

**THE SMARTE ENRICHMENT PROJECTS:  
SUMMER ACADEMY FOR MIDDLE SCHOOL TEACHERS**

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## SUMMARY

The Southeast Michigan Alliance for Reinvestment in Technological Education (SMARTE) is a consortium of community colleges, school systems, Wayne State University, and businesses in southeast Michigan formed in September 1993. The alliance exists to promote communication and cooperation among its partners to address mutual needs pertaining to education of technological workforce. The specific mission of this virtual center is to collaboratively focus on restructuring product design curricula and teaching practices with authentic activities in an application mode.

In the fast changing world of science and technology, there exists a need for an integrated education experience for middle school students so that students and their parents and teachers appreciate the fact that technical education provide viable careers. Students at the middle school level should be nourished to become talented technicians and engineering professionals as they proceed into the world of technological development. One of the important activities of the consortium is to organize enrichment activities of middle school teachers and counselors, known as Summer Academy for Teachers.

Curriculum is designed for teaching middle school teachers and counselors. In a laboratory based setting, CAD/CAM, computers and programming, manufacturing, and electrical/electronics are taught by a team of faculty members from school system, community college, and WSU. In our first phase, a group of 12 teachers participated in pilot setting of a two week summer session at WSU. This paper shares the curriculum components, teachers' learning, laboratory setting, teacher perceptions of technical curricula, and lessons learned. Additionally, this brief report identifies and compares outcomes of this enrichment activity for middle school teachers and counselors.

## INTRODUCTION

Based on the 1986 report, A Nation Prepared, there is a direct link between economic growth in the United States and the skills and abilities of the people who contribute to that growth [4]. The US Bureau of Labor Statistics reports that under represented groups including women will constitute nearly 70% of the new entrants into the labor force by the year 2000 [5,6]. Population projections indicate that the non-white racial and ethnic groups will constitute an increasing percentage of the total US population in the next century. Demographic realities manifest an urgent need for intervention to assist and promote the representation of all people and especially under represented ethnic and racial groups and women in careers that contribute to society through education, creation of new learning environments, and transfer of skills to future generations.

Public Law 99-383 gives special, directed purpose for increasing the representation of under represented groups in the areas of science, engineering, and technology. The task force established under the auspices of the legislation reported the following: America faces a shortfall of scientists and engineers by the year 2000; and these shortfalls can only be met by utilizing all of our nations' talent, i.e., women and under represented ethnic/racial groups [7,15,16,17].

The Southeast Michigan Alliance for Reinvestment in Technological Education (SMARTE) is a consortium of community colleges, school systems, WSU, and businesses in southeast Michigan formed in September 1993. The alliance exists to promote communication and cooperation among its partners to address mutual needs pertaining to education of the technological workforce. Its mission is to work collaboratively in a virtual center that focuses its efforts on restructuring of product design curricula and teaching practices in mathematics and science with integration of authentic activities in an application mode [1,2,3,18,19,20,21].

During the last three years, nine enrichment programs for middle school students were organized by the consortium. After two years of successful programs for 8<sup>th</sup> grade students, a new component was introduced in the program. This paper explains curriculum components, teaching pedagogy, recruitment of teachers and counselors in the program called Summer Academy for Teachers, impressions of participants, and other lessons learned to address the pipeline issue of the technical workforce.

## **ENRICHMENT PROGRAM**

In today's technology based environment, technical programs, both at associate and baccalaureate levels, can benefit in many ways from integrated education [8,9,10,11]. Instruction in technical education calls for urgent attention to preparing proficient technicians, technologists, and engineers for the scientific and technological world. As a result, there is an urgent need to look at the technical curricula in order to decide on the foremost ways to integrate basic sciences, mathematics, computers, and communications to make technical discipline more inviting. This should be extended to K-12 education as well. Various models are presently available to give contemporary students applied scientific knowledge to prepare them to face the demands of a technological environment [11].

The SMARTE Enrichment Program was developed and taught jointly by a team of faculty and educators from WSU, Oakland Community College, Wayne County Community College, Schoolcraft College, and Detroit Public Schools. The primary focus of the project is to increase student interest in technical disciplines. A curriculum was designed for 8th grade students to

explore applications in engineering and technology. This program was extended to middle school teachers and counselors. A first pilot program, for two weeks in June 1998, was organized at WSU. The curriculum involved 90 minute long lab based sessions on computer programming, electrical/electronics, CAD/CAM, and manufacturing. Table 2 shows a typical program for whole day. Table 3 shows enrichment program participation by 12 teachers and counselors from middle schools.

## **RECRUITMENT OF TEACHERS**

Initially, a colleague from the WSU College of Education contacted principals/counselors at each middle school that was targeted by this project. For the program, about 130 letters of invitation were mailed to principals, teachers, and counselors at the area middle schools from where 8<sup>th</sup> grade students attended our enrichment programs. The following information was also sent: SMARTE Brochure, SMARTE latest newsletter, table showing the full curriculum and activity, orientation program, application forms, applicant essay forms, and a table showing benefits to different subject area teachers. Our goal was to provide this enrichment activity to teachers and counselors so that they become ambassadors promoting technical careers to students and parents. Also, the invitation letters were signed by faculty members from Engineering Technology and Education. About ten days prior to the application due date, telephone contacts were made with each middle school.

## **WORKSHOP ORIENTATION PROGRAM**

Upon selection of teachers and counselors, letters were sent to principals of middle schools. A special orientation program was organized as shown in Table 1. This was an important opportunity to publicize the fact that technical education provides a viable and exciting career. A film, viz., Skill Trades and Engineering: Explore the Possibilities, was shown as part of the program [12]. Many teachers and counselors had not visited technical laboratory facility in a university and this was our opportunity to promote technical programs as well as other opportunities our institution provided.

There was a lot of informal interaction with teachers pertaining to their schools, technical career paths, etc. Participants were also given a separate packet of information containing class schedules, room numbers, faculty/teacher names, and coalition

contact persons. Participants were required to sign release forms to allow use of their pictures and names in our publications. Each teacher/counselor was provided a T-shirt which displayed our logo, list of participating institutions, and NSF support recognition.

## **TEACHER PERCEPTIONS**

At the end of first week, participants filled out an evaluation form for each and every class which was used by the faculty to revise the content and pace. At the last class of the program, each teacher/counselor completed an assessment of their perceptions of the enrichment program. Table 4 contains specific answers for all four knowledge areas. Almost all the comments and evaluations were positive. In general, participants were very impressed with their exposure to technical disciplines. Some asked if they would be invited to a similar program again.

For the twelve teachers/counselors who participated in the academy, an award ceremony was organized at the conclusion of the program which was well attended by participants' school administrators. A group picture of teachers/counselors, their school administrators, and faculty/staff was taken for publication on the web page (<http://ozric.eng.wayne.edu/smarTE.html>). Participants were invited to contact faculty and staff for career information. Four participants volunteered to enrolled in a course that awarded 2 graduate credits and paid tuition personally. Each participant received a \$200 stipend for involvement in the academy and was provided with lunch coupon for use in campus restaurants.

## **CONCLUSIONS/RECOMMENDATIONS**

In the era of declining enrollments and tremendous need for technically trained personnel, it is very important that the engineering and technology faculty take on this task of spreading the message that technical education provides viable and exciting careers. A major challenge for professional curricula is to develop an appropriate response to the rapid advances in technology and needs of the workforce, an aging technical workforce in Michigan. Suitable curricula should provide students with a solid purpose to pursue new challenges. With a view to serve the needs of the technological community, this activity was

conducted using existing models that were tailored to make middle school teachers and counselors as our ambassadors.

The curriculum presented to middle school teachers and counselors as well received. There were concerns on part of faculty about our ability to teach middle school teachers and counselors and our ability to explain the technical subject matter. In some sessions, some faculty had to reach out for additional things to do beyond what was planned. Since the teaching was taking place in lab setting, it was not difficult to introduce additional material. About 2-3 additional faculty and graduate students were available to help the subject area lead faculty. General consensus was that if middle school teachers and counselors are exposed to more technical skills and knowledge, more they were willing to learn. We did not observe boredom among them.

It is equally important that our faculty continue to work with school teachers to address and explore techniques for similar models to be used in school systems.

## **ACKNOWLEDGMENTS**

The authors would like to thank the following for their very valuable contributions and dedication in developing various curriculum components and this program: Cora Eubanks, Vanessa Spencer, and Gary Gold from Detroit Public Schools; Catherine Ferman from Schoolcraft College; Rahmatollah Golshan from Wayne County Community College; and Lisa Anneberg, Larry Herrick, Akihiko Kumagai, and Chih-Ping Yeh from WSU. Special note of appreciation goes to our graduate students, Julie Brown and Babushanker Sambamoorthy for taking care of so many details. This paper is based on a project funded by the National Science Foundation's Advanced Technological (ATE) Program Grant # 9752024.

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**Table 1. First SMARTE Summer Academy for Teachers - Orientation Program**

Place: 2020 Engineering Technology Building Wayne State University	
Time: 7:00 pm	Date: May 27, 1998
<b>Agenda:</b>	
Welcome	Joella Gipson, WSU
Purpose	Catherine Ferman Schoolcraft College
School Perspective	Cora Eubanks Detroit Public Schools
Industry Perspective	Frank Vassallo, Ann Hobbs, UAW GM
Film	Careers in Engineering & Skilled Trades, UAW GM
Academic Guidelines	Joella Gipson, WSU
Lab Tour	Chih-Ping Yeh, Larry Herrick, WSU

**Table 2. First SMARTE Summer Academy for Teachers - Daily Schedule**

	First Day	Last Day
8:30 am	Registration	
9:00 am 10:20 am	CAD/CAM Vanessa Spencer	Same
10:30 am 11:50 am	Electrical/Electronics Chih-Ping Yeh	Same
12:00 pm 12:50 pm	Lunch Joella Gipson	Same
1:00 pm 2:20 pm	Computer Lab Lisa Anneberg	Same
2:30 pm 4:00 pm	Manufacturing Lab Akihiko Kumagai	Same
4:10 pm 4:30 pm		Award Ceremony

**Table 3. Enrichment Program Participants**

Allen Park M S	Patricia A. Haynes
Baptist Park School	Cindy A. Briles Donna G. Cowen
Courtis E/M S	Leah C. Freeman
Earhard M S	Delora A. Rosser
Holmes M S	Cari P. Cibirka
Inkster M S	Spencer Grant, Jr. Phyllis E. Martin
Paul Robeson Academy	Vonda Walker-Gwynn Everett C.J. Whitfield
Remus Robinson M S	Robert Banaszak
University Public S	Jerry B. Jones
3 Males 9 Females	4 Whites 8 African Americans

**Table 4. Benefit to Subject Area Teachers**

Subject area	Computer	CAD / CAM	Electronics	Mfg
Technology	yes	yes	yes	yes
Math	yes	yes	yes	yes
Science	yes	yes	yes	yes
Language Arts	yes	yes	-	yes
Social Studies	yes	yes	-	yes
Physical Ed	yes	-	-	yes
Music	yes	yes	yes	yes
Arts	yes	yes	yes	yes
Computer	yes	yes	yes	yes
Foreign Language	yes	-	-	yes
Home Economics	yes	yes	yes	yes

**Table 5. Workshop Evaluation Summary**

Number of Responses: 10

1. How did you like the program ?	Unsatisfactory %	Satisfactory %	Good %	Very Good %	Excellent %
Computer Lab	0	0	10	40	50
Electrical/Electronics	0	0	10	40	50
CAD/CAM	0	0	0	30	70
Manufacturing Lab	0	0	20	40	40
2. What have you gained from the workshop that you can use in your classes?	<p>(a) I have gained confidence about myself. I feel I can bring this attitude and be a better teacher in my classroom.</p> <p>(b) A better appreciation of the unlimited possibilities in the technology, and specifically a much better understanding of computer operation.</p> <p>(c) A lot.</p> <p>(d) How to create a web page. Power point: I had it on my computer and did not know what it was.</p> <p>(e) Valuable information on integrating real life applications of math and science.</p> <p>(f) Able to work on Internet.</p> <p>(g) Knowledge.</p> <p>(h) Patience, patience, patience.</p> <p>(i) The ability to use the Net, the ability to use CAD, and its functional to keep.</p> <p>(j) Computer classes helped with new knowledge such as power point and Internet that I can use in instruction.</p>				
3. What class was most beneficial? Why?	<p>(a) Electrical because I was so weak in understanding that and yet I am supposed to teach it.</p> <p>(b) All classes were interdependent and supported one another (2).</p> <p>(c) Computer because I could use a lot of it in my class (4).</p> <p>(d) Computer and manufacturing although all the classes were enjoyable. Both classes introduced new concepts that I can use in my class.</p> <p>(e) CAD/CAM because I did not know anything about it and I really enjoyed it. Also, electronics, we teach it at our school.</p>				
4. What did you like the least?	<p>(a) I have no complaints about any of them (2).</p> <p>(b) Not enough time in some subjects (2).</p> <p>(c) The fourth day of robotics.</p> <p>(d) Lots of information in a very short time (2).</p> <p>(e) It was hard to keep the group together as all of us worked at different pace.</p>				

<p>5. What are your suggestions to enhance SAT activities in the future?</p>	<p>(a) Keep doing activities which will be useful in our classrooms.  (b) Extend the length, possibly add a third week.  (c) Keep the same instructors, they were very good.  (d) I thought it was a great experience. I learned a lot and all the teachers were very helpful.  (e) Periodically send updated newsletters to participants and have more workshops for teachers who have attended this program.  (f) Use of a demo table for certain instructors.  (g) Bring us back each year.  (h) Have coffee and cookies in the morning.  (i) I think the counselors should be involved because they ultimately guide students towards their careers.  (j) Relate more to education and ask teachers to help you integrate SMARTE into the classroom.</p>
<p>5. Comments/Suggestions:</p>	<p>I am very grateful for this opportunity and would like to thank the instructors, assistants, and staff of Div of Engg Tech. This was truly one of the best learning experiences I have had in 26 years on the job.</p>

### BIOGRAPHY OF AUTHORS

**Mulchand S. Rathod:** Mulchand S. Rathod, Ph.D., P.E. joined WSU as Professor and Director of the Division of Engineering Technology in 1987. He earned his B.E. (Mechanical) degree from Sardar Patel University in 1970; and M.S. in 1972, Ph.D. in 1975, both in Mechanical Engineering from Mississippi State University. At WSU, he has been instrumental in starting four new undergraduate and a graduate program. He established student chapters of SME and Tau Alpha Pi and is the founding leader of the Professional Order of Engineering Technology (POET).

His prior appointments include State University of New York at Binghamton, Tuskegee University, Jet Propulsion Laboratory, and IBM. A registered Professional Engineer, he is active in ASME, SME, ASHRAE, and ASEE. He has served as a Commissioner on the TAC of ABET. A holder of numerous publications and inventions, he is listed in several Who's Who publications. He was awarded the 1995 Dedicated Service Award and 1998 Ben C Sparks Medal by ASME and Certificates of Recognition by NASA and IBM for technical innovation. Also, a recipient of numerous grants and contracts and a Fellow of ASME, Dr. Rathod is a nationally known leader in Engineering Technology education arena.

**Joella Gipson:** Joella Gipson, PhD, is a professor in

the College of Education at Wayne State University since 1972. Her special academic areas include mathematics education, curriculum and instruction and computers. She serves as a Co-Director of Students' Opportunities in the Sciences, a program for 7<sup>th</sup> grade girls in mathematics, computers, physics and astronomy funded by the National Science Foundation. She is a member of the SMARTE Project for parents and 8<sup>th</sup> grade students in computers and engineering principles.

Dr. Gipson served as an administrator, mathematics department chairperson and teacher in the Los Angeles Unified School District during the period 1960-69. She received a baccalaureate degree from Mount Saint Mary's College, a master's degree from the State University of Iowa, and a doctorate degree from the University of Illinois. A Fullbright Scholar, Dr. Gipson is a member of several professional organizations for mathematics teachers.