Successes of an Engineering and Technology Institute for Secondary School Teachers

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Successes of an Engineering and Technology Institute for Secondary School Teachers

Abstract: The future of any country lies in the ability to use its resources to build a strong and competitive economy. The most important resources of any country are the young men and women still in secondary schools. Objective is to increase the awareness and interest in engineering and technology among this group. By introducing students to the type of work engineers do and by showing them how the principles of science are applied in the real world, students will have a greater appreciation of science and technology. Pilot teacher training workshop was held during July of 1995 at the University of Arkansas, Fayetteville. During the workshop, the teachers learned about engineering concepts and the role of engineers in society. A workbook of suggested engineering discussions and activities was developed and presented to each of the participants at the workshop. At the end of each session an evaluation of the experiments, such as difficulty level, relevance, concepts learned, and feasibility of conducting similar experiments in schools was done. The results of the evaluation are highly encouraging. This report describes the Institute, educational materials developed, evaluation procedure, and evaluation result as well as how to access the education materials.

1.0 Introduction

The future of any country lies in its ability to use its resources to build a strong technological base. One of these critical resources of any country are the young men and women in secondary schools. Objective is to increase the awareness of and interest in engineering and technology

among this group. Our goal is to create a more technologically literate youth. A by- product of this goal is to motivate students to pursue careers in engineering.

The question that arises is what approach is required to bring technology awareness to middle, junior, and high schools students. Who will be the partners in accomplishing this task? One of the group identified as potential partners are the science and mathematics teachers in schools who are in direct contact with the students. With this objective in mind, The Summer Institute for Engineering and Technology Education was founded at the University of Arkansas, Fayetteville.

This report describes the Institute, the pilot teacher training workshop, the materials development process for the workshop, the methodology used to evaluate the Institute, and evaluation results. Instructions to access the workshop activities, career guides, lab exercises, materials required to perform the lab experiments, sources for the materials, and career guides are also included.

2.0 Motivation

The authors of *Science for All Americans* [1] state, "The terms and circumstances of human existence can be expected to change radically during the next human life span. Science, mathematics and technology will be at the center of that change causing it, shaping it, responding to it. Therefore, they will be essential to the education of today's children for tomorrow's world."

This tells us that the future of America's global competitiveness depends upon a well-educated, technologically literate workforce. The key to developing this workforce lies in our ability to teach our youth about the importance of science and technology in our rapidly-changing, rapidly shrinking world. Careers in engineering and technology are the fastest growing fields in the United States. For example, *Money* magazine projects a growth of 112% for computer engineers in its annual career survey [2].

Recent studies indicate that students lose interest in science courses in junior high and high school. In a study that tracked 1982 high school seniors, it was revealed that only 23% were interested in science and engineering disciplines in their senior year. Only 24% of high school sophomores were interested in engineering and technology. Only one half of the students surveyed thought that science would be useful to them in the future, and less than one third thought that they would pursue a career in science. Enrollment in undergraduate engineering programs also shrunk 17% in the last decade [4]. It is not surprising that many young people are unaware of the excitement and the wonderful careers that engineering has to offer.

There is strong urgency to introduce engineering at an early age. According to David Schwartz of The Society of Automotive Engineers, "It is important to get young people aware of and interested in engineering at an early age. As children get older, they feel engineering is something they're not capable of doing [3]." There is a need to create an interest in engineering amongst students and project engineering as interesting, fun, and relevant to everyday lives.

Recognizing the importance of engineers, mathematicians, and scientists, the state of Arkansas has developed the Arkansas Statewide System Initiative - a bold attempt to change mathematics and science education systematically in public schools.

The Summer Institute for Engineering and Technology Education has identified several potential groups and other voluntary organizations who would build on this Arkansas Statewide System Initiative and be partners in projecting and promoting engineering. Of these groups, the science and mathematics teachers are the ideal choice because they are directly involved with the students and bring science and mathematics to classrooms. Public school science and mathematics teachers will be the catalysts for motivating students to pursue careers in engineering and technology. Unfortunately, few teachers have expertise and resources to introduce engineering into their curriculums.

3.0 The Summer Institute for Engineering and Technology Education

The Summer Institute for Engineering and Technology Education will introduce middle, junior high, and high school teachers to the principles of engineering and technology, expose them to the latest technological advances, and stress the importance of math and science in technology. The objective of this institute is to create a group of well trained teachers who can introduce the concepts learned from the summer institute, to the students and other teachers in their school district.

3.1 Goals of the Institute

The Summer Institute for Engineering and Technology Education was founded to accomplish the following goals:

1. To support the state of Arkansas in its efforts to improve education statewide through reform in mathematics, science, engineering, and technology education;
2. To create a pool of technically trained teachers throughout the state who can conduct workshops on engineering and technology in their own school districts and educational cooperatives;
3. To develop partnerships with Arkansas public schools to increase awareness of and interest in engineering and technology;
4. To increase the technological knowledge of Arkansas students;
5. To increase the number of women and minorities who pursue degrees in engineering;
6. To reach a broad range of students, particularly those from the Delta region who might not otherwise consider engineering as a viable career opportunity;
7. To help improve the technological workforce of the state and region;

3.2 Program of Summer Institute for Engineering and Technology Education

The Summer Institute for Engineering and Technology Education conducted a three week workshop in July of 1995. It was the ultimate goal to have individuals who will be able to assist in the development of district wide systemic initiatives to integrate technology and engineering concepts into the science and math curriculum within each educational coop in Arkansas.

A steering committee of University of Arkansas faculty and professional volunteers in Northwest Arkansas reviewed 45 applications and selected 25 teachers from middle, junior high and high schools in Arkansas to attend The Workshop. Selection was based on a number of factors, including the qualifications of the applicant, the geographic location of his or her school, and the level of commitment of the applicant and willingness of his or her school administration to integrate technology concepts learned in the workshop into the school's curriculum.

The workshop was held on the University of Arkansas, Fayetteville campus. Participants were provided room and board in University dormitories. Fifteen of the twenty-five participants were paid a $1000 stipend to compensate for the loss of part-time summer employment. Graduate credit was given for participating in the workshop. University of Arkansas faculty and engineering professionals served as faculty for the workshop and were responsible for developing materials, demonstrations, field trips and laboratory experiments.

The workshop among various other activities included the following components.

- **Introduction to Engineering.** Participants toured engineering facilities, met workshop faculty and staff, and participated in icebreaker activities and team-building exercises.
- **Computer Concepts.** Participants were introduced to computer concepts and applications which included Internet, World Wide Web, Netscape, HTML, workstation windows, UNIX, PC Windows, and DOS.
- **Applications of Engineering Technology**. Participants examined current consumer products and analyzed the engineering skills needed to design them. They also analyzed

the Stiquito robot [4] and the Society of Automotive Engineer's "World in Motion" Educational Kit.

- **Role of Women and Minorities in Engineering.** Workshop faculty discussed the career opportunities for women and minorities in the engineering profession and addressed current issues which are specific to these under-represented groups.
- **Activities Involving Engineering Disciplines.** Engineering faculty members held one-day or one-half day sessions on each of the following engineering disciplines: Biological and Agricultural, Biomedical, Chemical, Civil, Computer Systems, Electrical, Industrial, Materials Science, and Mechanical and Environmental Engineering.
- **Industry Visits.** Participants toured selected Arkansas industries to gain first-hand knowledge of the types of technological jobs available in the state and to observe the latest technological advances utilized by today's manufacturers.

4.0 Workshop Educational Materials

Materials for the workshop and participants include workbooks for teachers and students which the participating teachers used during the workshop and will use in their respective schools. Teacher workbooks contain units for each engineering discipline, general information on each topic, information on each lab experiment, suggested field trips, materials checklists for experiments, suggested resources for materials, and suggested speaker topics. Student workbooks consist of units for each engineering discipline and other topics, a 50-minute class for each unit, two to seven 50 minute laboratory experiments. Teachers who attended the workshop were provided laboratory supplies and equipment for use in their classrooms.

4.1 Constraints

4.1.1 Audience

A survey of more than 400 engineering students at the University of Arkansas was administered in the Fall of 1994. Students repeatedly emphasized that the ideal age to learn about engineering was in the sixth through ninth grades. This group of secondary school students was the focus of this work while developing the lab experiments. Students in this group have very limited math and science skills. If tried to introduce too much science and math the students might be confused and scared, which would be counter-productive to our goals. There is a need to strive to achieve a balance by introducing the concepts that the students might already be familiar and try to introduce new concepts which they could easily relate. The experiments should also be easy, interesting, and thought provoking.

4.1.2 Resources

Few schools have sophisticated equipment commonly found in engineering schools, primarily due to high costs. The funds to buy expensive equipment are not available in many school districts. Therefore, experiments must involve inexpensive science and math equipment commonly found in many schools.

4.1.3 Time

Many schools are already overburdened with their academic and other curricular activities and it would be a challenge to convince teachers to spend time on these experiments. To keep the students focuused the expeiements should be short, and should be completed in one or two class

periods.

4.1.4 Commitment

As explained in the Goals for The Summer Institute for Engineering and Technology Education, the Institute is relying heavily on this select group of teachers who attend the workshops to promote and introduce engineering and technology by conducting similar workshops in their respective school districts. The task at hand will be to motivate the teachers to commit themselves to this cause.

4.2 Materials Development

Laboratory experiments involving different branches of engineering were developed. The various branches of engineering identified for this purpose were

Biological and Agricultural Engineering

Chemical Engineering

Civil Engineering

Computer Systems Engineering

Electrical Engineering

Environmental Engineering

Industrial Engineering

Materials Engineering

Mechanical Engineering

Each section of the workbook focuses on one particular branch of engineering. It includes a three to five page introduction to a particular branch of engineering followed by short laboratory experiments. The introduction includes a brief history, traces how this branch of engineering has evolved, and a list of different fields in which engineers work with specific examples of job titles along with responsibilities that are part of the job. It includes the course work that engineers would be required to take during the Bachelor's program and also explains how the students can be better prepared for the engineering program by taking courses in mathematics, physics, and computers during their Junior and Senior year in high school. A list of career options and the salaries and rewards available to engineers were presented to help the students in making a choice. The introduction also contains a list of career guides, names of the professional organizations, information on how to conduct similar programs in schools, and a list of possible field trips.

The next section contains about two to seven short experiments related to the different branches of engineering. These experiments make use of science concepts with which the students are already familiar and will introduce new concepts to which the students can easily relate. Introducing young men and women to the type of work engineers do, and showing how the principles of science are applied in the real world, students would gain a greater appreciation of engineering and technology. At the end of each lab experiment are some activity based questions which test the concepts learned. Feedback of the experiments was taken from selected school teachers in Arkansas in Spring 1995 and Summer 1995 and were revised accordingly.

5.0 Evaluation

Evaluation of the work conducted at The Summer Institute for Engineering and Technology is very important. The evaluation process was divided into three different sections which consisted of :

1. Evaluation of the entire three-week Institute.
2. Evaluation of the relevance and sufficiency of information regarding the various branches of engineering.
3. Evaluation of the educational materials including questions regarding the various experiments.

5.1 Methodology

The evaluation in each of these three sections was divided into two forms. In the first form the participants were given a series of question and were asked to choose one answer from five different options:

1) Strongly Agree ***2) Agree*** ***3) Undecided*** ***4) Disagree*** ***5) Strongly Disagree.***

Each of these options were given an integer score in the range of one to five (1 if the answer was Strongly Agree and 5 if the answer was Strongly Disagree). An evaluation of the modules for each of the branches of engineering was conducted at the end of each session. The scores obtained from all the participants were collected and the average of the scores are presented in Table 1, 2 and 3.

The second form consists of some open ended questions and the participants were asked to write their comments, opinions, or suggestions on the modules, introduction to engineering, and the Summer Institute for Engineering and Technology Education.

5.2 Evaluation Results

5.2.1 Section 1: Evaluation of the Entire Three-week Institute.

The questions asked to evaluate The Summer Institute for Engineering and Technology Education were divided into two parts. In the first part, the teachers were asked mark their choice from five different options:

1) Strongly Agree ***2) Agree*** ***3) Undecided*** ***4) Disagree*** ***5) Strongly Disagree.***

The questions asked were:

1. The principles of engineering and technology were well presented in the workshop.
2. We got exposure to the latest technological advances as promised.
3. The activities involving various engineering disciplines were useful.
4. The computer concepts were well presented.
5. The issues concerning the role of women and minorities in engineering were well addressed.
6. We gained a first hand knowledge of the types of technological jobs available during the industry visits.
7. I am confident that I can share the information presented in the workshop with my colleagues in our school district or educational cooperative and help improve the awareness about engineering and technology.

8. The duration of the workshop is sufficient.

The results of the evaluation are summarized in Table 1.

Table 1: Results of Evaluation of the Entire Three Week Institute

Question	Average of the results
Q1	1.83
Q2	1.61
Q3	1.70
Q4	2.43
Q5	2.83
Q6	1.56
Q7	1.80
Q8	2.21

The summary of the results of the evaluation are very encouraging. The participants ***Agree*** that the principles of science and engineering were well presented in the workshop and that they got exposure to the latest technological advances (Columns Q1, Q2 in Table 1 and Figure 2). The participants felt that the activities involving various engineering disciplines were useful and that the computer concepts like Introduction to Computers, PC's, Workstation, Internet, World Wide

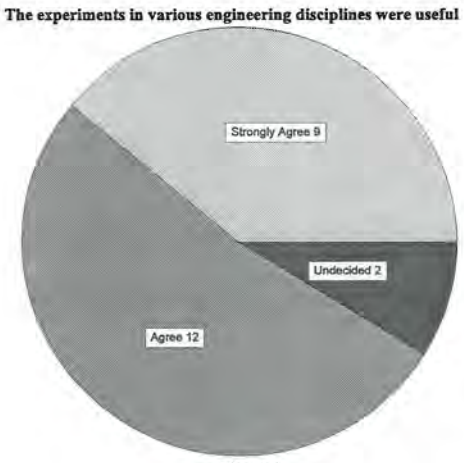

Figure 1

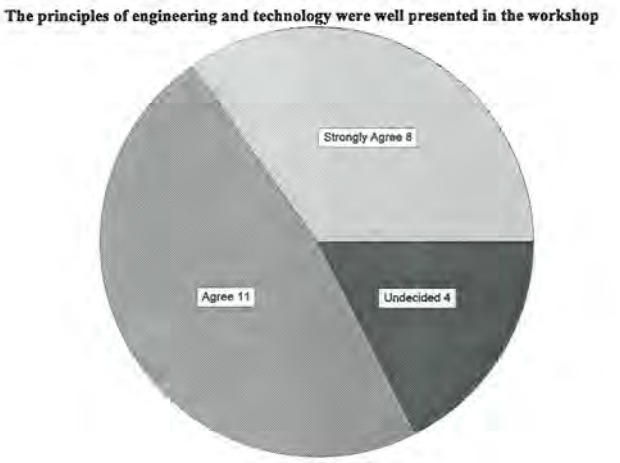

Figure 2

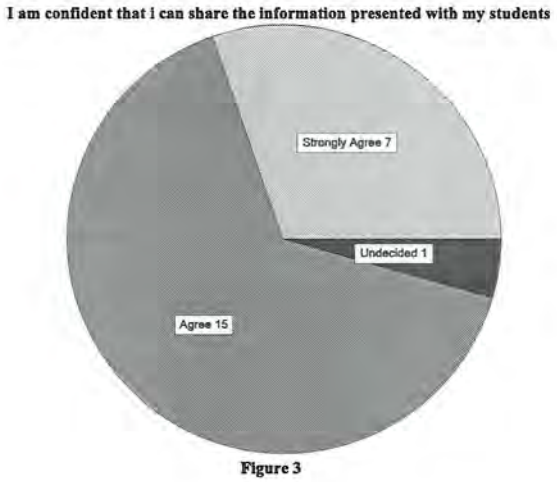

Figure 3

Web, Netscape, and Networking, were well presented during the workshop. Some of the participants expressed that more time should have been devoted to the issues concerning the role of women and minorities in engineering. This is also reflected in the evaluation for Question 6 (Column Q6 in Table 1) with an average of 2.83. The participants in the workshop with exception of one member, answered that they either ***Strongly Agree*** or ***Agree*** (Figure 3) that they are confident that they can share the information presented in the workshop with their colleagues and students in the school district or educational cooperative and help improve the awareness about engineering and technology. This is very important because one of the goals of The Summer Institute for Engineering and Technology Education is to create a pool of technically trained teachers throughout the state who can conduct workshops on engineering and technology in their own school districts and educational cooperative.

The second form of the evaluation of the Summer Institute for Engineering and Technology Education consists of open ended questions and the teachers were asked to comment on some of

the questions like:

1. Do you think technology is an important component in math and science education?
2. Do you think more people should be given the opportunity to participate in the workshop?
3. Do you think the reimbursement, fellowship, room, and board are well taken care of?

and The teachers were also asked comment on how **The Summer Institute for Engineering and Technology Education** was conducted and how it can be improved to achieve its goals.

All of the participants answered "*Yes*" to the question "*Do you think technology is an important component in math and science education.*" One of the participants felt that due to lack of awareness on his/her part he/she was not able to provide enough encouragement for the students. All the teachers who attended the workshop were of the opinion that more people should be given the opportunity to participate in the workshop. A few suggestions in this section were:

- More such workshops should be conducted at different times of the year.
- This kind of workshop would be more helpful to Chemistry and Physics teachers.

The participants of the workshop expressed diverse opinions to the question on how the reimbursement, fellowship, room and board were handled. One of main reasons for this was the fellowship. There were 25 participants at the workshop but only 15 people were paid the fellowship of $1000. The reason behind this was the lack of sufficient funds to cover all the participants. Some of the opinions expressed on this issue are:

- Every effort should be made to pay the fellowship to all of the participants.

- The fellowship money should have been equally divided amongst all the participants.

The participants were happy about the room and board provided at the University of Arkansas. They also felt that the availability of University facilities like the library, computer labs, and HPER was beneficial.

Some of the suggestions or comments on how The Summer Institute for Engineering and Technology Education was conducted and how it could be improved to achieve its goals are:

i. More time should be given to complete the projects

ii. Projects should be assigned one week in advance

iii. The information provided by the various instructors was excellent

iv. A very enlightening three week workshop.

v. Some of the participants of this year's workshop should be given the opportunity to share their experiences with students at next year's workshop.

vi. Most of the participants expressed that because of the long hours that were spent during the day on lectures, experiments, and field trips which sometimes extended into the weekends was very hard. They felt that there was insufficient time to reflect on the engineering concepts presented at the workshop. The participants also expressed that due to the time constraints they had to reduce the amount of time in computer and other research labs.

vii. Some of the participants were not familiar with the word processors like MS Word, Word Perfect 6.0 and initially had some problems in preparing project reports.

5.2.2 Section 2: Evaluation of introduction to engineering

At the beginning of each Workshop session, an introduction to that branch of engineering along with a brief history, the career opportunities available, and the future trends in engineering were covered. An evaluation of the introduction to engineering was conducted and the questions were:

1. All of the different branches of engineering were covered in the workbook.
2. I learned more about the engineering profession, job opportunities, course work required, and future trends in different branches.
3. The information presented about different branches of engineering will be helpful to the students in making a career choice in engineering.
4. The information regarding professional organizations, career guides (books and videotapes) field trips was helpful and relevant.

The teachers were also asked to comment on *What additional information would be helpful to the students in making a career choice in engineering?*

The results of the evaluation to Introduction to Engineering are summarized in Table 2. The results of the evaluation of introduction to engineering show that the participants of the workshop ***Agree*** that the various different branches of engineering were well covered and they also expressed that they learned more about the engineering profession, job opportunities, course work required, and the future trends in different branches. The teachers were also confident that the information presented during the workshop about the different branches of engineering will be helpful to the students in making a career choice in engineering.

Table 2: Results of the Evaluation to Introduction to Engineering

Question	Average of Results
Q1	1.95
Q2	1.48
Q3	1.52
Q4	1.76

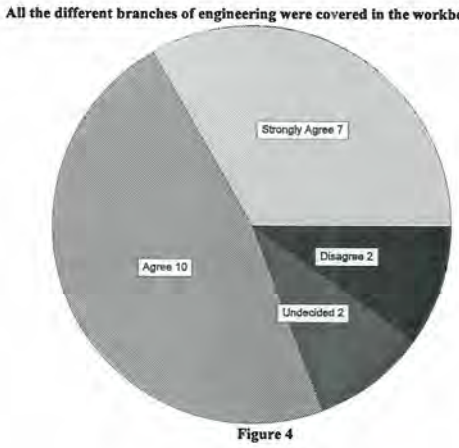

Figure 4

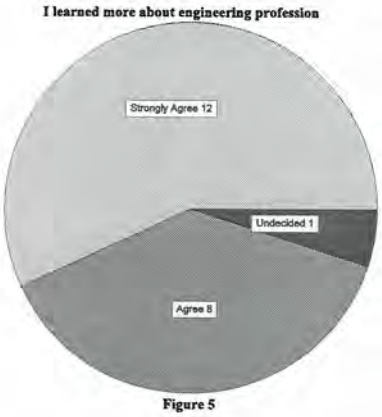

Figure 5

Some of the participants expressed that the lesser known branches of engineering like Petroleum, Nuclear, Metallurgical, Aeronautical, and Mining Engineering were left out. The University of Arkansas does not have specialized departments related to these branches of engineering. The constraints on time was the main reason as to why only the well known branches of engineering were covered in the workshop.

Some of the important suggestions on any additional information that would be helpful to the

students in making a career choice in engineering are:

- The participants were interested in knowing more about the course loads and the requirements for admission into the College of Engineering at the University of Arkansas.

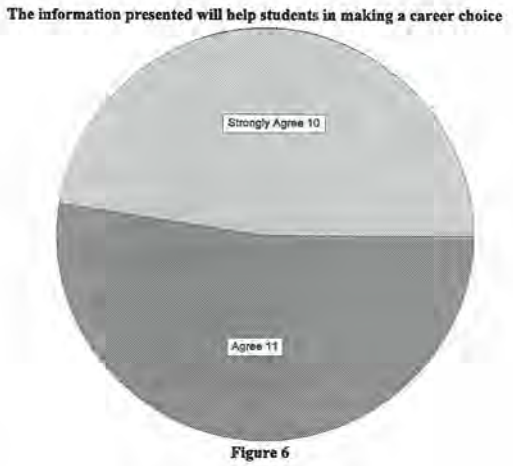

Figure 6

- A week long workshop which would expose recommended school students to the engineering college and careers in engineering.
- A list of successful engineers from the University who could be invited to schools to talk about engineering.
- A video on the different branches of engineering at the University of Arkansas.

5.2.3 Section 3: Evaluation of Education Materials

The evaluation of the Engineering Education Materials development includes questions regarding the various experiments developed for each of the modules. The questions asked during the evaluation were:

1. The modules are easy to understand.
2. The equipment to conduct the experiments described in the modules is readily available in my school.
3. There is enough support from my school district to conduct similar modules.

4. There are sufficient resources to conduct similar modules in schools.

5. The modules are interesting.

6. The students can easily relate the modules to the science concepts learned in school.

7. The students will be able to perform the modules easily.

8. These modules fit into the current math and science curriculum.

9. Activity based learning is the best way to introduce science and technology to students.

The teachers were also asked to give their input to some of the open-ended questions like:

10. What did you like about the module?

11. How could the module be improved?

12. Are the given instructions adequate?

13. Are other materials required?

14. Could the module be adapted to the time allotted in the classroom?

15. How much of your time was required to complete the module?

16. Please give any additional comments about the modules.

The result of the evaluation regarding the modules is presented in Table 3. The results of the evaluation of the modules in various branches of engineering show a large variation. The participants ***Agree*** that some of the modules are very easy to understand (for example, modules in Civil and Materials Engineering) while the modules concerning Applications in Engineering and Introduction to HTML were widely perceived as difficult to understand (column Q1 in Table 3). A comparison of the results of the evaluation to the question "*The modules are easy to understand*" is shown in Figure 7.

Table 3: Results of Evaluation of Experiments Described in the Modules

Module	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Intro to Engg	1.67	1.52	1.48	1.48	1.38	1.52	1.71	1.52	1.14
Bio Ag Engg	1.52	1.65	1.57	1.74	1.57	1.74	1.61	1.70	1.30
Bio Med Engg	1.74	3.53	2.89	3.00	1.42	1.89	2.53	2.26	1.21
Civil Engg	1.39	2.09	1.70	1.87	1.43	1.61	1.70	1.70	1.13
Chemical Engg	2.43	2.38	2.24	2.43	2.24	2.14	2.24	2.05	1.29
Computer Sys Engg	2.05	2.86	2.55	2.86	1.59	2.00	2.45	2.05	1.14
Electrical Engg	2.26	2.78	2.04	2.35	1.22	1.48	2.26	1.52	1.13
Materials Engg	1.41	1.68	1.55	1.59	1.36	1.50	1.50	1.50	1.09
Mechanical Engg	2.00	1.57	1.43	1.48	1.33	1.43	1.90	1.48	1.14
Intro to HTML	3.00	4.00	3.39	3.61	1.61	2.74	3.09	2.52	1.30
App in Engg	3.56	2.88	2.56	2.69	2.56	2.75	3.31	2.69	1.13
Stiquito	2.80	4.10	3.05	3.45	1.70	2.30	3.70	2.25	1.25
World in Motion	1.39	1.87	1.57	1.78	1.35	1.30	1.57	1.30	1.04

The feedback from the evaluation suggests that a lot of hands-on activities were involved in the Civil Engineering and Materials Engineering modules. The participants felt that the materials required to conduct experiments in these areas are readily

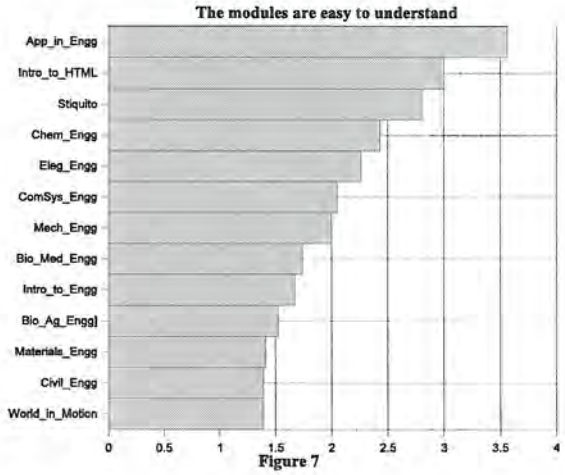

Figure 7

available and that the students will be able to visualize the science and math behind these activities easily. The participants said the modules on Introduction to HTML were very interesting and very useful but most of the people thought that the modules were difficult to understand (Columns Q1 and Q5 in Table 3) in the allotted time.

The feedback to question "*The equipment to conduct the modules is readily available in my school*" suggests that the participants were of the opinion that equipment is readily available to conduct the modules in Mechanical Engineering, and Introduction to Engineering Design and is reflected in Column Q2 in Table 3. The participants ***Disagree*** (Figure 8) to the same question on the modules in Introduction to HTML and Stiquito. The results are not surprising because some of the modules in Mechanical Engineering, like the Egg Drop and the Bridge construction, made use of less expensive and more readily available material like popsicle sticks, eggs, balloons, scotch tape, and straws. Most of the schools in Arkansas are in the process of getting access to the Internet and hence the equipment to conduct modules on Internet and HTML documents was not

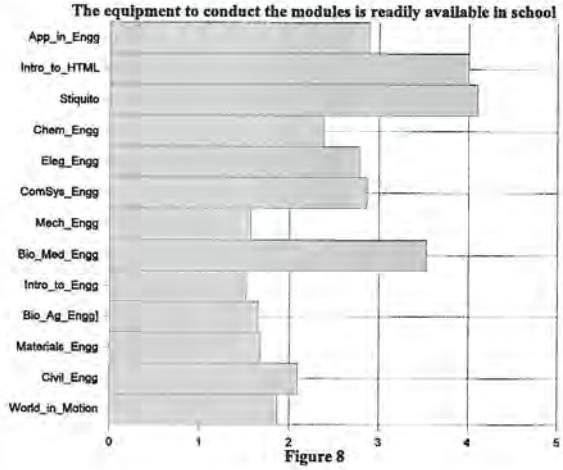

Figure 8

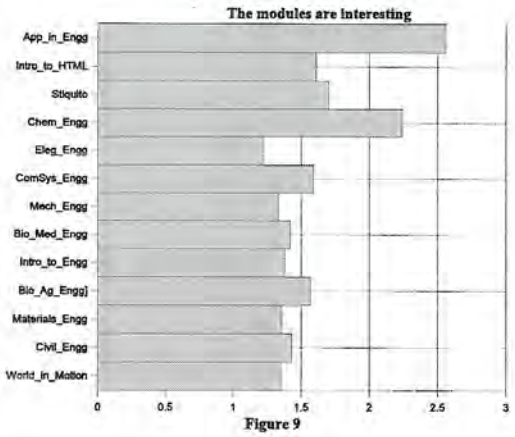

Figure 9

readily available. The same trend was observed in the evaluation for the question "*There are sufficient resources to conduct similar modules in schools*" (Column Q4 in Table 3) for the same reasons.

The participants agreed that the modules are interesting in their answer to the question on "*The modules are interesting*" (Column Q5 in Table 3 and Figure 9).

The results of the evaluation to the question "*The students can easily relate the modules to the science concepts taught in school*" suggests that the modules in *World in Motion* were better ranked than the rest (Column Q6 in Table 3 and Figure 10). *World in Motion* modules were developed by the Society of Automobile Engineers. These modules demonstrate some of the concepts of physical science like mass, potential energy, and kinetic energy which are taught in all the schools.

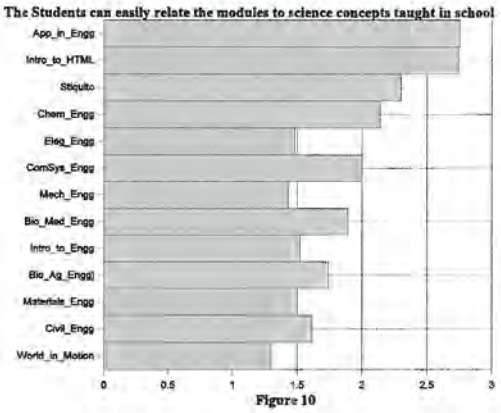

Figure 10

In the evaluation to the question "*The students will be able to perform the experiments easily*" the participants felt that the modules on Stiquito are difficult to perform because they require a lot of knowledge in programming and the hexadecimal number systems with which the students are not very familiar (Column Q7 in Table 3) . The teachers were of the opinion that the modules in Materials Engineering would be easy to perform because of their simplicity.

The participants repeatedly expressed their confidence in activity based learning and strongly

agreed that "*Activity based learning is the best way to introduce science and technology to students*" (Column Q9 in Table 3).

Conclusions

The Summer Institute for Engineering and Technology Education described above has had and will continue to have a significant impact on engineering and technology education in middle, junior high, and high schools across the state. It will help to improve the technological workforce of the state and region, and highlight the strength of technology intensive industries that effect America's success in the global market. The results of the workshop are highly encouraging. Look forward to have similar workshops in future. Some of conclusions that can drawn from the workshop and the results of the evaluation are:

i. It is a highly productive three-week workshop.

ii. The participants were convinced that they learned more about engineering.

iii. All the participants were confident that they will be able to share the information presented in the workshops with their students and their colleagues in their school district.

iv. The workshop hours are very demanding and hence the time of the workshop should be extended to four to six weeks rather than the existing three weeks in the future.

v. More people should be given the opportunity to participate in the workshop by having similar workshops at different times.

vi. Increasing the time of the workshop would give the participants an opportunity to have a more"'*hands on*" experience with different experiments and would also give them

sufficient time to complete the projects.

vii. The fellowship should be made available to all the participants if possible.

viii. Some of the modules like Stiquito, Introduction to HTML, and Applications in Engineering are difficult to understand and hence they should be redesigned for junior high students.

ix. Most schools have a problem in finding equipment to conduct similar experiments in engineering and every effort should be made to provide them the equipment where necessary.

x. The modules are very interesting and will help in promoting Engineering and Technology among students.

xi. The students would be able to relate the modules to the science concepts taught in school.

Details of the workshop and lab exercises can be obtained by anonymous ftp to engr.engr.uark.edu, subdirectory pub/engr_ed. The file workshop.txt contains detailed information on the organization of the workshop. The lab experiments for the different engineering branches are located in the subdirectories like meeg, cseg, eleg, etc... The file README.txt gives a one line description of the experiments.

References

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SUMMER INSTITUTE FOR ENGINEERING AND TECHNOLOGY EDUCATION
Evaluation
July 5 - July 25, 1995

Evaluation Questions regarding, The Summer Institute for Engineering and Technology Education:

1) The principles of engineering and technology were well presented in the workshop

SA	A	U	D	SD
1	2	3	4	5

2) We got exposure to the latest technological advances as promised

SA	A	U	D	SD
1	2	3	4	5

3) The activities involving various engineering disciplines were useful

SA	A	U	D	SD
1	2	3	4	5

4) The computer concepts were well presented

SA	A	U	D	SD
1	2	3	4	5

5) The issues concerning the role of women and minorities in engineering were well addressed

SA	A	U	D	SD
1	2	3	4	5

6) We gained a first hand knowledge of the types of technological jobs available during the industry visits

SA	A	U	D	SD
1	2	3	4	5

7) I am confident that I can share the information presented in the workshop with my colleges in our school district or educational cooperative and help improve the awareness about engineering and technology

SA	A	U	D	SD
1	2	3	4	5

8) The duration of the workshop is sufficient

SA	A	U	D	SD
1	2	3	4	5

SA-Strongly Agree A-Agree U-Undecided D-Disagree SD-Strongly Disagree

9) Do you think that technology is an important component in math and science education ?

10) Do you think more people should be given opportunity to participate in the workshop ?

11) Do you think the reimbursement, fellowship, room and board are well taken care of?

12) Please give your suggestions or comments on how **The Summer Institute for Engineering and Technology Education** was conducted and how it can be improved to achieve its goals.

SUMMER INSTITUTE FOR ENGINEERING AND TECHNOLOGY EDUCATION
Evaluation
July 5 - July 25, 1995

Evaluation Questions regarding introduction to engineering:

1) All the different branches of engineering were covered in the workbook

SA	A	U	D	SD
1	2	3	4	5

2) I learned more about the engineering profession, job opportunities, course work required, and future trends in different branches

SA	A	U	D	SD
1	2	3	4	5

3) The information presented about different branches of engineering will be helpful to the students in making a career choice in engineering

SA	A	U	D	SD
1	2	3	4	5

4) The information regarding professional organizations, career guides (books and videotapes), field trips was helpful and relevant

SA	A	U	D	SD
1	2	3	4	5

5) What additional information would be helpful to the students in making a career choice in engineering ?

SA-Strongly Agree A-Agree U-Undecided D-Disagree SD-Strongly Disagree

SUMMER INSTITUTE FOR ENGINEERING AND TECHNOLOGY EDUCATION
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Name of the Module:

1) The modules are easy to understand

SA	A	U	D	SD
1	2	3	4	5

2) The equipment to conduct the modules is readily available in my school

SA	A	U	D	SD
1	2	3	4	5

3) There is enough support from my school district to conduct similar modules

SA	A	U	D	SD
1	2	3	4	5

4) There are sufficient resources to conduct similar modules in schools

SA	A	U	D	SD
1	2	3	4	5

5) The modules are interesting

SA	A	U	D	SD
1	2	3	4	5

6) The students can easily relate the modules to the science concepts taught in school

SA	A	U	D	SD
1	2	3	4	5

7)The students will be able to perform the modules easily

SA	A	U	D	SD
1	2	3	4	5

8) These modules fit into the current math and science curriculum

SA	A	U	D	SD
1	2	3	4	5

9) Activity based learning is the best way to introduce science and technology to students

SA	A	U	D	SD
1	2	3	4	5

SA-Strongly Agree A-Agree U-Undecided D-Disagree SD-Strongly Disagree

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Module title:

1) What did you like about the module?

2) How could the module be improved?

3) Are the given instruction adequate?

4) Are other materials needed?

5) How could you use the module in the classroom?

6) Could the module be adapted to the time allowed in the classroom?

7) How much of your time was required to complete the module?

8) Additional comments.