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# Incubating Innovators

## *Desmond Murray and the BEST Early Research Program*

### On a rainy afternoon in late April, 22

slightly nervous high school seniors sat in the Chemistry Amphitheater at Andrews University. In their hands they held notes for presentations titled, “Hyperbranched Azastilbenes” or “Acetoacetanilide Styryl Dyes.” With complete confidence, the students spoke in pairs about their projects—how they switched reactants and catalysts for better results, the difficulty of trying to isolate their product from the reaction mixture, and the potential implications of their research in a global economy. These twelfth graders were conversing fluently about organic chemistry, a subject not normally covered until the second or third year of college.

These presenters for the first BEST Early Research Symposium are students who attend the Math & Science Center at Andrews University. During the spring semester of their senior year, they participated in an independent research period (IRP) under the supervision of **Desmond Murray**, assistant professor of chemistry. This first symposium was “a milestone on the path to universal adoption of early research participation,” says Murray, also the founder and CEO of



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Below: High school students from the Math & Science Center demonstrate their research projects



BEST (Building Excellence in Science and Technology). The students’ presentations were the most recent products of a program begun nearly 15 years ago by Murray.

In 2006, Murray partnered with the Berrien County Math & Science Center, one of eight similar high school programs across the state of Michigan, to bring the research experience to twelfth grade students. The following year, BEST officially became a nonprofit organization, and to date over 650 students have conducted research. Projects have included synthesis of dyes; novel fragrances/flavors based on ginger; hybrid drugs of ibuprofen, Vitamin B and Vitamin C; biocompatible polymers; biodegradable cosmetic chemicals; antifungal agents; and conducting polymers and molecular sensors with potential forensic applications.

Lisa Bowman, a co-presenter of “Lactate Acylals,” explains that the application process for the Math & Science Center actually begins in eighth grade. Students from local high schools who show proficiency in math and/or science are given qualifying standardized tests. If their scores indicate an aptitude for math or science, they can then fill out an application for the Math & Science Center. Students accepted into the Math & Science Center spend half their day at their high school and travel to Andrews for the other half of their day. As freshmen, they take classes in geometry, biology and computer science in addition to their regular curriculum.

And it helps. Some of these students are going to MIT; the majority will enter the fields of biology and health sciences. Both Bowman and her lab research partner, Kristine Gordon, state that they have been inspired by participating in the research. “It makes it relevant to us. I learned that I, too can do research; it’s not just for the adults.” Even those who do not plan to enter the sciences draw benefits from participating in early research. Kristine plans to study English and drama in college, so how can an organic chemistry project contribute to her future? “Even though I won’t be studying organic chemistry, these projects still require a lot of writing, and good writing skills are just as important as proper procedures.”

In an economy largely driven by innovation, the ability to think critically, question and creatively solve problems is key to a person’s success—or even the success of a nation, says Murray. However, these vital attributes seem to be disappearing from

American schools. A recent National Research Council report found that “the quality of science laboratory experiences is poor for most U.S. high school students” due to underfunding, emphasis on technical knowledge and other factors.<sup>1</sup> Other similar reports show that eighth grade science students ranked 11th internationally in 2007;<sup>2</sup> declining numbers of high school students are participating in science fairs, and only 28% of Americans are scientifically literate. It is this deficiency that Murray and his colleagues at the Berrien RESA (Regional Education Service Agency) have tried to address by designing early research participation programs and implementing them at the Math & Science Center. Tonya Snyder, Math & Science Center coordinator, says, “Initially funded by the governor’s office, the Math & Science Center was created to provide professional development for the community and to provide advanced math and science education to the gifted students of Berrien County.”

Murray and the students participating in BEST Early Research have garnered national, state and private support for early research programs. This includes over \$370,000 in grant monies from the National Science Foundation, American Chemical Society, Andrews University, Michigan Works! and other sources. BEST research has been presented at regional, national and international conferences, and BEST students have co-authored published papers.

Earlier graduates from the BEST program have discovered the advantages of participating in early research. Gretchen Bell, a recent graduate of the Department of Biology, notes that BEST enabled her to “make worthwhile contributions now instead of having to wait until after I had an advanced degree. I know the research experience will give me a leg up as I start my career.”

Participation in early research does not just impart professional advantages and personal economic benefits. The students in the BEST Early Research program have learned skills that will help them solve many of the problems our world faces today, and their contributions can produce real innovations for the future.

1 *America’s Lab Report: Investigations in High School Science*, National Research Council of the National Academies, 2005.

2 For more information on these and other statistics, visit <http://www.bestearly.com/reports-links>.