IPRO 309 Final Report

Fall 2010

Designing an Interdisciplinary Orthotics and Prosthetics Course

H.O.P.E

Human Orthotic and Prosthetic Education

Advisor: Kevin Meade

Team Members:

Wen Chan	Christopher Fistek	Katherine Garczek
Krystian Link	Alexandra Luttinen	Michael Muller
Olivia Rovegno	Jessica Shaw	Matthew Song
Rafael Sosa	Sydney Williams	Soha Zahir

1.0 Executive Summary

The aim of this project was to create a college level interdisciplinary Orthotics and Prosthetics course for Centro Don Bosco in Bogota, Colombia. The goal of this course is to ultimately improve patient care. There are currently no college courses which integrate the three categories of the O&P field: Prosthetist/Orthotists, Orthopedic Technologists, and Prosthetic/Orthotic Technicians.

Our IPRO group has learned a great deal about the O&P field this semester from various sources and a trip to Bioconcepts. With the knowledge gained, we have created a senior level course which will give students hands on experience to better prepare them before they enter work force.

2.0 Purpose and Objectives

There are a number of problems our IPRO group sought to address this semester. There is currently a large demand for O&P practitioners around the world, and our group has focused on Centro Don Bosco in Bogota, Colombia. There are only 50 certified O&P providers in Latin American, while there is an estimated 2.5 million people there in need of O&P treatment. There is a need to improve patient education, which should include exposing students to new research, treatment methods and technology that can improve patient care. This also includes improving the patient, caretaker, and family's knowledge of how to care for the patient, as well as any orthotic/prosthetic device they may have.

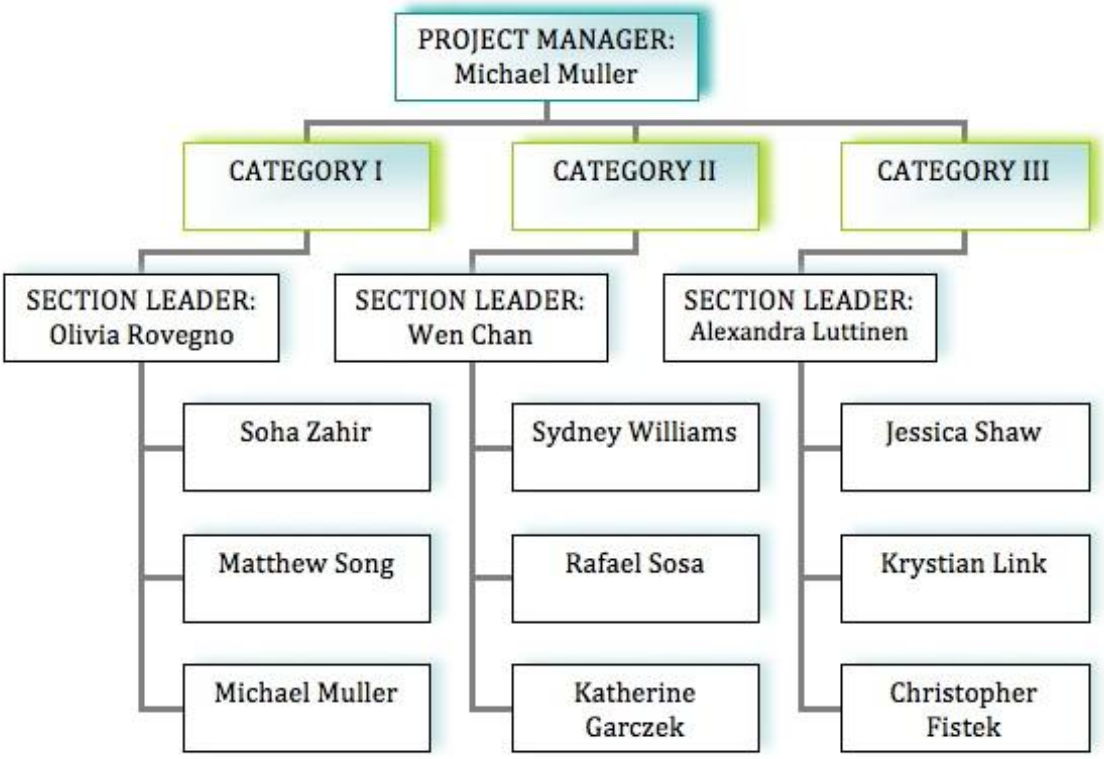
To address these issues, our IPRO group designed an interdisciplinary O&P course that could be integrated into a college program. We designed such a course, since currently none exist in Centro Don Bosco. With the help of Professor Kevin Meade, and information from our sponsors: Laboratorio Gileta, Dynamic Orthotics & Prosthetics, and TX Military University, our IPRO group learned about different aspects of the O&P field, and just how important O&P providers are. This course should help enrolled students become more familiar with all three O&P categories and how each category relates to one another. It should also improve teamwork skills, increase exposure to new studies, technologies, treatment methods, and ultimately improve patient care.

3.0 Organization and Approach

In order to accomplish the goals set forth in section 2, the IPRO group began analyzing the work that was done in this specific IPRO since it started in 2006. This was done to observe the areas where the group could be able to provide aid for efficiency. Three subgroups were then formed to work on an area requiring growth and improvement. The following are the three subgroups that correlate to the three categories formed by NCOPE:

- *Category* I (Prosthetist/Orthotists)
- *Category II* (Orthopedic Technologists)
- *Category III* (Prosthetic/Orthotic Technicians)

3.1 Group Organization



3.2 Research

Each subgroup identified all of the tasks that must be completed in order to fulfill the goals as well as reach the main objective of the IPRO project. Research was conducted during the 14 weeks in many different ways:

- Review NCOPE's scope of practice for each category
- Examine powerpoints about conditions, injuries, and solutions provided by Professor Meade:

  Brief Overview of Orthotics, by Tom DiBello

  US IPSO Presentation

  Center for O&P Learning and Outcomes/Evidence-Based Practice

  Centro Don Bosco Presentation

- Analyze relevant journal articles**:**

  Biomechanics of the Foot and Ankle Under Static Conditions; Carol A. Oatis
  Cardinal planes, axes, and movements
  Range of motion and weight distribution

  Education of the Patient with Neuropathic Limb; Elizabeth A. Yetzer MA MSN CRRN
  Educating ALL involved health care professionals, caregivers, and patient
  Adult education
  Diabetic foot complications
  Documentation
  Lesion prevention

  Effect of wearing a lumbar orthosis on trunk muscles: Study of the muscle strength after 21 days of use on healthy subjects; Isabelle Fayolle-Minon, Paul Calmels
  Lumbar orthosis
  Study limitations

  Effects of a New Spinal Orthosis on Posture, Trunk Strength, and Quality of Life in Women with Postmenopausal Osteoporosis: A Randomized Trial; Michael Pfeifer MD, Bettina Begerow PhD, Helmut W. Minne MD
  Spinal orthosis
  Patient desires complicate study

  Functional Limitations from Pain Caused by Repetitive Loading on the Skin: A Review and Discussion for Practitioners, with New Data for Limiting Friction Loads; J. Martin Carlson CPO

Friction induced skin lesions
Lesion prevention

- Review evidence based practice
- Field trip to Bioconcepts Laboratory

These research methods were chosen to help the IPRO group become more familiar with orthotics and prosthetics. These methods were also deemed the most beneficial by the IPRO group in the process of creating a senior capstone course since there is no course like this currently.

3.4 Team Strengths and Skills

Team Member	Skills	Learning Needs	Expectations
Chan, Wen	-Previous experience in this IPRO -Good organizer, scheduler -Gets everyone involved -Completed capstone design courses (thermal systems and design of mechanical systems) -Practiced in ProE, SolidWorks, EES, and MATLAB	-Communication -Presentation skills -Learn more about medical treatment process -Learn about materials for fabrication -How an engineer can help as well as cut the financial cost	-Exposure to information on O&P technologies -Opportunities to meet practicing professionals and see their projects -Determine if the field of prosthetics would be of interest for graduate study
Fistek, Christopher	-Knowledge of hand and power tools -Willing to learn -Past experience gave opportunity to hone skills in Microsoft tools, multi-tasking, and group communication -Photoshop	-Gain knowledge in the field of O&P as well as medicine especially from the perspective of an engineer -Improve sense of visualization as opposed to simply doing -Continue to improve group work skills	-Learn more about the field of O&P -Expand on previous semesters while contributing something tangible to it -Learn more about the IPRO system in general
Garczek, Katherine	-Communication within a group -Capability to handle and adapt to change -Ability to prioritize and organize -Knowledge of as well as experience within in the field of medicine	-Expand knowledge about thermoplastics -Collaborate with different ideas from the various majors	-Every group member is able to educate someone about O&P's -Incorporate medicine into the IPRO -Organize demonstrations and lectures to educate others
Link, Krystian	-Diligent, driven worker -Enjoys socializing with others and being the "morale booster" -Creative and hands on -Experience in project management	-Understand the anatomy and how O&Ps work -Learn about the body from an engineer's perspective -Expand knowledge on group project skills	-Learn about the body from the perspective of an engineer -Gain information about the field of O&P -Obtain the ability to better help those in need of O&Ps in the world
Luttinen, Alexandra	-SolidWorks -Excel -MATLAB -Auto CAD	-Gain knowledge of O&Ps -Apply engineering to a more human based field -Create an effective timeline to accomplish a long-term task in the most efficient manner possible	-Learn something new about engineering and its applications in a more personal sector -Work well with a team
Muller, Michael	-Creative thinker -Motivated worker -Past exposure to working within a group as well as project management processes -Strong analytic skills	-Gain knowledge in the field of O&P and the fabrication of O&Ps -Learn more about the human body -Learn more about the materials used in O&Ps	-Learn more about O&Ps, specifically cybernetics -Meet professionals within the field and learn about recent develops in technology -Use own experiences and interests to further help improve the quality of this IPRO
Rovegno, Olivia	-Strong communicator and can transform abstract ideas in focused statements -Well versed in Microsoft Office -Extended exposure to the doctor-patient relationship via hospital volunteering -Motivated goal oriented worker	-Limited teaching experience -Learn more about how O&Ps are created and applied -Observe the communication between IIT and the Colombian university, specifically the effectiveness of said conversations and frequency of them	-Produce a tangible result, ideally a unique contribution that builds on previous IPRO groups -The project will make a sincere difference in its community
Shaw, Jessica	-Previous experience in this IPRO -Lived in Bogota for 2 months and spent time at the Lab Gilete -Speaks some Spanish	-Knowledge of materials -Related medical information -Learn about the different types of O&Ps	-Hands on learning as well as field trips -Focus on interpersonal relationships -Explore new research in the O&P field
Song, Matthew	-Previous experience in this IPRO -Leadership skills -Experience in teaching and mentoring individuals -Motivating others to ensure project completion	-Finish tasks earlier before deadlines -Developing multitasking skills -Stick to an agenda -Develop skills in mechanical design	-Learn more about O&Ps -Help those in developing nations make practical programs in the teaching and application of technologies
Sosa, Rafael	-Willingness to work, learn, and help -Respectful, responsible worker -Latin American background	-Develop teamwork and team communication skills -Gain a better understanding of the O&Ps field -Developing research skills, specifically conducting research towards finding a solution to an existing problem	-Develop an educational program to expand the field of O&Ps in Latin America as well as the United States
Williams, Sydney	-Experience in the field of biomedical engineering -Motivated worker -Respectful, responsible worker	-Gain experience in project-based courses such as this IPRO -Develop more of a voice in the group setting	-IPRO makes a tangible development this semester -Provide as much as possible to the Colombian community
Zahir, Soha	-Determined, respectful, responsible worker -Experience in the field of biology -Proficient in gathering information and determining what is relevant and most important	-Learn about the creation of prosthetics and the technology behind them -Better communication skills and self-confidence within a group -Gain knowledge about how biologists can help with O&Ps	-Gain knowledge in the field of O&P -Help others and gain a sense of community and service -Be exposed to professionals, researchers, and manufacturers in the O&P field

4.0 Analysis and Findings

IPRO 309 began this semester by analyzing the goals that have been established so far and finding where we could help the most. The problem we found was there was no senior capstone course that brought all three categories together like we planned on creating. The other problem was educating: the patient, their families, caretakers, and each category practitioner, about the patient's orthosis/prosthesis and how to properly use and maintain the device.

The main resources used came from: NCOPE's own website with information regarding the categories themselves, the journal articles that we reviewed within our subgroups and presented to the class, the information gained by the previous IPROs, and the powerpoints shown to us by Professor Meade.

As a group, we have designed a senior capstone course. This would be an interdisciplinary course, incorporating students from all three categories, which has never been done before. This course will incorporate real life scenarios as well as helpful information, such as patient education. The capstone course is three main milestones:

The first milestone would be two weeks long and include: team building exercises, group formations, lectures and journal reviews pertaining to the O&P field, along with an assignment about their scope of practice. The second milestone would be four weeks long and focus on case studies of patients, using videos of various patient/practitioner interactions. It will also include a student group evaluation, and an individual report related to the case studies. The third milestone will be ten weeks long, and focus on the complete treatment of multiple simulated patients to give students hands on experience in the O&P field. It will include the creation of a portfolio with all patient treatment documentation, as well as an individual report, and final presentation of the students work.

5.0 Conclusions and Recommendations

Our objective this semester was to design an interdisciplinary team-based capstone course that can be integrated within an existing O&P program to improve patient care by instructing O&P students in new methods of patient education. We came to two main conclusions; first, that better patient education is necessary to improve patient care, and second, that certain countries have a greater need for qualified well-trained O&P practitioners. For example, there are only 50 certified O&P providers in Latin America despite an estimated 2.5 million people in need of O&P treatments. Accordingly, we focused on developing an O&P course that can be integrated into an existing O&P program at Centro Don Bosco in Bogota, Colombia who currently utilize category I, II and III O&P programs.

The course we designed should span at least one semester (16 weeks). Currently, people receiving category III training never interact with people receiving training in the other two categories. We recommend that these O&P students overlap their education with students from other categories and collaborate so that they can learn from each other. We suggest creating a curriculum with an emphasis in vertical integration, in which students from each category of a profession can enter into the curriculums of the other mutual professions, thus allowing the students to build upon each subject of knowledge that he/she previously learned. (Please refer the appendix D for an idealized O&P curriculum flow chart). We recommend first implementing a cross-category course into an existing O&P curriculum at Centro Don Bosco in Bogota, Columbia. If successful, we believe that it will eventually be expanded to other O&P programs in other countries.

Appendices

Appendix A: IPRO 309 Budget

IPRO 309 Budget	Costs
Equipment for Technical Group	$500
Field Trips	$450
IPRO Day Presentation/Photocopies/Printing	$200
Total	**$1150**

Appendix B: List of Team Members

Category I Prosthetist/Orthotist	Category II Orthopedic Technologist	Category III Prosthetic/Orthotic Technician
Olivia Rovegno	Katherine Garczek	Chris Fistek
Matthew Song	Chan Wen	Krystian Link
Soha Zahir	Rafael Sosa	Alex Luttinen
Michael Muller	Sydney Williams	Jessica Shaw

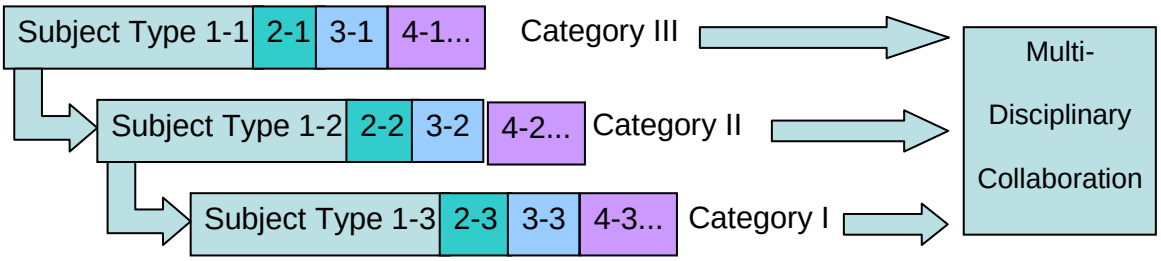
Appendix C: Sponsors

Collaborating Organizations	Location
Laboratorio Gileta	Botoga, Columbia
Bioconcepts, Inc.	Burr Ridge, IL
Dynamic Orthotics & Prosthetics	Houston, TX
TX Military University	Bogota, Columbia

Fabrication Demonstration Facility	Bioconcepts
Name of Contact	Kevin Meade
Address	100 Tower Drive, Suite 101 Burr Ridge, Illinois 60527

E-mail	meade@iit.edu

Appendix D: Idealized O&P Curriculum Flow Chart



Appendix E: Websites

Website Address	Organization
www.ispoint.org	International Society for Prosthetics & Orthotics
www.ncope.org	National Commission on Orthotic & Prosthetic Education

Appendix F: Special Thanks

Kevin Meade, PH.D. Clinical Orthotist, M.P.H
2004 Graduate of the orthotics program at NUPOC
Ph. D. in Theoretical and Applied Mechanics, Northwest University, 1982
M. S. in Applied Mathematics, Illinois Institute of Technology, 1978
B. S. in Mechanical and Aerospace engineering, Illinois Institute of Technology, 1974
Professor of Mechanical Engineering, IIT