Curious Software Engineering Experience

North and South Americas' Spanglish

Barbara Victoria Bernal
Dept. of Software Engineering & Game Design
Kennesaw State University
Marietta, GA USA
Bbernal1@kennesaw.edu

***Abstract*—It is paramount for software engineers to develop the skills and background necessary to effectively work, communicate and innovate on an international scale. Our growing global world needs an increasingly diverse workforce. The effects of the globalization have been felt in the software engineering arena through software engineering projects realized by diverse professionals located in different continents with different industrial background, culture, time zone, and even language. During 2014 and 2015, Kennesaw State University (KSU) faculty from Marietta, GA, USA traveled to La Salle University in Arequipa, Peru to deliver special Software Engineering (SWE) winter programs. The programs provided opportunities to study the student's understanding of software engineering terms, knowledge, and practices in two different international arenas, KSU and La Salle. This paper discusses details and results of the winter programs executed by KSU bi-lingual faculty to La Salle participants with limited English understanding. A cycle of knowledge building emerged from the two cultures in the preparation and execution of the courses. The student participants aligned their knowledge and understanding of their Latin American software engineering practices to the new perspective given in the program. The experience educated faculty and participants of the agreements, differences, and challenges to the software architecture and game development curriculum, terminology, and development trends. The process of the collaborative knowledge distribution and assimilation that was built and experienced in the courses was surveyed with the student's views about pre-understandings, personal comprehension, opinions and final assimilation of the course content.**

Keywords— Software Engineering Curriculum; Language Barriers; Models of Software Engineering Education

I. INTRODUCTION

International student exchange programs provide educational, personal, and long-term benefits. As a result, some educational programs include international experience as a graduation requirement while others strongly recommend it. To foster global experience, academic institutions seek ways to provide diverse, multicultural, and meaningful educational experiences. The vision for international experiences includes the student's development of skills and maturity needed for the global industry.[2] We realized that one way to accomplish the goal of international dialogue for students at a low cost is to have international faculty travel to the students. Wouldn't it be interesting to interact with students educated in a different language and country? Interest in the possibility for an international faculty exchange program grew.

Key faculty and administrators from the universities in Arequipa, Peru and Kennesaw State University (KSU) planned possible faculty connections. The universities participating in these conversations in Peru were San Agustin National University, San Pablo Catholic University and La Salle University. All are similar sized academic institutions with bi-lingual faculty (expertise in Spanish and English) who were interested in these collaborations. The original motivation for faculty exchange was associated with the new software engineering programs in development in Arequipa. KSU has experience and success in the SWE ABET accreditation. San Agustin National University wants their SWE degree to be in line with SWE ABET accreditation. Explorations and reviews about the tenets of SWE educational approach are on-going. Initial outcome include:

1) increasing the knowledge of the SWE discipline and the SWE program variation; and

2) heightened expectations for both academic institutions to experience master/apprentice relationships.

The analysis and review of faculty exchange and future faculty/student exchange was conducted with reviews/comparisons to the past international exchange program from these institutions. Along the way, we learned from the challenges of establishing, conducting, and maintaining international collaborations. Success and failures have occurred. In 2011 San Agustin faculty was target to teach winter term 2012 at KSU. The challenges of J-1 visa, health insurance, housing, etc. were met and working. But the faculty exchange did not happen due to a key participant's family emergency. But in 2013 a KSU faculty member traveled to San Agustin to teach for the summer term and the program officially launched.

II. CYCLE OF KNOWLEDGE BUILDING

The North and South Americas' on-going faculty conversations served as foundation for the software engineering curricula offered at the new La Salle University in

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Arequipa, Peru. The University's inauguration took place on March 2012. As part of the new SWE program's assessment, La Salle University proposed a special software engineering 2014 winter program: Software Architecture and Computer Gaming Design. These two classes were a good medium for a verification of the knowledge in the software engineering academic community (current SWE students, current SWE professors, alumni, and individual software developers). In 2015, another winter program was offered.

The winter programs were the result of three-year planning and collaboration efforts managed primarily by the KSU and La Salle faculty. The bi-lingual KSU professors gained a deeper understanding of the challenges and rewards for international knowledge exchange while preparing the Software Architecture and Computer Gaming Design courses. Both courses were first experiences delivering English content translated into Spanish. The translation of the SWE content from English to Spanish proved to be a challenge due to the scarce Spanish SWE resources readily available. Translating the SWE lectures was challenging because of variations in the key terms used in Latin America. [7][8] Pre-course research for correct SWE terms revealed a common practice of the English term included in the Spanish rendition. This was also true in the classroom. The course participants, recruited from the current SWE undergraduate student body, recent employed graduates of La Salle, practicing Alumni, individual software developers, and the La Salle faculty reported in a post survey that they gained a substantial increase in software engineering knowledge from the international experience. The students gave positive reviews for the winter program's bilingual final format: projected slides in English combined with Spanish lecture.

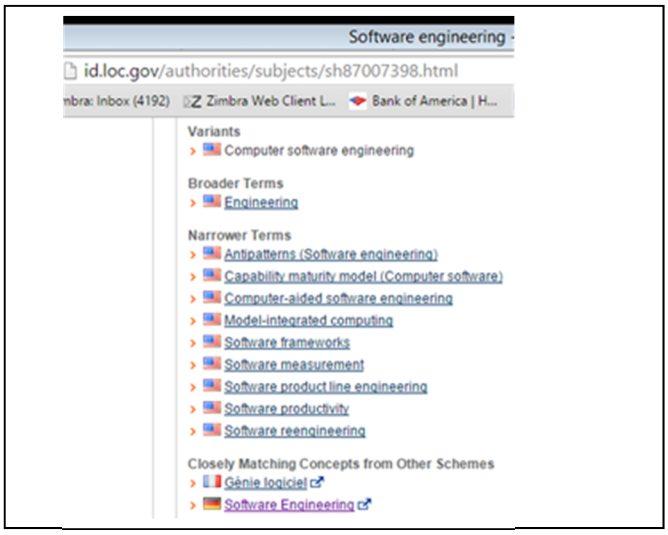
What are the challenges involved in translating English to Spanish in relatively new disciplines with new jargon and emerging technologies? There were limited resources to assure correctness in the translations. Often there aren't agreed standardized terms in other languages including Spanish, so we used English terms interlaced in the Spanish text. The Library of Congress shows subject headings in the field of software engineering with flag icons to represent the origin of terms which are used internationally rather than translated into native languages (Figure 1).[7] When we interviewed Spanish-speaking software professionals, they reported commonly using English terminology for software terms.

III. Assessment Methodology

Initial investigations into avenues for the student's feedback about the courses were discussed and constructed as a specific survey addressing socially responsible leadership, efficacy, and identity development.[3] The development of learning outcomes by education organizations have taken shape and been refined during the last decade for several reasons. Primary drivers are the recognition and adoption of the continuous improvement movement in higher education and the intent of accreditation organizations to place the burden of proof for education quality on the university.[4] Placing the burden of proof for education quality have led to the replacement of detailed degree program content imperatives with learning outcomes that allow the university faculty to develop and demonstrate how to best educate their students. Focusing on learning outcomes motivated this investigation.[6]

The goals of this research were to investigate fundamental elements to improve teaching abroad, including tackling language barriers and their impact on understanding, and appropriate duration of courses. The investigators asked each participant to fill out an anonymous survey. The survey collected their opinions about how the courses went and how the course could improve.

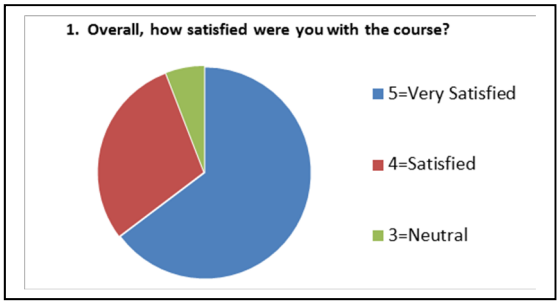
Fig. 1. Screenshot – Library of Congress.



IV. Results

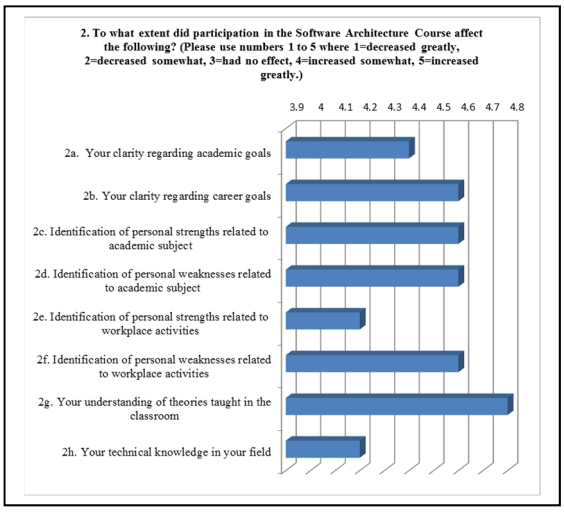
The post-course survey created on line and an email with a URL link to the survey was sent out to the 39 students in 2014 and the 20 students in 2015. The students had 3 weeks after the courses to complete the survey and offer feedback. The overall response rate of the survey was 84%. The initial question of the survey was answered by all survey participants. (See Fig. 2 below) The majority of the students were satisfied with the course.

Fig. 2 – Survey results for question 1.



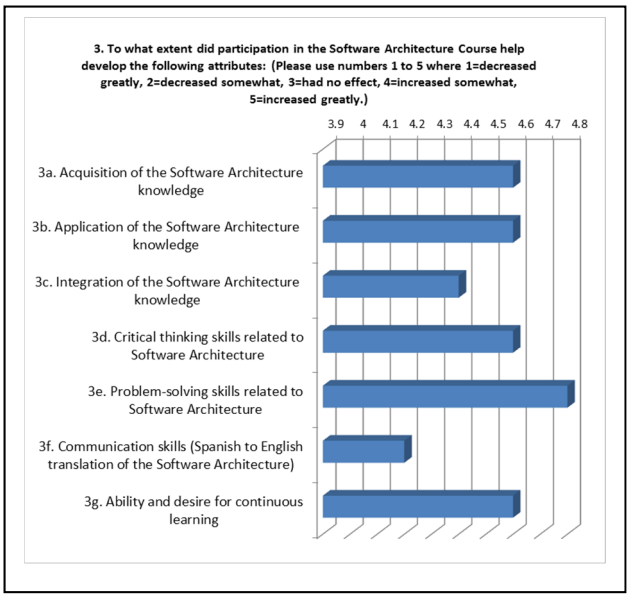
The second question in the survey was an investigation of the students' learning and recognition of the goals of the course. (See Fig. 3) The effect of what was learned the students experienced with relation to the learning and recognition of new/unknown/different/expansion of their knowledge and understanding.[5] The survey was administered upon receipt of preapproval by the Institutional Review Board (IRB).

Fig. 3 – Survey results for question 2.



Question 3 shown in Fig. 4 below gathered data about whether the participation in the Winter Program increased or decreased learning attributes. Analysis of the responses support exposure to the different SWE education, views, explanations and cases presented in the translated classes did make a difference to the students.

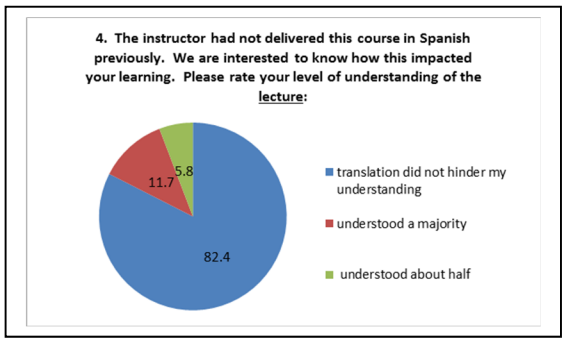
Fig. 4 – Survey results for question 3.



This initial data comprises learning characteristics which can be hypothesized as "valuable" to the participant in specific areas. The course impacted the students' academic and career goal. Overwhelmingly they reported that their problem-solving skills, their application knowledge and their critical thinking skills improved. The students had particular learning outcomes in mind when they entered into the Winter Programs. They had repeatedly asked for these courses because of challenges they were encountering in their software projects. The initial feedback data above strongly shows that the students connected the world of software projects and the world of learning.[3][6]

It is interesting to note that the lowest increased attribute was the communication skills (Spanish to English translation). As you will see below they also gave feedback that the SWE terms are easier to communicate if you keep the term in English and do not translate. Question 4 seen in Fig. 5 below measured the impact of the translation with regards to their learning. As you can see in the chart below, the students did not have major problems.

Fig. 5 – Survey results for question 4.



V. Specific Feedback

The feedback regarding the duration of the daily course lecture was:

28% answered to shorten the hours of lecture.

16% answered to keep courses lecture the same length.

56% answered to increase the course lecture to 5 daily hours.

The survey participants gave the following comments when asked to give improvements:

60% answered to leave the slide material in English and keep the conversation in Spanish;

6% answered to continue to improve the Spanish lecture delivery.

20% answered with comments about the logistics (lunch, slides availability, etc.);

20% left the comment unanswered.

Two student's thoughts about the English Spanish translation are shown below in the original Spanish form, then in translated English (shown in italics):

- En el mundo el uso de algunas palabras, en especial respecto a nuestra carrera estan internacionalizadas y se les reconoce muy bien de esa manera, tratar de traducirlas aveces, en mi opinion, es aveces dificil y causa confusion. Usarlas en su idioma nativo (ingles) es algo totalmente aceptable :)

In the world the use of some words, especially with respect to our industry are internationalized and is very well recognized them in that way, try to translate them sometimes, in my opinion, is sometimes difficult and cause confusion. Use

them in your native language (English) is something completely acceptable :)

- No hay ninguna queja con respecto al idioma del instructor porque de la manera mas facil y clara trato de enseñar y lo comprendi a la perfeccion.

There are no complaints with regard to the language of the instructor because of the ease and clarity used to teach and I understood perfectly.

VI. Conclusions

The 2014 & 2015 collaboration with the Arequipa University gave opportunities to investigate and discover interesting translation challenges. The bi-lingual professors gained a deeper understanding of the challenges and rewards for international knowledge exchange while preparing and delivering the software engineering courses. The students' feedback obtained through the administration of the anonymous, online surveys gave assurances that the use of English SWE terms, even to non-English speaking participants, was uniformly recognized.

Collaboration on complex software engineering and research projects with colleagues and collaborators across the world is the trend in this industry.[1] Communication problems exist when the cultures and languages differ. English to Spanish translation and communication were experienced with interesting solutions. We offer the information as contribution to the body of knowledge on international faculty exchanges. There were lessons learned, results of a survey, and discussions on the feedback. We look forward to more conversations, more investigations and analysis in this arena to foster more international collaborations.

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