USING STEM & GREEN SCHOOL STRATEGIES WITH URBAN YOUTH

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ABSTRACT

Establishing a STEM High School (Science, Technology, Engineering, & Mathematics), and the Aiken Environmental, Ohio's first public environmental high school proved to be successful strategies to increase student engagement and raise standardized scores in science. High-poverty urban students from declining academic and disciplinary environments produced significant gains on science test results and credit attainment towards graduation. Using multiple overlapping rigor and SEL strategies, students experienced "science immersion," project-based learning, and a social-emotional curriculum that emphasized personal development and team/community-building skills. Features of the schools included off-campus "intersessions," outdoor adventures, student-led conferencing, and interdisciplinary project-based learning. Methodology includes qualitative analysis through faculty writing/reflection, and analysis of test scores and credits earned towards graduation. Theoretical underpinnings include Richard Louv's nature-deficit (Louv, 2008), social-emotional learning, attachment (Perry, 2005), and instructional immersion/engagement.

INTRODUCTION

Critics of the school reform movement in U.S. public schools have characterized the effort for being long on fresh starts and short on actual research and results. As early as 1966, James Coleman identified ineffective common practices, many of which are still in use. "New" approaches have often consisted of a school or district attempting to muster constantly shifting existing resources to do a more effective version of traditional schooling. In the U.S., this means a post-World War II factory model that has long been acknowledged by educators and the public to be increasingly irrelevant to an increasingly global economy.

KIDS IN THE CREEK: Using STEM & Green Strategies With Urban Youth

A 1983 government report, A Nation At Risk succeeded in raising an alarm bell, but powerful the deference by lawmakers to commercial interests, such as the textbook industry, compromised potential curriculum and structural changes. A rapidly growing entertainment industry, coupled with accelerating technology access, has exacerbated a persistent anti-intellectual culture among youth and their families. International news continues to be in relatively short supply, and knowledge among families and even educators often lacks awareness of international events, dynamics, and changes.

Urban students living in poverty, often suffer the brunt of these effects. The legacy of U.S. slavery is still felt by African-American families, subject to continued individual discrimination and institutional racism. Hispanic and Asian families suffer the stratified views from that history as well. The U.S. welfare system, an economic safety net, provided processed foods for families in need, but not books. Generations of families never gained literacy, or have lost it in the economic struggle.

Student alienation from schooling is common in U.S. high schools. Achievement data from NAEP testing reveals U.S. schools to be non-competitive in international circles, particularly in the disciplines of math & science. Even in middle-class and wealthy suburban high schools, teachers encounter unmotivated and unresponsive students, and many families that do not or cannot provide home support for learning.

Criticism has also extended to teacher preparation and support; prospective teachers in math and science fields are often drawn to industry, where salaries and professional conditions are better. Inner-city high schools, short on supplies and qualified teachers, often graduate students with few or no significant lab experiences in science. Poor preparation in math and science render urban students at a serious competitive disadvantage for college preparation, even among their American peers.

With respect to mathematics, American parents are notorious for making statements to their children that communicate low expectations of understanding and performance. Math phobia is common and accepted, and reinforced in daily conversation among students, parents, and even

teachers. Statements such as "Just do the best you can on the math, I was never that good at it myself…." are stated and acknowledged with a laugh in school conferences and family and social conversation in the U.S. In some cultures, these statements would be rare, unheard of, or publicly contradicted.

In spite of these obstacles, urban educators in the U.S. can be very inventive and dedicated. They often band together with huge energy in an effort to improve their schools or found new ones that work better for kids. As the environmental movement has gained ground in the U.S., city teachers have experimented with strategies to engage and motivate their charges by re-connecting them with nature and a mission to save the planet.

Class differences between teachers and students can mean a great divide on environmental awareness, nutritional access, and marketing messages. Most teachers in the U. S. cities are homeowners, while most of their students live in apartments. Recycling access often differs for these, with recycling habits now common among homeowners and the middle class, but with systems for the poor that are strictly throwaway/landfill/garbage collection-oriented. Excessive packaging and processing of foods, and lack of transportation mean that many poor families are trapped in "food deserts.* Michelle Obama's recent initiatives to bring fresh market produce models to these areas opens up a whole new avenue of science discovery, research, and potential action projects for high school students.

Urban educators in the U.S. are beginning to see the instructional and motivational opportunities in this scenario, and respond with inventive ideas. In Cincinnati, a Midwestern city in Ohio, his has taken the form of many teacher-initiated class projects, and the establishment of two different schools with specific focus on environmental and STEM strategies (science, technology, engineering & mathematics).

The potential for establishing effective and engaging schools with teenagers is seen in the marriage of high academic expectations with student development and empowerment. Effective schools have been established in the reform movement with one or the other of these, however, the most persistently low performing schools and districts have not until recently seen the opportunity

that lies in deliberately doing both. There are two recent examples of these strategies in use, Hughes STEM High School and Aiken High School in Cincinnati, Ohio.

AIKEN UNIVERSITY HIGH SCHOOL

Aiken University High School, a college prep program that was struggling academically, was established as Cincinnati's first environmental school in 2007 with a deliberate emphasis on environmental science and SEL (social-emotional learning). AU, before undergoing this transformation, had the lowest science scores in the state; only 8% of the students passed the science graduation test. After two years, those scores stood at 54.5%, but the district closed the school in a consolidation move.

The young woman who graduated as Aiken valedictorian in 2010 and won admittance and scholarship to 6 colleges, began her 9th grade as a fighter. She was repeatedly suspended for disruption and violence until her second year when the school initiated the environmental program. She became president of the Green Team, an extra-curricular club for the development of leadership, and turned her grades from failing to Honor Roll. Her transformation, and that of her entire circle of friends, was an example of breaking down resistance to learning through team- and community-building process, dovetailed with engaging academics.

HUGHES STEM HIGH SCHOOL, established 2009

Hughes Center, in the same public city district, was also struggling with declining enrollment, academic performance and discipline problems following the retirement of a particularly effective principal, Robert Suess. The short tenure of several interim administrations destabilized the school, which lost its former "excellent" rating with the state.

Teachers who had been at Hughes during its highest years of performance banded together with district, union, university and business leaders to take advantage of the Ohio STEM Learning Network, the state department of education, and a major corporation. A major grant proposal was written and approved, and the rebirth of Hughes as a STEM school was launched. A planning team

designed the curriculum and selected a principal known for collaboration, who supported and extended the planning team's ideas about establishing a school culture with ambitious academic depth and core values.

Following are the descriptions and designs of both Aiken U. and Hughes STEM. Some features of their design were unique, to take advantage of their locale and histories. Aiken U. was situated adjacent to a major forest in the local park system; this offered unique science study opportunities. Hughes is located on a busy city corner, but positioned directly across the street from the University of Cincinnati, making a major partnership with their faculty a real possibility.

In both cases, the schools struggled with the bureaucracy of state and district regulations. Neither was a selective school, and in spite of their "themed" marketing, enrolled many students who chose it more for the social life, transportation routes, or alumni in the family. In both cases, the faculty banded together and eked out a hard-won victory to establish a balance between order and student empowerment. Budget decisions by the district made scheduling common planning time for teachers difficult or impossible. The work was intense and difficult, yet both staffs gained attention for their successes.

One important difference between these efforts is noted: Hughes STEM is less isolated, born of large partnerships and linked with other STEM start-up schools in the state. It has the attention and support of the Governor, and resources through OLSN. It is the largest and most ambitious of the 10 OSLN schools, as most of them are more of a "charter" school model than a fully public model. For that reason perhaps, Aiken U. did not survive, while Hughes STEM is clearly positioned to grow and thrive. A decision by the district's Superintendent enabled Hughes STEM to establish its own junior high feeder system, growing into a full grade 7-12 school of about 1200 students.

Uncertainty, anxiety, and stress were common at Hughes in that first year, yet the faculty bonded and supported each other. Together, they produced a major shift of culture through the combination of high academic expectations, engaging projects, and the SEL program, particularly the Intersessions.

STEM SCHOOL DESIGN: PBL AND BRIDGING THE DIGITAL DIVIDE

PROJECT-BASED LEARNING

PBL was an instructional strategy that also became a culture-building strategy. The STEM design generally is built around engineering protocols, and technical support & training for the initial OSLN STEM schools was provided by engineers. Teachers eager to do interdisciplinary work instead of isolated subjects found a comfortable home in this dialogue. Some Hughes STEM teachers had experienced rigorous project-based work in the previous Teaching & Technology program at Hughes several years before, where a project called Life After High School became the gold standard. LAHS was a capstone Junior project, which teachers credited with changing the quality and rigor of work done in the subsequent senior terms. LAHS differed from more typical school projects because the T & T program succeeded in establishing stability. Teams with strong leadership refined this project over a period of 12 years; it went from a stumbling set of oral presentations to a polished and sophisticated multi-media product that challenged every junior with rigorous research and other rubric requirements.

PBL dovetailed very well with the culture vision of the planning team and the new principal at STEM. Teamwork and communications were considered critical 21st Century skills: what better way to improve them than by practicing them daily in a content-rich, product-oriented environment? Awkward introductory get to know you activities in the student teams gave way by the end of first semester to student's ability to directly discuss content and work strategies.

I-Works was conceived of as a vehicle to get project work done. Students came to understand that while the project work would be facilitated by the teachers, they had to apply their own forces of energy to execute the products.

The well-documented gap between families of means and those without may already be affecting both differently in the global economy. As urban districts struggle with funding challenges, energy costs, technical progress can be reduced in priority when compared with keeping the heat on. Incremental change in city schools is unlikely to result in closing the divide between

the children of the middle class and those of poverty in the near future with respect to science, math & technology foundations. Schools interested in making inroads into this gap must plan for aggressive tech growth and major transformational changes in modes of instruction. Assumptions about ordinary budgeted items such as textbooks must be challenged in the light of rapid changes in the information industry.

Hughes STEM High School in Cincinnati opened in the fall of 2009 with 300 freshmen and a waiting list. The program is introducing 350 PC Dell refurbished laptops to all students in house through laptop carts. The school will eventually distributing machines for home use based on merits and grades. Laptops were imaged using Norton's ghost through a multicast server. The laptops will be used primarily to administer Blackboard and software that will be used to support project based learning. (Standard Software for the image: Microsoft Office, Adobe Design Suite, Inspiration & Geometer's Sketchpad. SchoolVue for classroom management.) Teachers will also be using a wide variety of Web 2.0 tools such as Google docs, Google earth, Google Sketchup, wiki spaces, etc. The district is challenged by the increasing cost of software and interested in dialogue with other districts exploring or using open source materials. Current digital access and variety of applications and tolls have grown dramatically.

Anticipated needs include handhelds such as those used by the Mobile Learning Institute from the Chicago Field Museum, which are not currently part of the strategy, as the cost is prohibitive. In addition, the school needs solutions to sustain Blackboard and wireless beyond pilot phase resources. Distance learning and video conferencing capabilities must be added as well. An initial batch of digital backpacks, for use by teams and containing a variety of e-gear, are being provided by an NSF grant, but as with all such equipment, the school will need strategies to repair, replace, and extend such gear to the future entering classes as well.

Hughes STEM developed an innovative interview & hiring process to recruit and select collaborative and skilled faculty, has a team-based, project-based strategy, and has an impressive list of university and corporate partners in Cincinnati. The school is building a Science Superlab in conjunction with one corporate partner, a Fusion professional demo lab in partnership with the University of Cincinnati, and is affiliated with the Ohio STEM Learning Network, a project

supported by Battelle and Ohio's Governor Strickland's education initiatives. By design, it was to be innovative, aimed at developing and modeling 21st century learning skills.

Hughes STEM High School continuously seeks additional partners at the regional and national level to collaborate in designing and implementing future-focused models that will engage our students at the highest tech-savvy levels of future industry. Organizational and academic challenges are always present, yet funding and other support often waver according to trends in federal, state, and foundation resources and requirements.

ESTABLISHING FACULTY CULTURE

Hiring for Collaboration: Team Task Interviews

How does an innovative work team hire the right person for an opening? The new Hughes STEM High School in Cincinnati had to fill over a dozen new teacher positions to prepare for their opening in the fall of 2009. Teachers on the selection committee planned thoughtfully to choose the right questions, yet they knew what all interviewers understand by instinct: anyone can say anything in an interview. Secondly, the skills of responding to interview questions can sometimes be quite different than those needed to do the job well. *The team task interviews were the result of a problem-solving process designed to produce a faculty for the new school whose communications skills were consistent with STEM and 21st Century learning models.*

In public sector environments, work rules are often highly developed and professionals are entitled to interview. Qualifications, training, experience and seniority as determinants often get reduced to transfer rights using seniority as the main or only criteria. Without a thoughtfully designed process, this trend can detract from creating a competitive environment in which to attract & retain a high-quality teaching staff.

The STEM high school project was an outgrowth of a powerful local university-business-school district partnership and the Ohio STEM Learning Network, with support of Ohio Governor Ted Strickland and his administration. By design, it was to be innovative, aimed at developing and

modeling 21st century learning skills. The vision of the planning team and principal? A non-selective public high school that offered an academically rigorous learning environment while developing a collaborative, supportive culture among both students and faculty.

The district, Cincinnati Public Schools, and the AFT-affiliated teacher union (CFT) had a history of collaborative projects, including peer review and mutual support for strong teacher-leadership development. The lead teacher model enabled talented classroom teachers to choose paths other than administration to practice instructional a program leadership.

In August, four lead teachers were selected to plan the new school. As the fall progressed, curriculum and instructional design dialogues led to a choice to use project-based learning, with an interdisciplinary focus. Team planning and co-teaching was a must in this design.

The planning team's duties also involved hiring the principal as part of a selection committee including parents and community representatives. Those principal interviews were focused on finding an administrator with a collaborative viewpoint and practice and who was open to teacher leadership and shared governance.

The group then served as the teacher selection panel during the spring of 2009, along with the new principal, who was assigned to join the group in June due to her previous assignment. This unanticipated development meant that the teacher planning group continued under its own internal, and by now, very collectivized leadership. Teacher selection panels were not a STEM innovation; they were a practice codified in the existing collective bargaining contract.

The planning group was passionate about their mission, and about identifying teacher-colleagues that would understand and embrace the new collegial, collaborative model. Why was this important? Because to teach 21st Century collaborative skills required that teachers practice and be highly skilled in collaboration themselves.

Teacher Orientation/Candidate Recruitment

In teacher recruitment sessions in March of 2009, the planning team described this collaborative approach, and made it clear that teaching in the STEM school would be very challenging. In a deliberate effort to break out of traditional teacher isolation, candidates were warned that this was not a school in which a teacher could choose to shut the classroom door and "do their own thing," their own way. Classrooms would be a "fishbowl" environment, with university professors, grad students, and undergrads strolling through the classrooms, observing through glass and electronically, via STEM-cams and distance learning through the HUB Fusion Center, another important element of the OSLN design and the STEM partnership. In a model more familiar to medical professionals than teachers, a clinical setting was envisioned, with analysis and dialogue occurring across pre-service, novice, and veteran teachers.

Other warnings were shared with prospective applicants: Teachers would all be on a challenging learning curve, as the program involved technology integration directly into every course, and the physical facility would be highly uncomfortable the first year, as the school would be crammed into "swing space" while a district-led renovation project completed their permanent space. Every teacher would also be expected to participate in the SEL (social-emotional learning) component of the program through an advisory group. Even the initial interviews would contain an "active" component.

Over 65 prospective teachers attended the orientation session in March of 2009, including many district colleagues from other high schools, from six other local districts, and some pre-service prospects. Laying out this collaborative vision to their colleagues was energizing to the group, but the real test was designing an interview process that would enable teachers with a high level of teamwork-related skills to have their assets revealed and recognized.

Discussions of interview questions were intense, and the conversation turned to a challenge: could the group find a way to have the candidates actually demonstrate their teamwork skills instead of just talking about them? Jamie Beirne, in the role of rotating chairman of the group, produced a document designed to capture responses to a host of carefully crafted questions. Key

issues explored included understanding of STEM/21st Century learning skills, technology, commitment, comfort level with the clinical environment, interdisciplinary planning skills, disciplinary knowledge, project-based learning modes, teamwork, and strategies for working with students with special needs.

TEAM TASK

"You have 15 minutes to design an Intersession (a 1-week non-graded alternate course). It must be interdisciplinary, active, and high interest. You have a budget of $500 for 20 students. Students will not be in regular classes during this week, and you do not have to be on campus. It must serve STEM goals, can be graded or non-graded, and has to be a project that 2 teachers could actually plan and execute together while teaching a full load in the weeks previous to the Intersession.

Candidates were usually performing this task with a candidate that was not competing for the same subject position, i.e., we paired a science teacher with a social studies teacher. This was designed to reduce raw competitiveness behaviors and increase the selection committee's ability to see cross-curricular skills. After about 20 minutes, the pair is asked to begin wrapping it up by providing a name for their project.

Candidate participation. There were significant variations in the behaviors and responses of the pairs. As the selection committee discussed later that day, individuals earned points in at least five different ways. Examples from the candidates' dialogue are given for each:

Idea generation (for content, activities, goals)
Extending ideas or providing details
Questioning of ideas to measure against goals or for more detail or purpose
Providing encouraging/discouraging signals, including positive social signals in response to partner ideas or responses
Structural or practical suggestions of how to execute

Caveats. Disclosures at the beginning of the interview included a description of a "fishbowl" or open environment, where teachers would be expected to co-plan, co-teach, and would regularly experience college professors and business partners trooping through with their colleagues, visitors, or undergrads in tow. Teachers would need to be able to discuss and engage with these partners as they analyze their lessons and be comfortable doing so. After construction, the Fusion Lab would provide a high-tech space where teachers would be able to broadcast demo lessons for observation through glass and for a distance learning audience. All staff were expected to function directly as advisors for students as part of the SEL curriculum. (SEL: social-emotional learning, including individual and leadership development and community and team-building among students.)

Disclosure. The team task process was described to the candidates as they arrived for the interviews. This was done deliberately to minimize prior over-preparation.

Candidate reaction: when the team task process was described briefly, this news invariably produced the immediate, nervous, and full attention of the candidate. Most candidates put their "game face" back on right away, signaling flexibility and adaptability to the selection committee. This created a "fishbowl" environment
meant to simulate the high-scrutiny teaching environment planned for STEM teaching.

To reduce nervousness and discomfort, the committee engaged in positive greeting behaviors as the team task overlap began. Candidates were praised and reinforced for being willing to engage in this atypical process before they began, after they completed the task, and again as they completed the whole interview before exiting. This visibly provided some relief of pressure and tension, and seemed very appreciated by the candidates, as the challenge of this task and the pressure it produced was acknowledged.

Response Theme: Interview as Induction

Teacher candidate responses demonstrate an emergence of this process as an interview/induction model. The design, which sought to reproduce the actual work environment, became functional as a practice experience, an experience that became part of the candidates' knowledge base. The experience was then used as a basis for the candidates' final decision about accepting the position.

Taken as a full recruitment cycle, the first critical feature, the Teacher Orientation session, generated the positive excitement about teaching in the new school, and offered a preview that enabled prospective teachers to move closer to the STEM model by applying, or to make an informed choice not to do so. One candidate was overheard while leaving the orientation: "That sounds like a whole lotta work. I'm not doing all that s---!"

The second prime feature that emerged was "the caveats." These warnings, all delivered with a smile, got the candidates' attention and foretold a non-typical environment. The caveats included:

This is a co-teaching, co-planning model—deliberately moving away from the isolation of the usual classroom. Teachers will make decisions, collaborate, and implement the collective vision along with the co-planned curriculum.

Teachers will all serve as advisors in the SEL program and work closely with a small group of students in a holistic way.

Teachers must be adventurous, willing to go the extra mile to engage students: going overnight, on camping and other trips, is part of the expectation.

Candidates must be comfortable in the "fishbowl," a very public model, with university professors, grad students, and partners, strolling through their classrooms on a regular basis. Classes would eventually be filmed (STEM-Cam) and observed, taped and part of distance or other electronic learning formats.

It's a high-tech program, which means that everyone will be out of their comfort zone and in continual training to infuse technology into the curriculum.

The program is interdisciplinary and arranged around PBL—Project-Based Learning. You will be crossing disciplines on a regular basis.

These caveats were delivered twice: once at the Teacher Orientation/Recruitment session, and again at the beginning of the individual questioning portion of the interview.

Engagement Patterns

There were varying patterns to the engagement of the two candidates, from the most successful to the least, in which neither or both made a very positive impression on the selection committee:

a. Some were immediately congenial and signaled receptivity to the others' ideas with nodding and other supportive gestures or responses; these pairs tended to put across an encouraging tone to the partner, excited and positive. They were respectful but energetic; they seemed be fully aware that they had a short time together and had to be efficient in their conversation, moving from general ideas to selecting one key idea, then structuring a workable plan around that idea. Both candidates generated original ideas and responded to those of their partner. In these pairs, both exhibited listening skills and showed respect for their partner. These pairs tended to be surprised when "time" was called—they were deeply involved in their thinking about their plans, and most were easily able to name the project in less than a minute, often with creative titles. They managed their time well, carefully gauging "brainstorming" time and saving time to plan and structure in a practical way.
b. In some pairs, both candidates generated ideas and responded to each other, but they failed collectively to synthesize their ideas. In these groups, there was some difficulty in choosing between competing ideas or committing far enough to rule any one idea in or

out for practicality. This tended to produce a circular conversation, in which proposals kept coming back, but no structure or plan was possible and there was little direction at the end, or conversely, a direction was chosen by the end, but there was no plan to execute it.

c. In some pairs, one candidate exhibited more creativity in generating content ideas, but the other was more skilled in extending, responding, and using the ideas to shape a plan. These pairs did well, though each candidate earned "points" in very different ways.

d. Some pairs had one or both candidates that exhibited less than ideal listening skills. One might wait politely while the other spoke, then shared an idea that had nothing to do with what the other candidate had suggested. Candidates who generated original ideas, but failed to acknowledge and respond to those of their partner were not considered successful by the interviewers.

e. Some pairs had widely divergent skills, in which one candidate both generated ideas and responded well, while the other candidate seemed lost and unable to do either. In these, the strong candidate clearly had to decide how to "manage" a weak partner. Some used encouragement and strategies that linked to a stronger idea; some signalled that the idea was impractical or not consistent with the goal, or suggested a different direction. Some compromised and sought common ground, giving way to a weaker idea, but trying to find ways to make it work. The committee found this to be interesting, as most had extensive teaming experience, including occasionally with teaching team members deficient in content or communications skills. The stronger candidate was given significant credit by the interviewers for their attempts and skill at leading the partner. In a few cases, committee members could detect concern by the stronger partner; our interpretation was that the stronger candidate was worried that the poor performance of their partner would affect the committee's view of them. It was not difficult, however, to differentiate the skills individually and give credit where credit was due.

f. In a few pairs, one partner seemed willing to make the other carry the workload without much contribution. "Mm-hmmmm," or polite nodding was followed with little or no reciprocal response and in some cases seemed disingenuous with friendly rapport but no substance. These partners did not impress the interviewers, were not viewed as skilled in teamwork, and clearly lost ground in the competitive process.

g. Finally, in a few pairs, neither partner was able to generate ideas nor get the other person to do so. These interviews were painful to watch, as the time dragged on while the candidates were clearly struggling with what to say to each other. A weak idea or set of them might have emerged by the end, but they had difficulty naming the project, as their goals, strategies or both were clearly undefined or not understood in common.

Committee members used their individual notes for discussions later in the day after all interviews were complete. As there were several dozen interviews, the committee was in interviews for many hours a day for several weeks. At the end of day's interviews, or sometimes the following day, the team met to review each candidate, using both the common tool that had been developed as well as individual notes. Points were totaled for each area of questioning and for the team task, however, final decisions were holistic, as the dialogue and comparisons of points among colleagues produced some shifts in thinking.

Results of T2 Interview Process

The T2 interview process was the result of a problem-solving dialogue in which the four STEM planning committee teachers and the incoming principal sought a way to test for the elements of "21st Century" learning skills that would have to be fully understood, modeled and taught by the initial faculty being hired to open the school.

The team task portion of the interviews, while viewed initially as experimental, was confirmed as a more and more valuable element after each pair. Overall, candidates were clearly on a continuum of communications skills, easily shown by the challenge of the team task. Some candidates who did well in the traditional questioning portion were not strong on the team task; this altered the committee's view of their total value as a candidate. The same was true in reverse; some candidates whose individual questioning portion did not put them at the top of the list, were able to shift their position on that list by showing exceptional communications and teamwork skills.

Only one group was completely unable to title the project. The titling question, while simple, became an important basic litmus test of the pair's ability to bring a task to conclusion. Secondarily, it revealed marketing skills, as pairs were conscious of the fact that students would be choosing which Intersession projects to participate in, and an active, creative, or exciting title could help recruit students to join in.

Post-interview candidate response

Nearly all candidates expressed visible relief after the task was finished. Most commented in a positive way about the level of challenge of the task. Some candidates expressed exhilaration or other positive orientations verbally and physically to the committee; there were smiles, and "wow!" statements, including extended positive comments as they were walked out of the room. In some cases, they spoke to waiting candidates. In conversations with the principal later on the phone as a position was being offered, or in some cases not offered, additional comments were shared. These included the following ideas:

a. Increased understanding of how important teamwork is to the STEM concept.
b. Observation that the challenge of the team task might be predictive of the challenge of being on the STEM faculty in a non-selective high school.
c. Perception that being a STEM teacher would be a very different daily experience than being a teacher in more traditional, teacher-isolated models.
d. Contrast of co-planning, co-designing with traditional lesson planning.
e. Appreciation for the level of energy required to co-plan.
f. Acknowledgement of collegial peer expectations as a member of STEM faculty.

Process Reflection

Committee members, during informal reflective dialogue, raised several questions during and after the process. Some of these questions address ethics and principles of a selection process, and were raised in the context of the 5 core values adopted by the planning team (courage, respect, desire, curiosity, integrity). Was it OK to wait until the candidates were "in house" before

disclosing the team task? Or was warning the audience at the teacher orientation session sufficient? Was the initial anxiety displayed by some candidates acceptable, or should disclosure be given when the interview was scheduled? If so, how detailed must it be? Was the discomfort an acceptable trade-off for the value generated by the spontaneous display of communications skills?

The committee was concerned that if outlined in advance, the task would become known among prospective candidates, and that would give some later candidates an unfair advantage. Was the value of having a single common task worth the nervousness it caused? If disclosed, would the ability of candidates to prepare extensively negate the value of the activity?

At one point there was concern that the task had become known. The committee switched to a different task for several pairs, until it became evident that the second task was not the quality of the original and did not generate the volume and quality of data. The original task was brought back for the remainder of the interviews, and there was no evidence that it was disclosed specifically among remaining candidates.

There is concern, however, about future interviews. As the initial staff had limited positions available for the start-up year, many candidates were encouraged to interview with an eye towards joining the staff in a future year. There were some positions that drew a number of very highly qualified teacher-leaders; they were encouraged to view the process as long-term. If they were not chosen the initial year, we asked them not to view that as any kind of rejection, but to be willing to return next spring as additional positions opened.

As the staff adds another dozen positions next spring for the new freshman cohort, positive collegial relationships among candidates in the district will result in discussion and dialogue. This is not viewed as negative; however, it means that next spring's committee must design a second-year interview process that does not give those previous candidates an unfair competitive advantage.

Conclusions on T2

1. Administration and teacher-leaders can create a competitive, high-value selection process dynamic process for staff selection, including in urban districts with strong union contracts and highly codified personnel processes.

2. Five key components produced these results:

a. Agreement on a competitive selection process co-designed by the principal and teachers
b. Attention to district's staffing process, calendar, and contractual obligations
c. Teacher orientation session to build a pool of interested candidates
d. "Caveats," designed to both warn and entice teachers to expect a different working environment
e. Team Task interviews, which actually demonstrated the "fishbowl" environment of STEM and enabled candidates to actively show the essential STEM skills of collaboration and teamwork.

3. Out of an initial teaching force of 18, the process succeeded in attracting three Nationally Board Certified teachers, and nine with district-level "lead" status and who had experience as department chairs or team leaders. Most have masters' degrees and many have achieved honors or selection in prestigious, competitive programs such as the University of Cincinnati's Engineering School's "STEP" program.

4. The planning committee's goal of establishing a high-quality staff was met and exceeded in an urban district, struggling with funding issues, and in a school with an 84% poverty rate.

Tech Café & Anti-Isolation Strategies

Many STEM teachers were familiar with the common feeling of isolation among classroom teachers. This is universal and well-documented in school research. One teacher, arriving from the

most prestigious high school in the city, initially shocked by student behavior and academic deficiencies, began to express out loud her gratitude for her new colleagues, who reached out to help her make the adjustment. She shared that while teaching was "easier" in her previous school, she never felt the level of personal support and professional help that she experienced on this new faculty. These remarks were very positively received by other teachers, as she was considered to be a bellwether: some teachers had remarked that they might be gauging our success on her reactions: would she regret leaving the best school in the city for this untested experiment?

A few weeks after school began, with everything being new, something really new happened. The two technology teachers were in classrooms in the basement, connected by a storage walkthrough, just a corridor about eight feet long and two feet wide, lined on one side by glassed cabinets above and a countertop below. If it were in a home, it would be known as a butler's pantry.

Doug Stevens brought in a coffee pot, his colleague Cliff Carter started mentioning it to teachers as he ran into them in the STEM office in the morning as they retrieved their mail. Teachers started stopping by during their prep. A microwave appeared; Carter brought in leftovers, Stevens made a casserole. Teachers began to chip in for the coffee and bring lunch down. By the end of first quarter in October, Tech Café, as it was dubbed, was born. Casseroles, soups, and leftovers were shared in a hurry, but they came.

STEM was designed around project-based learning, yet the staffing level did not permit common planning time. Block & "A/B" day scheduling meant that individual teachers didn't even have a prep at all every other day. While the 30 meager minutes of lunch was not enough for planning, it did provide offer the chance for some colleagial support, a moment's relief from the alternate choice of staying in one's room and seeing no adults.

The principal believes that Tech Café represented a critical new element in the formation of collaborative staff culture. More than just blowing off steam, the teachers had reacted to the stresses of the school's opening by seeking each other out. They'd had significant bonding and

contact during the summer; they were voting with their feet to continue these relationships and not allow the pressures of the teaching day to defeat the school's design of collaborative work.

Recognition/Research

In the November 2010 issue of Cincinnati Magazine, Hughes STEM was recognized among 30 "Best high schools" for having 89% of its teaching staff with advanced degrees. Only one small suburban district exceeded that level. Evaluation is underway, and first-year standardized testing results will soon be delivered. The school is furiously planning its first Expo, a presentation-based assessment of collaborative and communications skills.

AFT, the nation's largest teacher union, representing most urban districts, endorses teacher-led and collaborative approaches:

"Teachers are more likely to come-and to stay-if a school is known to have an effective principal, safe and clean facilities, exciting opportunities for professional development and collaboration, supportive conditions that include teachers having a say in decision-making, and the staff and resources to quickly and effectively provide the one-on-one and small-group work necessary to help struggling students."

Student Culture: Freshman Orientation & Bridge

Our freshman class of 300 is different from other schools because of the diversity of the group. In an ordinary suburban high school, a freshman class might draw from 3 or 4 feeder schools; in the city districts, perhaps 15 or 20. The STEM High School in Cincinnati, however, has students who entered from 49 different elementaries and junior highs. This wide range of neighborhood backgrounds, variations in school background and school culture, social and family norms, all made for a very exciting group.

We all know that will happen in this environment is that students will come in suspicious of one another, looking for offense, and looking over their should to figure out who might be coming after them. Bloom's level 1: Safety and security.

I've never bought the argument that increasing the use of metal detectors and security guards in the school is needed to make it safe. Those of who work in high schools, particularly understand that this sometimes only made people feel less safe.

First I met Janine, in tears during Bridge, who told be that she had been attacked the day before, had been raped previously, and was afraid of the other kids, and afraid her attacker would be able to find her again and hurt her. She wasn't going to feel safe around her peers until she got around them, met them, made some friends, and also had enough positive interaction with the ones not in her immediate circle that she could relax.

So we did Bridge. Through the magic of STEM partnerships, Museum Center in Cincinnati hosted us in the museum space itself. Two dynamic and energetic teachers—new teacher Ronnda Cargile and Chris Sorrentino, and science veteran Sharon Bachman, designed an active "day camp" series of engineering and "get-to-know-you" activities. They succeeded in dragging their colleagues into structuring these activities and teamed up with Museum staff and parents to get everything ready.

200 students showed up for Bridge. The culminating assembly and video was a high-energy, positive step in bringing 200 students into a community. Leadership was exhibited and acknowledged, students' work was showcased, awards given out. Most importantly, the ice was broken among peers, tiny bits of trust were built among peers, and friends were made. As staff, we thought the bridge we were trying to build was that between junior high and high school life. The bridge was really that between many individual students and their peers. Only these small and fledgling links enabled school to move forth the next week without the fear and conflict that would surely derail teacher's best instructional efforts. The experience "took the edge off" of the stranger mistrust that the group could have fallen into. The faculty was exhausted, and couldn't believe that we were closer to the beginning of something than the end of something else. The Big Work was still in front of us, but Bridge had played its part in preparing for it.

Core Values

The original planning team, after much dialogue, chose five core values: Courage, respect, desire, integrity, and curiosity. The principal wrote in November of the first year:

"To what degree are these core values becoming imbedded in our school culture? I'm not sure any of us are satisfied that our chosen core values are fully evident and operational. In fairness, faculty & staff members are in different positions to see the evidence of development or growth in these values. As Principal, I don't see every classroom every bell; I see mostly brief interactions among staff and students that sometimes reveal glimpses of that development and are encouraging; these occur daily. I also see interactions that demonstrate the need, and sometimes the lack of, these values.

My belief is that we are rapidly developing as a community of learners and will continue to see growth. This is due to several factors: First, a very strong staff that has bonded for survival, professional growth, and collegiality. Secondly, there are several subgroups of students who form important elements within the student body—these include a group of students who deliberately chose our school for its STEM theme, another group who chose our school because of their desire to attend a "better" school, and their perception that we would be a better school, and another group who are creative, open, and who already possess these core values more than some of their peers. These sub-groups often overlap, and we could probably identify some more sub-groups that may be emerging as well.

Finally, there's very determined leadership within the faculty to succeed in this very ambitious teacher-led project in spite of the many significant obstacles we face. Team leaders, subject-area leaders, Allen Frecker, the chair of the Instructional Leadership Team, Tech Coordinator Melissa Sherman, and Kathy Wright, the Program Facilitator—all experienced and creative veterans, exhibit an extremely high energy level and the ability to multi-task continually in forming and shaping this project on a daily basis.

I think of each of them as with a football, running like hell down the field, ducking and weaving like crazy to get through while keeping an eye on the goal.

Because of the significance of the leadership factor, let's examine the first core value: Courage. Both staff and students exhibited this first through their initial decision to leave their comfort zone and come form this school as the founding faculty and student body. STEM is a relatively untested experiment; all would have found an easier way to go attending established programs at other high schools. There are also daily examples of courage as teachers—Danielle Battle, Liv Ramstad, and Cliff Carter, for example, trying out the projects they helped design last summer, which are ambitious for students. Our students, who came together from 49 different elementary schools, have taken a giant leap, dropping their social barriers, personal fears, and adolescent insecurities, to leave behind their typical "posturing" and often very judgmental social talk to discuss math with each other, and science with each other.

In Ronnda Cargile's science class, what I've seen students not doing by the second month of school was even more revealing than what they were doing. Sitting in teams of four, they were mostly NOT discussing what a girl's hair looked like, what a boy said to another boy's cousin about a fight, how ugly someone's shoes were, or why our family doesn't talk to people from that neighborhood. They were talking about their motion detectors and how to set them up. They were discussing how to get their rocket to launch further, and they were sometimes arguing about an item that was or wasn't supposed to be included in their science notebook.

This represents significant courage in the form of students at age 14 departing from the strong social norms of their peer group. It has been displayed consistently enough that academic talk partially replacing social talk, has actually now become a part of the school's culture. I believe it has become significant enough that it has already and will positively affect our achievement. It's displayed regularly in classrooms, and is sometimes present in social setting, such as in the lunchroom, as well. This must be viewed as a success in the infusion of courage as a core value.

Another example is a recent recruitment session at the Zoo, where students who were serving as ambassadors bragged about how strict the school's rules were and how much academic work was necessary. Several of the students communicating this to freshman prospects had personally challenged and resisted the uniform rules and rigorous study. It was a reminder that young adolescents in a relatively privileged society can be a study in contradictions. Loyalty was beginning to develop, even though resistance was still evident.

If the growth in our core values is not as rapid or steadily consistent as we'd all like to see, there may be several reasons for this: The values were chosen by the initial planning team of five teachers, as part of an extended and in-depth dialogue as the school was initially conceptualized. They were formed with the "luxury of time," though it did not feel that way at the time to the planning team, as those teachers were released for these planning tasks.

The faculty engaged in a collective set of exercises that continue during the Advisory groups, to teach and inculcate the values to students. However, in the hectic initial staff training, nor during the extremely challenging start-up process once students arrived, we did not design a process for revisiting, revising, or re-committing to the chosen values as a whole-group process. To students, they may feel imposed from the exterior, though few if any student would disagree with them.

But if we are truly constructivists, we must admit that students—and staff—need to "make meaning" of these values and how they are described, so that they—we—all really own them. Individual classroom teachers, ceremonies, and specific activities have addressed and accomplished this in part, but to cement us as a whole community, fully embracing these or other values, requires a deliberate process that we have yet to design.

This is an omission that is totally ripe for correcting; it will only take a discussion and decision in ILT to design a simple process and timeline for an annual review & commitment process, which can be done 2nd semester. We are a work in progress, and we will continue to grow."

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Faculty Culture –The Writing Group

The writing group met at the Rohs St. Café across the street from the school. The café was a project of the church in which it was housed, and the minister was chairperson of the school's Local School Decision-Making Committee. Rev. Jackson had generously offered the café space and even the sanctuary space as needed during the construction. Dr. Virginia Rhodes, the school principal, Kelly Obarski, OSLN/UC liaison, Dr. Annette Hemmings, UC Professor, and Sharon Bachman, Jerome Brady, Carol Lynn, Douglas Stevens, Kathy Wright, and Liv Ramstad, Hughes STEM teachers, showed up. Prior to the encounter, some of the teachers, OSLN/UC liaison, and the principal generated several common prompts. Each of the participants picked one common prompt and spent 15 minutes writing. The group then broke up into smaller groups of three to go over what they wrote. The group reconvened and each member picked a split prompt depending on when and how they entered the school.

The group waxed and waned, and the coldest weather months found only a few willing to trade Saturday morning family time for what was a fun but non-mandatory stint. A few writers returned in the Spring of 2010, and many are committed to publishing, but struggling with committing the time for the joint writing session.

First Year Implementation—Student Resistance and Unfinished business

Four things have produced anxiety on the STEM staff: the first three are anticipation, uncertainty and the sheer amount of planning and fine-tuning that needed to be done to get to Opening Day and beyond.

The first weeks and months were marked by high energy on the part of faculty, and from the faculty's point of view, resistance to school rules and academic rigor on the part of the new freshmen. Struggles over uniform compliance were common, and it was clear to teachers that many students had come from schools where "worksheet" instruction (students working alone filling in blanks on questions) was common. This, of course, was relative, since teachers had come from

many different settings; some had seen much worse, and others had worked in stable programs where high performance norms were well developed. None, including the principal, had ever started a new school where every norm was not yet established.

The fourth element is the sense, as this rapid and heavily-laden train moves down the track, of losing track of good thoughts and ideas as the practical and urgent tasks of daily operations replaces the reflective & anticipatory thoughts of the planning phase.

This causes worry. Wow, what happened to our mastery discussion? We had some really lofty dialogue about the shallow and antiquated nature of typical grading practices. Many of us observed that these common practices tend to establish minimal expectations, and do not promote intellectual development or nurture a high regard for it among adolescents.

Advisory—are students having the kinds of life-altering encounters with their peers that really opens their eyes to a new way of thinking about their worth, and their capabilities? Or is the added planning burden driving a less powerful experience?

The danger is cynicism, and keeping the faith and cohesion of the group; avoiding any sense of discouragement or wondering if we meant what we said when we shared these initial goals and thoughts.

I think, if we can hang on, and maybe talk about, just identify some of these items, it will help us view these as unfinished business, not the discomfort zone where our collective psyche is disturbed by the nagging thought that we didn't mean what we said—we did! I feel defiant about this. We did, I feel like shouting, and we still do, and we will get there, but apparently not all at once. As ambitious and overachieving as we all are, we will have to live with that, and not let it undermine our confidence or detract from our sense of success for the many, many elements we have delivered and well.

Looking Ahead

Serious challenges face the Hughes STEM community. A strong parent support system is desired, but has yet to be built. The scale-up of the school will result in the adding of additional grade levels each year, including a junior high, until the school houses a full 7-12 program. That will enable the school to compete for students from top public and private schools in the area for more academically competitive students, although it will remain non-selective.

How will the school build on the elements of positive culture so hard-fought and hard-won in the first year? In the second year, the staff will double: none of those new teachers experienced the first year. The student body will double: will the rising sophomores form a leadership level that draws the freshmen into the core values? How can those values get stronger rather than become diluted?

The school is physically moving from its current "swing" space in a small wing of the building, into the newly renovated Classical Building, a 100-year old architectural gem, with Italian terrazzo tiling, gothic grotesques, and stunning Rookwood fountains. The faculty is excited about this move. Perhaps the bonding experience of the planning team, Y1 & Y2 teachers will be that of sharing and organizing this new space with the existing Hughes Center teachers. The principal has rearranged the original renovation design to provide a place for the Tech Café, so that it can expand and grow as a unifying place where staff can connect.

Growing a powerful culture among students, families, and staff remains a strong goal of Hughes STEM.

Science Immersion Practice: Aiken University High School

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.

KIDS IN THE CREEK: Using STEM & Green Strategies With Urban Youth

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.

INITIAL RESULTS

63% Increase in 10th grade Science OGT scores* (from 8% to 54.5%)
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 10th 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 9th & 10th 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 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

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.*

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 candelight 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 Tiin, 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

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

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/M²SE, 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.lncigc.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
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 9th 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.

AU's DEMISE

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, due to a restructuring of the district high schools. The fact that enrollment patterns and budgetary constraints can overshadow those gains was a difficult lesson for the staff to accept.

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Special thanks to Diana Porter and Tim Nolan of the Greater Cincinnati Tech Prep Consortium for their leadership in making the STEM & ES programs a success.

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Inquiries about developing or supporting STEM schools or programs, including environmental-themed curriculum, may be directed to:

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Context note:
Aiken University High School 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. Hughes STEM High School is also non-selective, and has built upon the environmental theme as it developed its Engineering Futures and Zoo Academy majors, a nationally unique program emphasizing animal & plant

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