
AC 2011-557: CARIBBEAN COMPUTING CENTER FOR EXCELLENCE: BUILDING UNDERGRADUATE RESEARCH SKILLS, CHANGING PER- CEPTIONS OF POST-GRADUATE STUDY

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Luis F. Font has a B.S. in Biological Sciences from University of Puerto Rico; and a M.B.A. in Marketing from Universidad Metropolitana of Puerto Rico. Luis has been working with students for his entire professional career. In 2005 he started as an Auxiliary Librarian helping and orientating students with their academic work. Later, he became AHORA Program Coordinator at Metropolitan University where he administrated the entire academic organization and execution programs in education, business and computer sciences. Luis has worked as Business Administration Professor where he teaches Marketing and Business Ethics courses to Undergraduates students. Since December 2009, he is the BPC-A Coordinator at Ana G. Mendez University System (AGMUS) for the Caribbean Computing Center for Excellence (CCCE) Alliance to support students to continue studies in computer related fields in Puerto Rico and the U.S. Virgin Islands.

CARIBBEAN COMPUTING CENTER FOR EXCELLENCE: BUILDING UNDERGRADUATE RESEARCH SKILLS, CHANGING RECEPTION OF POST-GRADUATE NEEDS

Abstract¹

The Caribbean Computing Center for Excellence (CCCE) was established in 2009 as a partnership between nine universities in Puerto Rico and the US Virgin Islands. The Broader Participation in Computing-Alliance (BPC-A) was designed around the primary goal of increasing the recruitment and participation of students in computing disciplines. In order to fulfill this goal, Alliance members established the CCCE focused on five main objectives: 1) reach and impact economically-disadvantaged students with Alliance activities; 2) increase the recruitment of high school seniors into computing fields through hands-on research experiences in a university setting; 3) provide professional training in computing to in-service science, computer and mathematics public and private high school teachers; 4) provide research experiences in computing to undergraduates, and ultimately, 5) increase the number of graduate students in computing fields and transfer 40% of BS graduates to graduate school.

Additional partners for this project include the Puerto Rico Department of Education, the Institute of Electrical and Electronic Engineers (IEEE) Computer Society Chapters in San Juan and Mayaguez, Puerto Rico, and public and private high schools. An extended partnership with academic and industry research institutions in Puerto Rico, the US mainland, and abroad is also part of this Alliance.

Through a grant from NSF, funds for the project total \$2.25 million over three years to mentor 345 undergraduates from participating institutions; train 948 science, computer and mathematics teachers from Puerto Rico and the US Virgin Islands with workshops, teaching/learning strategies and research experiences; improve student support research infrastructure, provide strong student support to increase retention and graduation; successfully transfer 40% of BS graduates into graduate school; provide pre-college research activities for 1,008 students; impact 1,200 economically-disadvantaged community members with careers in computing-related areas; and disseminate the Alliance's model and best practices to other institutions in the Caribbean and nationwide.

This paper will present the outcomes of the grant after one year of implementation in the areas of pre-college research, Saturday research academy, and summer research program for undergraduates, research symposia and transfer to graduate school in computer-related fields. We will also describe the rationale behind the Alliance's goals and activities, based on prior successful programs aimed at boosting transfer of undergraduate students to graduate study.

I. Introduction

The Broader Participation in Computing-Alliance (BPC-A) is a project designed to impact Hispanic American and African American institutions in Puerto Rico and the US Virgin Islands, including women and persons with disabilities. It focuses on reaching economically-

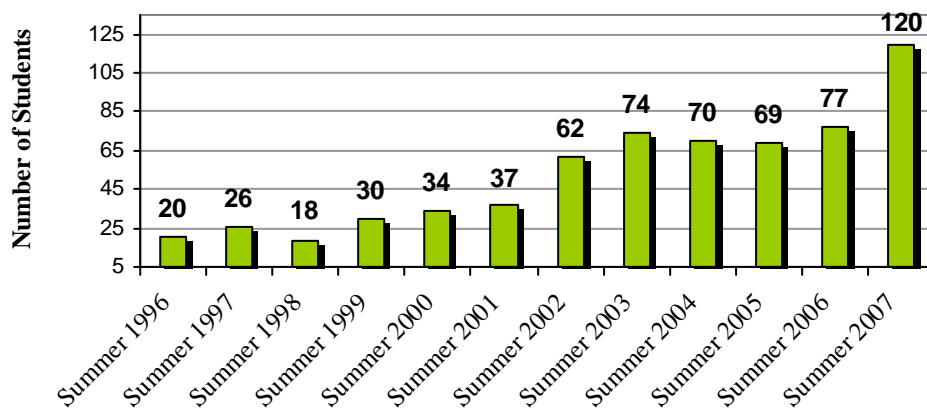
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disadvantaged communities in Puerto Rico and the US Virgin Islands through partnerships with municipalities, community-based organizations, and professional organizations in computing. A network of institutions, mentors, administrators in Puerto Rico, the Virgin Islands, the US mainland, and abroad are actively engaged for the implementation of Alliance activities. Through its activities, The BPC-Alliance motivates and increases the recruitment of students to choose computing disciplines as their major in college. It impacts pre-college students, science and mathematics teachers, undergraduates, graduates, and economically-disadvantaged community members. The Alliance is formed by institutions of higher education in Puerto Rico and the US Virgin Islands, government agencies, public and private high schools, US mainland institutions and national laboratories, research institutions and industrial partners. See **Appendix I** for a list of partner institutions.

The lead institution is the Ana G. Méndez University System (AGMUS) through Universidad Metropolitana (UMET). The CCCE Alliance is managed through the consortium formed by an Executive Council, a National Advisory Board, an Implementation Team, and a Project Coordinator led by an experienced PI and a team of Co-PIs from Alliance organizations.

The motivation for the creation of the Caribbean Computing Center for Excellence (CCCE) is based on a number of successful initiatives at AGMUS, including a Model Institutions for Excellence (MIE) program at UMET. The thirteen years of MIE Projects at six institutions (University of Texas, El Paso; Xavier University of Louisiana; Bowie State University; Spelman College; Oglala Lakota College; and UMET) produced a model for successfully moving minority students through the science pipeline including technology, engineering and mathematics. UMET, in particular was able to make a significant impact on the progress and success of Hispanic students in Puerto Rico. Most students at AGMUS are economically-disadvantaged, first-generation college students. The MIE Project at UMET created a pathway for science that went from pre-college to graduate school with programs involving research at all levels. For example, the UMET/MIE program was extremely successful in placing over 600 students in summer research internships during the twelve year period of the grant. **Figure 1** illustrates student placements by summer. The Summer Research Internship Programs offers students the opportunity to develop and strengthen their research knowledge. This experience helps them emphasize their study area, and prepares them for graduate studies. During the MIE Project, a total of 108 students were accepted to graduate school, all of them participating in at least one Summer Research Internship Program. With this initiative, the program aids the student to in exploring various university environments to which they will apply for graduate school.

Figure 1: Students placed in summer research internships as part of UMET/MIE program, 1996-2007



For the CCCE program, four of the seven components of the MIE model were selected, based on prior success: 1) Pre-College Research Program; 2) Student Support System; 3) Undergraduate Research Program; and 4) Bridge to Graduate School.

II. Projects Goals and Outcomes

The primary goal of this BPC-Alliance is to reach economically disadvantaged communities in Puerto Rico and the US Virgin Islands and increase the recruitment and retention of students in computing disciplines. In order to fulfill this goal, this Alliance has established the Caribbean Computing Center for Excellence (CCCE), hosted at AGMUS, using the structure, facilities and staff of the Student Research Development Center. The CCCE focuses on five main objectives:

1. reach and impact economically disadvantaged students with Alliance activities
2. increase the recruitment of high school seniors into computing fields through hands-on research experiences in university settings;
3. provide professional training in computing to in-service science, computers, and mathematics public and private high school teachers;
4. provide research experiences in computing to undergraduates and graduates; and
5. increase the number of graduate students in computing fields and transfer 40% of BS graduates impacted by this program to graduate school.

Core activities for the CCCE during the fall 2009 and spring 2010 semester have been held at the sites of the Alliance in Puerto Rico and the US Virgin Islands. During summer 2010, the summer research experiences will be held at US mainland partners' sites and abroad.

The Caribbean Computing Center for Excellence (CCCE) offers a pre-college research experience to a total of 320 high school students per year, for a total of 960 students during the three year project. A Saturday Academy Program in the Alliance sites includes twenty students per site per semester. This area of the project impacts the recruitment of talented high school students interested in science technology, engineering and mathematics. During the summer, sixteen (16) pre-college students have the opportunity to work in research projects at partner institutions in the US mainland. In total, forty-eight pre-college students are impacted with this summer program. To do date, 9 pre-college students have been recruited to participate in the program.

The second area of this project is in-service teacher training. A total of nine hundred (900) public high school science and mathematics teachers, around three hundred (300) per year, have the opportunity to participate in workshops on computer-based technology. The workshops are held during the pre-college research symposia. To date, 55 teachers have participated in CCCE workshops, and will continue on through the program's duration.

The third area this project impacts is undergraduate research in computing fields. One hundred eighty (180) undergraduates, sixty (60) per year participate in summer research activities in the United States and abroad. In 2009 and 2010, 19 students participated in summer research, and a cohort of 45 students is applying for summer 2011 projects.

The expected outcomes for this project are:

- 92% of the pre-college students will enroll in college with 85% of these in science, technology, engineering and mathematics, mainly in computing-related fields; for comparison, the current college enrollment rate (for all majors) in Puerto Rico is 75%.
- 90% of the undergraduates will graduate with a Bachelor in Computer Science and at least 40% will enter graduate school in computing-related fields. The other 60% will pursue professional careers in industry, business and teaching at the K-12 level.
- It is anticipated that 90% of the science teachers impacted by this project will complete their training and disseminate the knowledge learned to their students in classrooms in Puerto Rico and the US Virgin Islands.
- Of the community members impacted, 60% will complete the seminars and workshops and 30% will express their desire to pursue careers in computer sciences. These objectives are expected to be obtained at the end of the third year of the project.

III. Pre-College Research Program

The MIE program built an effective pipeline from K-12 levels into the undergraduate level for computing majors. The UMET MIE Pre-college Research Agenda of the program was used as the base model for the CCCE's initiative in this area. This model has a very successful track record of transferring almost 100% of its participants into college, with 85% of them entering into STEM fields. The partnership with public and private high schools of the Metropolitan San Juan area, forged by the MIE Project at UMET for the past thirteen years, impacted more than 2,000 high school students from grades 10, 11 and 12 from 125 schools. This methodology was used to expand recruitment into University of Puerto Rico Mayagüez (UPR-M) and University of Puerto Rico Humacao (UPR-H).

The Pre-College Research Program for the BPC-Alliance is implemented each fall and spring semester for the duration of the project. Projects are accepted in computing-related areas with emphasis on computer science, computational biology, computational chemistry, engineering applications, modeling and simulation, visualization at the macro, micro and nanoscale, mathematical modeling and simulation, expert system development, artificial intelligence, physical applications and software development and the Internet. Two mentors who are responsible for a group of ten students are selected at each site. The mentors implement at least three different projects with their students. Targeted students are those interested in exploring science, technology, engineering and mathematics. Students interested in the program submit a formal application, available at <http://ccce.suagm.edu> as part of an application package. During the sixteen weeks of the project, mentors work with the students on a regular basis, from 8:00 am -12:00 on Saturdays. Mentors are responsible for implementing the steps of the research cycle within the specific computer-related projects. Previous project experiences of CCCE include the following projects:

- "Computational Study of Amino Acids Changes with Gene ECH1"
- "Electrode Shape Design for Uniform Glow Discharge Confinement"
- "A Software Programming Version of the Classic 'Hangman Game'"
- "Wireless Communication Network to Help with the Treatment of Diabetes"
- "Robotic Model for the Reduction of Landfills to Improve the Environment "Syncop: Software for Calculating the Synthetic Protein Cost"
- "Observations on the Performance Tool Passmark Test Used in Windows XP "How are the Greco-Latin Squares used for the Design of a Computer Game using Alice?"

- “Artificial Intelligence: Development of Knowledge”
- “ Digital Graphics and Displays of Chemical Ingredients of Selected Cosmetics and Products for Personal Care”

To evaluate the results of the Pre-College Research Program, a pre-test and post-test is administered to all participating students about their knowledge of the research process for comparison at the end of the program and evaluation of learning outcomes.

IV. Summer Undergraduate Research Experiences

The summer internship/research experience for undergraduates at institutions in the US mainland and abroad is a partnership with research mentors of the PI/CCCE network. The network includes more than one hundred institutions such as UCLA, MIT, Cornell, Purdue University, Arizona State University, among others. Undergraduate students participating in the program during the fall and spring semester are encouraged to apply to REU programs early in the fall semester of each year of the project. The application process is supervised by the PI, and Co-PIs. Students apply at least to five different REU programs and are provided with support in their applications and personal statements required by the REU programs, whose main objective is to train undergraduates in state-of-the-art technologies and applications in computing-related fields. Students selected either by the mentors or programs at the institutions in the US mainland or by the PI and Co-PIs to participate in the summer programs travel to their selected sites and work in research for a ten-week period, on average. Mentors working in REU programs are high-caliber scientists who are interested in preparing and training students for graduate school.

It is expected that up to 60 undergraduates will be selected per year together with a group of at least 15 pre-college and 16 science teachers to participate in the CCCE summer research internship programs. REU programs generally have special training for the Graduate Record Examination (GRE), and participants are encouraged to take advantage of this opportunity. Although there is no statistic on the effect of the trainings, the students have an opportunity to relate with previous and work directly with students who previously have taken the test. The summer program is a ten-week research experience for undergraduates during the months of June, July and August. Partnerships with industry may provide additional summer positions in local and national industry locations. At the conclusion of the summer program, all participants take part in the Undergraduate Research Symposium, an event organized by the Student Research Development Center (SRDC) every fall in San Juan, Puerto Rico.

Summer Program Outcomes

The CCCE offers pre-college and undergraduate students the opportunity to have a Summer Internship in different institutions in the US mainland and abroad to develop their scientific skills. In 2010, a total of 20 students had the opportunity to attend a Summer Internship Program. See **Appendix II** for the titles of the summer projects. Reactions among these students have been extremely positive: 15 of the 20 students are interested in completing another summer research internship, and have expressed an interest in graduate education in computing-related fields, where they had previously only envisioned completing their Bachelors’ degree. All the students accepted to graduate school have participated in a Summer Internship Program at least once, with a high percentage of them being accepted at institutions where they worked in previous Summer Internships.

V. Research Symposia Model

The dissemination of scientific research conducted in the MIE Project Pre-College and Undergraduate Programs at UMET became a well-known model by local, national and international institutions. The research symposium is an activity designed with several goals in mind. The first is to disseminate the research work of pre-college and undergraduate students among their peers. The second goal is to train the next generation of scientists in oral and poster presentations. A third goal is to motivate other students to become involved in research activities at an early stage of their training as scientists in STEM area fields. The UMET Research Symposia Model includes a pre-college component with three symposia during the year, and the undergraduate component with two symposia during the year.

The Pre-College Program, specifically the Saturday Academy Program, organizes two symposia per year-one in May, at the end of the spring semester, and the other one in December, at the end of fall. The Summer Adventure Research Program (SART) also organizes a disseminating event early in August of each year. The undergraduate research program, the third of the components, organizes two research symposia per year-one for the research activities with UMET mentors in May, and a second in October for research activity done at US mainland institutions and foreign countries during the summer.

The overall symposium model is the key component to reach a level of excellence with the pre-college and undergraduate research activities conducted in an academic environment. Programs such as this one accelerate the participation of underrepresented minorities in research-related activities at early stages of their development and will sustain the goals and objectives of the MIE Program at UMET.

Undergraduate Research Symposium

This activity is an annual event in the fall. For two days, undergraduates of the Alliance present their research projects developed during the previous summer and the academic year and participate in a series of orientation activities given by professionals from research institutions. The symposium begins with workshops in topics such as: computer technology, AI, data visualization, networking and robotics, 3D graphics, sensor networks, computer vision, mobile computing, wireless networking, computational biology, computational chemistry and computational nanotechnology. Special workshops for persons with disabilities are prepared and provided by AccessComputing Alliance. A poster session is held on the evening of the first day. The second day generally includes keynotes from scientists in the computing community and the BPC Alliance. There is an orientation for summer research opportunities and for graduate school presented by representatives from graduate schools in the US mainland and graduate students who are AGMUS alumni. Orientations for summer research opportunities are also available. The second day includes oral presentations by students and a second poster session. An awards ceremony is held at the end of the symposium, where the best presentations are recognized. Awards are provided by local companies (Hewlett Packard, Microsoft Puerto Rico, Waters Corporation, Bristol Myers Squibb). The most recent AGMUS Research Symposium was held on September 9-10, 2010 with a total of 225 participants. The first day, workshops in the area of Computer Science, Computational Chemistry, and Computational Biology were offered as well a talk from Hewlett Packard Laboratories.

Eight scholars with the projects presented at this Symposium had the opportunity to attend the SACNAS National Conference in Anaheim, CA where the students disseminated their projects, as well as participated in scientific workshops and meetings with undergraduate, graduate and scientific mentors from academic institutions across the USA

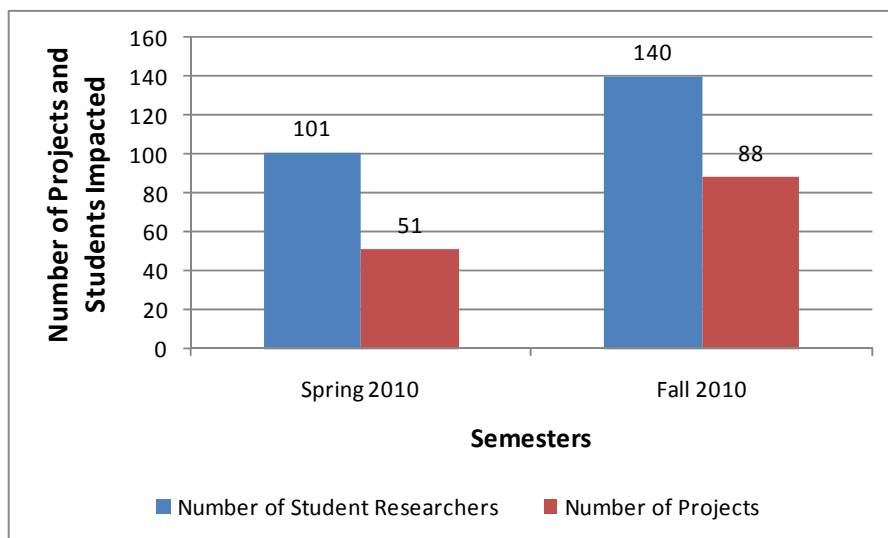
One of the objectives for the national AGMUS Research Symposium held at UMET every September is the preparation of the student researchers for the dissemination process of research outcomes. A second objective is to compete with peers from colleges and universities in Puerto Rico and the US mainland in reaching levels of excellence and performance similar or superior to those of national conferences such as SACNAS, NCUR, ACS or IEEE. A third objective is to teach the students networking abilities and connectivity to graduate school.

Pre-College Program Symposium

The Pre-College Program symposia are similar in format and structure: They are implemented during one day, on a Saturday, in May and December of each year. The program has a keynote speaker who addresses the topic of pre-college research and its implications in the overall dynamics of motivating pre-college students to pursue careers in STEM fields. Scholars present their research outcomes in professional oral and poster format to peers, mentors, parents and members of the pre-college and academic community in Puerto Rico. Student presentations are formally evaluated by professors and scientific judges. Three evaluations are necessary to compete for the best three symposium awards in either Biological and Life Science and Physical Sciences/Mathematics and Computer Science Pre-college students from high schools in Puerto Rico are also invited to attend these symposia. These students have developed their research projects mentored by either a science teacher or a university professor in facilities other than UMET. A symposium proceeding is published for each Pre-College Research Symposium. It contains all the abstracts of the projects developed and implemented by the students during the sixteen-week period or the five intensive weeks during the summers. The Spring 2010 Pre-College Research Symposium was attended by a total of 312 participants, and the Winter 2010 Pre-College Research Symposium was attended by 450 participants. See **Appendix IV** for list of research projects.

A summary of the outcomes for the two symposia, in terms of students impacted and projects presented, are provided in Figure 2.

Figure 2: Pre-College Research Projects Implemented



VI. Bridge to Graduate School

The overall objective of the CCCE project is to increase the number of students earning Ph.D. degrees in computing-related fields. The “Bridge to Graduate School” component of the program helps students prepare for the transition to graduate school. This is very important as minority students at institutions participating in CCCE generally do not have a tradition of applying to graduate schools. Early orientation to graduate school is offered by project personnel and scientists from the community worldwide. A Fulbright Visiting Scholar series in Computer Science is usually implemented at Alliance sites. See Appendix III for the list of scientists.

In addition to visiting scientists to the Alliance sites, Graduate Record Examination (GRE) and Test of English as a Foreign Language (TOEFL) preparation courses are offered for juniors and seniors early in the process. Representatives from graduate schools in the US and abroad are invited to participate in orientation seminars for scholars during the fall and spring semesters as well as during the AGMUS undergraduate research symposium. The success of the Bridge to Graduate School component is evident with four CCCE Scholars who enrolled in graduate programs during the Fall 2010 semester at the University of North Texas (2), the University of Iowa (1), and North Carolina State University (1), and

VII. Conclusions

The model for pre-college and undergraduate students successfully developed and implemented by the MIE project at UMET have informed the current CCCE project, and are helping a significant number of STEM minority students at both pre-college and undergraduate levels to achieve a higher degree of academic excellence, while providing orientation to successfully transition from high school to undergraduate studies, and from undergraduate to graduate school.

The Caribbean Computing Center for Excellence is the next step of the MIE model dissemination from UMET to sister institutions in Puerto Rico and the US Virgin Islands. With the objectives obtained through MIE, it is expected that these institutions will successfully attract potential students and place them in graduate schools in the US mainland. Along with these institutions, the partnership developed with the Department of Education of Puerto Rico and other private industries will help in the development and guidance of students through the pipeline for graduate school

Acknowledgments

The support and outstanding work of the Student Research Development Center Staff at AGMUS make the implementation of many of the activities of the CCCE Alliance possible. Dr. Gladys Bonilla was instrumental in helping with this paper. The Co-PIs of the CCCE Alliance, mentors, pre-college and scholars are the key for the success of the CCCE Model. Many thanks to all of them for their fine work and accomplishments.

Appendix I: Partner Institutions

University Partners

Ana G. Méndez University System (Universidad Metropolitana-UMET, Universidad del Este-UNE, Universidad del Turabo-UT), the University of Puerto Rico (Mayaguez and Humacao Campuses), Inter American University of Puerto Rico (San Germán and Metro Campuses), Polytechnic University of Puerto Rico, and the University of the Virgin Islands in St. Thomas. Other partners of the Alliance in Puerto Rico include the Department of Education of the Commonwealth of Puerto Rico, public and private high schools including Academia Bautista de Puerto Nuevo, Academia María Reina; US mainland institutions (Carnegie Mellon University, the University of South Florida, New Jersey Institute of Technology, Humboldt University, Jackson State University, Iowa State University, Rice University, the University of California-San Diego, the University of Rhode Island, Virginia Tech, the University of Washington-Seattle, Wayne State University, the University of California-Santa Cruz, the University of Notre Dame), national laboratories (Argonne National Laboratory-Illinois, Livermore National Laboratory), research institutions (Arecibo Observatory in Puerto Rico), international partners (Universitat Politecnica de Catalunya-Barcelona, Spain; Universidad de Málaga, Spain; Universidad Andrés Bello, Santiago, Chile; Politehnica University of Bucharest; Spanish Research Council (CSIC), Spain).

Industrial Partners

In addition to the academic institutions of higher education in Puerto Rico, the US Virgin Islands, the United States, and abroad, the CCCE includes industrial partners such as Hewlett Packard, Janssen Ortho LLC, Merck, Medtronic; local municipal governments (Barceloneta, Comerío, Manatí, Caguas), consortia of municipalities (INTECO, INTENOR), professional organizations (IEEE computer society), and community service organizations (Centro Sor Isolina Ferré, Boy Scouts of America, ASPIRA). The BPC-Alliance will form strong relations with existing BPC-A organizations such as the Stars Alliance, CASHI Alliance, AccessComputing, and EL Alliance.

List of participating high schools

A total of 37 high schools among Puerto Rico have been impacted with the Pre-College Research Program: Colegio Bautista de Caguas, Academia Barbara Ann Roessler, Academia San Jorge, Colegio Bautista de Levittown, Colegio Calasanz, Colegio Luterano Resurrección, Colegio Nuestra Sra. de Belen, Colegio Santa Maria del Camino, Commonwealth School, Episcopal Cathedral School, Padre Rufo Bilingual School, Eduardo Garcia Carrillo School, Ernesto Ramos Antonini School, Jose Aponte de la Torre School, Maria Teresa Piñero School, University Gardens School, Miguel Such Metropolitan Vocational School, Inter-American School, Josefina Barceló School, Margarita Janer School, Petra Mercado School, San Antonio Abad School, American Military Academy, Caguas Military Academy, Notre Dame Catholic School, Espiritu Santo School, San Ignacio School, San Juan Apostol School, Santa Gema School, CROEM School, St. Mary's School, Gilberto Concepcion de Gracia School, Isabel

Flores School, Juan Jose Osuna School, Manuela Toro School, SESO School, and Petra Zenón de Fabery School.

Appendix II: List of Summer projects

Undergraduate 2010

- “A Comparative Study of Information Loss Using SDC Methods”
- “Integration of an RFID Reader To a Wireless Sensor Network and the use of it to Identify an Individual Carrying RFID Tags”
- “Pervasive Outlet-level Energy Data Monitoring and Archiving”
- “Tekkotsu Support For The Calliope Robot”
- “Probing the Cation- π Interaction of Metals (Ca⁺⁺, Mg⁺⁺) and Ammonium (NH₄⁺) Ions with Benzene and two Model Amino Acids”
- “Identifying Specific Zinc Finger Proteins Using Machine Learning Classifiers”
- “Computer Forensics”
- “Cooperative Mapping and Assessment Using Smartphones”
- “Electrode Model for Glow Discharge Confinement Using MATLAB”
- “Reducing the Dengue Outbreak with Insecticides in Puerto Rico”
- “Design and Prototyping a Communications Protocol for Networked Appliances to Enable Peak Shifting”

Pre-College 2010

- “Sign Whine”
- “Accuracy of the Rule Ensemble Method”
- “Photosynthesis: The Movie”
- “Testing the Rule Ensemble Method”
- “What’s Hazardous”
- “Bird Watch”
- “Wastewater Transformed to Produce Geothermal Energy”
- “Artificial Photosynthesis vs. Natural Photosynthesis”

Appendix III: List of visiting scientists:

- Dr. Guy-Alain Amoussou, NSF Program Officer
- Dr. Gonzalo Ares de Parga, National Polytechnic Institute of Mexico City
- Dr. Gilberto Colón, NASA Special Assistant to the Deputy Center Director
- Dr. Mohamed El Ansario, Department of Mathematics and Computer Science, Ibu Zohr University
- Dr. Miguel Labrador, Department of Computer Science, University of South Florida
- Dr. Ulanbek Mambetakunov, State National University, Bishkek, Kyrgyz Republic
- Dr. Francis Vanderhaeghen, Flemish Research Institute of Technology (VITO)
- Dr. Juan A. Gatica, Department of Mathematics, University of Iowa
- Dr. Anders Bjorn, Department of Mathematics of Linkopings University in Sweden

- Dr. Virgil Duma, University of Arad, Arad, Romania
- Dr. Michael Rubner, Director of the MIT Center for Material Science and Engineering
- Dr. Alonso Corona, National Institute for Astrophysics Optics and Electronics, Mexico
- Dr. Eduardo Rosa-Molinar of the Biological Imaging Group, University of Puerto Rico-Rio Piedras
- Prof. Harold Zur Hansen, a Nobel Prize winner
- Dr. Elizabeth Rodriguez, Free University of Brussels, Belgium
- Dr. Pavel Jachym, Astronomical Institute, Academy of Sciences of the Czech Republic, Prague
- Dr. Sebastian Ulrich, University of Oxford, United Kingdom

Appendix IV: List of research projects presented at recent Symposia

Computer Science

- *Theoretical Studies on the $(H_2O)_n$ and $(H_2O)_nX_m+$ ($n=2, 3$; $X=H, Li, Na, Mg, Ca$; $m=1, 2$) Clusters*
- *Understanding from Molecular Perspective the MOS_2 -CO Unsupported Catalytic Nanostructures by HRTEM and TEM Simulations*
- *Pervasive Outlet-Level Energy Data Monitoring and Archiving**
- *Identifying Specific Zinc Finger Proteins Using Machine Learning Classifier**
- *A Comparative Study of Information Loss Using SDC Methods**
- *Computer Forensics*
- *Cooperative Mapping and Assessment Using Smartphones**
- *Tekkotsu Support for the Calliope Platform**
- *Integration of an RFID Reader to a Wireless Sensor Network and the Use of it to Identify an Individual Carrying RFID Tags**
- *Electrode Model for Glow Discharge Confinement Using MATLAB*
- *An Analysis of the Fiscal Impacts of Natural Gas Drilling on Communities in the Marcellus Shale: An Assessment of Informational Needs*
- *Dynamic Manipulability for a 3-Degree of Freedom Robot*
- *Object Recognition in Tekkotsu**

Computational Mathematics

- *QA/QC Data Analysis and Procedure Development*
- *Dynamic Manipulability for a 3D-Degree of Freedom Robot*
- *An Analysis of the Fiscal Impacts of Natural Gas Drilling on Communities in the Marcellus Shale: An Assessment of Informational Needs*
- *Dynamic Manipulability for a 3-Degree of Freedom Robot*
- *Probing the Cation- π Interaction of Metals (Ca^{++} , Mg^{++}) and Ammonium (NH_4^+) Ions with Benzene and two Model Amino Acids**

Engineering

- *Assessing the Restorative Properties of Natural vs. Urban Visual Scenes in Younger and Older Adults*
- *Adding 1 to 2: A Design of a 3 Degree of Freedom Manipulator*

- *Design and Prototyping a Communications Protocol for Networked Appliances to Enable Peak Shifting*

References

- 1) **Jorge Castro**, Universidad del Turabo, Guillermo Navarro-Arribas, Artificial Intelligence Research Institute, “A Comparative Study of Information Loss Using SDC Methods”, AGMUS Research Symposium, September 2010, San Juan, Puerto Rico, and SACNAS Meeting, Anaheim, CA, 2010.
- 2) **Bolivar F. Torres**, Polytechnic University, Gordon W. Skelton, Natarajan Meghanathan, Jackson State University, “Integration of an RFID Reader To a Wireless Sensor Network and the use of it to Identify an Individual Carrying RFID Tags”, AGMUS 2010 Research Symposium, September 2010, San Juan, Puerto Rico, SACNAS Conference, Anaheim, CA, 2010
- 3) **Sara Avila**, Polytechnic University, David Irwin, University of Massachusetts Amherst, “Pervasive Outlet-level Energy Data Monitoring and Archiving”, AGMUS Research Symposium, September 2010, San Juan, Puerto Rico, SACNAS Conference, Anaheim, CA, 2010
- 4) **Francisco Palou**, Polytechnic University, David S. Touretzky, Carnegie Mellon University, “Tekkotsu Support For The Calliope Robot”, AGMUS Research Symposium, September 2010, San Juan, Puerto Rico, SACNAS Conference, Anaheim, CA, 2010
- 5) **Katherine Calderon**, University of Puerto Rico, Humacau Campus, Devashis Dejumdar, Jackson State University, “Probing the Cation- π Interaction of Metals (Ca⁺⁺, Mg⁺⁺) and Ammonium (NH₄⁺) Ions with Benzene and two Model Amino Acids”, AGMUS Research Symposium, September 2010, San Juan, Puerto Rico, SACNAS Conference, Anaheim, CA, 2010
- 6) **Glorimar Castro Noriega**, University of Puerto Rico, Humacao Campus, Deepak Reyon, Drena Dobbs, Iowa State University, “Identifying Specific Zinc Finger Proteins Using Machine Learning Classifiers”, AGMUS Research Symposium, September 2010, San Juan, Puerto Rico, SACNAS Conference, Anaheim CA, 2010
- 7) **Joehan Carrasquillo**, Universidad del Turabo, Dr. David S. Touretzky, Carnegie Mellon University, “Object Recognition in Tekkotsu”, AGMUS Research Symposium, September 2010, San Juan, Puerto Rico, SACNAS Conference, Anaheim, CA, 2010
- 8) **Alvin Peralta**, Jose Aponte de la Torre School, Carol J. Diaz, Universidad del Este, Amir Rodriguez, Inter-American University-Metro Campus, “Computational Study of Amino Acids Changes with Gene ECH1”, Spring 2010 Pre-College Research Symposium, May 2010, San Juan Puerto Rico
Gabriela Acebal, Wendy Figueroa, Clarianne Moscoso, Commonwealth-Parkville High School, Eng. Franklyn Colmenares, Polytechnic University, “Electrode Shape Design for Uniform Glow Discharge Confinement”, Spring 2010 Pre-College Research Symposium, May 2010, San Juan, Puerto Rico.
- 9) **Amarilis Araya, Jose Aponte de la Torre School, Isis Laham**, Universidad del Este, “A Software Programming Version of the Classic ‘Hangman Game’”, Spring 2010 Pre-College Research Symposium, May 2010, San Juan, Puerto Rico
- 10) **Ubec Carambot, Manuel Mangual, Jose Aponte de la Torre School, Lorna Salaman**, Universidad del Este, “Robotic Model for the Reduction of Landfills to Improve the Environment”, Spring 2010 Pre-College Research Symposium, San Juan, Puerto Rico.
- 11) **Nestor Carrasco**, Petra Mercado Bougart School, Glorimar Castro Noriega, University of Puerto Rico, Humacao Campus, “Syncop: Software for Calculating the Synthetic Protein Cost”, Winter 2010 Pre-College Research Symposium, December 2010, Guaynabo, Puerto Rico
- 12) **Cristian Claros**, San Jorge Academy, **Jean Guma**, San Ignacio School, Eng. Joaquin Rivera, Polytechnic University, “Observations on the Performance Tool Passmark Test Used in Windows XP”, Winter 2010 Pre-College Research Symposium, December 2010, Guaynabo, Puerto Rico.
- 13) **Lina V. Daza**, Inter-American School, Yvonne Aviles, Inter-American University, “How are the Greco-Latin Squares used for the Design of a Computer Game using Alice?”, Winter 2010 Pre-College Research Symposium, December 2010, Guaynabo, Puerto Rico.
- 14) **Carlos Feliciano, Hazel Cruz**, St. Mary’s School, Dr. Angel Caraballo, Prof. Irma G. Alvarez, Inter-American University Metro Campus, “Artificial Intelligence: Development of Knowledge”, Winter 2010 Pre-College Research Symposium, December 2010, Guaynabo, Puerto Rico.