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ABSTRACT

This report evaluates the 1996 Connecticut Pre-Engineering Program (CPEP) Summer Science Camp, a 5-week educational program for upper middle school students that emphasizes processes of thinking and development of personal and social attitudes that are appropriate for academic success, especially in the areas of mathematics and science. Qualitative and quantitative methods were used including site visits, interviews, collection of documents, and surveys. Data indicate that the students' response to the summer science camp was very positive. First-time students' perceptions of their abilities was found to be higher than their teachers' assessments while second-time students' perceptions were closer to their actual performance and their teachers' assessments. All students indicated that they wanted to be actively involved in their learning. It is concluded that CPEP is a valuable introduction to high school and college careers in mathematics, science, and engineering for those children who come from disadvantaged minority groups. The report is divided into six sections: introduction; description of the summer program and its participants; analysis of survey data; summary and conclusions with an emphasis on main themes and issues; recommendations for improvements and further development; and biographical sketches. (Author/JRH)

CPEP
Connecticut Pre-Engineering Program

Formative Report

September 1996

by

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Abstract

The 1996 CPEP Summer Science Camp is a five-week educational program for upper middle school children, who live in Hartford, Connecticut. The location for the program is the Trinity College campus in Hartford. The curriculum emphasizes processes of thinking and development of personal and social attitudes that are appropriate for academic success, especially in the areas of mathematics and science. The teachers who work in this pre-engineering program are highly skilled veterans, who integrate mathematics, science, language arts, and counseling and career guidance in a problem solving, hands-on approach to learning. Assessment procedures are coherent with the curriculum, incorporate a pre and post test format, and follow the State's objectives for standards-based curriculum and assessment.

This report is a formative evaluation of the 1996 CPEP Summer Science Camp by Curriculum Research and Evaluation. The process of evaluation included quantitative and qualitative approaches. The principal evaluator made site visits to obtain documentation on ordinary as well as special events, such as daily classes, lunch room activity, Science Olympics, and Career Fair. Analysis of data also included interviews with key participants, collection of documents, and specially prepared surveys of teachers and students.

The data show that the students' response to the CPEP Summer Science Camp is very positive. First-time students' perceptions of their abilities are usually higher than their teachers' assessment. Second-time students' perceptions are closer to their actual performance and their teachers' assessments. Girls' self-assessment is closer to their actual performance level than boys'. All students indicate that they want to be actively involved in their learning. The program promotes parents' participation in the daily and special events. Opening and closing ceremonies, Science Fair, and Career Fair are inspirational. CPEP Summer Science Camp includes a year-long follow-up program.

CRE concludes that CPEP would be a very beneficial educational experience for all children, but it is an especially valuable introduction to high school and college careers in mathematics, science, and engineering for those children who come from disadvantaged minority groups, are poor, and have family histories of underachievement.

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Curriculum Research and Evaluation would like to thank—especially—the school teachers, who participated in the 1996 CPEP Summer Science Camp, for their willingness to share their classrooms and their craft. A special note of thanks goes out to all of the students, for their ever-friendly demeanor and the data they supplied. CRE also thanks the students' parents for agreeing to let their sons and daughters participate in this study. To the administration and faculty of Trinity College: thank you very much for your assistance. Finally, CRE greatly appreciates the opportunity to study CPEP, one of Connecticut's finest educational programs. CPEP is a very fine introduction to the study of mathematics, science, and engineering—for some of the most deserving and truly lovely children. Thank you Glenn Cassis, Beverly Hunter Daniel, and all the staff at CPEP.

All the best.

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CPEP
Connecticut Pre-Engineering Program

Formative Report

1. Introduction

In 1996, the Connecticut Pre-Engineering Program, Inc. (CPEP) received a grant from the National Science Foundation (NSF) to support its 1996 Summer Science Camp at Trinity College: A Summer Enrichment Program in Mathematics and Science. CPEP, Inc. is a collaborative organization of school, business, college and university, government, and community organizations whose main purpose is to increase the number of African-American, Hispanic, Native American, women, and other under represented minority students who pursue college study and careers in mathematics, science, engineering, and technology.

Currently, CPEP operates year-round programs and activities at these Connecticut cities: Bridgeport, Danbury, Hartford, New Britain, New Haven, Stamford, and Waterbury. An important, intermediate goal of CPEP is to encourage historically under represented 8th and 9th grade students to take more challenging secondary school courses after they complete the summer program. The specific concern of CPEP's curriculum is to offer students an integrated, stimulating, and "hands-on" approach to learning science and mathematics. The program also emphasizes study skills, language arts, and career counseling.

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This is a report of the external, formative evaluation of CPEP's 1996 Summer Science Camp by Curriculum Research and Evaluation (CRE). In spring 1996, the principal evaluator met with the program's Executive Director, Glenn Cassis, and members of the CPEP Administrative Staff to discuss the program and the process of evaluation. The main concern of this evaluation is to assess the extent to which the summer program accomplished its goals and objectives.

The goals of CPEP's Summer Science Camp are as follows:

- *To identify, recruit, and enroll Hartford's middle school students with an aptitude in science and mathematics for an intensive enrichment program, thus, stimulating an interest in taking courses in science, mathematics, and engineering;*
- *to broaden awareness of future career options that utilize scientific and mathematical expertise and that potentially offers professional opportunities for under represented minority students;*
- *to offer motivational programs for participants and their parents, including academic guidance, financial aid information, and exposure to the worlds of higher education, business, and industry;*
- *to expand the learner's cognitive skills in language arts, communication, and problem solving;*
- *To strengthen the learner's self-concept and self-esteem through academic and guidance counseling activities;*
- *To demonstrate to students how scientific knowledge is integrated in the process of engineering design; and*
- *to provide opportunities for strong parental support and involvement with the Summer Program and CPEP in order to better encourage students to achieve success.*

The objectives for the 1996 Summer Science Camp Project are:

- *To design and sponsor an intensive, five-week enrichment program during the summer and school year follow-up activities in science and mathematics for under represented minority and economically disadvantaged Hartford students who are entering the 8th and 9th grades;*
- *to identify, recruit, and enroll 45 Hartford middle school minority students with an interest and aptitude for mathematics and science through the help of their parents, guardians, school guidance staff, teachers, and CPEP advisors for the CPEP program;*

- *To offer participants an integrated, "hands-on" and multi-disciplinary learning experience in mathematics, science, engineering, and computer applications during the summer. During the school year, to offer three follow-up sessions taught by college faculty, master secondary school teachers, and college students;*
- *to arrange opportunities for students' parents to participate in field trips, special events, and planning of activities, and to attend workshops on academic guidance, financial aid, and how to support their child for the challenges of higher education and business and industry;*
- *To ensure that each participant completes an academic course of study plan (pre-college focus) by completion of the Summer Program and monitor each student's academic progress during the school year;*
- *to provide participants with the opportunity to come into contact with role models (at least 10) from industry and/or higher education, thereby affording participants exposure to real world application of science, engineering, mathematics, and technology; and*
- *To provide NSF with follow-up data regarding the Summer Program participants and to continue to conduct in-depth program evaluations and other longitudinal studies assessing Summer Program participants' progress and overall Summer Program functioning.*

In sum, the CPEP Summer Science Camp would recruit 8th and 9th grade students from the Hartford Public School District, who come from under represented and poor families, and who have an ability and an interest in science, to participate in an intensive, five-week summer program followed by a year long program that emphasizes an integrated, hands-on approach to learning academic subjects and encourages the youngsters to enroll in college-prep courses when they attend high school. Also, there would be participation by the students' parents, academic and career counseling, and role models.

At the Parent and Student Orientation Meeting of the 1996 Summer Science Project, CPEP started its 10th year of operations in Hartford, where the program began in 1986. Throughout this time, CPEP's base of operations for its summer programs in Hartford has been Trinity College, a private liberal arts college, which is located in the city of Hartford, near

the State Capital. CPEP recruits students from 3 of Hartford's middle schools (Lewis Fox, South, and Quirk) and 4 of its K-8 schools (Batchelder, Burr, Kennelly, and Naylor). At the start of the summer project, there were more than 300 students who were participating in CPEP's regularly sponsored programs at these seven schools.

The 1996 CPEP Summer Science Camp is a highly successful program that introduces Hartford's, upper middle school students to the college preparatory, high school curriculum in mathematics, science, and engineering. The data show that there are substantial differences in first and second-year students' self-assessments, in that second year students' perceptions are closer to their actual performance levels and their teachers' assessments, than first-year students.' Also, students indicated what they perceived to be their areas for additional assistance in mathematics, science, and language arts. Students reported that the CPEP learning environment emphasized hands-on learning, ample opportunity to collaborate with peers, and they were introduced to role models who were African American and Hispanic. The daily and special events constitute a high quality experience for these urban school children, one that should accomplish the program's main goal: to encourage them to enroll and succeed in high school, college-preparatory courses.

Methodology

Methods of data collection and analysis included qualitative and quantitative procedures. On several days, the principal evaluator visited the summer camp at the Trinity College campus to observe and participate in the program's activities. Usually, these visits lasted several hours; there two full days. While present, the evaluator observed and participated in science, mathematics, language arts, and counseling classes; dined with teachers, students, and administrators; observed special events, such as the Career Fair, Physics Olympics, and Last Day Awards Ceremony and Luncheon; reviewed curriculum materials and assessment instruments, and interviewed teachers, students, Trinity college professors and administrators, and CPEP administrators. Also, CRE prepared survey instruments to assess the students' and teachers' perceptions of the students attitudes, knowledge, and skills in science, mathematics, language arts, study skills, and careers.

Organization of the Report

This report of the CPEP formative evaluation has the following organization. In Section 2, there is a description of the summer program and its participants. In section 3 is the analysis of survey data. Section 4 presents the summary and conclusions, with an emphasis on main themes and issues. In Section 5, there are recommendations for improvement and further development. Near the end of the report, there are biographical sketches. Samples of the survey instruments are available from CRE upon request.

2. Summer School at Trinity College

Description of the 1996 CPEP Program

Orientation

On June 18, at approximately 6:00 p.m., in the Mather Student Center at Trinity College, the new CPEP students began appearing with their parents. They walked up the stairs to the second floor, and entered Rittenberg Hall without saying much to each other, and, if so, not above a whisper. Some of the parents brought along other siblings than the one who would enter the program and they all sat in groups as little families. When everyone was seated, there were empty chairs separating these clutches of families. It was evident that very few if any of these people were acquainted with each other.

Beverly Hunter Daniel went to the podium and gave everyone a warm welcome to the 1996 CPEP Summer Science Camp. Then, she explained the program, policies, rules, and schedule. She introduced all of the teachers, who were also present, and the administrative staff of Trinity College and CPEP. In a short while, the students went to a large room with the teachers, and where there were approximately a dozen tables and chairs set up. Their parents remained in Rittenberg Hall for the questions and answers they would have.

Once the students were in the large room, they took their seats without saying much or anything to one another. The teachers, whom none of the students had met previously, provided another welcome and informed them that they would now complete a few exercises and, they would soon discover that it will be very important for them to work together on the solutions to these problems. Then, the teachers passed out the papers with the assignments. The teachers started talking to each other and with the students about the problems. They were playing with the students and the subject matter. Within a few minutes the students were transformed from individuals who seemed not to care who or what was going on, into a lively social organism where every one of them was eager to get to know another person and, then, another person and yet another to solve the problems. Also, someone was constantly asking them, too, for help in solving the problems. They discovered that the teachers were right: the most important solution was having fun with your teachers and fellow

students in science and mathematics. They did so. The orientation and ice breaking events were successful for CPEP's parents, students, teachers, and program administrators. The 1996 Summer Science Camp would begin on July 1 and run through August 2.

Schedule

During a typical week at the CPEP Summer Camp, 8th and 9th graders followed a five-block, flexible, daily schedule, which started at 8:30 a.m. and ended at 2:30 p.m. For example, during the first block on Monday morning, there would be a 2 hour science class, followed by 1 hour of guidance, 35 minutes for lunch, 1 hour of language arts, and 1 hour of mathematics.

On Tuesday, the day would begin with 1 hour of mathematics, then, there would be 1 hour of guidance, a 1 hour presentation by a member of the Trinity College faculty, 35 minutes for lunch, 1 hour of science and 1 hour of language arts.

Wednesday would follow the Monday schedule, except that the mathematics class would meet for 2 hours in the morning and science for 1 hour in the afternoon. Since there was only one set of 5 teachers, the students would swap rooms between classes. Hence, when the 8th grade was attending its 2 hour science class on Monday mornings, the 9th grade was attending a 2 hour mathematics class.

Preparations for field trips and special events, like the Career Fair, took place on Thursdays.

Field trips occurred on Fridays. The 1996 CPEP students took field trips to The Maritime Center at Norwalk, Mystic Marinelife Aquarium's Project "O," the Boston's Science Museum, and Riverside Park.

Curriculum and Assessment

The teachers designed their own curriculum materials and assessment instruments. They produced fully developed, written plans, that are complete with all handouts for practice exercises, enrichment problems, and homework assignments. Each course began with a pre-test to determine the students' level of competency with specific skills, including thought processes, that the teachers had targeted for emphasis in the summer program.

These skills followed the guidelines suggested in the national standards for teaching science and mathematics and the Connecticut Academic Performance Test (CAPT) and Connecticut Mastery Test (CMT). For instance, the science teachers, Mr. Mangini and Mr. Segall, emphasized the following dimensions of science: problem definition, experimental design, data presentation, and drawing conclusions. At the start of the courses, the students received a binder that included most of their reading material for the summer. While delivering their lessons, the teachers would emphasize these processes of thinking, by guiding students' work, and providing numerous examples, demonstrations, and illustrations. Similarly, in their pretests and subsequent classroom instruction, the mathematics teachers, Ms. El-Shaboury and Mr. Hutchins, emphasized various dimensions of the mathematics standards in metric conversions, interpreting graphs, familiarization with the TI-81, and probability.

The language arts teacher proceeded in a similar fashion. Also, he frequently employed figures of speech and anecdotes to give students both puzzlement and mirth. The language arts curriculum included emphasis on reading and study skills, note taking, and composition. An important product for the summer language arts program is the CPEP newspaper, *CPEPers*. It is written by the students in their Language Arts class, under the direction of Dr. Lebetkin. To produce the newspaper, students had the opportunity to select from all of the writing they did during the summer, the one piece of writing that they believed represented their best effort at producing a five paragraph essay. Near the end of the summer, the students proudly distributed their *CPEPers* publication.

Another product of the Language Arts class was a Class Will to the 1997 CPEP summer camp students. The 1996 CPEP Summer Science Class Will follows:

> *We, the undersigned students of CPEP Summer Science Camp for 1996, being of sound mind and body, leave the following items to next year's Summer Science Camp.*
>
> *Natasha leaves the eggs at the egg toss to crack all over next year's students*
>
> *LaAquaddeyia leaves her sense of humor*
>
> *Karina leaves the funny shoes Mr. H wears*

Solace leaves the jelly beans used for the Jelly Belly math problem

Edwin leaves his spirit in every classroom including everything he learned since this was the best program he has been in

Carlos leaves knowledge and fun

Patrice leaves her "big mouth," the will to do what people want, and her craziness

Candice leaves her intelligence and craziness

Gina leaves her learning

Marnie leaves all the funny things she was taught and leaves her loud voice to Dr. L's video

Michelle leaves the will to do whatever one wants in life

Ramary leaves intelligence and the ability to pay attention

Avionne leaves her intelligence and beauty

Mary Alyson leaves the notion that being different from everyone else doesn't make that person weird—just ORIGINAL

Gorilla leaves the fun to be with tutors

Beatrice leaves the caring teachers

Andrew leaves the neon blue CPEP shirts

Jocelyn leaves the smell of the dissected shark

Paul leaves his lateness behind

Ramon leaves the food

Jerry leaves his personality and obedience

Madeline leaves her beautiful smile

Jaianti leaves all her silliness and being funny

Mrs. V, an aunt of one of the students, leaves all the exciting good memories she shared with the Summer campus children from CPEP. She really enjoyed herself the past two days she chaperoned.

In addition to exhibiting the sometimes wacky characteristics of upper middle school and budding high school students, these statements in the will (the same point holds true for the *CPEPers* publication) reveal important elements of the summer curriculum and impart a sense of what the students must have valued and how much they must have grown in the short time they were together with these teachers.

Ms. Senteio, the guidance counselor, proceeded in a less structured fashion than the others. She would develop topics on career planning and development and, with the students' participation, troubleshoot some of the current issues and problems for the adolescent child and American society.

A college professor offered the following appraisal and description of the CPEP curriculum,

> *"I would enjoy taking this program. The teachers have these students take actual scientific measurements in the ocean. The kids get sea sick on the boat. They apply mathematic and scientific analyses. As a result, the students experience what it is like to be a real scientist. They know the field at that level, and not just the theoretical perspective."*

Despite the different emphases, every aspect of the summer curriculum was integrated into the whole picture of meaningful, worthwhile academic study and had some kind of relationship with careers in science, mathematics, and technology. Whether the specific topic was the laser beam or the SQ3R study technique, the teachers always found a way to link these elements together into a coherent and operational curriculum design.

Science Olympics

One means through which apparently disconnected elements of the curriculum came together for many students was the Science Olympics, which was held on July 31, 1996. (Incidentally, this is the year when the United States hosts the summer Olympics in Atlanta, GA.) After the opening ceremonies during which the teachers clarified the rules and helped students form their teams, they all went outside and began the events of the day. In small groups, which were identified by different nations, the students rotated on the hour from one location for events to another, until they had all completed the four contests.

Each location had a constellation of sub-events and using teamwork for solving the timed problem was essential for success. To explain further, at Location 1, students would do a stair walk, cantilever, and metric approximation. Then, at Location 2, students would engage in a slow bicycle race, egg toss'n'catch, and frisbee salad. At Location 3, students entered the mind bender, dimensional analysis, and brain teaser events. Finally, at Location 4, they made the straw structure, paper airplane, and aluminum boats. Each event constituted a set of problems and each team received a number points for their solutions to the problems. To solve these problems, students had to draw upon and interrelate the disciplines of mathematics, science, and technology.

Language arts received emphasis through the skills of reading, writing, listening, and note taking. Cooperation and collaboration were essential elements. At the end of the day, the teachers totaled the points awarded to each team and presented an awards ceremony. Everyone received some kind of award.

At the CPEP Science Olympics, the students experienced the joys of excitement, teamwork, and discovery in the learning process. There was laughter at pratfalls, shouts of encouragement, and screams for the joy of winning. The teachers took pleasure in observing how these students, who only a few weeks earlier at the orientation session, found it so difficult to say anything to one another, were now constantly helping each other and their groups to realize success. A light rain fell on the day of the Science Olympics, but it did not deter the program or dampen the spirits of the contestants and officials.

Career Fair

On July 18, CPEP held its second annual full day Career Fair, which was sponsored jointly by the National Society of Black Engineers and CPEP. The keynote speaker was Dr. Pamela McCauley-Bell, Professor of Engineering at the University of Central Florida. Also, there were 12 different workshops conducted by men and women from different ethnic minority groups, who represented major business and industry, such as Hamilton Standard and Monsanto. Each student received a career packet that included handouts, brochures, and booklets that provided advice on many items dealing with attending college, including lists of college prep courses for high school, scholarships, organizations, and highly recommended colleges and universities. Near the end of the day, there was a demonstration of physics and technology by the Chairman of the Physics Department at Trinity College, and a question and answer session. Students' active participation, general enthusiasm, and comments and questions indicated that the program was very well-received by them.

Teachers

The men and women who taught in the CPEP Summer Science Camp (Esther El-Shaboury, math; Doug Hutchins, math; Dr. Peter Lebetkin, English; John Mangini, science; Robert Segall, science; Charlene Senteio,

Guidance) are veterans of the classroom. They have been teaching for more than twenty years (Mangini and Segall have taught in CPEP for 10 years). They are experts in their subject matter speciality. They know very well the psychology of the middle and high school child. They are exemplars of the teaching method. In their home school districts and statewide, they are seen as model teachers who are actively involved in their own professional development and their colleagues'. One is a Presidential Award winner. One has a doctoral degree. Their credentials shined every day in the CPEP classrooms. The students were obviously impressed in very positive ways. A professor of engineering had this to say about the teachers,

> *"They are terrific teachers. I sit in on their weekly meetings. They know the strengths and weaknesses of every student. They come out of a different culture than we do and it is fascinating to watch them at work."*

During lunch and between classes, the teachers sought each other out for discussion of their professional interests, engaged in playful antics, and came together for a good time. Faculty morale was very high. Occasionally, there was some kind of issue to resolve, and as soon as they were all together for lunch, they would shift into a serious mode, solve the problem, and return to having some fun on the job. Throughout the summer camp the teachers conducted themselves in a highly professional manner, thus, giving the students continuous association with positive role models for their adult lives.

One of the teachers had this to say about the CPEP Summer Science Camp.

> *"It's a bridge that provides continuity from one school year to the next at a time in a child's school career that is somewhat difficult to negotiate. Also, CPEP reinforces the process of education for these kids. It places less emphasis on mastery of content than on full engagement in the learning process.*
>
> *We (teachers) help the students to work together as a multi-cultural group. We ourselves are a diverse group of men and women from different races and ethnic groups. We organize groups of different individual students for collaborative problem solving sessions. This grouping practice is an important accomplishment of the CPEP program.*
>
> *We emphasize studies for enrichment and activity-based or*

hands-on learning. Since the curriculum is not organized strictly by the subjects, the kids don't hit all the content areas of math, science, and language arts, but what we do in this program as a process may impact on them later. They will be familiar with the general territory known as intellectual inquiry. As a result, they will make connections more easily between science, mathematics, and technology and they will do this academic work with energy and enthusiasm.

For the kids who go through this program, you could say that they might be successful without it, but CPEP helps to ensure their success. They will go to their high school with a positive attitude about science, mathematics, and communication. They won't do like too many of their peers—shut down their personal selves at the start of the school year as freshmen. That kind of response to high school often leads to failure and drop out. In the least, it contributes to under achievement, which is what these students have been doing for too long now.

As a team, we present an integrated curriculum. To give an illustration of our teaching methods, if one of us is doing something with the students in one way, in the next minute the other teacher might do it from a different direction and, thus, have a dual impact on the students. In general, we always try to provide the CPEP students with the dynamic appeal to science and mathematics that most students don't experience in their normal school career. Also, we provide a performance-based assessment program. Our approach is to help the students to focus on the content to solve problems, rather than to just 'learn' the content in isolation."

The teachers taught in teams and independently. For example, when the language arts teacher had one half of the 8th graders, the guidance counselor had the other half. The two mathematics teachers team-taught whole groups of 8th graders and 9th graders. During their teaching, they each took responsibility for different topics. When one was teaching, the other was providing assistance to individuals and small groups. Often, the back-up who was working the small groups and individuals would jump in with a statement of clarification or example for the whole group. Occasionally, to add interesting digressions, they would engage in intellectual discourse with one another on a specific aspect of the day's lesson. The science teachers did likewise. Then, during their labs, both of the science teachers roamed independently from group to group or from one individual to another to provide assistance to the students. At least once each week, the teaching staff met formally to discuss the program,

curriculum, students' needs, and their practice of teaching.

At the closing ceremony, one of the teachers had this to say to the parents, fellow teachers, CPEP administrators, and especially, students:

> *"This is the 10th year of the CPEP program. As you have discovered, we are not a collection of isolated individuals and programs. Also, we are connected to you now and for always. You are connected to us for high school, college, and beyond. We will always be with you. This message comes from the Trinity College staff, the teachers, like myself, and everyone else that you see around you. It is not for everyone to make history, but to be a part of history. You will be a part of the CPEP history. The chemistry of this group is very fine. Five weeks ago, you were all different and separate individuals. Now you are learning together."*
>
> *"To the parents I would like to say: we had a great time working with your sons and daughters. Thank you very much and good luck to all."*

Observation and interview data indicate how the curriculum ties into the goals for the summer science program. The teachers emphasize students' motivation to learn and pursue a college-preparatory high school curriculum; expand their cognitive skills in language arts, communication, and problem solving; strengthen their self-concept; and demonstrate how scientific knowledge is integrated in the various fields of engineering. As the above quote indicates, the program makes a serious effort to get parents involved in the education of their children for lifelong learning.

Tutors

There were six college-level tutors, who provided technical assistance to the teachers and tutored students. They are Walddir Alvarez, Eric Badros, Tanya Jones, Barnarado Navarro, Ramón Paguada, and Wendy Tseng. Teachers, students, and CPEP administrators said that the tutors, a diverse group, provided valuable assistance to the program. They also presented positive role models for the urban students.

Students

The total number of participants who enrolled in the 1996 CPEP Summer Camp was 46. Of this number, 63% were female and 37% were

male; 46% were entering the 8th grade and 54% would enroll in the 9th grade in fall 1996. General observation revealed that the summer program enrolled a substantial number of children from each of the ethnic and racial groups targeted by the CPEP. (CRE has no specific data on the students' race or ethnicity.) The average age of the students who enrolled in the summer program is 13.2. The specific analysis of ages of these students is as follows: 12 years old (12%), 13 (46%), 14 (33%), and 15 (4%). A large majority of the students (72%) indicated that this was the second time they enrolled in the CPEP program.

Trinity College

For ten years, Trinity College has served as the base for CPEP's summer science program. Throughout this time, Naomi Amos has served as the Trinity College liaison with CPEP and its on-site administrator. Her Trinity College colleagues and the CPEP teachers and staff recognize Ms. Amos as "a really good administrator." A department chairperson said,

> *"Naomi is very careful in all she does to help CPEP and she has made it a big win for the College. She makes sure that the higher level administrators and other college faculty are fully informed about CPEP's operations."*

Nina Lynch, also on the staff of Trinity College, served as administrative assistant to Ms. Amos.

At a general level, Trinity College provides the urban students with an opportunity to negotiate a college campus successfully at an impressionable time in their lives. During the five weeks of summer, these youngsters see that the college environment, while different from their neighborhoods, is nonetheless appealing because of its rewards for academic study, stimulating architecture and landscaping, and congenial atmosphere. On this point, one of the Trinity College administrators said,

> *"Just being present on a college campus, learning to negotiate it, makes these students realize that they can go to college some day. They longer see it as an alien place."*

At a more specific level, Trinity College contributes classroom space, computer facilities, playing fields, science laboratories, the expertise of its faculty, copy services, administrative assistance, tutors, and the lunch room. Different members of the Trinity College faculty make formal

presentations to the students on aspects of engineering, such as laser technology, and blend into their lectures relevant aspects of various sciences and mathematics. Faculty from different departments in the liberal arts attend the formal events. The Chairman of the Engineering Department is very strongly committed to supporting the CPEP program.

There are also benefits from the CPEP summer science program for Trinity College. In explanation of this point, a professor of engineering said,

> *"We get to meet these kids who live in Hartford. In that way, CPEP calibrates reality for us. We are better able to understand the academic difficulties of disadvantaged minority students, when they come to the college. It also helps us with writing grant proposals, in that we can apply to NSF for money to purchase equipment that will be useful to this program. Also, CPEP gives me a chance to help some of my regular college students. For instance, last year, I announced in my classes that CPEP needed tutors and that it would be a great way to help others. I also said it would be a good way to improve on the college students' knowledge in science and math. Two of my students came up to volunteer. They were struggling in the course I was teaching. This tutoring work was good for them in many ways."*

Participation in the CPEP program is one way in which Trinity College expresses its commitment to the city of Hartford. In return, the College not only maintains its image as a good citizen, but also its faculty and administration gain firsthand knowledge about the current educational challenge and the opportunity offered to all colleges and universities by disadvantaged students.

CPEP Administration

Glenn Cassis is the Executive Director of CPEP. Beverly Hunter Daniel is the Director of CPEP's Summer Science Camp. Cheryl Devokaitis serves as Administrative Assistant. And Lisa Pizzoferrato is the Clerical Assistant. These different individuals exercise substantial effort and sacrifice to make the CPEP program work for the students. For example, when students are unable to get to the program, Ms. Daniel picks them up in her personal car.

The CPEP administrators were often present for the luncheon period, make periodic visits to classrooms, and attended all of the special events,

such as the Science Olympics, Career Fair, and opening and closing ceremonies. They created a professional atmosphere for the CPEP summer program that has a wholesome, personal basis. For instance, during the closing ceremonies, especially the outdoor luncheon, CPEP teachers, students, administrators, board members, and parents mingled on the Trinity campus lawn in a relaxed, personally comfortable way. Students asked their CPEP teachers and administrators to pose for pictures with their parents. Administrators chatted informally with parents, students, and teachers. Everyone had a very good time.

During the formal, closing ceremony, Glenn Cassis expressed his sincere appreciation to the CPEP staff, teachers, Trinity College administration and faculty, the tutors, and all other participants for helping make the 1996 program a success. He reminded everyone that the teachers and students went from their regular school year directly into the CPEP program, because the heavy snow fall of the past winter took away all of their vacation time. He thanked Ms. Hunter for all of the work she did to organize and manage the program so well. To the youngsters, he said, "Hug your parents."

Then, he told a true story about an Olympic rower, whose wife was pregnant and expecting to deliver their child at the time the games would begin. The young man decided not to compete, and instead to remain home with his wife and watch their child be born. In later years, this child went to the Olympics and won the gold medal. Then, the son gave his gold medal to his father, who he knew had given up his chance to compete in the Olympics. Then, Mr. Cassis said to the CPEP students,

> *"You have made a sacrifice. By devoting your summer to the CPEP Science Camp, you have made a decision for your future. You should realize that the benefits will be a long way down the road. Enjoy what you got from CPEP—the new friends, exciting teachers, the chance to be on a college campus. Appreciate all of these wonderful things. And remember always: that many good things in life entail sacrifice. Most of education is like that."*

The closing ceremony, including the awards and recognition for students and teachers, gave a warm and meaningful touch to the CPEP Summer Science Camp.

4. Summary and Conclusions

The 1996 CPEP Summer Science Camp is accomplishing its goals and objectives at a very high level. Qualitative and quantitative data show that the students' are very pleased with the program. The curriculum offers the youngsters a highly interesting and appealing program for any time of the school year, but especially the summer vacation. The teachers—who are highly skilled veterans in their craft—integrate the disciplines of mathematics, science, and language arts into a problem solving, hands-on approach to learning. The daily schedule is varied and flexible. Also, it presents a substantial emphasis on the students' learning of essential, academic skills through solutions of real world issues and problems. Team work, or collaboration with peers, is an important element of every activity. Counseling and career guidance opportunities introduce the youngsters to new ways to solve or cope with local problems and to find new directions in life.

Special events include the Science Olympics, Career Fair, and field trips to science exhibits, museums, and parks. In each of these special activities, students receive a different and more challenging introduction to the knowledge of mathematics and science as an essential element of so many modern careers, in particular, and of life, in general. Parents receive encouragement to participate in daily and special events. Some do so, but most have other obligations. The opening and closing ceremonies are heartwarming, revealing affairs, that are very similar to graduation ceremonies. Students seek their teachers, for whom they have very high esteem, for photographs with their parents. Throughout the five weeks of intensive schooling, the students are introduced to numerous men and women, who are African American or Hispanic, and who represent different, major U.S. engineering business or industry.

The only issue CRE found concerned bus service. Apparently, it is sometimes difficult for the bus to reach every child's home who would participate in the program. There have been times when the program's director, Ms. Hunter Daniel, would pick up children in her personal car on the way in to work. There were minor complaints regarding the food service and classroom space (classroom is too small for mathematics), but these concerns were resolved.

5. Recommendations

CRE offers the following recommendations to CPEP for its future development.

- CPEP should seek additional support from private and public funding agencies.
- Locate mathematics classes in a larger room, with tables and chairs in place of student desks.
- Provide follow-up activities to assure students of the additional assistance they will need in mathematics, science, and language arts while in high school.
- Look for opportunities or devise an additional program to articulate the CPEP curriuculum and instruction with the Hartford public schools and teachers.

6. Biographical Sketches

Curriculum Research and Evaluation is a firm that is devoted to research and development of programs in the field of education. CRE's specialities are: to provide services in order to evaluate the quality of education programs for private business and industrial companies, public and private funding agencies, and schools; and to develop and guide the implementation of curriculum and instruction.

Charles Bruckerhoff is Principal Evaluator and Research Associate for Curriculum Research and Evaluation. He received his doctorate from the University of Wisconsin. His research interests are curriculum theory and development, philosophy of education, effects of public policy on the classroom teacher, and school restructuring. He is the author of *Between Classes: Faculty Life at Truman High* and has written articles on curriculum development, qualitative research, urban collaboratives, and disadvantaged youth.

Theresa Bruckerhoff is Operations Manager and Research Associate for Curriculum Research and Evaluation. She has a Bachelors in Elementary Education and a Masters in Curriculum and Instruction. She has sixteen years of teaching experience ranging from preschool to the middle school levels. She taught in gifted programs, special education programs, and is an experienced classroom teacher. She has held executive board positions for child care centers and a nursery school. Currently, she studies state and national programs for teachers' professional development and school restructuring.

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