

1. PROJECT ABSTRACT OR SUMMARY

Responding to the school district, industry, and emerging workforce trends, Palm Beach Community College is offering a unique interdisciplinary model to connect gifted and high achieving students to the growing fields within Biotechnology and Environmental Science studies. Through the *Math & Science Institute (MSI) Summer Program*, Palm Beach Community College will provide 30 rising 11th and 12th gifted and high-achieving high school students a rigorous, college credit awarding program in emerging industries such as biofuels and ethanol production from vegetation, as well as authentic field-based experiences that will serve as a model for interdisciplinary studies and act as a bridge between secondary and post-secondary education. Students can dually-enroll in the Program at no cost and earn from 6-8 elective college credits while attending the Program on a daily basis for eight weeks from June 8, 2009 – August 7, 2009, Monday through Thursday, 10:00 a.m. to 3:00 p.m. Seventy percent of authentic learning experiences within authentic learning environments are planned (e.g. Scripps Research Institute, South Florida Water Management District, Advanced Water Technology, Cytonics Corporation, Ocean Ridge Biosciences, and TransDermal Technologies

In addition to providing a rigorous curriculum, MSI will implement an innovative instructional delivery methodology that utilizes multi-assessments to challenge and engage the students in goal-oriented tasks that build character and recognition for accomplished practices. This includes the Honors Project and Mentor Academic Author Project (MAAP) activities where students learn the art and science of producing and publishing scientific works, learning how to learn from expert mentors in a measurable and tangible way (i.e. what is required to perform with excellence at the next level of academia).

PBCC's MSI is committed to the explicit goals initiated and expressed though the Working on Gifted Issues (WOGI) Challenge Grant Project, as supervised and coordinated by the Florida Department of Education (FLDOE), Bureau of Exceptional

Education and Student Services. Our aim is to: 1) Produce an exemplar GSP demonstration project that embodies the frameworks for educating the gifted learner in alignment with Florida's Next Generation PreK-20 Education Strategic Plan; 2) Improve college and career readiness; 3) Expand opportunities for postsecondary degrees and certificates; and 4) Improve quality of teaching in the education system.

2. PROJECT NEED

About Palm Beach Community College and The School District of Palm Beach County

Palm Beach County contains 37 municipalities and spans over 2,578 square miles in a county that dwarfs the states of Rhode Island and Delaware combined. Growth data indicate that Palm Beach County is the eighth fastest growing metropolitan area in the United States. By the year 2015, the county government estimates the population will reach 1,542,910 people. In landmass, it is the largest school district east of the Mississippi River. The county's growth correlates with the school system's ranking as the 10th largest school district in the U.S. based upon enrollment and 4th largest in Florida, with a student population that grows by approximately 5,600 new students a year. **Palm Beach Community College (PBCC)** and the **School District of Palm Beach County** (the District) have a long-standing, positive relationship, partnering in many initiatives to improve the quality of education for students in the county's K-12 system. The two agencies are committed to their continued collaboration under the proposed Math & Science Institute (MSI), described herein.

The Need for the Project

Acknowledging that nearly 55% of all first-year PBCC students come from within the county and are graduates of the district's schools, the partners formed a joint Teacher Education Advisory Consortium, where administrators, educators, support staff and faculty examine challenges and identify solutions associated with the need for a highly effective and engaging education spectrum in Palm Beach County. One of these challenges relates to the call for qualified STEM graduates to fulfill the employment

demand in Palm Beach County. Both partners are working to heed this call through their respective programs. In fact, PBCC is set to launch the Math & Science Institute in the spring of 2008, with the opening of the brand new 90,000-square foot, \$15 million science complex. PBCC's newly completed bioscience complex, featuring two buildings connected by a multi-media lecture hall and courtyard, includes one building that houses state-of-the-art classrooms and laboratories for the core science classes (biology, microbiology, anatomy and physiology, physics and chemistry) and another building reserved for biotech classrooms and labs, environmental science, and environmental horticulture. In the new complex, biotechnology students can experiment with cutting-edge technologies such as recombinant DNA technology, protein production and purification, and biomanufacturing. The BioScience Technology Complex allows for expansion of the research components of PBCC's Environmental Science and Horticulture programs. Lab equipment includes: Bio-Rad Gel Documentation System, Real-Time PCR Machine, Nanodrop Spectrophotometers, New Brunswick Shaking Incubator, Tissue Culture Laboratory (Sartorius Industrial Grade Bioreactors - Bacterial and Mammalian, Laminar Flow Hoods, Zeiss Microscopes - Inverted and Fluorescent). And Instrumentation Laboratory (Agilent 5975 Gas Chromatography/Mass spectrometer, Fluid Phase Liquid Chromatography-AKTA Explorer, LICOR DNA Sequencer with Microsatellite Package).

Similarly, the District is home to three facilities that focus on biotechnology and environmental science. Seminole Ridge Community High School offers hands-on introductory, biotechnology courses that provide students with all of the laboratory and research skills necessary to fill entry-level positions in the biotechnology field. Upperclassmen are provided the opportunity to continue honing those skills in the Biotechnology III and IV courses or begin preparing for postsecondary education by taking the academically rigorous, honors-level, Biotechnology Research III and IV courses.

In tandem, the Environmental Science & Technology Academy at Forest Hill High School and the Environmental Research & Field Studies Magnet at Jupiter High School meet the needs of students wishing to pursue an academic curriculum with an emphasis on research and environmental studies. Students explore and evaluate the many challenges related to local, regional, and global environments. Ecosystem restoration, water-related problems, agricultural awareness, field research, and sustainability in the 21st century are some of the issues students investigate in this program.

The aim is to bolster this STEM pipeline growing from K-12, through college and post-graduate studies—with multiple completion points depending on students’ workforce aspirations. The MSI at PBCC is a success and has had a direct impact on the number of gifted and high achieving students that are electing to pursue the local college route, as evidenced by the surge in enrollment in PBCC’s Honor’s College, with an admissions criteria of SAT combined verbal & math score of 1170; ACT average score of 24 (English, reading, & math); and CPT Reading Comprehension score of 90 AND CPT Sentence Structure score of 100.

PBCC Honor’s College	
Term:	Enrollment Count:
Spring 2007	320
Summer 2007	321
Fall 2007	383
Spring 2008	450
Summer 2008	664
Fall 2008	784

Magnitude of Need for Services

The MSI partners are poised to play a significant role in taking these respective STEM programs to the next level to cultivate the county’s brightest students, prepare them to pursue advanced math or science degrees and contribute to South Florida’s anticipated boon in high-growth/high-skill workforce needs. The evolving and expanding STEM industries in Palm Beach County demand an increasingly skilled workforce, as evidenced by the multiple STEM related fields identified on the 2007 list of

targeted high-skill/high-wage/high-need occupations for Florida Regions 20 and 21 (Indian River, Martin, Okeechobee, Saint Lucie and Palm Beach Counties).

Occupational Title* (per Florida's Targeted Occupations List for Regions 20 and 21)	Annual Percent Growth		Annual Openings		Mean Hourly Wage		Entry Hourly Wage	
	21	20	21	20	21	20	21	20
*denotes High Skill/High Wage								
Medical & Clinical Laboratory Technicians	4.65%	2.91%	55	356	\$15.93	\$16.31	\$10.51	\$10.73
Medical & Clinical Laboratory Technologists*	2.35%	2.35%	421	421	\$23.25	\$23.25	\$18.63	\$18.63
Medical and Health Services Managers*	2.97%	3.45%	40	11	\$41.13	\$30.48	\$26.51	\$20.30
Medical Records & Health Info. Technicians	3.41%	3.97%	39	20	\$15.05	\$12.63	\$10.27	\$9.40
Pharmacy Technicians	5.10%	N/A	41	65	\$12.91	\$11.53	\$10.09	\$11.33
Surveying and Mapping Technicians	2.13%	2.13%	494	494	\$14.52	\$14.52	\$9.76	\$9.76
<u>Source:</u> Florida Agency for Workforce Innovation, Labor Market Statistics (2007)								

Part of this workforce need is represented by the Scripps Research Institute. Scripps', with a contractual obligation to create 545 new positions within seven years, has already begun to serve as a catalyst for other science-industry companies to cluster in the region. By most accounts, the impact of TSRI's move to Palm Beach County and the emergence of new and spin-off businesses and related jobs are not easily measured or immediately felt. Educated estimates project the biotech/pharmaceutical cluster to generate 8,620 new employment positions, with direct, indirect and induced economic impacts supporting nearly 44,300 jobs (The Washington Economics Group,

Inc, 2003). In recognition of its impending labor needs, Scripps supports bioscience and environmental science education by identifying and honoring teaching excellence in these disciplines in Palm Beach County and agreeing to serve a key partner in the MSI and its summer program.

Similarly, the Germany-based Max Planck Society announced its plans to establish a research facility in Palm Beach County. At its most recent Bioscience Stakeholder Meeting (October, 2007), Business Development Board President & CEO Kelly Smallridge said the bioscience industry in Palm Beach County is progressing rapidly, adding that “Max Planck’s world-renowned research and development will bring international exposure to the life sciences cluster and, combined with Scripps Florida, the county will become the home to the highest level of science excellence.” South Florida is approaching a critical mass of life sciences research institutions that will be a catalyst for other biotech businesses to follow.

Finally, the multi-billion dollar Comprehensive Everglades Restoration Project (CERP), scheduled to be completed within a 20- to 30-year time frame, is well underway due to South Florida Water Management District’s “Acceler8 Project”. CERP’s momentum will expand the number of conservation activities in South Florida’s wetlands and will demand an increasingly skilled workforce in STEM disciplines. Acknowledging this fact, the South Florida Water Management District has also agreed to serve as a key partner to the MSI program.

Other industry partners for this project include: Advanced Water Technology, Cytonics Corporation, Ocean Ridge Biosciences, TransDermal Technologies, and the Palm Beach Community College Foundation. MSI will utilize the strengths of these locally based employers to exercise a first-of-its-kind STEM recruitment effort aimed at attracting under-represented populations. Partners have also agreed to allow students access to facilities for observations and field-based learning, providing guest speakers for the Speakers Bureau, and granting internship priorities for MSI scholars.

Documented effective mechanisms for increasing diversity in STEM studies include: 1) demonstrating the technological appeal to urban students; 2) engaging students in research and research related activities; 3) building partnerships between K-12 teachers and guidance counselors, community colleges and other higher education organizations, families, and communities to address pipeline issues; 4) promoting mentoring relationships among scientists, educators, and students; and 5) providing financial support to facilitate participation (Huntoon, 2004).

In 2008, PBCC “soft-launched” an eight-week summer program (Jun. 10 – Aug. 5) geared towards high-achieving 11th and 12th graders (who gained access to the program through dual-enrollment), as well as PBCC students. Twenty-one students enrolled in MSI’s inaugural year following a comprehensive recruitment and application process that placed special emphasis on attracting minority and female participants and included: completion of an MSI admission questionnaire and PBCC admissions application, submission of official high school or college transcript and college admissions test scores (minimum test scores: SAT: Verbal - 480; Math - 480; ACT: English - 27, Math - 27; CPT: SS/RC - 100, CLM – 95). The MSI Admission Committee, comprised of 12 administration and faculty members, examined applicant credentials and selected students to ensure quality and diverse cohorts. Institute scholarships offered by the College covered tuition (for those not already covered by the state through dual-enrollment), books and materials.

“[The Institute] was created to engage students who showed an affinity for math and science that may not have had an idea of a possible career path or saw themselves as a scientist,” said Ed Willey, campus dean of academic affairs. “[After] meeting with high school teachers, principals and parents, giving them tours of the buildings, they saw the labs and got to meet with the faculty; they saw what we had to offer. That’s what made the difference.”

At the summer’s end, 85% student participants indicated they would recommend MSI to a friend and three-quarters reflected that the program increased their interest in

pursuing a STEM career. MSI is a confirmed success for gifted and academic high achievers, through a mix of dynamic partnerships with the secondary and post secondary education continuum and partnerships with business & industry.

For 2009, PBCC and the school district plans to expand the MSI by:

1. Expanding the authentic experiences with industry scientists to nearly **70% of student contact time**. This will demonstrate that student scientists have the aptitude to perform under rigorous industry standards and bolster STEM academic and workforce pursuits;
2. Incorporating a student research project whereby students will develop a hypothesis, conduct experimentation, and defend their results to a panel of industry scientists;
3. Broadening underrepresented participation through targeted outreach to the schools identified below and beyond.

Magnitude of the Problem

Home to the Math & Science Institute facility, PBCC's Palm Beach Gardens campus opened in 1982 as a permanent, full-time facility offering associate in arts and associate in science degrees and certificate programs. Today, PBCC at Palm Beach Gardens offers credit and noncredit courses, programs and workshops to approximately 10,000 students each year. The campus also features modern multimedia classrooms and laboratories, a horticultural nursery, community athletic fields, the 250-seat Alfred W. Meldon Lecture Hall and an art gallery. Yet, despite its offerings, it remains the campus with the lowest enrollment of Black and Hispanic students. The proportion of these underrepresented students is even lower in core math and science courses required for STEM majors.

Project Focuses on Those With Greatest Needs

To remedy this diversity gap, PBCC and the district have identified the secondary schools with the greatest populations of minorities classified as gifted/high achieving students (see table).

SCHOOL	WHITE	BLACK	HISPANIC	MALE	FEMALE
Atlantic High School	10%	1%	9%	5%	6%
Boca Raton High School	11%	2%	6%	10%	8%
Glades Central High School	0%	4%	7%	3%	6%
Sun Coast High School	22%	14%	21%	20%	20%
Wellington High School	13%	5%	7%	11%	11%

Project Focuses on Identified Needs of Target Population

The MSI summer program will integrate the highly effective STEM instruction mechanisms with Florida’s Frameworks for Gifted Learning and revised Sunshine State Standards for Science to recruit gifted/high achieving students. The theory of change is that the District and PBCC will work together to recruit students from the identified targeted high schools, and beyond, to participate in the MSI and to regard the Institute as a prime choice for continuing their STEM focused education following high school graduation. PBCC is a compelling option for educational pursuits when considering the costs associated with other post-secondary options.

Post-Secondary Institution Type:	Average Annual Tuition and Fees:
Private Institution	\$22,218
In State 4 Year Public Institution	\$5,836
In State Community College Institution	\$2,272

* The College Board’s Trends in College Pricing, 2006. Based on average projected costs for rising seniors.

These figures merely represent tuition and fees and do not take into account other expenses such as dormitory fees, necessary if a student is moving away from home for college. Increasingly, students are remaining at home as they pursue their postsecondary options Florida’s higher education system is designed to allow students to successfully pursue a bachelor’s degree by first attending a community college and

then transferring to a 4-year institution, if desired, through the 2+2 system. With the cost of living and university enrollment caps, millennial students are trending toward this option. In this way, students gain cost-effective access to degree and career pursuits.

Lastly, the MSI committee (including school district representatives) recognizes the need to reinforce the benchmarks assessed by the newly implemented FCAT for Science. Analysis shows that Palm Beach County students need further enhancements in the domains of Earth Space, a subject area that many advancement placement students skip in favor of dually enrolled science courses (Speilman, personal communication, November 7, 2008).

Criteria for Student Eligibility

The target population of gifted/high achieving students will have the greatest possibility for success in such a program, particularly since the curriculum and related activities will maintain the highest standards in academic rigor. Therefore, the Pbcc and the District will exercise an enrollment process for the MSI summer program where at least three of the following four criteria are met:

- 1) The applicant has participated in the Gifted Education program (K-8) prior to secondary education, or is currently enrolled in an Advanced Placement and/or Inter Baccalaureate (IB) program.
- 2) The applicant is a current student of the Environmental Science & Technology Academy at Forest Hill High School, the Environmental Research & Field Studies Magnet at Jupiter High School, or the Biotechnology Academy at Seminole Ridge High School and is in good academic standing.
- 3) The applicant has a grade point average of 3.0 or higher.
- 4) The applicant has been nominated by a representative of his or her high school and has successfully completed the application for admission into the program (please see Appendix A for the Student Application and Nomination Form).

Both PBCC and the District will work collaboratively to conduct outreach and recruitment for the program through the dissemination of flyers, guidance counselor recommendations, and guest-speaker presentations by PBCC's Dean for Student Services, Dean for Academic Affairs, Director for Biotechnology, and Department Chair for Environmental Science and associated partners.

3. PROJECT DESIGN AND IMPLEMENTATION

Overview of the Program

Through the Math & Science Institute summer program, Palm Beach Community College (PBCC) intends to offer a rigorous and hands-on program in the disciplines of biotechnology, environmental science and statistics to outstanding gifted and high-achieving high school students. The MSI summer program, which will be offered on PBCC's north campus in Palm Beach Gardens and will accept 30 students throughout Palm Beach County, will be held for eight weeks from June 8, 2009 – August 7, 2009, Monday through Thursday, 10:00 a.m. to 3:00 p.m.

A unique feature that the MSI will offer students is the choice to participate via dual-enrollment in one of two tracks: Biotechnology Track or an Environmental Science Track.

- (1) The Biotechnology Track will require students to enroll in Introduction to Biotechnology (3 credit lecture course), Introduction to Biotechnology Lab (2 credit lab) and Statistics, with an emphasis on bio-statistics (3 credit lecture course); or
- (2) The Environmental Science Track will require students to enroll in Environmental Conservation (3 credit lecture course) and Statistics, with an emphasis on bio-statistics (3 credit lecture course).

Once students complete the Program, they will have earned eight college credits (Biotechnology Track) or six college credits (Environmental Science Track) which they can count towards their undergraduate degree if majoring in Biotechnology or Environmental Science, or as elective classes if another major is selected.

In addition to fast-paced and challenging course lectures and labs and performance measured assignments, 70% of PBCC's MSI proposed curriculum is field-based emphasizing applied real-world learning experiments in authentic learning environments; for example, tours of local biotech and renewable energy companies, field trips to environmental sites, opportunities to conduct real-world experiments such as converting algae into biodiesel and testing it on PBCC maintenance vehicles.

To complete the instructional plan for rigor and relevance to give the students a profound sense of what they must do to prepare for the next level of academic challenge, MSI will provide "multiple assessment" experiences to assist the students to reflect upon and measure their own growth and progress. To accomplish this task, MSI plans:

1. Career guidance from in-the-field researchers and professionals
2. The opportunity to design, conduct and complete an Honors Project
3. Participate in scholarly writing seminars in tandem with faculty mentors
4. Produce technical and scientific papers of publishable quality
5. Perform career goal assessment for postsecondary degrees and certificates.

The end-of-the project will culminate in a special event that showcases students' Honors Projects including recognition and awards for students 'Accomplished Practices' as aligned with *Florida's Frameworks for K-12 Gifted Learners*. Of notable importance here in achieving academic excellence for gifted learners, MSI has partnered with the Text and Academic Authors Foundation (TAAF) representing 1400 plus college and university faculty nationwide to provide expert training in practices, principles, and processes for writing, composing, and publishing academic works (e.g. scientific articles, journals, monographs). In this respect, the Mentor Academic Authors Project (MAAP) is designed to complement the rigor and relevance of MSI's core curriculum in mathematics and science by providing gifted and high-level achieving students with challenging, engaging writing experiences that tests what they think and feel through the powerful media of technical and scientific writing. That is to say, translating and describing what they have learned in the classroom and during in-the-field learning

experiences in the manner and form expected of accomplished academicians and authors of science and mathematics text.

PBCC MSI is committed to the Florida Department of Education's (FLDOE) "Next Generation PreK-20 Strategic Alignment approved by State Board of Education, October 2008 that emphasizes improving college and career readiness and expanding opportunities for post-secondary degrees and certificates, As a part of this commitment the instructional plan incorporates FLDOE standards and benchmarks for *Just Read, Florida! Initiative and Office of Mathematics and Science* that provides instructional approaches and learning experiences to educate and train Florida's students in "how to read and write math and how to read and write science" as an example.

Recruitment

To attract students to the MSI summer program, PBCC staff and faculty will pursue the following initiatives:

- (a) Disseminate Program nomination forms, student application forms and student participation criteria;
- (b) Select participating schools, with a focus on those that have a large number of underrepresented students in the fields of science, technology, engineering and mathematics;
- (c) Meet with school principals, counselors and math and science teachers and promote the Program; and
- (d) Continue to enhance and maintain a web site for the MSI and post all appropriate forms for students to access.

Admission into the MSI will be dependent on the following documents being submitted (all documents must be submitted by students unless otherwise noted):

First Screening

- ✓ Nomination Form (submitted by high school teacher, counselor, principal, etc.)
- ✓ a 2009 Math & Science Institute, Summer Application Student Program Application
- ✓ Official Transcripts

- ✓ Appropriate placement test scores(i.e. SAT, ACT, FCELPT)

Second Screening

- ✓ Two Letters of Recommendation

Final Requirement

- ✓ a PBCC Admissions Application

An orientation will be required for all students participating in the MSI. The orientation will be held in the new Science complex. PBCC's College President and the Provost at the north campus will welcome participants, their parents, nominators and special guests. Attendees will receive a tour of the new complex. At the conclusion of the orientation, MSI participants will be placed in their respective tracks and the Program will officially begin.

Goals, Objectives, Activities and Timeline

The overall goal of PBCC’s Math & Science Institute summer program is to offer gifted and high-achieving high school students an educational and rigorous hands-on program in the fields of biotechnology and environmental science. Please see below for the goals, objectives, activities and timeline that will guide the development and delivery of PBCC’s MSI. All goals were derived from Florida’s Frameworks for K-12 Gifted Learners. All objectives were derived from the Sunshine State Standards.

Goal #1: To Support Gifted and High-Achieving Students in the Ability to Set and Achieve Personal, Academic, and Career Goals.			
Objective	Activity	Timeline	Person(s) Responsible
<u>Objective #1:</u> 100% of program participation slots will be filled by gifted/high achieving students from the target high schools, through a coordinated marketing and outreach effort, as measured by program enrollment rosters. <u>Evaluation:</u> Program enrollment rosters.	Finalize Student Application for admission	March 2009	Program Director
	Identify high schools with high percentage of gifted students (emphasis on underrepresented students in the STEM field-- females and minorities)	March 2009	Program Director
	Inform high school principals, counselors, and math and science teachers of PBCC’s MSI summer	March 2009 – May 2009	Program Director

	program		
	Target students identified as Gifted/high achieving through marketing and recruitment efforts. Provisions made to include a representative population from female and minority populations.	March 2009 – May 2009	Program Director
	Enhance MSI web site to streamline enrollment	March 2009	PBCC IT Department; Program Director
	Disseminate MSI recruiting brochure	March 2009 – May 2009	Program Director; PBCC College and Marketing Relations
	Promote the MSI via school visits, brochures, web site, etc.	March 2009 – May 2009	Program Director; School District Staff
	Review Student Applications; select and notify participating students	May 2009	Program Director; Review Committee
	Grant scholarships to qualifying students	May 2009	Program Director; Financial Aid

	Assign students to either the Biotechnology or Environmental Science track	June 2009	Program Director; Program Faculty
	Hold a mandatory Program Overview orientation for students and families	June 5, 2008	Program Director; Program Faculty

Goal #2: Provide Gifted and High-Achieving Students with Opportunities to Conduct Thoughtful Research/Exploration in Multiple Fields, with a Rigorous, Hands-On, and Comprehensive Experience in Biotechnology.

Objective	Activity	Timeline	Person(s) Responsible
<u>Objective #1</u> : 90% of biotechnology program participants will be able to distinguish between an experiment and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation, as measured by student honors projects (SC.912.N.1.3; SC.912.N.2.2).	Provide course lectures and corresponding labs that will cover biotechnology concepts in-depth	June – August 2009	Program Faculty
	Supervise students conduct experiments in DNA isolation, gel electrophoresis, physics (optics), etc.	June – August 2009	Program Faculty
	Instruct students how to utilize journal databases and how to critically examine scientific articles	June – July 2009	Library Faculty

<u>Evaluation:</u> Honors Project rubric.	Provide guidance to students in completing an Honors Project	July 2009	Program Faculty
	Assign MAAP mentors and begin research for scholarly writing component	July 2009	
	Evaluate students' Honors Projects	July 2009	Program Faculty; Honors Program Manager
	Offer academic support throughout the Program to ensure student success	June – August 2009	Supplemental Student Instructors
	Track student progress and grades, and advise and mentor students as necessary	June – August 2009	Program Faculty; Program Director
	Provide course lectures and corresponding labs.	June – August 2009	Program Faculty
<u>Objective #2:</u> 85% of biotechnology program participants will increase their awareness of bio-manufacturing and related careers by identifying ways in	Industry tours begin (see partner letters)	June 2009	Program Faculty; Goodwin Biotech Staff
	Inform students of the various career and internship opportunities	June – August 2009	Program Faculty; Career Center Staff

<p>which science influences society and is influenced by society, as measured by participant reflection journals (SC.912.N.4.1).</p> <p><u>Evaluation:</u> Authentic authorship rubric.</p>	available		
	Offer students a “Careers Symposium” with a post doctoral panel of biotech researchers	July 2009	Program Faculty; Partners’ Staff
	Provide students a career assessment and guide them in researching career opportunities in their field of interest	July 2009	Career Center Staff
	Provide course lectures and corresponding labs that will discuss forensic science concepts in-depth	June – August 2009	Program Faculty
	Supervise students conduct experiments in DNA lab to test criminal evidence	June – August 2009	Program Faculty
<p><u>Objective #3:</u> 80% of program participants will be able to explain that true scientific investigations frequently do not parallel the steps of the scientific method, as measured by</p>	MSI faculty receive expert training in the art and science of academic authorship (practices, principles, and processes)	June 2009	TAAF Expert Presenter

<p>participant reflection journals (SC.912.N.3.1; SC.912.N.3.2).</p> <p><u>Evaluation:</u> Authentic authorship rubric.</p> <p><u>Objective #4:</u> 80% of program participants will be able to distinguish between an experiment and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation, as measured by authentic assessment (SC.912.N.2.2).</p>	MSI faculty provide science writing workshop to students	June 2009	MSI Program Faculty
	Students select subject area (environmental, biostatistics, biomedical) with assignment to produce technical paper within real-world publisher time table	June 2009	MSI Program Faculty
	MSI faculty receive continuing education from TAAF mentors	June – August 2009	TAAF Mentors and MSI Program Faculty
	MSI faculty receive constructive feedback from TAAF mentors regarding student progress	June – August 2009	TAAF Mentors

<p><u>Evaluation:</u> Instructor observation.</p> <p><u>Objective #5:</u> 80% of program participants will be able to identify sources of information and assess their reliability, as measured by authentic assessment (SC.912.N.1.1).</p> <p><u>Evaluation:</u> Instructor observation.</p>	<p>MSI assesses students' scholarly products with accompanying recommendations for improvement</p>	<p>June – August 2009</p>	<p>MSI Program Faculty</p>
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Goal #3: Provide Gifted and High-Achieving Students with Opportunities to Conduct Thoughtful Research/Exploration in Multiple Fields, with a Rigorous, Hands-On, and Comprehensive Experience in Environmental Science.

Objective	Activity	Timeline	Person(s) Responsible
<p><u>Objective #1:</u> 80% of program participants will be able to explain potential consequences to the environment resulting from various energy production technologies, as measured by post-activity survey (SC.912.N.1.2).</p> <p><u>Evaluation:</u> Survey.</p> <p><u>Objective #2:</u> 80% of environmental science program participants will be able to distinguish between an experiment and other forms of scientific investigation and explain that not all scientific knowledge is</p>	Provide course lectures that will cover environmental science concepts in-depth	June – August 2009	Program Faculty
	Offer field trip to Riverwoods Restoration Project in Kissimmee, Florida	July 4 - 5, 2009	Program Faculty
	Provide course lecture concerning the scientific method	June – August 2009	Program Faculty
	Supervise students collect data to extract and analyze plant DNA	July 2009	Program Faculty
	Guide students explore biological habitats of the river	July 2009	Program Faculty
	Instruct students on the river's hydrology and engineering	July 2009	Program Faculty

<p>derived from experimentation, as measured by student honors projects (SC.912.N.1.1; SC.912.N.1.3; SC.912.N.2.2).</p> <p><u>Evaluation:</u> Honors Project rubric.</p>	structures		
	Oversee students conduct water quality sampling, testing and analysis techniques	July 2009	Program Faculty
	Instruct students how to utilize journal databases and how to critically examine scientific articles	June – July 2009	Library Faculty
	Provide guidance to students in completing an Honors Project	July 2009	Program Faculty
	Evaluate students' Honors Projects	July 2009	Program Faculty; Honors Program Manager
	Offer academic support throughout the Program to ensure student success	June – August 2009	Supplemental Student Instructors
	Track student progress and grades, and advise and mentor students as necessary	June – August 2009	Program Faculty; Program Director
	Research field trip to Grassy	July 1, 2009	Program Faculty

	Waters Preserves in West Palm Beach, Florida		
<p><u>Objective #3:</u> 80% of program participants will be able to construct a logical rationale for how human behavior affects and is effected by atmospheric and hydrologic conditions in Florida, as measured by participant journals (SC.912.N.2.4).</p> <p><u>Evaluation:</u> Authentic authorship rubric.</p> <p><u>Objective #7:</u> 85% of program participants will increase their awareness of biotechnology and environmental science careers by identifying ways in which science influences society and is influenced by society, as measured by participant reflection journals (SC.912.N.4.1).</p>	Oversee students conduct habitat identification	July 2009	Program Faculty
	Guide students in participating in global positioning system (GPS) plotting and mapping	July 2009	Program Faculty
	Provide course lectures that will cover water analysis and conservation	June – August 2009	Program Faculty
	Lead students on a tour of the South Florida Water Management District pumping station	June 17, 2009	Program Faculty; SFWMD Staff
	Provide students a career assessment and guide them in researching career opportunities in their field of interest	July 2009	Career Center Staff

<p><u>Evaluation:</u> Authentic authorship rubric.</p>	<p>Student growth and progress is monitored and feedback provided to support accomplishment: Publish a work of scholarship by applying principles, practices, and processes of academic authorship</p>	<p>June – August 2009</p>	<p>TAAF Mentors and MSI Program Faculty collaborate on learning and measurement of authentic authorship rubric</p>
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Goal #4: Provide Gifted and High-Achieving Students with Experiences to Critically Examine the Complexity of Knowledge.

Objective	Activity	Timeline	Person(s) Responsible
<p><u>Objective #1</u>: 98% of program participants will demonstrate recognition that science involves: (1) posing questions about the natural world; (2) systematic observations; (3) examining books and other courses of information to see what is already known; (4) reviewing what is known in light of empirical evidence; (5) planning investigations; (6) using tools to gather, analyze, and interpret data,(this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical</p>	<p>Participants showcase their Honors Projects</p>	<p>August 7, 2009</p>	<p>Program Director; Program Faculty; Parents; School District Staff</p>

<p>representations of data, including data tables and graphs; (7) proposing answers, explanations or descriptions of events; (8) generating explanations that explicate or describe natural phenomena (inferences); (9) using appropriate evidence and reasoning to justify these explanations to others; (10) communicating the results of scientific investigations and; (11) evaluating the merits of the explanations produced by others, as measured by culminating honors project demonstration (SC.912.N.1.1).</p> <p>Evaluation: Honors project rubric.</p>			
<p><u>Objective #2</u>: 100% of MSI faculty</p>	<p>Develop evaluation instruments</p>	<p>January 2009</p>	<p>Program Director; Program</p>

and staff will review, revise, and refine the program model, as measured by program assessment and post-implementation survey instruments. Evaluation: Post-implementation survey instruments.			Faculty
	Assess student satisfaction with the Program	August 2009	Program Director; Program Faculty
	Assess School District staff satisfaction with the Program	August 2009	Program Director
	Make modifications to the Program as necessary	ongoing	Program Director; Program Faculty

Outcomes

The following are the Program's outcomes that will be met through guidance of the project's goals, objectives and activities:

1. Thirty gifted/high achieving students participate in a hands-on, integrated curriculum that explores STEM fields, with a particular emphasis on Biotechnology and Environmental Science.
2. Program participants complete an Honors Project for college credit demonstrating the ability to distinguish between an experiment and other forms of scientific investigation.
3. Program participants complete a program-specific scholarly work, conforming to the academic authorship guidelines, demonstrating their awareness of the bio-manufacturing and environmental science industries and related careers.
4. Program participants complete a program-specific MAAP demonstrating their ability to explain that: (1) true scientific investigations frequently do not parallel the steps of the scientific method; (2) not all scientific knowledge is derived from experimentation; (3) assessment is needed to verify the reliability of scientific information; (4) potential consequences to the environment resulting from various energy production technologies and; (5) human behavior affects and is effected by atmospheric and hydrologic conditions in Florida.
5. Program participants present a speech on how a specific geological process is expressed in Florida and display a 3-D representation of surface features at partner educational institutions and other key locations.

Learning Experiences

Students in PBCC's MSI summer program will participate in the following enriching activities during the eight week intense summer session:

- (1) A Comprehensive and Rigorous Curriculum in biotechnology or environmental science, and statistics (students will be expected to complete a 16 week curriculum in eight weeks). Among other activities, students will learn about the scientific method – how to collect data, form a hypothesis, carry out an experiment, analyze the results, and form a conclusion). (please see Appendix B for the Course Outlines of each class).
- (2) Biotech Tours of companies representing the biotechnology industry, such as The Scripps Research Institute and Dyadic International. In these visits, students will have the opportunity to conduct experiments using the companies' laboratories. Students will also have access to researchers and professionals where they will learn first-hand what a day in the life of biotech professionals looks like.
- (3) Environmental Science Field Trips to sites such as Riverwoods Field Laboratory and Grassy Waters Preserves to collect data. In the Riverwoods field experience, students will learn about the restoration project, explore biological habitats of the river, learn about the river's hydrology and engineering structures, collect vegetation sampling, and learn water sampling, testing and analysis techniques. Through the Grassy Waters Preserves field site experience, students will conduct habitat identification, GPS plotting and mapping. In a third on-site learning experience, students will tour the South Florida Water Management District's pumping station to learn concepts in surface water management and water quality and quantity analysis.
- (4) Real-World Experiments conducted in PBCC laboratories, biotechnology company laboratories, and on-site environmental locations. PBCC is home to the Sugar Technology Institute, which is working with the sugar industry to convert biomass from cane into ethanol AND hosts living algae labs for

ethanol conversion. Extracted biofuel produced by students will be tested on PBCC maintenance vehicles as well as at industry partner sites.

- (5) A Speakers Bureau comprised of biotechnology and environmental science researchers and professionals. Students will attend symposiums with a panel of researchers and professionals where they will learn about these industries from professionals in the field. Panel members will also act as mentors and provide educational and career guidance to students.
- (6) An Honors Project in which students will design, conduct and complete an Honors Project in their respective tracks during the eight week Program. To complete their Honors Projects, students will draw on concepts learned in course lectures, labs, field trip experiences, and library research workshops. Through the Honors Projects, students will learn the skills needed to plan and conduct a real-world scientific product. Faculty will closely supervise and guide students during development of their projects.
- (7) Mentor Academic Authors Project (MAAP) educates and trains students in effective skills to conduct scholarly research and scientific-based paper preparation and publication. Text and Academic Authors Association (TAA) has for 21 years provided expert training in the art and science of academic and textbook authorship to college and university faculty nationwide. Designated TAA presenters are distinguished professors with extensive bibliographies of published scholarly works. Seminar workshops and subsequent mentoring experiences are customized to the need of the project. For example, topics of discussion and instruction may include, but not be limited to:
 - a. Conceptualizing a project
 - b. Write from the first day of your research project
 - c. Write daily for 15-30 minutes
 - d. Organize around key sentences
 - e. Use key sentences as an after-the fact outline

- f. Coding literature and developing a conceptual schema for the literature review
- g. Post your thesis on the wall and write to it
- h. Solicit the right feedback from the right colleagues
- i. Make effective use of feedback
- j. Fast writing and slow revising
- k. Enacting the scholar role instead of incomplete-scholar roles
- l. Assessing a project to be sure you have a doable research design
- m. Developing an original and sophisticated theory from your data
- n. Overcoming writing blocks
- o. Managing your time effectively
- p. Developing strategies for writing regularly
- q. Writing collaboratively
- r. Common errors to avoid
- s. Locating possible journals to target
- t. Analyzing and "measuring" a target journal for submission for publication
- u. Revising and resubmitting

In summary, MAAP works in tandem with MSI faculty to provide authentic learning experiences designed to expose students to: an introduction to scientific literature; sources and formats of scientific information; comparing and contrasting articles from academic journals and popular magazines; critically examining the structure, format and content of journal articles; effectively identifying and searching academic databases; locating journal articles in their field of interest and pertinent to their Honors Projects; and accurately creating a list of references in APA style format.

(8) Career Goal Assessment Seminars to assist students with their career development. Experienced Career Center staff will provide students a plethora of resources and services that will: assess students' competencies

and interests; provide students with occupational information that facilitates educational and career planning; convey to students the value of professional associations for their career and professional development; offer students access to Career Mentors who are professionals in the fields of math and science who will guide students in their career development, as well as offer students internship and employment opportunities (please see Appendix C for a list of Career Mentors); expose students to a Math and Science Career Expo that brings professionals from math and science related occupations to share career information with participants; and instruct students on developing strong resumes and job interviewing skills.

As faculty developed the curriculum and enriching activities for the MSI, careful attention was given to the needs of gifted and high-achieving students. This population will undoubtedly find the accelerated course lectures and labs, value-rich field experiences, exposure to industry employers, low student to teacher ratio (15:1), option to count Program classes towards their college education, and other relevant educational and career opportunities attractive, stimulating and rewarding.

PBCC's Academic Strengths and Unique Resources

The following illustrates PBCC's strengths and resources that will provide MSI summer participants with a high-quality, stimulating and enriching educational experience:

- (a) The brightest and most innovative faculty at PBCC: The three core faculty that will participate in the MSI, representing the disciplines of biotechnology, environmental science and statistics, are among the brightest and most innovative at PBCC. These faculty, who are scholars and experts in their fields, will act as mentors to students during and after the Program. All faculty have experience in educating gifted and high-achieving students.

- (b) New, state-of-the-art Science Complex: MSI participants will have access to the \$15 million, 90,000 square feet science complex on PBCC's north campus (where the Program will be offered) that houses state-of-the-art classrooms and laboratories. The complex features two buildings connected by a multi-media lecture hall and courtyard. One building will house high-tech classrooms and laboratories for core science classes (biology, microbiology, anatomy and physiology, physics and chemistry), while the other building is reserved for classrooms and labs in biotechnology, environmental science, environmental horticulture and a wellness center.
- (c) Strong community partnerships: PBCC is fortunate to have excellent relationships with area companies in the fields of biotechnology and environmental science. A sampling of these partners include: The Scripps Research Institute, South Florida Water Management District, Advanced Water Technology, Cytonics Corporation, Ocean Ridge Biosciences, TransDermal Technologies, and the Palm Beach Community College Foundation. As of a result of these partnerships, PBCC is able to offer participants: tours of biotechnology companies and the opportunity to conduct experiments in their labs; field trips to environmental locations to collect and analyze data; a Speakers Bureau and Career Mentors where researchers and professionals will guide students in their educational and career goals (please see Appendix D for Partner Letters of Support).
- (d) Creation of an AA and AS degree in Biotechnology: In response to the increase in biotechnology companies establishing offices in Palm Beach County, PBCC recognized that it could play a major role in preparing students for employment in this field and established an AA and AS degree program in Biotechnology. The degree program is comprised of 61 credit hours and encompasses class lectures, labs, and an internship (PBCC already offers an AA/AS Environmental Science program).

- (e) Mentorships: Through the MSI, participants will have access to experts in the fields of biotechnology, environmental science and mathematics. Program faculty will mentor students beginning the first day of the Program and will continue once students complete their tracks. Local researchers and professionals working in these industries will also serve as mentors providing students with practical educational and career guidance.
- (f) Mentor Academic Authors Project: MSI participants will have access to the following resources to complete class assignments and their Honors Projects:
- ⇒ Print Journals: Over 200 print journals representing a variety of fields, including periodicals such as Science, Nature, American Scientist, Discover, Perspectives in Biology and Medicine, Mathematics Magazine and Scientific American
 - ⇒ Electronic Journals: More than 40,000 electronic journals including such periodicals as Advances in Environmental Research, American Journal of Environmental Sciences, Applied Mathematics and Computers, Journal of Biotechnology, Cell, and Sierra
 - ⇒ Academic Databases: Over 110 academic databases that feature scholarly articles by experts in their fields, such as Academic Search Premier, Applied Science and Technology Full Text, JSTOR, Science Direct and LexisNexis Academic
 - ⇒ Media Lab: A Media Lab offering students a collection of over 3,500 educational multi-media videos such as: Thinking Globally, Acting Locally; About Your Environment; DNA: Blueprint of Life; Scientific Methods and Values; The Question of Causation; and Our Crowded Planet. Students are provided with individual viewing carrels to watch the videos in a quiet atmosphere
- (g) Accessible, affordable and relevant education offerings: Should MSI participants choose to attend PBCC to pursue their higher education goals, they can choose to major in one of over 90 degree and certificate programs,

be exposed to relevant and challenging coursework, interact with first-rate faculty, and receive an affordable education. In addition, the college is fortunate to offer numerous scholarships for STEM studies that exceed current application figures.

PBCC is confident that these resources highlight our strengths, specifically in the areas of science and mathematics and will greatly contribute towards offering a strong, rigorous and successful summer program to high-achieving and gifted 11th and 12th grade students.

Instructional Strategies

The MAAP model is committed to Increasing the number of secondary students (8th through 12th grades) receiving challenging education and training experiences in scientific-based authorship (processes and practices) within professional learning communities of diversity. The end-goal: teach students how to produce superlative, well articulated academic products that build self-learning and social psychological skills essential to realizing both high-level academic achievement and understanding for scientific accuracy and unbiased sensitivity impacting a global community. The backbone for this learning is the instructional approach based on application of the “blended-learning” model. That is, scheduling of face-to-face workshops with supporting collaborative mentoring activities (e.g Webinar, Internet learning communities, conferencing) to achieve academic authorship goals and objectives.

In developing the curriculum for course lectures and labs, field trip learning experiences, and other key Program activities, faculty custom-tailored these activities specifically to the participating population – gifted and high-achieving 11th and 12th graders – and allowed the research to guide the development of Program offerings. Faculty is well aware that this specific population learns in a different manner and at an accelerated rate compared to their non-gifted/high-achieving peers. In fact, in developing the MSI, faculty used the two primary methods consistently found in the research that gifted programs should include: (1) accelerating the Program curriculum;

and (2) enriching the curriculum to reflect more depth and complexity than the general curriculum (*Freeman, J. (1999). Teaching Gifted Pupils. Journal of Biological Education. Retrieved November 9, 2007*). The MSI curriculum infuses these two methods of learning in that participants will be presented with the equivalent of a 16-week curriculum in just eight weeks and course concepts are covered in greater intensity than regular college courses. Key enriching Program activities are also intended to deepen and enhance students' learning experiences.

The MSI curriculum is based on the Integrated Curricular Model for Gifted Learners which emphasizes advanced content knowledge delivered via a multi-disciplinary approach. This model: (a) integrates science, mathematics, humanities, arts, and social sciences; (b) requires higher-order thinking and processing; and (c) focuses learning experiences around major issues, themes, and ideas related to real-world and theoretical applications within and across disciplines. These areas represent the three MSI approaches to curriculum development and implementation as documented in the literature for talented learners (*VanTassel-Baska J. (1994). Curriculum for the gifted: An overview of theory, research, and practice. In J. VanTassel-Baska (Ed.), Comprehensive curriculum for gifted learners. Boston: Allyn and Bacon*).

Again, guided by research, Program faculty made a concerted effort to incorporate a number of instructional strategies in designing the course lecture, labs, field trip experiences and other relevant programmatic activities. To illustrate these briefly:

(a) Authentic Tasks: Authentic tasks require students to demonstrate proficiency by applying existing knowledge to solve a real-world problem. By requiring students to solve a real-world problem, an authentic task creates a bridge between the content learned in the classroom and why this knowledge is important in the world. Examples of MSI authentic tasks:

⇒ Lab Experiments and Honors Projects: in order to conduct and complete lab experiments and their Honors Projects, students will be expected to have mastery of course concepts and apply that knowledge in carrying out real-world experiments, as well as in designing and carrying out their Honors

Project (participants will present their Honors Projects and findings at the MSI Finale).

- (b) Authentic Environments: The purpose of authentic environments is to show students relevance and stimulate them to develop competencies that are germane to their future professional or daily lives (*Gulikers, J. T., Bastiaens, T. J. and Martens, R. L. (2005). The surplus value of an authentic learning environment, Computers in Human Behavior, 21, 509-521*). Authentic environments make it easier for students to identify themselves with the learning material and make learning more interesting and meaningful. It is intended that these exposure to these environments will stimulate student excitement, creativity and learning. Examples of MSI authentic environments:
- ⇒ High-Tech Research Laboratories: students will conduct real-world experiments in PBCC's new state-of-the-art Science Complex, utilizing lab equipment tantamount to that found in employment research facilities.
 - ⇒ Biotech Companies' Research Laboratories: visits to biotech companies will give students a first-hand glimpse of situations and equipment they will encounter once they enter the biotech field.
 - ⇒ On-Site Environmental Field Trips: students will visit environmental sites to participate in hands-on activities such as data collection and analysis.
 - ⇒ MAAP: students will learn to utilize academic databases, critically examine scholarly journal articles, and the skill sets needed to prepare their own scholarly papers for publication.
- (c) Multidisciplinary Approaches: Research has found that taking an interdisciplinary approach when developing course curriculum increases student motivation and learning (*Wicklein, R. C. and Schell, J. W. (1995). Case studies of multidisciplinary approaches to integrating mathematics, science and technology education, Journal of Technology Education, 6(2), 59-76.*)
- ⇒ Integration of Disciplines: MSI faculty collaborated to establish course objectives with each other's Program tracks in mind. For instance, the

Biotechnology Track highlights environmental science concepts and illustrates the relevancy of this field in biotechnology, and vice-versa for the Environmental Science Track.

- (d) Use of Technology: Technology has been shown to be effective in student learning as it creates interactive contexts to help students comprehend new ideas more easily (*Gulikers, J. T., Bastiaens, T. J. and Martens, R. L. (2005). The surplus value of an authentic learning environment, Computers in Human Behavior, 21, 509-521*).
- ⇒ Laboratory Equipment: As previously mentioned, MSI participants will utilize state-of-the-art lab equipment at PBCC and research companies to better understand the concepts they learn during course lectures.
 - ⇒ Library Academic Resources: As previously discussed, students will learn to effectively search academic databases and scholarly journals to conduct college level research and to complete course assignments and their Honors Projects.
- (e) Process Skills: Process skills are used to further the learning process and to link current learning experiences with previous knowledge. Process skills are critical in assisting students grasp and comprehend new knowledge they encounter.
- ⇒ Course Curriculum, Labs, Field Trips & Other Key Activities: The entire MSI will require students to employ higher-level thinking skills. Through the Program, participants will develop the following process skills: observation, questioning, hypothesizing, predicting, investigating, interpreting and communicating.
- (f) Student Reflection/Metacognition: Reflective thinking helps learners develop higher-order thinking skills by prompting students to: relate new knowledge to prior understanding; think in both abstract and conceptual terms; apply specific strategies in novel tasks; and understand their own thinking and learning strategies (*Hawaii Institute of Geophysics & Planetology, Reflective Thinking*,

Retrieved from <http://www.higp.hawaii.edu/kaams/resource/reflection.htm> on November 9,2007).

- ⇒ Intensive Documentation and Note-Taking: Students will take notes in all course lectures, labs, field experiences, Speakers Bureau Symposiums, and library and career seminars to reflect on at a later date in order to grasp and comprehend concepts and information learned at their own pace.
 - ⇒ Reflective Questions: Program faculty will pose relevant queries to students at critical points in the learning process that will require students to critically think, examine, and apply the knowledge learned in class to form accurate responses to real-world situations.
- (g) Student Products: One of the ultimate forms of verification that students have mastered the concepts they have been taught is through student products.
- ⇒ Student Portfolios: MSI participants' portfolios will comprise: reflective notes on all Program activities, problem-solving approaches, and accounts of their independent investigations.
 - ⇒ Honors Projects: All MSI participants will be required to design, conduct and complete an Honors Project in a topic of their choosing. The results of their experiments will be presented at the MSI Finale Event.

These instructional strategies, which are grounded in research, MSI practices and faculty collaborations, are intended to both: appeal to the needs of gifted and high-achieving students and make the most effective use of PBCC's multifaceted resources.

Transportation & Housing

For those MSI participants who do not have adequate transportation to the College, PBCC will offer students bus stipends. Transportation to field trip learning experiences, a bus will be chartered (funds for the charter bus will be contributed by PBCC).

Housing provisions are not applicable to the MSI as participants will return home every day after the Program ends.

The following chart depicts the staff and faculty who will design, carry out and oversee PBCC’s MSI summer program:

Faculty/Staff	Current Position	Highest Degree	Current Employer	Experience With Gifted and High-Achieving Students
Valerie Burks	Director, Honors College	PhD in Criminal Justice	PBCC	<ul style="list-style-type: none"> ⇒ Directs PBCC’s Honors’ College designed for gifted/high achieving students in post-secondary education ⇒ Taught gifted learners for seven years
Elizabeth Handel	Director, Biotechnology Program	PhD in Experimental Pathology	PBCC	<ul style="list-style-type: none"> ⇒ Teaches Biotechnology at PBCC ⇒ Taught research at undergraduate level ⇒ Taught science courses to graduate and undergraduate students
Jessica Miles	Professor, Environmental Science	Masters Degree in Biological Sciences (PhD candidate, Soil & Water Science)	PBCC	<ul style="list-style-type: none"> ⇒ Research Director at Forest Hill High School’s Environmental Academy which has high-achieving students, including Science Fair participants and Envirothon participants ⇒ Professor of dually-enrolled students at the Jupiter High School Environmental

				Academy, also a high-achieving population
Joanne Patton	Associate Professor / Counselor	Masters Degree in Rehabilitation Counseling	PBCC	<ul style="list-style-type: none"> ⇒ Guide students, including Honors students, in their career development ⇒ Director of Career Planning & Placement at Univ of Richmond, where 60% of students rank in top ten percent of their high school graduating class
Susan Setterlund	Associate Professor / Counselor	Masters Degree in Library and Information Science	PBCC	<ul style="list-style-type: none"> ⇒ Offers library seminars to students, including Honors students ⇒ Taught “Evidence–Based Medicine and the Use of Biomedical Literature” to 1st and 2nd year medical students at the University of Miami Miller School of Medicine@FAU

4. EVALUATION

Design of Evaluation Methods

The primary goal of PBCC's Math & Science summer program is to provide Palm Beach County's gifted/high achieving rising high school juniors and seniors an engaging and challenging integrated biotechnology and environmental science experience that will stimulate further exploration into areas of interest and pursuit of advanced education and career goals in STEM disciplines. All partners have identified evaluation instruments that are accessible and represent an objective, quantitative measure to assess program progress during and after the performance period. Both quantitative and qualitative data will be reviewed by the Math & Science Institute committee, acting as the summative committee for the MSI.

Description of Evaluation Instruments and Methods

To ensure that the project outcomes are met, project staff, other College offices and the School District of Palm Beach County will be involved in several project evaluation activities. First, staff will use its PantherNet student tracking database to monitor information on student enrollment and performance in the MSI. Second, program staff will collaborate before, during and after the project period to assess process and outcomes of all program activities and make adjustments, as warranted. Finally, leadership will require weekly reports on the progress and implementation status of the program during and after the performance period. A formative process will be utilized to address any quality assurance recommendations.

Follow-Up Plan

With the assistance of the School District, program staff will gather and analyze data regarding the impact of the MSI in (a) subsequent student academic performance and (b) encouraging underrepresented students to pursue advanced STEM educational and employment opportunities, especially in Florida.

Evaluation Methods Produce Timely Guidance for Quality Assurance

The activities comprising the project's evaluation plan will ensure that: (1) student data are meticulously evaluated and tracked; (2) project activities are carried out in substantial conformity to the proposal, and (3) project outcomes are achieved. Each evaluation instrument is designed to produce timely and efficient data that is accessible and readily interpreted. The instruments are selected based on their objective nature to accompany project activities in a quantitative and summative way.

MSI Evaluation Plan

MSI SUMMER Program Evaluation Plan			
Measurable Activities	Tracking/Evaluation Method	Person(s) Responsible	Due Date
Goal #1: To Support Gifted and High-Achieving Students in the Ability to Set and Achieve Personal, Academic, and Career Goals.			
Objective 1 - 100% of program participation slots will be filled by gifted/high achieving students from the target high schools, through a coordinated marketing and outreach effort.	Student Tracking Database; Enrollment Roster; Campus Scheduling.	Project Administrator, Project Coordinator, Project Faculty, Administrative Assistant, School District of Palm Beach County; PBCC	6/26/09
Goal #2: Provide Gifted and High-Achieving Students with Opportunities to Conduct Thoughtful Research/Exploration in Multiple Fields, with a Rigorous, Hands-On, and Comprehensive Experience in Biotechnology.			
Objective 1 – 90% of biotechnology program participants will be able to distinguish between an experiment and other forms of scientific investigation and explain	Honors College Rubric; Student Activities & Products (quantitative &	Project Administrator, Project Coordinator, Project	8/28/09

that not all scientific knowledge is derived from experimentation.	qualitative).	Faculty, Honors Program Director	
Objective 2 – 85% of biotechnology program participants will increase their awareness of bio-manufacturing and related careers by identifying ways in which science influences society and is influenced by society.	Student reflection journals; Student Activities & Products (quantitative & qualitative).	Project Administrator, Project Coordinator, Project Faculty	6/12 - 7/17 2009
Objective 3 – 80% of program participants will be able to explain that true scientific investigations frequently do not parallel the steps of the scientific method.	Student reflection journals; Student Activities & Products (quantitative & qualitative).	Project Administrator, Project Coordinator, Project Faculty	6/12 - 7/17 2009
Objective 4 – 80% of program participants will be able to distinguish between an experiment and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.	Student reflection journals; Student Activities & Products (quantitative & qualitative).	Project Administrator, Project Coordinator, Project Faculty	6/12 - 7/17 2009
Objective 5 - 80% of program participants will be able to identify	Student reflection journals; Student	Project Administrator,	6/12 - 7/17

sources of information and assess their reliability.	Activities & Products (quantitative & qualitative).	Project Coordinator, Project Faculty	2009
Goal #3: Provide Gifted and High-Achieving Students with Opportunities to Conduct Thoughtful Research/Exploration in Multiple Fields, with a Rigorous, Hands-On, and Comprehensive Experience in Environmental Science.			
Objective 1 – 80% of program participants will be able to explain potential consequences to the environment resulting from various energy production technologies.	Post activity survey.	Project Administrator, Project Coordinator, Project Faculty	6/12 - 7/17 2009
Objective 2 – 80% of environmental science program participants will be able to distinguish between an experiment and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.	Honors College Rubric; Student Activities & Products (quantitative & qualitative).	Project Administrator, Project Coordinator, Project Faculty, Honors Program Director	6/12 - 7/17 2009
Objective 3 – 80% of program participants will be able to construct a logical rationale for how human behavior affects and is	Student reflection journals; Student Activities & Products (quantitative &	Project Administrator, Project Coordinator,	6/12 - 7/17 2009

affected by atmospheric and hydrologic conditions in Florida.	qualitative).	Project Faculty	
Objective 4 – 80% of program participants will be able to connect surface features to surface processes that are responsible for their formation.	Honors College Rubric; Student Activities & Products (quantitative & qualitative).	Project Administrator, Project Coordinator, Project Faculty	6/12 - 7/17 2009
Objective 5 - 80% of program participants will be able to construct a logical rationale for how human behavior affects and is affected by atmospheric and hydrologic conditions in Florida.	Student reflection journals; Student Activities & Products (quantitative & qualitative).	Project Administrator, Project Coordinator, Project Faculty	6/12 - 7/17 2009
Objective 6 - 80% of program participants will analyze how specific geologic processes and features express themselves in Florida.	Student reflection journals; Student Activities & Products (quantitative & qualitative).	Project Administrator, Project Coordinator, Project Faculty	6/12 - 7/17 2009
Objective 7 - 85% of program participants will increase their awareness of biotechnology and environmental science careers by identifying ways in which science influences society and is	Student reflection journals; Student Activities & Products (quantitative & qualitative).	Project Administrator, Project Coordinator, Project Faculty	6/12 - 7/17 2009

influenced by society.			
Goal #4: Provide Gifted and High-Achieving Students with Experiences to Critically Examine the Complexity of Knowledge.			
<p>Objective 1 – 98% of program participants will demonstrate recognition that science involves: (1) posing questions about the natural world; (2) systematic observations; (3) examining books and other courses of information to see what is already known; (4) reviewing what is known in light of empirical evidence; (5) planning investigations; (6) using tools to gather, analyze, and interpret data,(this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs; (7) proposing answers, explanations or descriptions of events; (8) generating explanations that explicate or describe natural phenomena (inferences); (9) using</p>	<p>Honors College Rubric; Culminating Honors Forum.</p>	<p>Project Administrator, Project Coordinator, Project Faculty, Honors Program Director</p>	<p>8/7/09</p>

<p>appropriate evidence and reasoning to justify these explanations to others; (10) communicating the results of scientific investigations and; (11) evaluating the merits of the explanations produced by others.</p>			
<p>Objective 2 – 100% of MSI faculty and staff will review, revise, and refine the program model.</p>	<p>FDOE Evaluation Form (qualitative); MSI Committee Report.</p>	<p>Project Administrator, Project Coordinator, Project Faculty, Administrative Assistant, School District of Palm Beach County; PBCC</p>	<p>8/28 2009</p>

All goals were derived from Florida’s Frameworks for K-12 Gifted Learners. All objectives were derived from the Sunshine State Standards. All evaluation instruments were derived from MSI curriculum planning (DACUM) and guidance from the MSI Committee.

5. SUPPORT FOR STRATEGIC IMPERATIVES

Strategic Imperative #2: Standards – Middle and High School Standards – Improve student retention and progression rates through middle and high school. This

will be achieved by presenting gifted and high-achieving students a rigorous course and lab curriculum that incorporates the Sunshine State Standards and Florida's Frameworks for K-12 Gifted Learners. Research has found that student retention, learning and progression is attained if this population is presented with a challenging and stimulating curriculum, which will be guided by the State's Standards and Frameworks (as depicted in the Goals, Objectives and Activities chart earlier in the proposal).

Strategic Imperative #3: Students – High School Graduation – Increase the percent of high school graduates. Students who are presented with relevant and challenging curriculum are more likely to be successful in school and transfer to seek a higher education. The MSI supports this imperative by offering gifted and high-achieving students a custom-tailored Program that meets their learning needs and drives students to graduate high school and enroll in an institution of higher education.

Strategic Imperative #5: Choice – Quality Choice Programs – Increase participation in choice options available to students through federal, state and direct choice programs. PBCC's MSI supports this imperative by offering students a strong and thought-provoking educational option during the summer months. Students will learn critical concepts in biotechnology and environmental science, have hands-on field experiences and be exposed to mentorships, researchers and professionals representing the science industry.

Strategic Imperative #6: Workforce – Workforce Education Program Placements – Increase the percent of placements from High Skill/High Wage and Targeted Occupations List programs. The MSI supports this initiative by preparing and training students who will go on to seek high skill and high wage careers.

Strategic Imperative #8: Access – Postsecondary Continuation Rate – Increase postsecondary continuation rate of high school standard graduates. The MSI supports this imperative by introducing students to the college experience, including faculty and

the academic resources that the College can offer them. Another strategy that will increase the continuation rate of MSI participants is the mentorships that faculty will provide during and after the Program concludes.

PBCC's MSI will address the mission of FDOE's Office of Mathematics and Science, specifically Goal #4: Provide parents with information and strategies for supporting their children in mastery of mathematics and science knowledge. This will be achieved by offering students a rigorous and enriching summer science and mathematics Program, and encouraging parental participation throughout the Program, especially in attending the mandatory orientation that officially launches the Program, as well as the Special Finale Event where students showcase their Honors Projects.

PBCC's MSI will also address FDOE's reading, math and science initiatives through course lectures, lab participation, in-the-field learning experiences, and other enriching Program activities. In both the Biotechnology Track and the Environmental Science Track, students will be exposed to heavy reading assignments which will employ their reading comprehension and critical thinking skills. Students will be expected to complete 16-weeks-worth of reading in only eight weeks. Similarly, students will demonstrate math and science competencies through the required coursework in both Program tracks. As the two Program tracks prepare students for careers in the sciences, the three courses that are offered through the MSI (Biotechnology, Environmental Science and Biostatistics) will focus exclusively on mathematics and scientific concepts. In other words, these two subject areas are inherent concepts in both tracks that students will choose from when they participate in PBCC's MSI. Both tracks will equip participants with the knowledge, skills, and in-the-field contacts they will need to continue their educational and career goals to potentially enter the science or mathematics industry as qualified researchers or professionals.

6. DISSEMINATION PLAN

(Please note that recruitment strategies are discussed in detail in the first part of the proposal. This section is specific to post-Program dissemination activities.)

Palm Beach Community College's (PBCC) Math & Science Institute (MSI) Summer Program staff will pursue the following methods and strategies to disseminate and share information about our project: (a) hold a MSI Finale Event where students will present their Honors Projects and recount their experiences in the Program to a group comprised of high school teachers, area industry employers, counselors, principals, gifted coordinators, PBCC faculty and staff, and parents; (b) display student Honors Projects in their respective schools; (c) post on PBCC's Program web site student Honors Projects and other relevant Program information; (d) issue a press release promoting the MSI and the Program Finale Event; and (e) share – via email, phone and in-person communication, including state meetings and national conferences – Program successes and lessons learned to educators who wish to replicate a similar Program.

This combination of activities, ranging from print to electronic formats, will ensure that a variety of groups are informed about the MSI including students, school administrators, school staff, business industry researchers and professionals, parents and the general community. One of the primary goals of employing these dissemination strategies is to generate interest in the following year's Summer Program, as well as PBCC's Math and Science Institute.

7. BUDGET

Expenses are allowable, realistic, and accurate.

All budget items reflect the operational needs associated with carrying out the described activities for the realization of the goals and objectives. There will be no student costs of any kind.

Describe the number of scholarships to be provided.

100% of participants will receive scholarships and will not be responsible for any costs for this project. All of the participants will receive dual enrollment credit, upon satisfactory completion of all program requirements as described.

Ensure the costs are reasonable.

The staffing pattern for the MSI mirrors the personnel chain of a secondary education school. The Director position is designed to provide supervision and operational oversight, as well as act as a senior-level point of contact for families and students. The Coordinator position serves as the managing administrator, processing purchases, implementing schedules, and supporting faculty. Faculty will provide instruction and student support beyond class time and during field activities. The budget allows for transportation for students that may experience difficulty accessing the program and charter bus service to all field activities.

Illustrate that funding is appropriate to the length of the program.

PBCC has contributed over \$12,000 in cash math and in-kind services to ensure the success of the project. This leverage includes: personnel, transportation, and marketing materials—such as web applications and brochures. In this way, the MSI equates to merely just over \$992 in grant funds per student participant.