Chicago Pre-College Science and Engineering Program (ChiS&E)

STEM Smart Chicago Regional Workshop
Session: Equal Access to Quality STEM Experiences
April 10, 2012
Session Outline

- Introduction
- DAPCEP – A Proven Model
- How ChiS&E Came to Chicago Public Schools
- ChiS&E
- Ensuring a Stellar Program
- Program Evaluation
- Final Q and A
DAPCEP – A Proven Model

ChiS&E’s perspective: It took...
✓ A proven model –
DAPCEP – A Proven Model

**Work in Progress**

- 83% of DAPCEP students are either college graduates or are currently enrolled in college.
- Nearly 50% of DAPCEP students currently enrolled in college are majoring in engineering, science, or mathematics-related fields.

**DAPCEP College Students Pursuing Engineering & Science Degrees**

- Engineering: 243
- Computer Science: 60
- Pre-Med: 58
- Science & Chemistry: 24
- Biology: 12
- Architecture: 12
- Math: 9
- Physics: 3

*Based on the Higher Education Research Institute at UCLA, 1994 freshman declaring major*
DAPCEP – A Proven Model

FINISHED PRODUCT

72% of DAPCEP college graduates have earned degrees in engineering, science or mathematics-related fields.

DAPCEP College Graduates with Engineering & Science Degrees

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<tr>
<th>Field</th>
<th>DAPCEP Average</th>
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<td>41%</td>
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*Based on the National Science Foundation, 1996 Science & Engineering Indicators*
DAPCEP – A Proven Model

60% of college graduates attended one of DAPCEP's partner universities.

College Graduates Who Attended DAPCEP Partner Universities

- UNIVERSITY OF MICHIGAN (ANN ARBOR) - 125
- MICHIGAN STATE UNIVERSITY - 121
- WAYNE STATE UNIVERSITY - 88
- GMI ENGINEERING AND MANAGEMENT INSTITUTE - 82
- UNIVERSITY OF DETROIT MERCY - 40
- LAWRENCE TECHNOLOGICAL UNIVERSITY - 19
- WAYNE COUNTY COMMUNITY COLLEGE - 33
- OAKLAND UNIVERSITY - 11
- UNIVERSITY OF MICHIGAN (DEARBORN) - 4

66% of DAPCEP college graduates earned their degrees from a Michigan college or university.

173 DAPCEP alumni are employed by donor companies, with the largest employers being Ford Motor Company, General Motors Corporation and Chrysler Corporation.
## Saturday Enrichment Courses

### Academic Skills
- Student Tutorial: 2, 7-12, 75
- ACT/SAT Math Preparation: 2, 10-11, 40
- ACT Test Preparation Program: 4, 7-12, 160
- Study Smarter Not Harder: 2, 7-12, 66
- SAT Preparation: 2, 9-10, 60
- Total Academic Skills: 12, 396

### Computers
- Advanced Computers: 1, 6-9, 25
- Advanced Databases: 1, 11-12, 15
- Computer Aided Design & Drafting: 10, 7-8, 40
- Computer Aided Engineering Graphics: 10, 7-8, 20
- Computer Aided Engineering Network (CAEN): 1, 7-8, 15
- Computer Programming: 4, 7-8, 96
- Computers & Technology: 1, 7-8, 20
- Computers for 7th and 8th Graders: 7-8, 76
- Engineering Design w/ Computers Applications: 2, 11-12, 56
- Internet and Web Page Design: 1, 8-9, 35
- Information Tools 2000: 20, 11-12, 30
- Intro to CAD/CAM: 1, 10-12, 15
- Intro to Computers: 1, 8-9, 30
- Intro to Computer Applications: 1, 9-10, 20
- Intro to Computer Programming: 2, 10-12, 20
- Intro to Computing (C-Programming): 2, 10-12, 20
- Manufacturing Computer Systems: 1, 8-9, 20
- Object Oriented Programming with C++: 10, 9-10, 20
- Programming with C++: 2, 10-12, 44
- Technology Education as an Asset to Maximize Success (TEAMS): 4, 7-12, 120
- Windows and Internet Application Design: 1, 11-12, 30
- Visual Basic Programming: 1, 11-12, 15
- Total Computers: 34, 529

### Engineering
- Chemical Engineering: 1, 6-9, 25
- Civil Engineering: 2, 7-8, 25
- Creative Engineering: 2, 7-8, 40
- Everyday Engineering: 16, 9-10, 29
- Fun Factory: 1, 6-9, 18

### Course Name
- Introduction to Automotive Engineering: 1, 9-12, 16
- Intro to Electrical & Computer Engineering: 2, 7-8, 40
- Intro to Environmental Science & Engineering: 1, 7-8, 48
- Intro to Industrial Engineering: 1, 7-9, 30
- Intro to Machine Learning: 1, 10-12, 15
- Learning to Love Engineering through 3D: 2, 7, 50
- Mechanics: 1, 7-8, 30
- Physics: 10-11, 18
- Planes, Trains and Automobiles: 1, 7-8, 15
- Real Life Engineering: 1, 7-8, 30
- The Making of the Automobile: 1, 9-10, 45
- World of Electrical & Computer Engineering: 2, 7-8, 43
- Total Engineering: 39, 771

### Jobs Skills
- Communications: 1, 8-9, 25
- Technical Speaking: 2, 9-10, 60
- Soft Side of Engineering: 2, 9-10, 40
- Seeds of Success: 1, 11-12, 50
- Total Job Skills: 7, 175

### Mathematics
- Pre-Engineering Math for 6th Graders: 41, 6, 756
- 7th Grade Pre-Engineering Math: 6, 7, 146
- Calculus: 6, 11-12, 146
- College Math Prep: 1, 12, 25
- Graphing Methods and Applications: 2, 9-10, 24
- High School Math: 1, 7-8, 20
- Intermediate Math: 2, 7-8, 60
- Lines and Curves: 2, 8-9, 60
- Think 3-D Geometry: 1, 9-10, 25
- Total Mathematics: 59, 1,236

### Science
- Basic Laboratory Skills: 2, 7-9, 40
- Chemistry in Action: 1, 7-8, 15
- Discovery of Life’s Processes: 2, 8-9, 48
- Explorations in Biology: 2, 8-9, 48
- Glow Blur: 1, 7-8, 15
- High School Science & Technology Program: 1, 9-12, 75
- Laboratory Science: 1, 10-11, 24

### TOTAL SATURDAY COURSES
- 226, 5,057

### TOTAL SUMMER PROGRAMS
- 28, 621

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**DAPCEP – A Proven Model**
How ChiS&E Came to CPS

Founded in Chicago in 2008 by Kenneth Hill, founder and long-time executive director of the Detroit Area Pre-College Engineering Program (DAPCEP) to provide science and engineering programs to K–12 students in Chicago Public Schools (CPS).
A hands-on problem-based science and engineering program provided to K-3 students in seven Chicago elementary schools and their parents on four Saturdays per semester at the Museum of Science and Industry.

Launched in 2009 and supported by NSF, Chase Foundation, Honda Foundation, Private Bank, and local corporations and foundations.
Participating Schools

Sir Miles Davis Elementary Engineering School
Dvorak Technology Academy
Pershing East Magnet School
Spencer Technology Academy
Wells Prep Elementary School
Eli Whitney Technology Magnet Cluster School
Woodlawn Elementary School
## Participant Data 2011

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
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<tbody>
<tr>
<td>Students (K-3)</td>
<td>166</td>
</tr>
<tr>
<td>Parents</td>
<td>166</td>
</tr>
<tr>
<td>Teachers/Faculty</td>
<td>15</td>
</tr>
</tbody>
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ChiS&E – Current Program

Grade K = Little Civil Engineer
Grade 1 = Little Chemical Engineer
Grade 2 = Little Electrical Engineer
Grade 3 = Little Mechanical Engineer

Based on the K – 3 model developed by DAPCEP...
... plus Cyberlearning:

- Computers, iPads, cameras, video cameras, and cell phones
- Students and parents capturing stories, photos, and movies of their learning experience
- Shared with schools, teachers, and fellow students; families, friends, and community
- Building knowledge, experience, confidence, and creativity with technology, while reinforcing learning
#1 – **Students in the early elementary grades can grasp scientific and engineering concepts**
#2 – Parents will make the commitment to learn alongside their children and support their learning outside the program sessions
ChiS&E – Cyberlearning + Parent Involvement

Parents and Students as Videographers...
ChiS&E’s perspective: It took...
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DAPCEP – A Proven Model

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DAPCEP College Students Pursuing Engineering & Science Degrees

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<td>SCIENCE &amp; CHEMISTRY</td>
<td>18%</td>
<td>16%</td>
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<tr>
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</tr>
<tr>
<td>BIOLOGY</td>
<td>8%</td>
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<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>ARCHITECTURE</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>PHYSICS</td>
<td>4%</td>
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NUMBER OF DAPCEP ALUMNI
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<td>University of Detroit Mercy</td>
<td>19</td>
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<tr>
<td>Lawrence Technological University</td>
<td>13</td>
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<tr>
<td>Wayne County Community College</td>
<td>13</td>
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<td>University of Michigan (Dearborn)</td>
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DAPCEP – A Proven Model
How ChiS&E Came to CPS

ChiS&E’s perspective:
It also took...

- A local believer
- A feasibility study
- A local angel
- A business plan
How ChiS&E Came to CPS

ChiS&E’s perspective:
It took...

- Local district buy-in
- Model program experts
- Major funders
District perspective: CPS asked...

- What results did DAPCEP produce?
- Who in Chicago/CPS is recommending it?
- Where in CPS does it belong? What CPS unit is committed to implementing it?
- Do principals, teachers, and parents want it?
District perspective: CPS also asked...

- Who from Detroit will train our teachers?
- Who will fund the new program in Chicago?
- Who in ChiS&E can win support from principals, parents, district and civic leaders, and funders and coordinate the program’s many components?
How ChiS&E Came to CPS

District perspective: CPS provided...

✓ Introductions to school staff and school visits
✓ Funds and staff time to help develop the NSF proposal
✓ An administrative “home” in CPS for the program
✓ Timely assistance in addressing emerging programs needs
What it takes:

- Involve master teachers from the model program → Best Practice

- Ensure fidelity to key components of the model → Replication

- Support creativity among local teachers → Innovation
Building a Stellar Program

What it takes:

- Engage local teachers in program development → Ownership
- Inspire and expect a commitment beyond “9 to 5” for all → Results
- Build local capacity through continued support from master model program educators → Sustainability
ChiS&E in Action!
Year One Evaluation: CEMSE* Found...

- ChiS&E is implementing its theory of change.
- Participant attendance has remained consistent.
- The program is building parents’ capacity to support their children’s education.
- ChiS&E is preparing students to participate in the STEM fields.
- DAPCEP staff is preparing ChiS&E teachers to effectively engage students and parents.

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