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Paper ID #39095

Board 20: Work in Progress: Investigating the Impact of International Education on Cultural Understanding, Health Disparities and Collaboration through Project-based Learning

Breanna Kilgore

Breanna Kilgore is a graduating senior biomedical engineering student at the University of Arkansas. Breanna has participated in an REU at Johns Hopkins university and studied development policy and global health in Switzerland. She has been named an international Gilman scholar, a NSF Honors College Path Scholar, and selected as a Senior of Significance at her university.

Dr. Luis Carlos Estrada Petrocelli, Universidad Latina de Panamá, Facultad de Ingeniería

Luis Estrada Petrocelli earned a Bachelor's in Biomedical Engineering from Universidad Latina de Panamá (ULATINA, Panama, 2004) and a Master's in Biomedical Engineering from Universitat de Barcelona and Universitat Politècnica de Catalunya (Spain, 2009). After researching at Politecnico di Torino (Italy, 2010), he obtained a Ph.D. in Biomedical Engineering from UPC and University of Zaragoza (Spain, 2016). He completed postdoctoral fellowships at Institut de Bioenginyeria de Catalunya (Spain), and King's College London (UK) (2017-2022). Currently, Estrada Petrocelli is an associate professor at ULATINA and Biomedical Engineering Program Coordinator. His research focuses on biomedical signals and sensors, and respiratory system studies.

Dr. Jay Molino, Univesidad Especializada de las Américas

Jay Jesús Molino is the Dean of the Faculty of Biosciences and Public Health at the Universidad Especializada de las Américas (UDELAS), located in Panama. Dr. Molino received his Ph.D. from the University of Tokyo in 2014. Molino's research collaborations focus on the Research of micro/nanocontainers, interfacial processes, biomolecules, and applied research in medical engineering and social dynamics. He is also a senior IEEE Engineering in Medicine and Biology (EMBS) member. In addition to his research activities, Dr. Molino strongly advocates for the democratization of science and technology and off-grid development for Panama's most vulnerable communities. He is also a book author, father of a young scientist, and passionate about legos and amateur rocketry.

Dr. Ernesto Antonio Ibarra Ramirez P.E., Universidad Latina de Panama

Dr. Ernesto A. Ibarra R. has a Ph.D. in Biomedicine from the Universidad de Barcelona (UB), a Master's Degree in Biomedical Engineering from the UB and the Universidad Politecnica de Cataluña (UPC), a Master's Degree in Radiological Protection from the Universidad Especializada De Las Americas (UDELAS), Master's Degree in Management Engineering from the University of Louisville (UoL), Bachelor's Degree of the Universidad Latina de Panama (ULATINA). He is a teacher, researcher, and manager of Panama's biomedical science and technology projects. He stands out as Research Professor at Universidad Tecnologica de Panamá (UTP). He is also a professor at UDELAS and the ULATINA in biomedical engineering subjects. In research, he has developed scientific articles on Wireless Body Area Networks (WBAN), Human Energy Harvesting (HEH), Telemedicine, Radiation, and human health.

Dr. ABHISHEK MAHESH APPAJI, B.M.S. College of Engineering

Dr. Abhishek Appaji is working as R&D Head and Associate Professor at B.M.S. College of Engineering, Bengaluru. He is also serving as Guest faculty at Maastricht University, the Netherlands. He is a graduate of the Massachusetts Institute of Technology Global Entrepreneurship Bootcamp specializing in new ventures leadership. He obtained his Bachelor of Engineering in Medical Electronics with University Rank from BMSCE, Masters of Technology in Information Technology, and a Masters of Engineering (M.E) in Bioinformatics from University Visvesvaraya College of Engineering, Bengaluru. His Ph.D. was in Mental Health and Neurosciences from Maastricht University, the Netherlands which received the best thesis award. Abhishek is a Senior Member of IEEE. He has served in various volunteering positions at IEEE.

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Currently, he is the Treasurer of the IEEE Bangalore Section, Vice Chair, IEEE SPS Bangalore Chapter, Treasurer of the IEEE Computer Society Bangalore Chapter, execom member of IEEE PES Bangalore Chapter, and advisor for IEEE EMB BMSCE Chapter. Abhishek has received various grants from Indian agencies like DST, DBT, BIRAC, and from abroad. Abhishek has also worked as a research associate at the Centre for Nanoscience and Engineering (CeNSE), Indian Institute of Science (IISc), Bengaluru. He has two patents filed in Medtech Space. He has more than 50 International/National journal publications and conferences to his credit. He has been a part of more than 150+ Invited expert talks at various conferences, forums, and events. He has renowned laurels including IEEE International Best Paper Award in Malaysia, MGH CamTech Jugadathon Awards, Best Nodal Coordinator award, Gandhian Young Technological Innovation Award 2016 at Rastrapathy Bhavan (President of India House) New Delhi, Elderly care Hackathon (the Netherlands), Winner of Class 5 Massachusetts Institute of Technology (MIT) Global Entrepreneurship Bootcamp, IEEE MGA Young Professional Achievement Award, R10 YP achievement award, DST Inspire Award, etc.

Dr. Rogelio Garcia Contreras, University of Arkansas

Dr. Garcia-Contreras is a Teaching Faculty leading social innovation initiatives at the Strategy, Entrepreneurship and Venture Innovation Department of the Walton College of Business of the University of Arkansas. He holds a doctorate degree from the Josef Korbel School of International Studies at the University of Denver. Dr. Garcia-Contreras is a member of the Cathedra UNESCO and a visiting scholar at the Master of Social Economy at Universidad Abat Oliba in Barcelona. And a visiting professor at the Master of Microfinance and Impact Investment at Universidad Autónoma de Madrid. Also in collaboration with Universidad Autónoma de Madrid, he was part of a task force sponsored by the UN High Commissioner for Refugees to promote entrepreneurship at the Saharaui Refugee Camps in Northern Africa.

He serves as a board member of several social impact organizations, including the University of Fondwa USA, Partners for Better Housing, Restore Humanity, Magdalene Serenity House, Serve2Perform, Entrepreneurship for All, CACHE NWA, RefleXion Music Series, LatinX on the Rise, and the Sindji Project. He is an advisor to Sustainable Start Up Co. in Madrid and a consultant for ARCORES International.

Along with Dr. Laurence Hare, Dr. Garcia-Contreras hosts Points of Departure, a podcast produce in collaboration with KUAF 91.3 FM, the Northwest Arkansas affiliate of National Public Radio.

Dr. Raj R. Rao, University of Arkansas

Dr. Raj R. Rao is a Professor of Biomedical Engineering, University of Arkansas, Fayetteville. He currently serves as the Editor-in-Chief of the Journal of Biological Engineering, as an ABET Program Evaluator; and is a member of the Biomedical Engineering Society (BMES) Education Committee. His research interests are in the broad area of cellular engineering that utilize interdisciplinary approaches towards better understanding of stem cell fate in the context of regenerative biomedical therapies. He is committed to integration of research and education, and has developed courses and programs that relate to entrepreneurship, service learning and community engagement. He is an elected Fellow of the American Institute of Medical and Biological Engineering (AIMBE), an elected Fellow of BMES, and Past-President of the Institute of Biological Engineering (IBE). Awards and Honors include NSF-CAREER, Qimonda Professorship, Billingsley Professorship, IBE Presidential Citation for Distinguished Service and University of Arkansas Honors College Distinguished Leadership Award.

Work in Progress: Investigating the impact of international education on cultural understanding, health disparities and collaboration through project-based learning

Introduction

Internationalization and promotion of global understanding are important areas of focus for educators with interdisciplinary approaches emphasizing international health issues, causes, and technology-based solutions of global health issues. To effectively solve global health issues, people from different backgrounds must come together to develop innovative solutions. However, prior to addressing the problem, gaining a basic understanding of cultural differences and collaborating with different people is an essential skill to develop. This understanding can be gained in the classroom to prepare students to be global changemakers and leaders in the global health and technology field. Previous studies have indicated that international service-learning opportunities via study abroad programs contribute to development of intercultural competencies and promote increased awareness of global health issues [1-4]. Acknowledging the interdependence of our world, we have designed a "Biomedical Innovations for Global Impact" course that connects participating students with a global and local network of students, faculty, community partners, and mentors, and invites them to develop viable solutions to pressing health care or sanitation related challenges in different locations around the world. It is our hope that creating a global collaborative classroom environment will encourage students to develop cultural understanding in conjunction with the tools for product development.

The "Biomedical Innovations for Global Impact" (BMEG 4593/SEVI4103) course offered by the Departments of Biomedical Engineering in the College of Engineering and the Department of Strategy, Entrepreneurship, & Venture Innovation in the Walton College of Business at the University of Arkansas focuses on specific problems triggered by healthcare challenges and gives students the opportunity to work creatively with students from different countries and disciplines. The course is designed to include students from the United States, Panama, and India. Business and engineering professors instruct students on the importance of the design process during product development, and how global health needs impact the process. All students are placed in teams with a clinical advisor and consist of students from different majors. At the end of the semester, each interdisciplinary team present their proposed solution to meet the targeted global health need. The purpose of the course is to develop critical thinking skills, learn about the product design process, and expose students to international collaborations and healthcare issues around the world by creating engineering solutions. Our ongoing work-in-progress is focused on investigating the impact of the project-based learning course on cultural understanding, health disparities and collaboration.

Methods

Survey
This project collected qualitative and quantitative data through pre-course and post-course surveys administered using the Qualtrics system. Two 30-question surveys were used for data collection. The questions in the pre-course survey were framed to gauge the students' perspectives and expectations of the course; while each post-course survey question was slightly

modified to assess if course objectives were met. The surveys collected qualitative data through short-answer questions focused on four themes: personal growth, professional development, educational experience, and cultural understanding. This data is collected at the beginning and end of the course to observe the course's impact on the students experience. Quantitative data was collected with Likert scale questions focused on the four different categories. Students representing three countries (Panama, India, and the US) participated in the study. University of Arkansas Institutional Review Board (#2209420237A001) determined to be exempt.
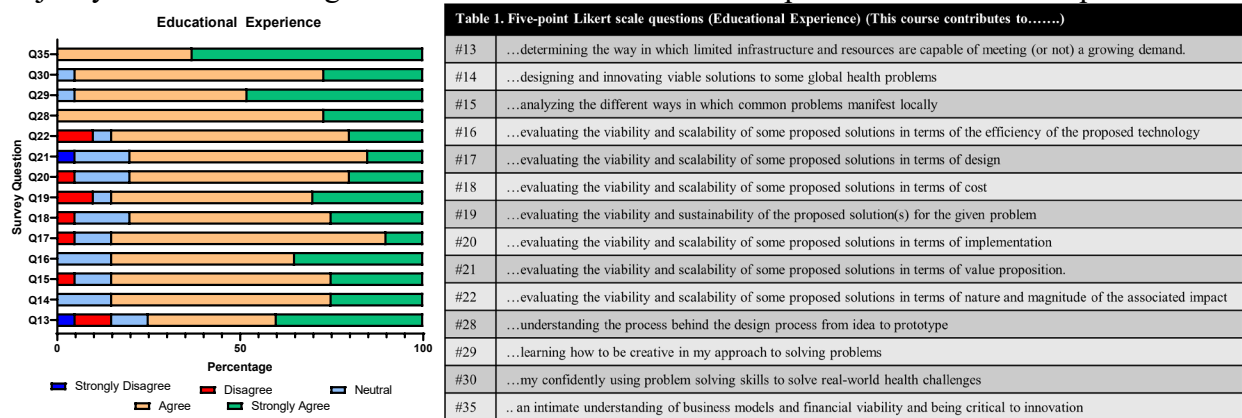
Data analysis
The data collected from the survey was exported and graphed using GraphPad. For Likert questions, percentages of each response were calculated and grouped together by country to be graphed. All questions were grouped according to their associated category to draw conclusions.

Results

The surveys provided information about student feedback on their experience and knowledge gained in the course. It was intended to measure the students' educational experience, professional development, personal growth, and cultural understanding.
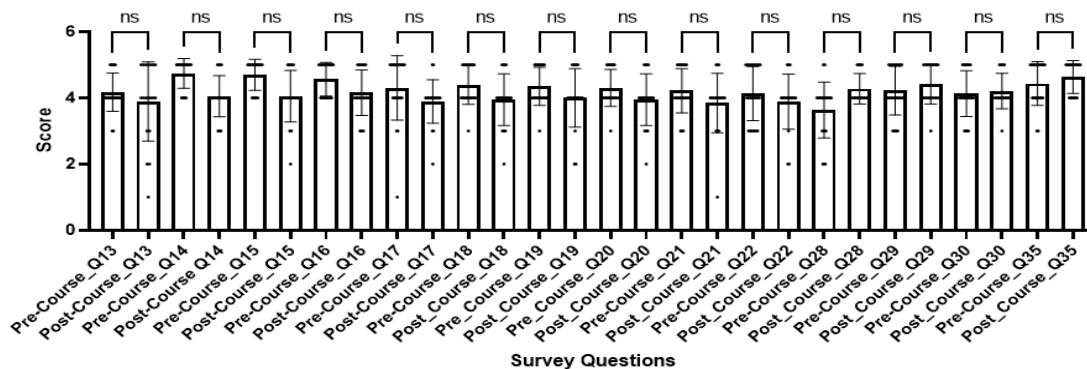
Educational Experience
To measure educational experience, 14 Likert-scale questions were asked. These questions and the student response distributions are shown in **Fig 1** and **Table 1**. In evaluating question 28, we noted that 72% of students agreed and 27% strongly agreed that they understand the process behind the design process from idea to prototype. For question 13, 75% of students agreed that they learned how to better determine the way in which limited infrastructure and resources is capable of meeting (or not) a growing demand. Only 15% of students disagreed with the learning objective, indicating that the methods of instruction used in the course were effective. Overall, majority of the students agreed that the course contributed to positive educational experiences.

Table 1. Five-point Likert scale questions (Educational Experience) (This course contributes to…….)	
#13	…determining the way in which limited infrastructure and resources are capable of meeting (or not) a growing demand.
#14	…designing and innovating viable solutions to some global health problems
#15	…analyzing the different ways in which common problems manifest locally
#16	…evaluating the viability and scalability of some proposed solutions in terms of the efficiency of the proposed technology
#17	…evaluating the viability and scalability of some proposed solutions in terms of design
#18	…evaluating the viability and scalability of some proposed solutions in terms of cost
#19	…evaluating the viability and sustainability of the proposed solution(s) for the given problem
#20	…evaluating the viability and scalability of some proposed solutions in terms of implementation
#21	…evaluating the viability and scalability of some proposed solutions in terms of value proposition.
#22	…evaluating the viability and scalability of some proposed solutions in terms of nature and magnitude of the associated impact
#28	…understanding the process behind the design process from idea to prototype
#29	…learning how to be creative in my approach to solving problems
#30	…my confidently using problem solving skills to solve real-world health challenges
#35	.. an intimate understanding of business models and financial viability and being critical to innovation

Figure 1. Student responses to the questions regarding educational experience, reported as a percentage.

We then decided to evaluate the student responses for each of the questions from both the pre-course and post-course surveys to determine if the educational experiences matched student expectations. After evaluating all the combined data, three individual comparisons were created for the different student groups: India, Panama, and the US. A one-way ANOVA comparison across the different groups, indicated that there was no significant difference in pre-course and

post-course responses for all questions (**Fig 2**) and even between student groups across different countries (data not shown), indicating that that the course outcomes met student expectations. Results also indicate that an inclusive educational environment for a diverse group of students was created and upheld. Majority of the questions had a median score of 4 out of 5, indicating that most students agreed with the statements as listed in Table 1.

Figure 2. Summary of student response scores to all the survey questions (Table 1) related to educational experiences. (Pre-course response (n= 23); Post-course response (n= 19). Statistical analysis indicated that there was no significant difference in responses for each question from the pre-course and post-course survey (ns- not significant).

Preliminary Conclusions and Ongoing Work

The results of this study provide evidence on how effective project-based learning approaches are at addressing global healthcare needs through biomedical innovation and contribute to student learning. In our analysis of educational experience through Likert-scale survey questions, we noticed that all students, irrespective of their location, had similar responses for each survey question with no significant difference between the pre-course and post-course responses. The high mean values for each survey question post-course is an indication that the course outcomes were met and aligned with the high expectations that the students expressed for each question in the post-course survey. The questions in the educational experience category gauged students' understanding of product development, implementation, viability and scalability. Many of the students commented on learning about the financial and business models for product development as an important component of the course, indicating the usefulness of this component in helping students better develop low-cost sustainable solutions with potential for broad impact across diverse populations. In the future, we plan on engaging with non-governmental organizations like 'Physicians for Peace' to provide valuable insights and perspectives on real-world challenges that are experienced in clinical settings across the globe. This would help broaden students' understanding of healthcare disparities and help develop skills for working in interdisciplinary teams to solve problems. Due to the broad overall impact of the course, we are continuing to analyze the date from three additional categories related to cultural understanding, professional development, and personal growth. This work will broadly investigate and seek to improve cultural competencies, and healthcare entrepreneurship across diverse groups in biomedical engineering education. With the guidance of this study, we will enrich the biomedical engineering curriculum and develop courses that promote empathy, solidarity, and transnational, multidisciplinary, multi-sector collaboration, making sure common problems are solved with common solutions.

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