

# KIDS IN THE CREEK

Using STEM & Green Strategies to Transform Urban Schools



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## INTRODUCTION

What does it take to improve science performance in an inner-city high school? Could a science “immersion” strategy change motivation and interest in science? How can we meet a key strategic goal of our urban district: *“All students graduate and are prepared for postsecondary education, successful careers and productive citizenship.”*

No doubt some in the Cincinnati community were surprised to learn that Aiken University High School had taken on an Environmental Studies focus in addition to its mission to prepare first generation college-goers for post-secondary success. The largely African-American school with a high-poverty population didn’t seem the likeliest candidate for stirring up a passion for studying the great outdoors and saving the planet, one recycling bin at a time. After all, there are only a handful of environmentally-focused high schools around the country, and even fewer in cities—one in Seattle, two in New York, and one in Chicago.

So how did the first year go? Did students get interested in studying the environment? Were they able to use that interest to improve their performance in science or other subjects? Did teachers embrace the program and use it to jumpstart a more student-centered form of instruction? Data from the first year of academic data showed a “yes” to these critical questions, however, district plans driven by facilities and budgeting resulted in decisions that reflected the resource challenges of urban districts. Ultimately, the data generated failed to gain traction for directional change in district science instruction.

## **WHY ENVIRONMENTAL STUDIES?**

Following is a brief review of why the environmental focus is chosen as a strategy for school improvement at AU:

**1. Need to improve student outcomes in science.** Science has become the most significant barrier to HS graduation in the state, as well as locally. AU’s science scores were the lowest in the state following the 2005 spring OGT (Ohio Graduation Test) testing session. An 8% passage rate meant something drastic needed to be done, and that there nothing to lose by trying something new. Many AU students had little previous exposure to environmental topics of study. Something new might just give teachers a way to help students find a new interest, a vehicle to get students more involved in their classes. AU students were accustomed to a worksheet-style of instruction from their elementary experience, and the faculty needed new ways to get them actively engaged.

**2. Rapid growth of STEM careers and college majors.** Along with new “green” commitments by the city and county, these developing fields will provide many economic opportunities in the near future for our students, but ones that require proficiency in math, science, and technology. These are high-growth jobs: MSD’s upcoming projects alone predict a rapid increase in the need for water engineers and water management specialists and technicians. Pathways have been created by Tech Prep Ohio providing articulation agreements, professional development for the staff, technology, and partnerships with business and industry.

**3. Support from local environmental-related organizations,** which were eager to help by providing curriculum assistance and hands-on experiences for our students (see list of partners on p. 9-10).

**4. Need to build college/career pathways.** Using an environmental studies focus enabled the faculty to increase both the quality and quantity of science instruction, gaining resources from Tech Prep Ohio through the Board of Regents, Ohio Dept. of Education Career Tech funding, and federal Perkins monies. The environmental focus enabled all departments in the school to contribute to the effort through interdisciplinary projects. Through Tech Prep, career pathways and partnerships could be built with local colleges and universities to make post-secondary study more familiar and more accessible.

**5. Social-emotional learning needs.** AU’s long-term agency partnership with Families and Children First, under the leadership of Joan Pack-Rowe, documented the toll taken on AU students from the health effects, both physical and emotional, of multigenerational poverty. High rates of asthma are aggravated by smokestack and indoor pollution, while early lead exposure is known to limit learning capacity. AU students are “housebound,” and many had limited exposure to nature and the environment. Some stayed indoors to babysit for younger siblings, or were prohibited from going to the nearest park because of safety hazards (broken glass, needles) and danger from weapons, sex offenders, and drug activity.

Housebound students, raised on concrete and without family means, lack the restorative avenues available to middle-class families with more resources for outdoor vacationing and even bicycling and going to local parks. Such students often suffer not only *post*-traumatic stress disorder (PTSD), but what might be termed OTSD: “*ongoing* traumatic stress disorder,” as the stress and trauma are not one-time events, but a constant churning of exposure to violence, unstable housing, changing domestic arrangements, and a high degree of school mobility. AU, Families and Children First, and Bridges for a Just Cincinnati were committed to build a 9-12 SEL curriculum that provides the tools for students to develop their abilities to manage and thrive in spite of this stress. The environmental program is designed to serve as a counterbalancing force in relation to that stress. Delivering this SEL curriculum is a key component of our Positive School Culture plan.

**6. District plans for a new building.** AU had an opportunity through the CPS Building Futures plan to design and build a new “green” building as the current building is razed and replaced. The location of the campus—62 partially wooded acres adjacent to Mt. Airy Forest—delivered a rich outdoor lab of flora and fauna right to AU’s door, so that the building, as well as its natural surroundings could enrich instruction by using the natural habitat as a living laboratory. Several students participated in the Design Team process with AU staff, parents, CPS Facilities branch, and the architects. While CPS committed to building the remainder of the new buildings to “gold” LEED standards, AU requested that Aiken be permitted to build to the higher standard of “platinum” LEED as an exemplar which would both showcase and be consistent with the new ES curriculum.

**7. The shortage of African-American math, science, and technology-trained students and teachers** offered another reason to give students more opportunities to gain skills and knowledge in these areas. STEM (science, technology, engineering, & mathematics) initiatives in Ohio were growing rapidly, and offered increased opportunities for AU students who developed these interests.

## FIRST YEAR RESULTS

### Year 1 Results Summary

63% Increase in 10<sup>th</sup> grade Science OGT scores\* (from 24% to 47%)  
47.4% increase in Social Studies test scores\*  
6.5% increase in Reading test scores\*  
7% increase in first-time passage of all 5 OGTs\*  
56 outdoor labs/classes conducted including service learning projects  
9 major field trips to experience physical challenges in outdoor venues  
(canoeing, hiking, biking, camping, rock climbing, tree climbing, horseback riding)  
500 pounds of bottles collected in a national recycling contest  
Seven college visits for students at all grade levels  
Active “Green Team” extra-curricular environmental leadership club developed  
The “Great Teen Dialogue” assembly exploring teen issues, including: “Is the environment really a concern for African-Americans?”  
School-wide comprehensive recycling program established  
Summer homework seminar initiated by the English Department  
16 teacher-training sessions conducted  
Area’s first student-led Recycling Pep Rally  
Conducted a site audit towards reducing AU’s landfill materials

**Testing.** The staff’s most obvious accomplishment for the first year is the 63.8%\* rise in the percentage of 10<sup>th</sup> grade students who passed the Science portion of the Ohio Graduation Test. The science test percentage went from 8% in 2005, moving up to 29.9 in 2007 and is 54.6 on preliminary results for the most recent test in Spring 2008. In addition, Social Studies test scores increased by 47.4%, and reading by 6.5%. There is a 7% increase in the students who passed all 5 parts of the test on their first try.

**Increased engagement in science.** Fifty-six outdoor labs or classes were conducted including service learning projects. Ten major field trips enabled students to experience physical challenges in outdoor venues--canoeing, hiking, biking, camping, rock climbing, tree climbing, and horseback riding. Five hundred pounds of plastic bottles were collected in a heated homeroom competition spearheaded by a national recycling contest.

An active “Green Team” extra-curricular environmental leadership club is developed. The “Great Teen Dialogue” assembly explored teen issues, including: “Is the environment really a concern for African-Americans?” A previously small recycling effort grew into a school-wide comprehensive recycling program. Sixteen teacher training sessions were conducted, and the area’s first student-led Recycling Pep Rally kicked off a lot of fun while increasing recycling awareness. For the first time in AU’s history, a school-wide summer homework & seminar program is initiated and is being led by the English Department under Sam Gerwe-Perkins’ leadership, using an environmental text.

**Construction of college pathways.** Aiken University High School is now a 9-12 Career Technical Pathways in Environmental Science. AU's team-based ES Career Academy prepares all of our students for 2- and 4- year colleges in an interdisciplinary way, and offers hands-on science outdoor education opportunities that can lead to a wide variety of careers in emerging environmental fields. Job shadowing and internships are being developed for the coming year.

UC provides a DE (Dual Enrollment) Sociology class. Articulation agreements with Cincinnati State Technical & Community College have been finalized for two new classes next year. Juniors and Seniors who receive a 2.5 or above in those courses will receive up to 13 hours of college credit in these entry-level courses:

- Ecology and Ecosystems (Environmental Science I)
- DC Circuits (an environmental engineering course)

Tech prep is also pursuing a similar articulation agreement with Central State's International Center for Water Resource Management Program.

**Coursework and curriculum development.** A four-year ES curriculum map has been developed, and the Tech-Prep "Crosswalk" has been completed. This is a document reflecting coordination of ODE high school science standards and Cincinnati State ES "competencies."

In the new program's first year, all 9<sup>th</sup> & 10<sup>th</sup> grade students took an additional science course--Environmental Futures. This course reinforces the science standards through additional labs, field trips and service learning opportunities. Environmental Futures also focuses on career opportunities in the emerging field of ES with job shadows, speakers and field trips to universities, businesses, government and non-profit environmental sites.

Eleventh graders took Environmental Chemistry and Environmental Systems 1 course. As seniors, they will have the option to take calculus and specialize in environmental engineering or take the entry-level Cincinnati State Environmental Science survey course with an optional ES internship.

Through career technical funding, classroom technology has been updated with each team now having a projector cart, a new laptop cart for students and additional laboratory equipment and supplies.

## Outdoor Classroom: A Learning Concept

Inspired by the principles in Richard Louv's Last Child in the Woods (Louv, 2005) and the No Child Left Inside movement, a new concept has emerged for our instruction. The "outdoor classroom" was originally conceived of as a specific place in the woods behind the school, perhaps with log benches or a lean-to or shed. It has evolved into *a process instead of a place*: we now think of it as any learning experience a student or class has in any outdoor setting, whether planned or not.

**Example 1: Deer carcass as inquiry.** *In late September of 2007, Mr. Lovaglio took his science students into the woods to do a botany lesson on leaf identification. As one group wandered a little further from the collection area, they came up over a rise and discovered a fully intact, bones-picked-clean deer carcass. They shouted to the others to come see what they found, and the leaf lesson was put on hold while the student pounded each other and the teacher with questions: What happened to the deer? Did it eat something poison? Was it attacked by another deer? The teacher let the questions and speculative answers flow, as it became a truly spontaneous discovery lesson. Much was learned that day about the Mt. Airy Forest ecosystem and what changes the summer's drought had produced. Even better, as the teacher related this story to the faculty, his colleagues realized that the deer was still there—they could also take their students into the woods on another pretext and have their kids "discover" the deer, too.*

**Example 2: Baby deer visit.** *In early May of 2008, staff and students arrived at school to find a week-old baby deer curled up by a corner of the main building. Many students were amazed, but one girl warned a teacher, "You better not be here when his mama come back—she will attack you!" Another boy threw a rock at the deer, before a fellow student who was upset to see this happening could stop him. Students and staff immediately organized "deer duty" for the remainder of the day to protect the deer. Dialogues with these and other students enabled staff to work with mistaken assumptions and instincts by drawing the students into knowledge about deer and deer habitat while using the live deer to stimulate interest and empathy.*

**Outdoor Adventures.** Outdoor Adventures is a way of offering alternate PE credit. Instead of calisthenics and team sports that are very familiar to our students, AU is looking for ways to expose students to the great outdoors. Students have fun and new talents were discovered on these outings:

- Millcreek—water sampling, getting muddy & wet
- Muddy Waters Riding Center—Horses plus African-American western history
- Miami Whitewater canoeing trip—team building
- Camp Joy retreat (Outdoor Ed Center)—community building in the woods
- LaBoiteaux Woods—service (clearing invasive species) in a nearby local habitat
- Rockquest Climbing Center—physical challenges, trust, and teamwork

Mt. Airy Forest—adjacent to our campus, hands-on labs in the woods  
Camp Campbell Gard on the Great Miami River  
IMAGO outdoor education center—study of natural habitat

**Student Leadership Development.** The Green Team and Leadership Team all got students active in leadership and service learning. The Green Team, with ES teacher Kim Thompson, became a very popular activity, including among some students who had major academic and disciplinary issues the previous year. The Leadership Team, under the leadership of Marty Kamrani, and working with the Mayerson city-wide service learning initiatives, continued service learning activities and began to build environmental concerns into those activities.

In addition, a special grant (ACTAG) from Ohio’s governor, Ted Strickland, enabled AU to hire a “Graduation Coach,” with the specific purpose of improving the passage rate of 9th grade African-American boys. The young men who worked with Mr. Robinson went on many outdoor excursions and college visits. The most memorable trip is the “Green For All-The Dream Reborn” conference in Memphis. Forty students attended a cutting-edge conference led by dynamic African-American environmental leaders, including Van Jones (“People, this is not the ‘save the whales’ movement!”) from Oakland and Majora Carter from the Bronx. Urban environmental issues, such as the rise in asthma in cities, lead poisoning in housing, and landfills located close to low-income communities, were explored. These presentations were interspersed with commemorative events such as the candlelight vigil at the Lorraine Motel, where Dr. Martin Luther King, Jr. had been assassinated forty years previous. Biko Baker, director of the League of Young Voters, led an inspiring Youth Track at the conference and made a follow-up visit to the school as well.

## **Faculty Development**

The Science Department at AU benefited from significant professional development opportunities. Beginning with the summer of '07, in which members attended Tech Prep orientation workshops at Miami/Hamilton, the department has:

1. Increased science faculty from 4 positions to 6
2. Attended 3 days of “ My Path to My future” Career Development PD, June 2007
3. Recruited a strong ES teacher from another district, who developed the Green Team as an extra-curricular environmental science club
4. Toured Cincinnati State’s Environmental Science department and met the faculty
5. Participated in a thorough National Science Teacher Association review
6. Met regularly as a vertical team to develop activities for the curriculum pathway
7. Reported regularly to ILT (Instructional Leadership Team) and the whole faculty
8. Applied for and won the University of Cincinnati’s College of Engineering STEP grant (This lends a graduate engineering fellow to assist AU’s science dept. for the coming school year.)
9. Received a grant for the chemistry teacher (Stephanie Simmons) to participate in RET training this summer at U.C.

10. Joined with Cincinnati State, Miami U., and Tech Prep staff for a full day of curriculum coordination activities in May of '08
11. Science Dept. Chair, Barbara Blackwell, participate in additional Career Pathway training in June 2008
12. Led a Tech-Prep orientation with Tim Nolan for the entire faculty
13. Worked with Kathy Wright of the IST (Instructional Support Team) to mentor the dept. through the vertical team process
14. Met with Civic Garden Center leadership to share plans for the developing Green Learning Station Project where students will be able to collect data on environmentally friendly building options
15. Attended a curriculum planning session at Fernald, a former nuclear materials facility which will be offering field trips, science investigations, and possible internship opportunities for the coming year

### **Enhanced science curriculum and special presentations**

1. Increased use of on-campus greenhouse for instruction and to build our connection with the College Hill Gardeners
2. Two Crystal Clear Ohio River Discovery presentations (Michelle Smith)
3. Alternate energy and energy-conservation (Larry Feist—Cincinnati State Professor)
4. Computer recycling facility visit
5. Interdisciplinary Ohio River project led by Junior Team Leader Stephanie Simmons, intertwining her chemistry class (water analysis) with social studies teacher Brooks Posta's history/economics of the river, English colleague Francesca Bownas-Rayburn's unit featuring the writings of Mark Twain, and Lynda Waters' math work in analyzing charts & graphs.
6. Four field trips to the Millcreek to work on the restoration project, along with an in-school presentation intruding the project: collecting data on stream conditions in multiple sites, and aiding in the construction of Laughing Brook Wetland
7. Cincinnati Nature Center (Rowe Woods) for a hiking & tree climbing experience
8. Berea College Tour, including the EcoVillage
9. Paddlefest and Earth Day educational booths staffed by AU students
10. Tour of Rumpke Landfill and the Material Recovery Facility
11. Recycling Pep Rally by the Aiken "Green Team" with skits and races
12. Gwen Roth, Hamilton County Soil And Water Conservation District, led lessons on topographic maps and watersheds using models and interactive activities
13. Larry Feist, Cincinnati State, gave an energy conservation presentation
14. Keep Cincinnati Beautiful gave recycling presentations, including a lesson on how to make recycled paper in the classroom
15. Service learning at LaBoiteaux Woods to pull invasive plants
16. Kathy Wright, IST science teacher, facilitated a DNA lesson with AU students
17. Green Team student leadership presentation to "the Friendship Force" at a church in Clifton, introducing the new program and their leadership
18. Assembly with environmental musician Jack Kaufman
19. Rumpke / Materials Recovery Facility (MRF) Educational Tour



20. Ring-Around-The-School (Campus Clean-up coordinated through KCB)
21. EPA Air Quality Lab Educational Tour
22. Green Team video subgroup is trained by CET to plan, record, and edit a recycling project video, which can be viewed at [cetconnect.org](http://cetconnect.org)
23. The “A” Team with Green Team’s help established a comprehensive recycling pick-up routine using HCDES, Rumpke, and KCB, with paid positions for self-contained special needs students.
24. Green Team held a bottle recycling competition with KCB and the national “Return the warmth” contest, complete with a recycling awareness campaign.
25. CET-produced video of interviews with Green Team President Queshonda Bolling and HDCES director Sue Magness on school recycling projects, which can be viewed at [cetconnect.org](http://cetconnect.org)

## **Partnership Development**

Our long-standing partnership with GE provided critical support by redesigning the OGT tutoring program, providing 1-on-1 tutoring to students, mentoring, and incentives through the GE Scholars program, community service projects, NSBE/M<sup>2</sup>SE, Exploring Engineering, Math Fundamentals, and Homework Helper. The following organizations have responded positively to Aiken University’s outreach and are working with the school to find ways to enhance the science curriculum, obtain grants, and to link students to professionals to speak in classes, provide field trips, be mentors, provide paid summer jobs, and job shadows and/or internships for students.

*The organizations listed below have provided extremely valuable assistance in our start-up year, genuinely committed to seeing the program succeed. As staff, we could not have hoped to get such a program off the ground, much less to experience some significant successes in the first year. We hope to work closer with these groups to continue direct activities, but also form an advisory committee for the program that will enable our students to really benefit.*

1. Hamilton County Dept of Environmental Services (HDCES)
2. Millcreek Restoration Project
3. No Child Left Inside Cincinnati
4. Ohio Tech Prep Consortium
5. Sierra Club/Inner City Outings Division
6. MSD (Metropolitan Sewer District)
7. GE Aviation & GE Volunteers
8. College Hill Forum
9. Ohio EPA
10. Green & Healthy Schools
11. Family & Children First
12. Muddy Waters Riding Center
13. Greater Cincinnati Earth Coalition
14. Blue-Green Alliance
15. College Hill Gardeners

16. University of Cincinnati School of Engineering
17. Berea College Sustainability & Environmental Studies Program
18. Cincinnati State Environmental Engineering Technology Program
19. Central State International Center for Water Resources Management
20. National Underground Railroad Freedom Center
21. Gear Up
22. Governor Ted Strickland and First Lady Frances Strickland
23. Bridges for A Just Community
24. Civic Garden Center
25. Hamilton County Soil and Water Conservation District
26. Rumpke
27. Honorable C.J. Prentiss and the ACTAG staff
28. Green For All/Van Jones
29. Children's Hospital Adolescent Facility-College Hill campus
30. Keep Cincinnati Beautiful
31. Bill & Melinda Gates Foundation
32. Fernald
33. ILT, PTO and LSDMC of Aiken University High School
34. City of Cincinnati-LaBoiteaux Woods
35. Cincinnati Nature Center
36. Granny's Garden
37. CET staff and volunteers
38. Duke Energy
39. Cincinnati Public Schools & Board of Education
40. IMAGO

## Recognition

1. Enquirer article: "Next Generation Scientists" Jan. 23, 2008
2. [www.incigc.org/news/articles/20071016\\_aiken.shtml](http://www.incigc.org/news/articles/20071016_aiken.shtml) No Child Left Inside Cincinnati website article: "Cincinnati Public Schools Boasts Ohio's First Environmental Studies High School"
3. City Beat Best of 2008 Award: *Best Way to Build an Eco-Friendly Future: The adoption of an environmental studies curriculum at Aiken University High School in College Hill*
4. CET Video: [www.cetconnect.org/cetconnect\\_video.asp?ID=2954](http://www.cetconnect.org/cetconnect_video.asp?ID=2954)
5. Ohio Tech Prep has recognized AU as the first and only urban environmental high school in the state.
6. "Environmental Educator of the Year" Award, given to principal Virginia Rhodes by the Greater Cincinnati Earth Coalition, Earth Day, April 08
7. College Hill Forum, City Council Members Jeff Berding and Leslie Ghiz donated 20 memberships to the College Hill Recreation Center for our students to help us get students more physically active.

## **Challenges & Difficulties**

**Budget.** Due to district-wide budget cuts, AU received no Career Technical weighted program funding from the district, in spite of qualifying for such funding. Due to that, and additional budget cuts this year, the 9<sup>th</sup> grade team is collapsed. This meant that the 9th grade students and teachers underwent many changes and disruptions during the first year of the program. No librarian, counselor, or music positions were possible. Private and grant funding is sorely needed to provide full staffing and full experiential learning for students, provide training for staff, and provide student and staff recognition, refurbish our inadequate science labs, and provide community and team-building activities to help transform our school culture.

**Shortage of instructional time.** AU has unsuccessfully petitioned the district to permit us to lengthen the school day from our current 6 hours, 20 minutes, to 7 hours. A longer day would enable team-based scheduling and allow more instructional time to assist all students to meet the learning standards, while also becoming fully engaged in the outdoor trips and projects that are an integral part of the program. Similarly, we have asked to be permitted to add grades 7-8 to our student body. This would enable us to induct, orient, and deliver a better math/science foundation to the students before the transition to the high school credit system begins.

**Staff turnover.** After recruiting an excellent environmental teacher, AU is the victim of its own success, as she is recruited into a Ph.D. program at the University of Cincinnati at the end of her first year. Another new recruit quit after a few weeks to pursue a less stressful environment. A third teacher accepted a position at Walnut Hills, a premier school in the district, for the coming year. This is a tough school--we are grateful to and respect every teacher who works with our students, whether for one year or thirty! Science teachers, especially those with comprehensive certification and experience or coursework in environmental science, are especially difficult to find and keep. We are currently interviewing to fill 2 key positions for the fall.

**Faculty/staff planning time.** In a short day, and with a short budget, planning efforts are largely volunteer. To ensure comprehensive planning, funding for training is needed to ensure all can participate. Essential training includes science content, interdisciplinary project-based learning strategies for all teachers, and a few days of "retreat" time annually to establish and nurture a common vision and map out strategies.

**Family involvement & attendance.** Even relatively high-performing students at AU generally show a pattern of attendance that is less than optimal. Because of budget cuts, clerical time to assist with attendance calls to parents has been lost. Resources are needed to keep that parent contact consistent, and to support and organize our parents to actively participate in their children's education.

## CONCLUSION

In spite of major challenges, AU staff and students, on short notice, put together an academically successful start-up year in which many gains were made. Building the next phase of the ES program, however, and developing our community partnerships in ways that will increase our students' interest, skills and knowledge in science, other disciplines, and in the natural world in which we live, was not possible. The district closed the school in spite of the significant gains in science. The fact that enrollment patterns and budgetary constraints can overshadow those gains was a difficult lesson for the staff to accept.

Special thanks to AU Science Dept. teachers Barbara Blackwell, Kim Thompson, Jean Jencks, Stephanie Simmons, Dominic Lovaglio, Marcia Uhl, Diana Porter and Paul Ramstetter of CPS, Tim Nolan of the Greater Cincinnati Tech Prep Consortium and Barbara Kerdolff of Gear Up for their leadership in making the ES program a success.

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***Inquiries about starting up or supporting Environmental or other STEM schools or programs may be directed to:***

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**Aiken University was a Cincinnati Public Schools "High School of Choice."  
Any student in our district was eligible to attend;  
there were no entrance requirements other than interest. The STEM High School  
is also non-selective, and will build upon the environmental theme as it develops its  
Engineering Futures and Zoo Academy majors, a nationally unique program  
emphasizing animal & plant sciences in residence at the Cincinnati Zoo &  
Botanical Gardens.**

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