experience with Web development and those students who feel intimidated by the range of tools used to create, validate, and make even a simple page available on the Web.

Instructors must be prepared to spend time one-on-one with some students in order to help them climb the learning curve for technologies with which they are unfamiliar. In some cases, this may include instruction on file and directory organization, introducing keyboard shortcuts for select, copy, and paste operations, or showing how to use a browser to view files being developed on the student's own computer, both as rendered by the browser and in "view source" mode. Nearly every student is intimidated by having to validate his or her XHTML code and expresses frustration with the process of correcting the errors that are reported.

Coordinating projects across physical distance is always more challenging than working in a collocated environment where richer forms of interaction are available. In this case, faculty and students at three sites are involved, and collaboration over distance was a particular challenge for the online reference service project group. While the instructors are responsible for initiating and scaffolding the student-to-student interaction related to the projects, the students must themselves negotiate and coordinate their relationships both within the group members at their own university as well as between the group members distributed across the three sites. For the students, this represents a degree of coordination overhead with which they are unfamiliar, even if they have previous experience working in project groups within single-location, face-to-face classes. Great physical distances separated the students at UT, UWM, and UPR. The consultant team's members were located in both Knoxville and Milwaukee. The consultant team in turn needed to interact with the client team located in Rio Piedras, Puerto Rico.

Coordination and technology challenges are intertwined by the need to mediate collaboration through technology. The course used synchronous technology to initialize the student-to-student collaboration, providing mediated, real-time contact between the classes at the three sites. Real-time networked meeting facilitation software was introduced to the students by scheduling joint lectures available to students from each of the three sites (recordings of these lectures could also be viewed subsequently by students who could not attend the real-time session). Instructors at each site presented one or more lectures at different points in the semester on topics such as virtual reference services, XML, Web accessibility, and internationalization and localization. The use of the synchronous technology itself complicates course planning and management: most of the students and half the instructors involved in the course had little to no familiarity with the particular synchronous learning tool being used (hosted by UT). Additional time must be allocated from class time in order to introduce the tool to the students and instructors who are not familiar with it. The instructors used the telephone for occasional course planning meetings.

The instructors and students from the three universities also used other synchronous and asynchronous information and communication technologies to coordinate activity. Telephone, video conferencing, e-mail, Web sites, Wikis, electronic learning systems (e.g., Blackboard) and electronic collaboration systems (e.g., Google groups, Google documents), and others were available to store and share information such as documents, diaries, minutes, notes of the meetings, layout ideas, and HTML code for the proposed prototype. A Google group was created specifically to support asynchronous interaction between the clients and consultants working on the multilingual / multicultural online reference service. The instructors and students also used an e-learning system (e.g., Blackboard) to coordinate activity within each of the individual courses taught at each site.

Students faced challenges engaging in virtual social and intellectual tasks while working on the multi-university collaborative project. Understanding, communication, and interaction depend upon individual assumptions and interpretations in the absence of non-verbal and visual communication cues (e.g., facial expressions, gestures, vocal tone) that

are lacking in a purely virtual working relationship (Wang, 2001). Culture and language differences exacerbate the communication and coordination challenges that occur in any distributed work group. Instructors should be prepared to give attention to these challenges, and provide helpful strategies that the students can apply in a distributed, multicultural, and multilingual environment. The consultant team based in the continental US spoke English as their first language while team Puerto Rico were native Spanish speakers with English their second language. The language barrier was overcome by communicating in English, the common language shared by the members of the groups.

Implications

Implications for LIS education can be categorized as implications for practice and implications for research. With regard to practice, the implications for managing dimensionally complex student projects and understanding instructor and student incentives and motivations are discussed.

Reflection on the student projects assigned in the first two iterations of the UT Introduction to Web Technologies course suggest that the projects can be characterized along a number of dimensions:

1. single-student ←→ student group
2. single class ←→ multiple classes, single location ←→ multiple classes, multiple locations
3. monocultural ←→ multicultural
4. monolingual ←→ multilingual
5. artificial / contrived project ←→ real-world / situated project

The definitions for the dimensions listed are largely self evident, although how specific projects are classified along each dimension can be debated. For example, if an artificial project assigned in a single class at single location is subsequently assigned to a group of students with dissimilar backgrounds, it may be reasonable to classify the project as multicultural. Would it be fair to classify a project as multi-lingual if the project group creating the prototype consisted of students with different mother tongues, while the prototype was expressed in a single language understood by all group members? Perhaps how one classifies projects along the artificial / real-world project dimension is most problematic. To illustrate, the Centro, GTN, and LTF projects in the first semesters were based in real-world community needs, but the students' experience of those needs was fully mediated by the instructor, who provided summaries based upon 12-18 months' direct interaction with each of those communities. In the second semester, the requirements for the online reference service project were defined by a group of UPR students as part of a class project in a reference course in a library and information science program. The UPR graduate students' class setting is not situated in an authentic library context, but the situation may be considered closer to real-world from the point of view of the undergraduates at UT and UWM who are trying to meet those requirements.

What seems clear is that moving from single class, single location student projects to *dimensionally complex* projects (multi location, multicultural, or multilingual projects)

increases the complexity of the classroom, instructor, and student experience. Similarly, the move from artificial / contrived projects to real-world / situated projects introduces additional layers of complexity for faculty and students alike. The use of situated projects in university settings is becoming more common, usually described as community engagement or service learning projects. Such projects are associated with increased student attention and provide additional benefits to the students as well as challenges of collaboration and social networking, especially when collaboration also crosses cultures (Yontz & McCook, 2003).

The experiences described here also suggest implications for faculty and other instructors involved in designing and delivering courses including dimensionally complex student projects. Many of the challenges described above were not accompanied by specific techniques for amelioration, so further investigation is required, followed by mentoring, workshops, or other means for transferring this knowledge to instructors in actionable forms. Equally important is the effective transfer of these techniques to the student experience, in terms of pedagogy, materials, and scaffolding. These dimensionally complex projects require students to simultaneously manage multiple forms of information and social relationships, which, if truly situated in the real world, are subject to breakdown (e.g., disengagement by a community group in the middle of a semester; student group members dropping a course late in the semester, etc.). Identifying or developing techniques to manage these challenges is critically important for educational units interested in moving successfully from "sage on the stage" to critically engaged modes of education.

Motivation and incentives to engage in this type of collaboration, for both faculty and students, is another important set of considerations. The extrinsic motivations were ambiguous and for UT faculty and instructors included the opportunity to participate in a high-visibility campus initiative and to strengthen relationships with faculty at LIS programs with relatively new but consistent patterns of collaboration, thereby expanding professional networks that could yield future research and publication opportunities. There were no direct economic incentives for the UT instructors. Intrinsic motivations included putting personal and institutional values into practice in the classroom in ways that exceeded the established norms for the school and university. Such values include increasing undergraduate exposure to the multicultural and cross-organizational realities of contemporary work and the importance of situating student projects in authentic settings (Yontz & McCook, 2003).

Incentives and motivation play an important role in making a complex collaborative project go. For faculty and instructors, the increased overhead in preparing materials, coordinating schedules, developing content to support the collaboration, participating in additional virtual and face-to-face meetings, and overcoming problems presented by use of the technology all represent an increase in work. In this collaboration, faculty from each of the universities took turns leading some lectures that were delivered using a synchronous online learning environment (Centra). This was seen as a way to reify the notion of the collaboration for the students, to allow them to meet and hear instructors with varying backgrounds and points of view, and provide them direct but guided

experience using a relatively complex suite of synchronous tools. This, for the students, is a form of legitimate peripheral participation (Lave & Wenger, 1991), which prepares them to engage directly with their peers at the other universities as they work on their project. On the other hand, introducing additional communications tools takes some of the class meeting time, reducing the contact time available to deliver core course content.

Motivation and incentives also play a role for the students engaged in a three-way remote collaboration. As in any group project, the students must negotiate interaction issues, coordination and planning issues, and manage conflicts that may arise, including questions of equity of effort. In this case, the situational dynamics are much more complex than in a single-class group project, and can grow to encompass cultural and language differences and potential for misunderstanding. Further research is needed to understand the motivations of the students who participated in the more complex online research service project, and what implicit incentives may have led them to volunteer for the project.

The experience of running the three-location multi-lingual / multi-cultural online reference service project suggests methods to employ to collect data that can shed light on some of the questions and complexities described above. Questions about incentives and motivation to participate can be addressed by using either interviews or questionnaires conducted prior to (in the case of instructors) and early in the semester (in the case of students). A longitudinal perspective on how motivation and incentives changed during the lifespan of the course and project could be obtained by conducting a similar follow-up interview or questionnaire at the conclusion of the semester. The students' and instructors' perceptions of the five dimensions outlined above could be examined using semi-structured interviews, and help assess the validity of those dimensions. Course and project participants might also reveal other important dimensions that were not included here. Finally, the instructors and students could be interviewed to determine which techniques were or were not effective in mitigating the negative impacts of the several challenges described here. Investigating the effectiveness of various techniques can serve to validate both the list of challenges and techniques as well as reveal additional important challenges.

Conclusion

The increasing number of North American LIS schools introducing undergraduate programs is changing the complexion of LIS education. Participating undergraduate students are being prepared for careers in an expanding information industry, and most will engage in careers beyond the boundaries of libraries and traditional information centers. For the most part these undergraduate programs emphasize the understanding and use of information and communication technologies in social contexts. As such these new information studies and technology programs for undergraduates are changing the nature and perceptions of the information professional within the academy and in society at large.

The multi-university project described here was designed to mimic a client-consultant Web development project frequently encountered in real work settings. The UPR client

team provided requirements used to inform the development of an online reference service. The UT / UWM consultant team was expected to take into account language diversity (English and Spanish in the initial design, with possible extensions to support other languages in the future) in the context of the Web, to address other functional requirements, and to accomplish the task within the constraints of the project and the semester. Both the UPR client team as well as the UT, UPR, and UWM instructors will evaluate the final prototype and report delivered by the students at the end of the semester.

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Biographies

Dr. Edwin Cortez has been a library and information studies educator for almost 30 years. He is currently Director and Professor of the School of Information Sciences, University of Tennessee. Prior to this post he was on the faculty of the School of Library and Information Studies at the University of Wisconsin, Madison. His teaching and research areas include organization of information, systems analysis and library automation, knowledge management, information retrieval and corporate librarianship. He is the author of several monographs in the area of management of information systems and technology. His research has been widely published and has appeared in such journals as the *Journal of the American Society for Information Science and Technology* and *Information Processing and Management*. Dr. Cortez is an active consultant for the government and private sector. He has served on the American Library Association's Committee on Accreditation and on the Board of Regents of the National Library of Medicine.

Dr. Robert J. Sandusky is Assistant University Librarian for Information Technology and Clinical Associate Professor at the Richard J. Daley Library on the campus of the University of Illinois at Chicago, where his responsibilities include digitization, digital preservation, scholarly communications, and library systems management. Previously, he was an Assistant Professor and faculty coordinator for the undergraduate minor in Information Studies & Technology at the School of Information Sciences at the University of Tennessee, Knoxville. His research centers on the investigation of the information practices employed by distributed/virtual communities as they collaborate to achieve their goals. He has performed his research in multiple domains including open source software engineering, digital libraries, and the management of distributed infrastructure on projects funded by the National Science Foundation, the Defense

Advanced Research Projects Agency and NASA. He is developing new projects in e-research, community informatics, and undergraduate education in the library and information sciences and is interested in connecting research and community engagement activities with classroom experiences for both undergraduate and graduate students.

Mr. Simon Aristeguieta is a Ph.D. student in the School of Information Sciences at the University of Tennessee. He holds a BA in sociology from the University of California, Berkeley and MIS from the University of Puerto Rico. His research interests are scientific information and bibliometrics. While working in Venezuela, he coordinated the scientific journal program in the Science and Technology Department and implemented SciELO (Scientific Electronic Library on Line), LATINDEX (Latin-American electronic index platform) and CVLAC (CVs academic database). Mr. Aristeguieta plans to work as a professor, teaching scientometrics in a university.