2011

Critical Issues and Lessons Learned in Establishing Concurrent International MS Degree Programs in Engineering Technology

Mike Murphy
Technological University Dublin, mike.murphy@tudublin.ie

Michael Dyrenfurth
Purdue University

Gary Bertoline
Purdue University

Robert Herrick
Purdue University

Kathryne Newton
Purdue University

Recommended Citation

Murphy, M., Dyrenfurth, M., Bertoline, G. et al (2013). Critical issues and lessons learned in establishing concurrent international MS Degree programs in engineering technology. *ASEE Annual Conference 2011*, Vancouver, Canada, 26-29 June, pp.22.402.1 - 22.402.13. doi:10.21427/ae9y-6679

AC 2011-1317: CRITICAL ISSUES AND LESSONS LEARNED IN ESTABLISHING CONCURRENT INTERNATIONAL MS DEGREE PROGRAMS IN ENGINEERING TECHNOLOGY

Michael J. Dyrenfurth, Purdue University, West Lafayette

Michael Dyrenfurth is professor in the Department of Technology Leadership and Innovation, in the College of Technology at Purdue University. He is co-PI of the DETECT project. He collaborates frequently with ProSTAR to deliver industry-oriented graduate programs to professionals in the field. Active in international aspects of the profession, he teaches and researches in the areas of technological innovation, technological literacy, and international dimensions of technological education.

Mike Murphy, Dublin Institute of Technology

Mike is Director and Dean of the College of Engineering & Built Environment at Dublin Institute of Technology.

Dr. Gary R. Bertoline, Purdue University, West Lafayette
Robert J. Herrick, Purdue University, West Lafayette

Robert J. Herrick is the Robert A. Hoffer Distinguished Professor of EET and has served as the ECET Department Head at Purdue University 2001-2010. He has held leadership roles on the following executive boards: Tau Alpha Pi (president); ETLI (chair, secretary); ETD (treasurer); ETC standing committee chair of the ET National Forum (founder); IEEE Press Editorial Board (Editor-in Chief, Electronics Technology Series Editor); FIE Steering Committee (chair); North Central and Illinois-Indiana Section conferences (program co-chair, proceedings co-editor); and Purdue's Teaching Academy (charter executive board member). He serves as a TAC of ABET program evaluator for IEEE and has served as an ASEE campus representative at Purdue University and the University of Toledo. He has been recognized with national, regional, university, college, and department awards for outstanding teaching and professional service, including ASEE's Fredrick Burger Award, Purdue's life-time Murphy Teaching Award for outstanding undergraduate teaching. He was inducted into Purdue's Book of Great Teachers, an honor reserved for only 267 faculty in the 137-year history of Purdue University. He has been an active advocate for outstanding teaching and education through his leadership in ASEE, IEEE, and FIE; "The Art and Technology of Teaching" workshops at invited inter/national conferences and educational institutions (co-facilitated with James Michael Jacob, the George W. McNelly Professor of Technology); and authored educational publications including the textbook, DC/AC Circuits and Electronics: Principles and Practice.

Kathryne Newton, Purdue University, West Lafayette

Dr. Kathy Newton is an Professor of Industrial Technology at Purdue University. Her teaching and scholarly interests are in the areas of industrial distribution, quality control, and graduate education. She recently completed a 3-year appointment as Department Head. Prior to her appointment at Purdue University in 1993, she spent seven years teaching for Texas A&M University's Department of Engineering Technology. Dr. Newton has a Ph.D. in Industrial Education, a Master's degree in Business Administration, and a B.S. in Industrial Distribution, each from Texas A&M University.

Sancho Maria-Ribera, Universitat Politecnica de Catalunya
Nuria Castell, Universitat Politcnica de Catalunya - BarcelonaTech
James L. Barnes, James Madison University

Dr. James L. Barnes is a professor of Integrated Science and Technology at James Madison University (JMU) and co-principal of Barnes Technologies International, LLC (BTILLC). He has over thirty-five years of experience in science and technology fields and has been the independent evaluator for many international programs. Prior to joining the JMU faculty, Dr. Barnes was the Director of NASA RISE, a NASA research institute at Eastern Michigan University and at the technology research center at The University of Texas at Austin. He earned his doctoral degree from Virginia Tech and authored numerous publications in Problem Solving, Sustainability, and Innovation.

Matthias Kuder, Freie Universitt Berlin
Gareth O'Donnell, Dublin Institute of Technology

Critical Issues and Lessons Learned in Establishing Concurrent International MS Degree Programs in Engineering Technology

Introduction & Context

Globalization, competitiveness, and innovation are frequently employed themes as governments, business and industry and universities attempt to respond to the challenges facing them. Clearly business as usual is not likely to be successful in the future.

One strategic response for universities has been a significant impetus – in many parts of the world – towards dual, joint or concurrent degree programs involving international partners[1],[2]. It is perhaps not surprising that engineering is among the disciplines that make most use of international collaboration but it seems that engineering technology programs do not yet participate as extensively in this aspect of international education. Furthermore, it seems that much of the movement towards such collaborative degrees is occurring at the Master's level[3].

At the 2010 ASEE Conference, the core of this author team presented an overview of the purposes and aspirations of a new concurrent Masters degree project funded jointly by the European Union and the Fund for the Improvement of Post Secondary Education. In that paper[4] the authors stated:

> A transatlantic degree consortium to implement a four-semester dual masters degree initiative across a three-institution consortium consisting of Purdue University (USA), the Dublin Institute of Technology (DIT), and the Universitat Politècnica de Catalunya - BarcelonaTech (Spain) is presented in this paper. This initiative, while focusing on graduate (Masters) student mobility, also includes faculty mobility, language instruction and assessment, project evaluation and other services to insure ongoing success.
>
> The Purdue – DIT – UPC project proposes dual master's degrees that focus on the critically needed technology innovation and sustainability skills which will make individuals, enterprises and nations more competitive and responsible. It does this by synergistically combining the strengths of three leading universities as well as capitalizing on the sensitivities generated by significant international and language experience…The project's program of study, comprised of a slate of currently existing courses, and new collaborative courses offered by the three partner universities and focusing on the critically needed technology innovation and sustainability skills will lead to two existing MS degrees. Students will be able to enter, pursuant to a collaborative application and admissions process, via any of the three partner universities and after completing the program successfully, they will

The contents of this report were developed under an EU-U.S. Atlantis grant from the Fund for the Improvement of Postsecondary Education, (FIPSE), U.S. Department of Education. However, these contents do not necessarily represent the policy of the Department of Education, and endorsement by the Federal Government should not be assumed. This report also derives content from actions receiving funding from the European Community through its EACEA agency. Sole responsibility lies with the authors, and the EACEA and the European Commission are not responsible for any use that may be made of the information contained herein.

graduate with a Masters of Science (Technology) from Purdue University and an existing Masters degree from the European partner via which they entered the program (for European students) or which they have choiced (for American students).

The project team evolved the graphic provided in Figure 1 to provide an easily understandable overview of student traffic/flow in this concurrent master's degree project.

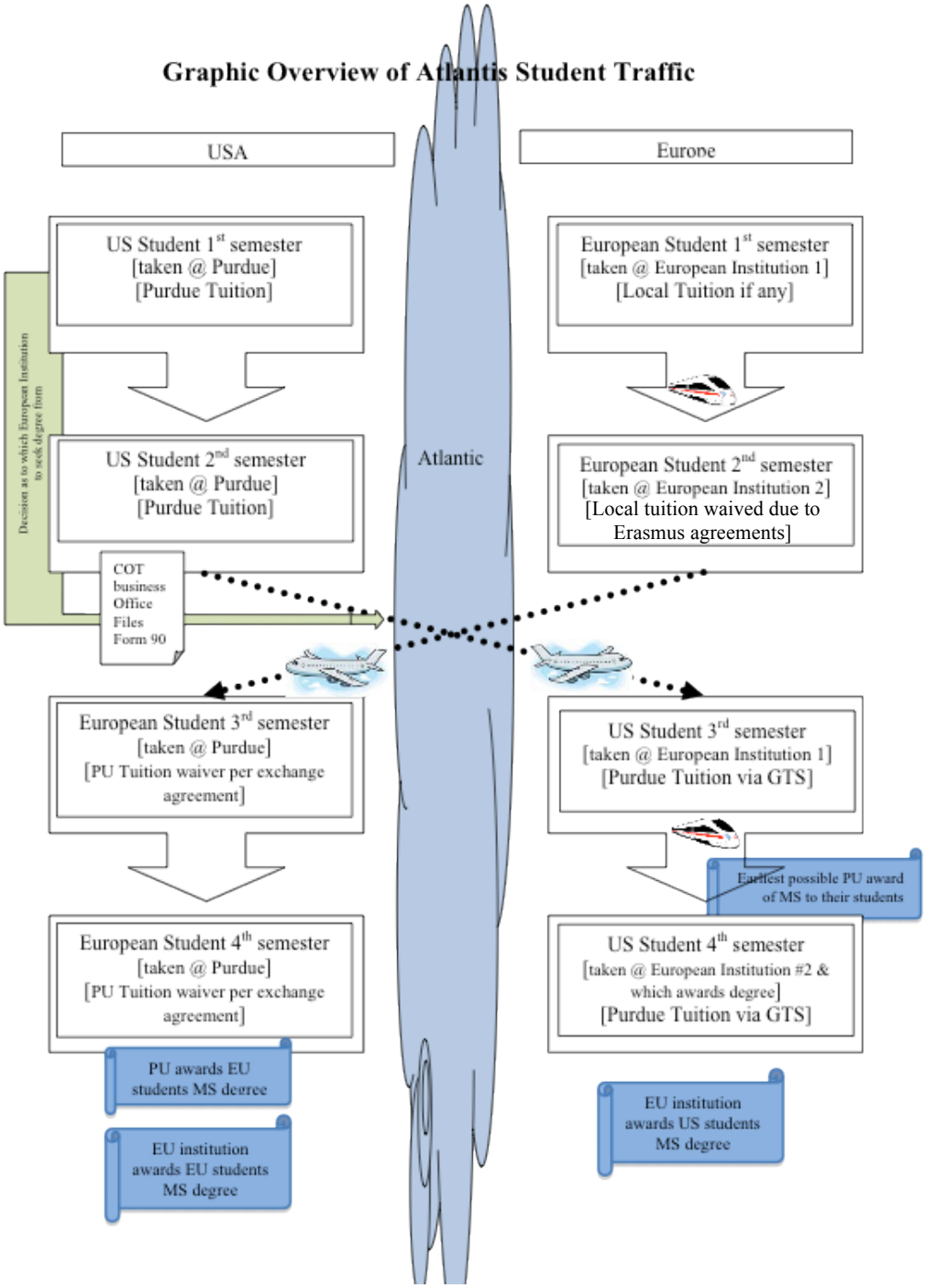

Figure 1. Student Flow in the Concurrent Master's Degree Project

Because students will enter the concurrent degree program with a variety of personal goals and backgrounds, students' plans of study will be tailored to the intersection of the program goals with the specific goals of each student. This is to be accomplished by a faculty committee consisting of two Purdue and two European faculty. To gain more synergy from the partnership and also to eliminate duplication of effort and experience across the Atlantic, the project team envisioned a single joint research & development-based capstone Directed Project/Thesis required of all students. The team also envisioned, in their initial publication about the concurrent master's degree program[4]:

> In addition to the two degrees awarded upon completion, each student will receive a transcript and diploma supplement from each partner university. The European Masters degree may be awarded by either of the two European partner institutions. The duration for the program is planned for four semesters, which is shorter than were the students to pursue two separate programs on their own. This fact in addition to the waiving of external student tuition fees for the exchanging students and the 12K $ or € Stipend will result in substantially lower costs…
>
> Upon completion of the Masters of Science in Technology Degree focused on Technology, Innovation and Sustainability, Students will demonstrate:
>
> 1. Enhanced capability with research & development.
> 2. Global perspectives on technology, technology management & sustainability.
> 3. Innovation and related process skills.
> 4. Awareness of and capability with entrepreneurship procedures.
> 5. Enhanced cross cultural communication & professional effectiveness.
> 6. A graduate level of technological expertise in one or more of the technology fields.

Purpose

The purpose of this current paper is to share the experiences, insights and lessons learned as the partnership of the Universitat Politècnica de Catalunya - BarcelonaTech (Spain); the Dublin Institute of Technology (Ireland); and Purdue University (USA) work to implement the first year of this innovative and important project. As this implementation proceeded, both anticipated and unanticipated issues and concerns emerged. Many innovative practices and considerable time was required to resolve the Memoranda of Understanding, academic governance, accreditation, financial aid, and tuition waiver issues that arose. Some of the lessons the team has learned with respect to Project administration, students, language, directed project, transfer credit, and faculty mobility mechanisms and the identification of potential research collaborations are also described. Our report of this case study is placed in context of the findings of several major international studies[1, 3] that have identified the predominant issues on a much wider basis.

Critical Issues and Lessons Learned

This paper presents the critical issues, innovative practices to resolve them, and lessons learned from our experience on both sides of the Atlantic. These are grouped into fifteen sections that follow below. After these, the results of a new international survey on joint and double degree programs conducted by the Institute of International Education and Freie Universität Berlin are presented.

Memoranda of Understanding

- MOUs, in order for them to be effective and not just window-dressing, require a commitment to the ideals of the initiative, and compromise. The latter involves the setting aside of some of each institution's practices and preferences in favor of some that advance the ideals of the project and some of the partners' needs. It will be constructive to recognize that exceptions, i.e., out of the norm activities or practices may be necessary in order to attain the desired goals. A will to agree is essential.
- Plan for the official signing and processing of MOUs to take considerably longer than anticipated and be sure to implement a document tracking mechanism.
- Consider the potential for significant publicity around the occasion of formal MOU signing.

Academic Governance & Administrative Commitment

- It was found to be genuinely useful that each partner university's project team was anchored by a senior administrator at the dean's level serving as co-PI. "The operation of this project is greatly facilitated by the ongoing positive commitment of key senior administrators at each institution, e.g., DIT's Dean of Engineering, Purdue's Dean of the College of Technology; and UPC's Vice Rector. In addition the preexistence of Memoranda of Agreement between DIT and Purdue; DIT and UPC: and UPC and Purdue also have eased the project's work because of the trust that these agreements and their supported activities have already established." (quoted from ASEE 2010 paper by this author team)
- Projects such as these evidence a clear need for long term effort to secure the escalating and outwardly spiraling, i.e., broadening of participation beyond the departments that initially submitted the proposal. Such broadening of participation is essential to sustainability beyond the external funding period because it increases the advocacy base.
- Extensive interaction is required to unearth all idiosyncrasies of each institution's operations, e.g., requirements related to timing of the awarded degrees and counting a particular course towards fulfillment of two different degrees.
- Approval of the final concurrent MS degree plan of study through each institution's normal approval mechanisms is critical.
- A jealously guarded aspect of institutional governance was the admission process as Figure 2 documents for Purdue students. Despite the avowed goal of creating an integrated admission process the project team found it impossible to accomplish this.

Each institution insisted on having students follow their established process for such admission even though this meant redundant work for student applicants. The team was, however, able to make such procedures more obvious. It should also be very useful to work toward a unique admission process as it is done in the Erasmus Mundus programs.

- The start-up phase for such projects takes a considerable length of time and extensive effort even if the relationship between the institutions is already well established. If formal academic program approvals are required this will only add to the time required (and may in fact stymie progress) – therefore building on existing programs will generally be more expeditious.
- While graduate programs and rules can be more complicated and much more difficult and time consuming to change or merge with other graduate programs, they typically do offer the advantage of generally being more flexible in terms of their requirements.

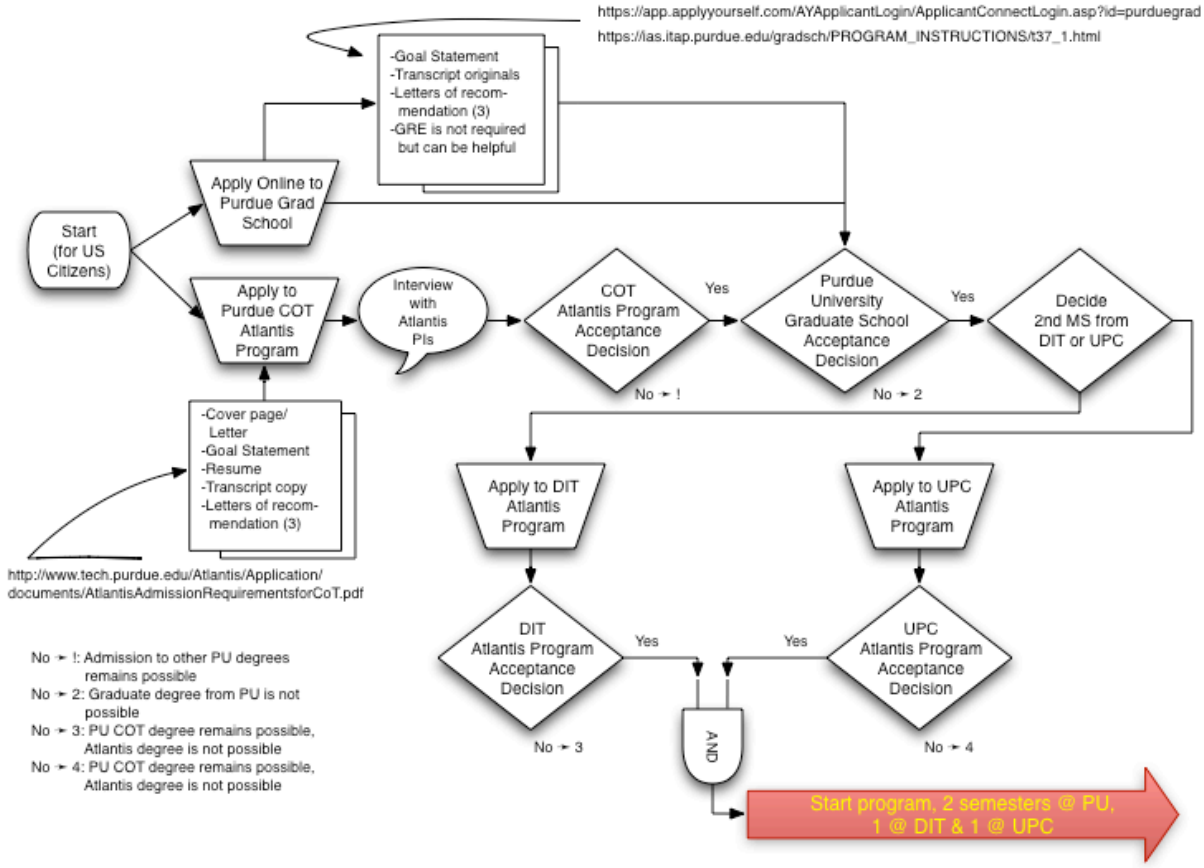

Figure 2. Combined Admission Process for Purdue Students applying to the Concurrent MS Program

Accreditation Requirements

- Purdue University learned that accrediting agencies, such as the North Central Association of Colleges and Schools, The Higher Learning Commission, have requirements that stipulate the maximum proportions of a program that may be

delivered by collaborating international universities before special approval procedures are required. Similarly, recently established accrediting agencies in Europe as well as government entities such as the Spanish Minister of Education also have regulations that must be addressed.

Financial Aid

- It is important in program design to establish requirements; and control the proportions of coursework offered by collaborating international universities; that permit enrolled US students to maintain their eligibility for USA financial aid. For European students institutional officers attend to eligibility for both Erasmus and Atlantis grants.

Tuition Waivers & Stipends

- The establishment of reciprocal tuition waivers or equivalent mechanism is necessary in order to make it possible for European students to attend American Universities given their typically high out-of-state tuition fees. Note also that increasingly, European institutions are also charging tuition or other fees that make Waiver agreements highly desirable. Typically tuition waivers between European partners are based on bilateral Erasmus agreements.
- It was noted that the availability of a significant stipend, in this case 12000 Euro or Dollars was a specific inducement for students to want to participate

Project Administration & Operation

- The work required by such a project, as overviewed in Figure 3, is so varied and extensive that it clearly cannot be successfully handled by any single project director or faculty member. There are simply too many facets and interactions to be addressed throughout the project for one person to attend to all successfully. It requires a team. Such projects require personnel with highly developed international understandings, negotiation skills, respect across campus, expertise in financial procedures, effective and engaging student interaction, tolerance for ambiguity, and more.

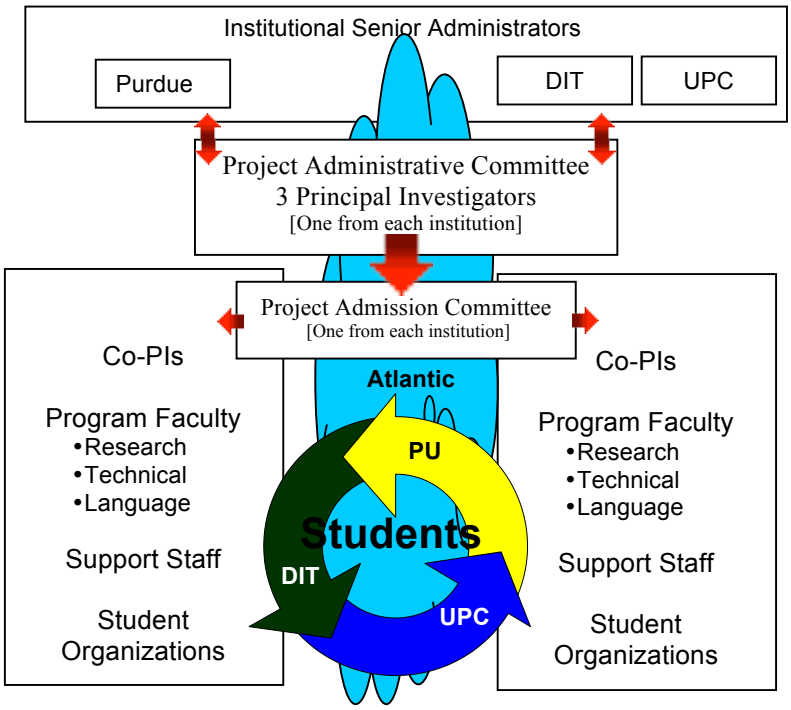

Figure 3. Project Management and Operation (from ASEE 2010 paper)

- "Among the lessons the partners have learned by experience with exchange programs is the criticality of selecting the right partners and then interacting extensively enough, at each other's site, to build significant understanding, rapport and trust. Central to this understanding is in-depth cognizance of each other's vocabulary, academic calendar, course content and scheduling, credit and grade equivalencies, and instructional culture." (quoted from ASEE 2010 paper by this author team)
- Close cooperation and the maintaining of project momentum require routine, frequent, and pervasive communications which are usefully facilitated by video-conferencing.

Project Students

- The project team noted with some surprise the extent of work required to recruit students for such projects.
- Similarly, the volume of information required/requested by students was unexpected. They may be in more need of the security that this information provides than what they typically might let on.
- The importance of contextual matters, beyond the actual degree program nature, e.g., housing, entertainment, and travel was noted.
- Considerable value was derived from having previous exchange students (from both sides of the Atlantic) interacting with the new ones just heading out.

Student Services & Orientation

- The availability of well-established campus and program orientations and incoming and outgoing student support services greatly reduced the load on program faculty. Essential survival aspects such as living/housing conditions, and travel must be carefully integrated into systematic orientation activities.
- Similarly it was found to be very useful to have established project linkages with the Spanish Consulate – particularly in clarifying visa requirements and expediting their processing.
- The team noted that the process for European students to secure a visa to enter the USA is significantly complicated if this occurs while students are physically studying in a European partner/country that is not their normal home.
- It was highly valuable to do an in-person, on-the-ground check out of housing in each of the international settings because typically European Universities do not have the on-campus, university-operated dormitory services that American universities do.
- Students must be carefully oriented in order to both prepare students adequately and also control their expectations—the latter is essential to favorable evaluation results.
- Difference in cultures, processes, and expectations of faculties, students and institutions can be accentuated to serve as positive aspects rather than being viewed as being problematic.

Language

- Students found that it was difficult to get language instruction considered as graduate credit. Faculty viewed it more like a prerequisite for which no graduate credit was appropriate than as a tool for graduate study analogous to statistics.
- It was difficult to secure discipline-specific language courses

Thesis/Directed Project Procedures & Requirements

- Faculty from partner universities all use similar words to mean different things and simultaneously different words to mean the same things. Nowhere was this more apparent than in what the various partners meant by the Masters research project. But, after dissecting what was meant, it became apparent that the conceptualization and conduct of a systematic research or development project was what was expected by each partner – despite the different words and methods they used to refer to this project and the procedures associated with its approval and review.
- Graduate faculty generally have similar requirements so the team needed to look beyond the often different words they use to identify what is actually meant and then notice the similarities
- Frequently faculty employ different procedures/processes to reach the same end. Given this, it is important to look past the procedural differences and focus on what the desired outcome/performance is.
- The need for and practice of having a graduate advisory committee for each master's candidate and requiring that a faculty member from each university is anticipated to be

challenging and will undoubtedly require considerable facility with video-conferencing.

- The project team is also moving towards joint videoconference and public presentations of the projects among the three partners by using their existing technology infrastructure

Transfer Credit

- Institutions may have regulations and/or practices that differentiate between what is required to merely place transfer credit on a students' transcript or if they record specific graded courses earned at another institution.

Faculty Mobility

- It takes work to interest faculty in participating in overseas activity even when the money stipend exists.
- Many faculty, not surprisingly, prefer to continue to do what they have always done rather than explore something different.
- It is useful to provide faculty with a framework of what is desired rather then merely letting them generate their own. An example of such a framework for mobility is provided in Appendix A – Application for Faculty Mobility.
- Project teams learned to front-end load mobility activity in order to prime the exchange activity and increase faculty and administrator familiarity among the partners. The earlier this evolves the better.
- A good indicator of whether the project relationships are evolving is if administrators and institutions move to expend their own funds (i.e., non-project) to support faculty and travel costs.

Identification of Potential Research Collaborations

- In order to generate the potential for the sustainability of initiatives initially stimulated by external funding, it is necessary to ingrain such activity in the larger spectrum of ongoing faculty interests and activities. At doctoral extensive/research intensive universities this necessarily requires some synergistic linkage with research and scholarship activities.
- Two of this project's partner universities have already invested considerable funds and faculty time in holding research interest exploration seminars on each other's campus where faculty have shared their R&D initiatives.

Funding Sources

- While undoubtedly external funding sources such as the Atlantis program are valuable for stimulating activity, they typically do not provide for ongoing support. Therefore it is critically important that project teams build the internal institutional support that will permit sustaining of project activities once federal and European funding ceases.

- Therefore, project directors must work towards institutionalizing such support. The strategic planning process has been invaluable in creating an environment where; to work towards institutional, College and Departmental strategic goals; the international exchange and collaboration programs become a key mechanism for their achievement.

Evaluation for Transatlantic Degree Projects

- Having an independent Third-Party Evaluator has proven to be a valuable component of the project's success. This has introduced useful ideas into the project's operation, it has relieved project faculty of considerable work, and it significantly enhances the credibility of project reporting.
- It is most useful to involve such evaluators right from the beginning, in the case of this project, they even participated in the proposal development.
- Evaluators must be trusted by students and faculty in the program otherwise their effectiveness is significantly reduced. They cannot be viewed as a critical enemy.

International Survey on Joint and Double Degree Programs

The Freie Universität Berlin and the Institute of International Education again launched a new international survey on joint and double degree programs in February 2011. Before the survey launch, the questionnaire was reviewed by a group of international experts with the aim of identifying and formulating the most relevant questions. The final version included a set of 26 questions grouped into three categories: (1) Program Details, (2) Recruitment, Admission and Accreditation, and (3) Program Development, Motivations, and Impact. The survey sought to collect information for the assessment of the current global landscape of joint and dual/double degree programs. The goal is to provide information for higher education professionals and policymakers on particular trends, including an analysis of the challenges and barriers to developing joint and double degree programs and recommendations for universities on emerging best practice examples. The new survey targeted higher education institutions worldwide and was mainly distributed electronically via international, national and regional higher education organizations, governmental agencies, higher education media, newsletters and listservs. The responses are currently being analyzed and a summary of the results will be made available on the IIE website (http://www.iie.org/) during spring 2011. Highlights of these will be incorporated in the ASEE session presenting this paper in Vancouver, June 2011.

Summary

Overall, the partner team is pleased to be able to report that the project has been even more rewarding than what they hoped at the time of proposal submittal. Numerous intangible but significant benefits and insights have resulted. The three partner university teams have gained much in terms of their understanding of and respect for each other. The exchanging students are very positive and are looking forward to their overseas experience. The project team has gained numerous insights as presented in the fifteen topical categories and has highlighted the key lessons learned that they believe are transferable to other projects and institutions seeking to exchange students.

Appendix A. Faculty Mobility Application

Transatlantic Faculty Mobility

EU-U.S. Atlantis STI Master's Project

This form provides Purdue, UPC and DIT faculty who wish to contribute to the Atlantis STI Master's Project by engaging in teaching, research, Joint Directed Project supervision, curriculum development and/or other relevant academic and scholarly activities, an opportunity to propose such activities and explain how both they and the project can benefit. Please forward completed forms to Dr. Gareth O'Donnell (DIT), Prof. Gary Bertoline (Purdue) or Dr. Nuria Castell (UPC) along with any other relevant/related information.

Name: | Telephone: | Email:

List your current and recent activities/duties which you believe are relevant to this project:

1.
2.
3.
4.
5.
6.
7.
8.

Briefly describe the academic and/or scholarly activities which you propose, including duration of stay:

I propose the following activities:

Briefly describe how the above activities may positively contribute to the project and be of benefit to you:

These proposed activities will contribute to the project in the following ways:

These proposed activities will be beneficial to me in the following ways:

The contents of these pages were developed under an EU-U.S. Atlantis grant (P116J090064) from the Fund for the Improvement of Postsecondary Education, (FIPSE), U.S. Department of Education. However, those contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.

Attention: This action has received funding from the European Community through its EACEA agency. Sole responsibility lies with the author, and the EACEA and the European Commission are not responsible for any use that may be made of the information contained herein.

References

[1] Marginson, S., & van der Wende, S. (2006, September). Globalisation and higher education. [draft #2b, prepared for OECD]. Paris, France: OECD.

[2] Bhandari, R. (2009, February). Key Research in U.S. Study Abroad: Findings from the Institute of International Education's Study Abroad Capacity Series. Paper presented at Emerging Directions in Global Education 2009 conference, Feb 9-11, New Delhi, India: IIE (New York).

[3] Committee on Enhancing the Master's Degree in the Natural Sciences, the Board on Higher Education and Workforce Policy and Global Affairs. (2008). *Science Professionals: Master's Education for a Competitive World*. Washington, DC: The National Academies Press.

[4] Dyrenfurth, M., Murphy, M., Bertoline, G., Herrick, R., Newton, K., O'Donnell, G., McHale, D., Castell, N., Barceló, M., Balas, D., Sancho, M.R., & Garcia, J. (2010). Concurrent masters degrees across the Atlantic: Innovations, issues & insights. Paper AC 2010-1372 presented at the ASEE 2010 Annual Conference, June 20 - 23, Louisville, Kentucky. Washington, DC: American Society for Engineering Education.