Signatures

Engineering Advances at the University of Notre Dame

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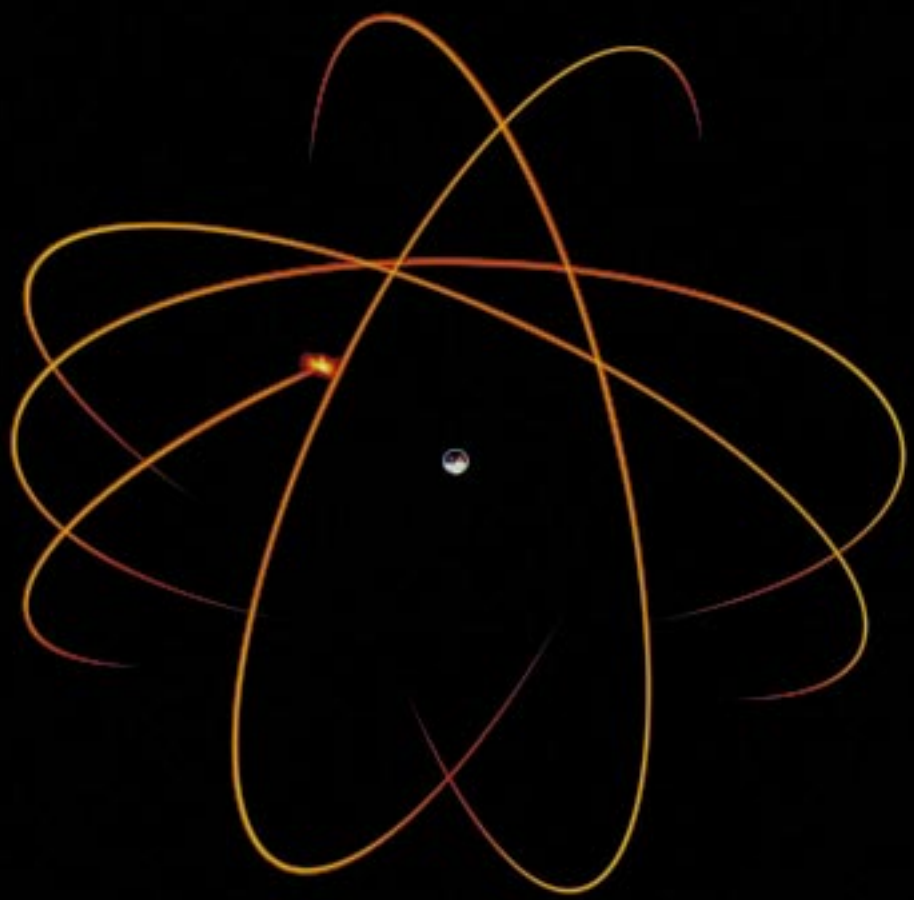
Mitigation:
Can We Curb the Effects of Natural Disasters?

Engineering and Minority Youth —
An Academic Initiative for the Future



Quantum-Dot Cellular Automata ...
Making Circuits Smaller, Faster, and Better

Distance Learning

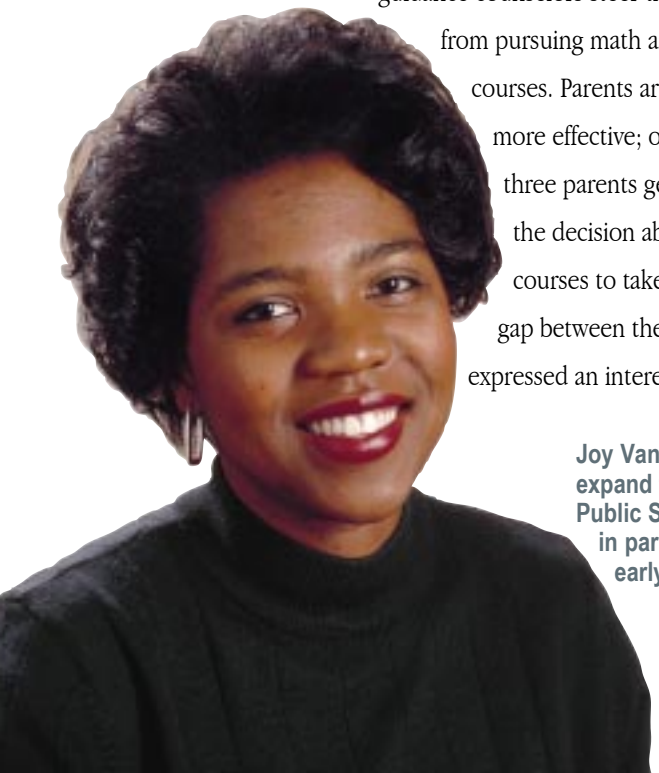
A new twist in educating tomorrow's engineers

Ask ten kids what they want to be when they grow up. Some will say "a doctor." Others want to be "a teacher" or "president." What happened to the kids who wanted to be astronauts, the ones who thought studying the earth's core was cool, the kids who loved chemistry and physics? There simply aren't as many of them as there used to be. Even if they are interested, they're not prepared for college and probably not looking at high-tech careers. It's a fact; 15 percent of all students and only six percent of minority students graduate from high school with mathematics courses through precalculus and science courses through physics.

Why don't they take the higher-level courses? Can't they handle the academic load? Are they just lazy? That's not it at all. They're discouraged. They're not motivated to excel by the adults they come in contact with. Two out of every five students say their guidance counselors steer them away from pursuing math and other "hard" courses. Parents aren't much more effective; only one in three parents gets involved in the decision about what courses to take. So, the gap between the jobs kids expressed an interest in and the work it took to get there just kept growing, especially in the fields of science and engineering. Nationwide, the trend in declining engineering enrollment began in the 1980s. Today, in many colleges and universities across the country, minority enrollment is down ten percent since 1992. That's just one of the reasons Notre Dame founded the Minority Engineering Program (MEP) in 1987. Since that time, minority enrollment has jumped from six to 15 percent. But there was more work to do.

> "Interest in engineering among minority students needs to be encouraged before high school ..."

"To increase awareness and bolster enrollment many institutions offered pre-college programs, summer sessions, and science camps, and we did that, too" said Joy Vann-Hamilton, Director of MEP at Notre Dame. "But we felt we needed something more." Vann-Hamilton believed that if MEP could reach students at a younger age, before high school, the program could produce greater results. The dream was to take middle school minority youth and show them how math, science, and engineering related to their everyday lives. The goal was to help learning



Joy Vann-Hamilton, Director of the Minority Engineering Program, is currently working to expand the distance learning program to other cities in Indiana. To date the Indianapolis Public School System and Kokomo Center Township School System have indicated interest in participating. They could be on-line with Notre Dame's distance learning program as early as Fall 1999.

at Notre Dame:

From October to May, students from six different middle schools meet two times a month as part of Notre Dame's pre-college engineering program. Two-way videoconferencing technology allows the students at each of the four home sites to interact with their instructors and volunteers through hands-on science and engineering projects. Learning is fun and attainable.

become fun, exciting, and achievable. Students would meet role models — minority and female engineers, scientists, and mathematicians serving as instructors and teaching aides. What they were learning in school would become easier to understand, and parents would become more involved in the education process.

Notre Dame administration agreed this was a good place to start. "Interest in engineering among minority students needs to be encouraged before high school," said University President Father Edward Malloy. "Without such interest, students simply will not choose, or succeed in a high school curriculum that will sustain them through college careers." Supported by the University, Vann-Hamilton completed research within South Bend-Mishawaka community and then began working with local organizations to get the program up and running.

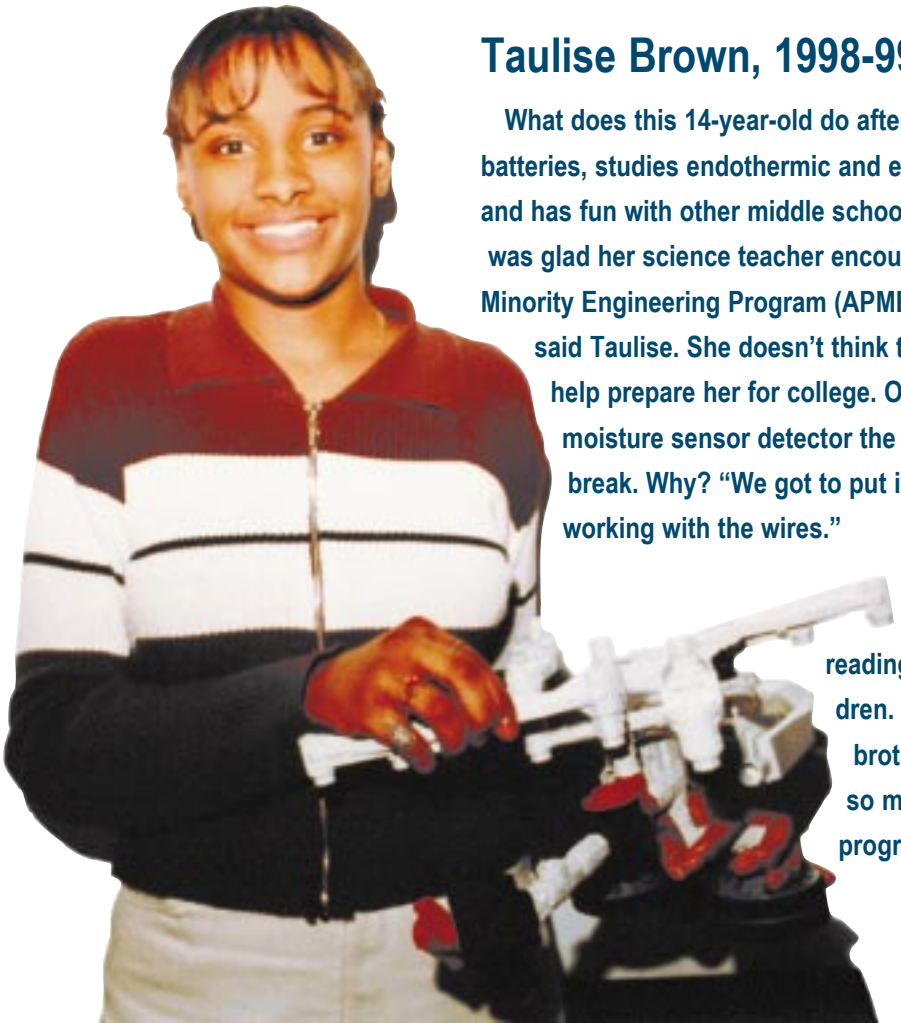
A not-for-profit affiliate of Ameritech, The Corporation for Educational Communications pledged $53,000 (most of which went

toward videoconferencing equipment) for the first year of the pre-college program. "Technology is the key that opens doors to learning and career success," said Kent Lebherz, president of Ameritech Indiana, "so we're pleased to sponsor the Ameritech Pre-College Minority Engineering Program at Notre Dame." Ameritech supports underrepresented students in technical fields through various grants and has recently contributed $60,046 to continue the APMEP. We are grateful for their support and dedication to educating tomorrow's leaders.

Another partner, the South Bend Community School Corporation, donated the space for three of the required four classrooms and also agreed to provide transportation for the students from their respective middle schools to the classrooms and then to their homes. Notre Dame provided the main site. University faculty, graduate students, and undergraduates, in tandem with the teachers at the middle and high schools, formed the teaching teams needed for each site. All the pieces were coming together, but there was not enough funding to rollout the program successfully. That's when Leo Dilling, a member of the Advisory Council of the College of Engineering, generously wrote a personal check for $10,000 to cover the gap in first-year funds.

By Spring 1997 the Ameritech Pre-College Minority Engineering Program (APMEP) was ready to launch. A distance learning initiative, APMEP was different from other pre-college programs because of its videoconferencing component. The four-way conferencing would allow all students to join in discussions, demonstrations, and question-and-answer sessions in real time. It would foster a team environment and encourage participation. "We consider this program one of the first to integrate interactive video technology into the delivery of pre-college engineering programs," said Vann-Hamilton.

As a final step minority students in grades 6 and 7 were invited to



Taulise Brown, 1998-99 APMEP Participant

What does this 14-year-old do after school every other Wednesday? She makes batteries, studies endothermic and exothermic reactions using water and baking soda, and has fun with other middle school students. Although Taulise likes math best, she was glad her science teacher encouraged her to apply to the Ameritech Pre-College Minority Engineering Program (APMEP) at Notre Dame. "It sounded like fun," said Taulise. She doesn't think the work is very hard, but she feels it will help prepare her for college. One of her favorite projects at APMEP was the moisture sensor detector the students worked on just before Christmas break. Why? "We got to put it together and take it home," she said. "I liked working with the wires."

Taulise is a seventh grader at Clay Middle School in South Bend, Indiana. She enjoys reading and playing sports. She is the oldest of three children. Her sister is eight. And, her 11-year-old brother likes what he sees Taulise doing in APMEP so much that he's looking forward to being in the program in a couple of years.

submit applications for the program. APMEP recruited early so by the time the children were in the program they would be in grades 7 and 8. A total of 78 students were accepted into the 1997-98 program. To become part of APMEP, students had to have at least a B average, an ISTEP score of 65 percent, and two letters of recommendation. But that was just the beginning. Each student and family accepted in the program were required to sign a "Family Participation Pledge." Signing the pledge meant a student and his or her family agreed to complete all homework assignments not only in APMEP but also in regular school courses. They agreed to be active participants in the APMEP sessions, to show respect for themselves and other students, and to follow APMEP guidelines. Parents agreed to help their children stick to the pledge.

Family participation is key. Parents are required to become actively involved in homework, starting with the orientation session. This shows students how much their parents are supporting their studies and, over the course of the year, gives parents a glimpse of the wide range of career opportunities in engineering available for their children. In addition, there are two planned Family Engineering Activities Days, one in the Spring and one in the Fall.

Sounds good. How does it work? Well, APMEP participants meet on the first and third Wednesday of every month from October through May. These sessions, however, are more than classroom lectures. A tremendous amount of work goes into planning and executing each session. "As technologically advanced as the video-conferencing equipment is," explained Vann-Hamilton, "it can still be like watching television if we don't actively engage the kids."

First, the faculty and graduate students outline the materials and presentation for each session, including the development of scripts. The scripts are used to detail lesson flow as well as provide cues to the main instructor about when to engage all the sites. Instructors also map out projects for the kids, making sure they are interesting and will hold the students' attention. For instance, one week students might be experimenting with heat transfer; the next they might be making a moisture sensor detector.

APMEP students get homework. They are given technical writing assignments to complete with their families, like designing a holding tank device for a water treatment plant. They even take "virtual" field trips. Recently, students participated in a long-distance telecast with Lockheed Martin Missiles and Space in Sunnyvale, California. The video field trip gave students the opportunity to meet several engineers and see some of the actual devices involved in the deployment of a satellite.

Students think these activities are "cool." What's more important is that these activities show the kids how engineering affects their lives while stimulating their imaginations. Parents like Gina Thundy agree. Her son, Zach, improved his classroom performance and his Science grades. "We know that APMEP has contributed immensely to this productive, rewarding year for Zach," she said. "He enjoyed it very much, and we believe it had a positive influence on him."

In addition to in-class instruction, homework, and field trips,

Education is not the filling of a pail, but the lighting of a fire.

— W.B. Yeats

students must give oral presentations about an engineering or technology related subject. They are evaluated on content and delivery. This is in addition to the formal quarterly progress reports their parents receive. During a video awards ceremony at the end of the program, students receive a certificate of recognition.

The 1998-99 session of APMEP marks the second year of the program. Currently, 62 minority youth from six different schools meet at Washington High School, Riley High School, Adams High School, and the University site. "APMEP truly makes a difference in Notre Dame's ability to reach out to the surrounding communities to share our blessings of talented students, faculty, and administrators," said Father Malloy. However, the University is also planning to expand the program to include other school systems in Indiana. The Indianapolis Public School System and Kokomo Center Township School System have expressed immediate interest. "If all goes well," said Vann-Hamilton, "they could be on-line as early as Fall 1999."

A lot of time and effort from a lot of different people have made APMEP possible. University faculty, graduate students, undergraduate students, middle and high school teachers and administrators, community volunteers, and parents believe it is already a success. They've seen the results in class and at home. But, what does this program really do for the students? Only time will tell. Right now, it makes them think. In addition to helping them understand basic engineering concepts, it promotes teamwork, research skills, and a sense of accomplishment. In short, it prepares them for a bright future.

Students work with volunteers in each APMEP session on a project that puts the theories they've just learned into practice. Shown (left to right) are: Ashley Frazier, Clay Middle School; Jessica Yeh, Clay Middle School; Jucain Butler, a graduate student in the College of Engineering; Rachel Alvarez, Clay Middle School; Julie Cramer, who teaches English as a second language at Clay Middle School; and Jennifer Woods, Holy Cross School.