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

ChiS&E Chicago Pre-College Science and Engineering Program

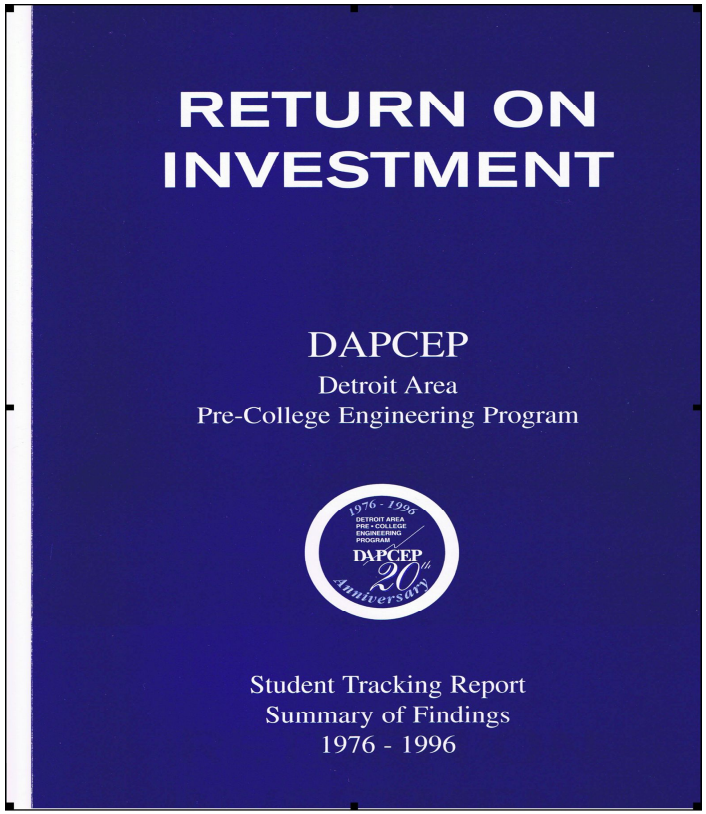
- Introduction
- DAPCEP – A Proven Model
- How ChiS&E Came to Chicago Public Schools
- ChiS&E
- Ensuring a Stellar Program
- Program Evaluation
- Final Q and A

DAPCEP – A Proven Model

ChiS&E Chicago Pre-College Science and Engineering Program

ChiS&E's perspective: It took…

✓ A proven model –



THE DRAWING BOARD

Based on grade-point average (GPA), California Achievement Test (CAT) and High School Proficiency Test results, DAPCEP students are better prepared to attend college and are more likely to stay in school than non-DAPCEP students (according to a Detroit Public Schools special report of 1993 and 1994 high school graduates).

High School Academic Performance

Test	DAPCEP	Non-DAPCEP
GPA	2.89	2.53
CAT (math scores)	782.36	733.06
High School Proficiency Test - Math (passing rate)	85%	60%

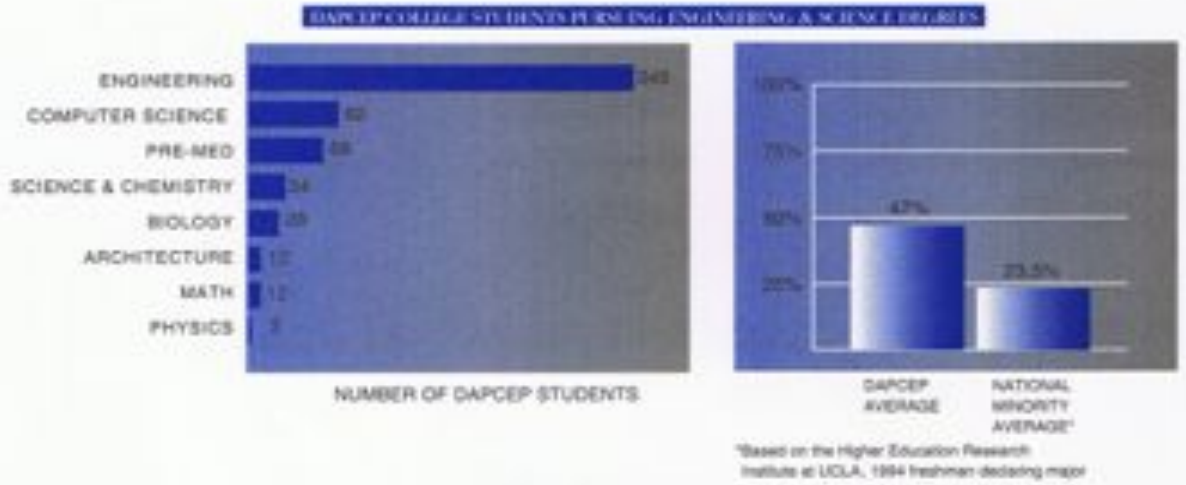
According to this same study, more than 75% of DAPCEP students enroll in 4- or 5-year colleges or universities, compared to 51% of non-DAPCEP graduates of the Detroit Public School System.

DAPCEP – A Proven Model

Chicago Pre-College Science and Engineering Program

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 mathematics-related fields.

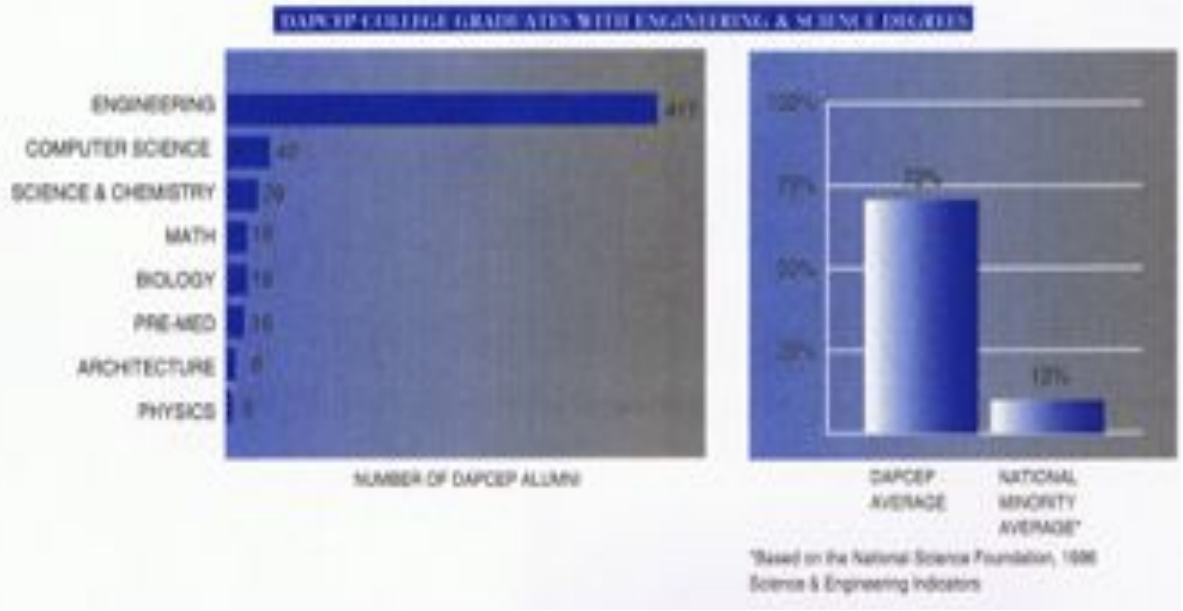


DAPCEP – A Proven Model

Chicago Pre-College Science and Engineering Program

FINISHED PRODUCT

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

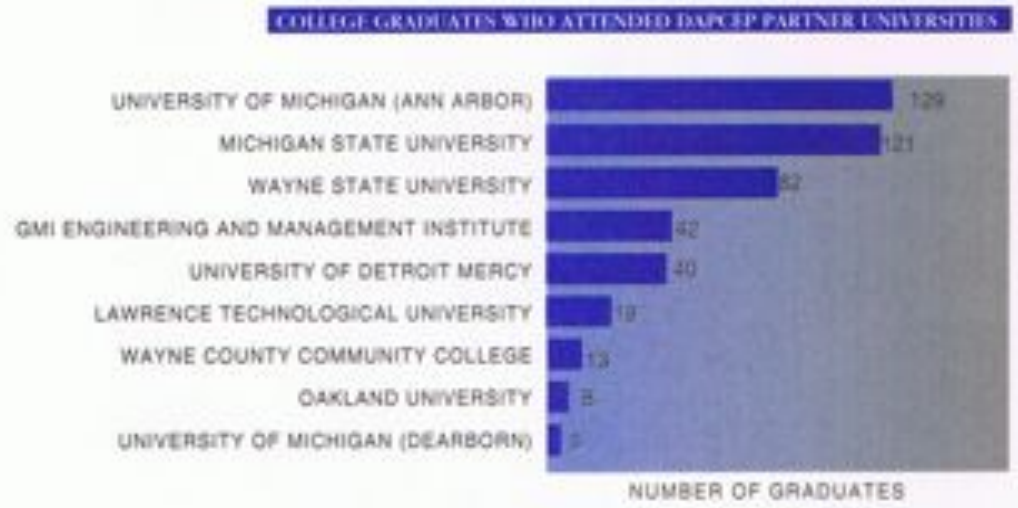


DAPCEP – A Proven Model

Chicago Pre-College Science and Engineering Program

*Based on the National Science Foundation, 1996 Science & Engineering Indicators

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



- 66% of DAPCEPcollege 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.

DAPCEP – A Proven Model

ChiS&E Chicago Pre-College Science and Engineering Program

Saturday Enrichment Courses

Course Name	Courses	Grade	Students
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	7-8	61
SAT Preparation	2	9-10	60
Total Academic Skills	12		396
Computers			
Advanced Computers	1	9-10	25
Advanced Databases	1	11-12	15
Computer Aided Design & Drafting	1	10	48
Computer Aided Engineering Graphics	1	10-11	20
Computer Aided Engineering Network (CAEN)	1	7-8	15
Computer Programming	4	7-8	96
Computers & Technology	1	7-8	20
Computers for 7 and 8th Graders	2	7-8	75
Engineering Design w/ Computers Applications	2	11-12	56
Internet and Web Page Design	1	10-11	25
Information Tools 2000	2	10-12	50
Intro to CAD/CAM	1	11-12	15
Intro to Computers	1	9-10	20
Intro to Computer Applications	3	9-10	60
Intro to Computer Programming (C- Programming)	2	9-10	40
Manufacturing Computer Systems	1	10-11	20
Object Oriented Programming with C++	1	10-12	20
Programming with C++	2	9-10	44
Technology Education as an Asset to Maximize Success (TEAMS)	4	7-8	120
Windows and Internet Application Design	1	9-10	50
Visual Basic Programming	1	11-12	15
Total Computers	34		529
Engineering			
Chemical Engineering	1	8-9	20
Civil Engineering	2	10-12	25
Creative Engineering	2	7	40
Everyday Engineering	16	1	288
Fun Factory	1	7-8	15

Course Name	Courses	Grade	Students
Introduction to Automotive Engineering	1	9-12	16
Intro to Electrical & Computer Engineering	2	7-8	40
Intro to Environmental Science & Engineering	2	7-8	48
Intro to Industrial Environmental Mgmt.	1	7-9	30
Introduction to Vehicle Engineering	1	10-12	15
Learn New Ways of Making Things	1	7-8	15
Learning to Love Engineering through 3D	2	7	50
Mechatronics	1	10-11	18
Plains, Trains and Automobiles	1	7-8	30
Real Life Engineering	1	8-10	45
The Making of the Automobile	1	7-8	15
World of Electrical & Computer Engineering	1	10-11	18
Wonders of Automotive Engineering	2	7-8	43
Total Engineering	39		771
Job Skills			
Communications	1	8-9	25
Technically Speaking	2	9-10	60
Soft Side of Engineering	2	9-12	40
Seeds of Success	2	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	2	11-12	60
College Math Prep	1	12	25
Graphing Methods and Applications	1	9-10	24
High Fives	2	7-8	60
Intermediate Math	2	7-8	60
Lines and Curves	2	8-9	60
Think 3-D Geometry	2	9-10	25
Total Mathematics	59		1,216
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 Blue	1	7-8	15
High School Science & Technology Program	1	9-12	75
Laboratory Science	1	10-11	24

Course Name	Courses	Grade	Students
Physics	1	11-12	30
Physics Around Us	2	8-9	40
Robotics	1	9-10	18
Rockets and Motors	4	7-8	104
Science Fiction	1	8-9	31
The Architectural World	1	10-11	20
The Chemical World	2	8	40
The Forensic Crime Stoppers	12	4.00	252
The Little Engineer that Could	2	K (Pilot)	60
The World of Physics	2	8-9	60
The Wonders of Flight	1	7-8	30
Up, Up and Away!	14	5.00	280
Water World	1	7-8	20
Wonderful World of Light	1	7-8	20
World in Motion	20	5	400
Total Science	75		1670
TOTAL SATURDAY COURSES	226		5,057
Summer Enrichment Programs			
AIM Program	1	11-12	10
ACT/SAT Summer Preparation Course	1	7-12	22
Engineering Summer Program	1	11-12	2
Engineering Summer Residential Program	1	10-11	26
Future City USA	1	7	20
Intro to Electrical & Mechanical Engineering	1	7-8	40
Junior Scholars Program	1	11	1
Lawrence Achievement Summer Enrichment Rewards (LASER)	2	9	32
Math Scholars	2	10-11	32
Mathematics and Laboratory Based Science	1	8-9	32
Minority High School Education Program	1	11-12	9
Minorities in Engineering	2	9-10	28
Paper Vehicle	2	7-8	47
Science and Math for 7 & 8 Graders	1	6-7	56
Summer Enrichment Program (SEPI)	1	7	28
Summer Enrichment Program (SEPII)	1	8	30
Summer Pre-College Enrichment Program	2	9-10	32
Summer Program at Oakland Univ.	2	7-8	60
Summer Youth Technology Discovery	1	6-9	28
The Science of Life: From the Anatomy to Atom	1	9-10	16
Unite '2000	2	8-9	30
Summer Total	28		621
TOTAL SUMMER PROGRAMS	28		621

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).

ChiS&E – Current Program

- 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.

ChiS&E – Current Program

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

ChiS&E – Current Program

Participant Data 2011

Students (K-3)	166
Parents	166
Teachers/Faculty	15

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…

ChS&E – Current Program

… 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

ChiS&E – Guiding Assumptions

ChiS&E Chicago Pre-College Science and Engineering Program

#1 – Students in the early elementary grades can grasp scientific and engineering concepts

ChiS&E – Guiding Assumptions

#2 – Parents will make the commitment to learn alongside their children and support their learning outside the program sessions

ChiS&E – Cyberlearning + Parent Involvement

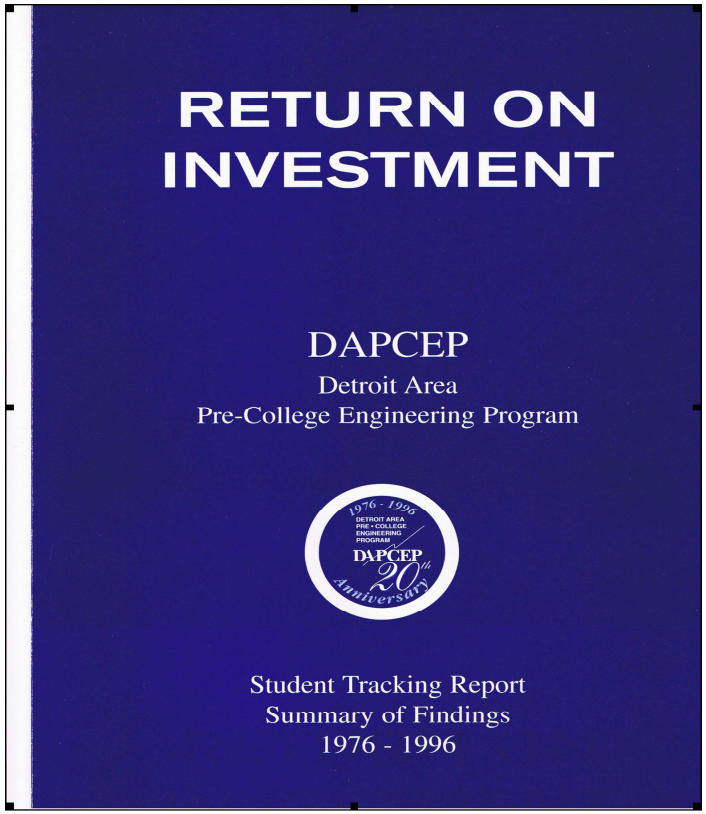
Parents and Students as Videographers…

DAPCEP – A Proven Model

ChiS&E Chicago Pre-College Science and Engineering Program

ChiS&E's perspective: It took…

✓ A proven model –



THE DRAWING BOARD

Based on grade-point average (GPA), California Achievement Test (CAT) and High School Proficiency Test results, DAPCEP students are better prepared to attend college and are more likely to stay in school than non-DAPCEP students (according to a Detroit Public Schools special report of 1993 and 1994 high school graduates).

High School Academic Performance

Test	DAPCEP	Non-DAPCEP
GPA	2.89	2.53
CAT (math scores)	782.36	733.06
High School Proficiency Test - Math (passing rate)	85%	60%

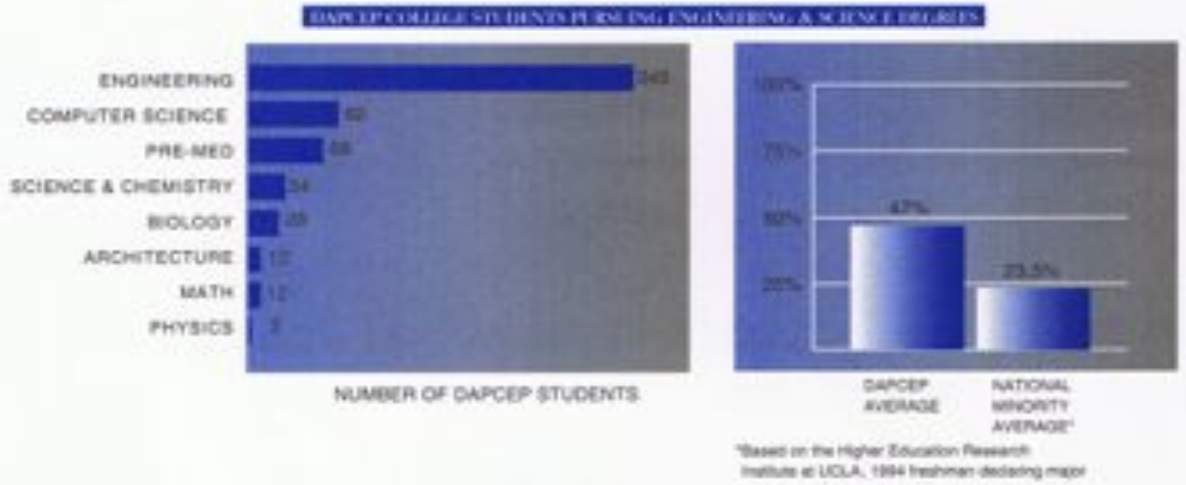
According to this same study, more than 75% of DAPCEP students enroll in 4- or 5-year colleges or universities, compared to 51% of non-DAPCEP graduates of the Detroit Public School System.

DAPCEP – A Proven Model

Chicago Pre-College Science and Engineering Program

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 mathematics-related fields.

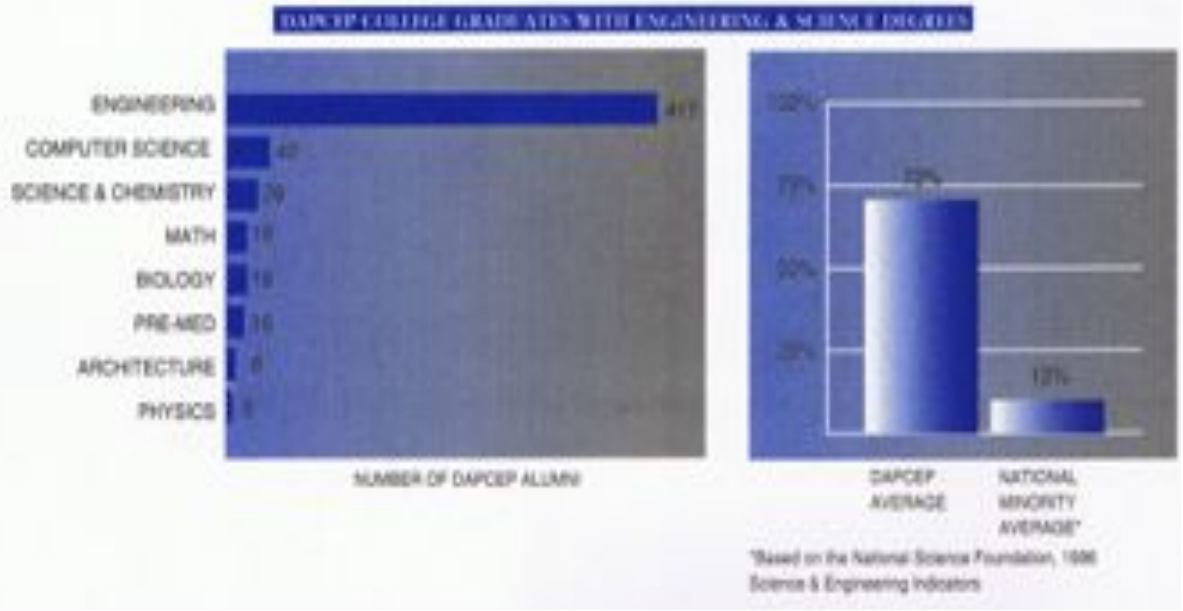


DAPCEP – A Proven Model

Chicago Pre-College Science and Engineering Program

FINISHED PRODUCT

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

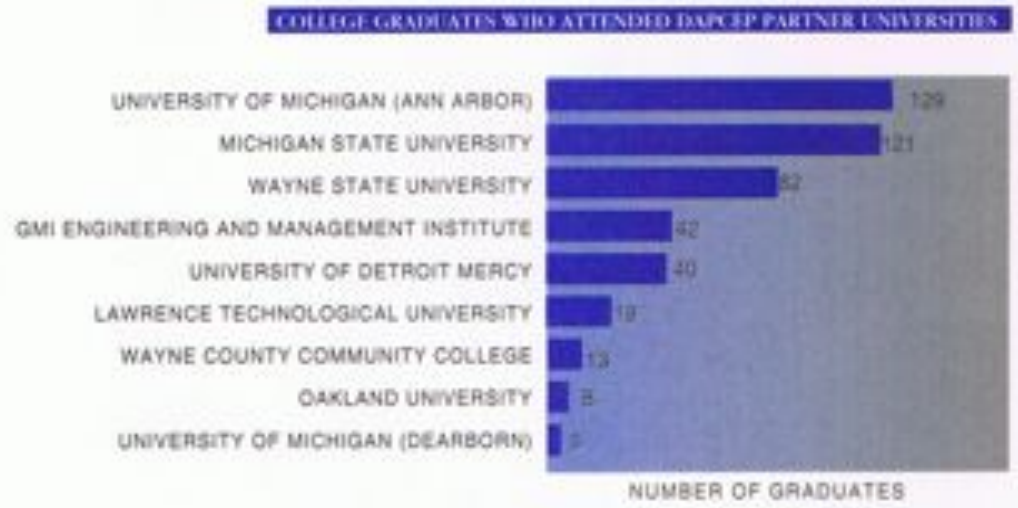


DAPCEP – A Proven Model

Chicago Pre-College Science and Engineering Program

*Based on the National Science Foundation, 1996 Science & Engineering Indicators

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



- 66% of DAPCEPcollege 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.

DAPCEP – A Proven Model

ChiS&E Chicago Pre-College Science and Engineering Program

Saturday Enrichment Courses

Course Name	Courses	Grade	Students
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	7-8	61
SAT Preparation	2	9-10	60
Total Academic Skills	12		396
Computers			
Advanced Computers	1	9-10	25
Advanced Databases	1	11-12	15
Computer Aided Design & Drafting	1	10	48
Computer Aided Engineering Graphics	1	10-11	20
Computer Aided Engineering Network (CAEN)	1	7-8	15
Computer Programming	4	7-8	96
Computers & Technology	1	7-8	20
Computers for 7 and 8th Graders	2	7-8	75
Engineering Design w/ Computers Applications	2	11-12	56
Internet and Web Page Design	1	10-11	25
Information Tools 2000	2	10-12	50
Intro to CAD/CAM	1	11-12	15
Intro to Computers	1	9-10	20
Intro to Computer Applications	3	9-10	60
Intro to Computer Programming (C- Programming)	2	9-10	40
Manufacturing Computer Systems	1	10-11	20
Object Oriented Programming with C++	1	10-12	20
Programming with C++	2	9-10	44
Technology Education as an Asset to Maximize Success (TEAMS)	4	7-8	120
Windows and Internet Application Design	1	9-10	50
Visual Basic Programming	1	11-12	15
Total Computers	34		529
Engineering			
Chemical Engineering	1	8-9	20
Civil Engineering	2	10-12	25
Creative Engineering	2	7	40
Everyday Engineering	16	1	288
Fun Factory	1	7-8	15

Course Name	Courses	Grade	Students
Introduction to Automotive Engineering	1	9-12	16
Intro to Electrical & Computer Engineering	2	7-8	40
Intro to Environmental Science & Engineering	2	7-8	48
Intro to Industrial Environmental Mgmt.	1	7-9	30
Introduction to Vehicle Engineering	1	10-12	15
Learn New Ways of Making Things	1	7-8	15
Learning to Love Engineering through 3D	2	7	50
Mechatronics	1	10-11	18
Plains, Trains and Automobiles	1	7-8	30
Real Life Engineering	1	8-10	45
The Making of the Automobile	1	7-8	15
World of Electrical & Computer Engineering	1	10-11	18
Wonders of Automotive Engineering	2	7-8	43
Total Engineering	39		771
Job Skills			
Communications	1	8-9	25
Technically Speaking	2	9-10	60
Soft Side of Engineering	2	9-12	40
Seeds of Success	2	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	2	11-12	60
College Math Prep	1	12	25
Graphing Methods and Applications	1	9-10	24
High Fives	2	7-8	60
Intermediate Math	2	7-8	60
Lines and Curves	2	8-9	60
Think 3-D Geometry	2	9-10	25
Total Mathematics	59		1,216
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 Blue	1	7-8	15
High School Science & Technology Program	1	9-12	75
Laboratory Science	1	10-11	24

Course Name	Courses	Grade	Students
Physics	1	11-12	30
Physics Around Us	2	8-9	40
Robotics	1	9-10	18
Rockets and Motors	4	7-8	104
Science Fiction	1	8-9	31
The Architectural World	1	10-11	20
The Chemical World	2	8	40
The Forensic Crime Stoppers	12	4.00	252
The Little Engineer that Could	2	K (Pilot)	60
The World of Physics	2	8-9	60
The Wonders of Flight	1	7-8	30
Up, Up and Away!	14	5.00	280
Water World	1	7-8	20
Wonderful World of Light	1	7-8	20
World in Motion	20	5	400
Total Science	75		1670
TOTAL SATURDAY COURSES	226		5,057
Summer Enrichment Programs			
AIM Program	1	11-12	10
ACT/SAT Summer Preparation Course	1	7-12	22
Engineering Summer Program	1	11-12	2
Engineering Summer Residential Program	1	10-11	26
Future City USA	1	7	20
Intro to Electrical & Mechanical Engineering	1	7-8	40
Junior Scholars Program	1	11	1
Lawrence Achievement Summer Enrichment Rewards (LASER)	2	9	32
Math Scholars	2	10-11	32
Mathematics and Laboratory Based Science	1	8-9	32
Minority High School Education Program	1	11-12	9
Minorities in Engineering	2	9-10	28
Paper Vehicle	2	7-8	47
Science and Math for 7 & 8 Graders	1	6-7	56
Summer Enrichment Program (SEPI)	1	7	28
Summer Enrichment Program (SEPII)	1	8	30
Summer Pre-College Enrichment Program	2	9-10	32
Summer Program at Oakland Univ.	2	7-8	60
Summer Youth Technology Discovery	1	6-9	28
The Science of Life: From the Anatomy to Atom	1	9-10	16
Unite '2000	2	8-9	30
Summer Total	28		621
TOTAL SUMMER PROGRAMS	28		621

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

How ChiS&E Came to CPS

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?

How ChiS&E Came to CPS

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

Building a Stellar Program

ChiS&E Chicago Pre-College Science and Engineering Program

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

ChiS&E Chicago Pre-College Science and Engineering 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!

ChiS&E Chicago Pre-College Science and Engineering Program

ChiS&E - Evaluation

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.

*University of Chicago—Center for Elementary Math and Science Education

Thank you!

Chicago Pre-College Science and Engineering Program
P.O. Box 805791
Chicago, Illinois
Phone: (312) 396-4076 Email: info@chiprep.org
Websites:
http://www.chiprep.org
http://www.mylittleengineers.com