# The Foundations of Technology Course: Teachers Like It!

*By Johnny J Moye*

*One teacher indicated that the course was, "a step in the right direction to help implement the STEM initiatives nationwide."*

Over the past several decades there has been a call to raise student technological literacy. To take such an abstract concept and produce a program that will increase student science, technology, engineering, and mathematics (STEM) literacy was not an easy task. However, it was accomplished. During the past two years many United States school districts have offered several Engineering byDesign™ courses. Teachers of one of the courses, *Foundations of Technology*, enjoyed teaching the course and unanimously agree that it will help raise student technological literacy. This article will discuss the *Foundations of Technology* course and provide results of a study that determined teachers' feelings concerning the course.

## Engineering byDesign™ and Foundations of Technology

Addressing the lack of technological literacy in the United States, the International Technology Education Association – Center to Advance the Teaching of Technology and Science (ITEA-CATTS) developed the Engineering byDesign™ (EbD™) National Model Program. The program was developed in consultation and collaboration with "ITEA-CATTS Consortium, Technology Education Advisory Council, ITEA Institutional Members, and the Mathematics, Science, and Engineering communities" (ITEA-CATTS, 2006, p. 2). The EbD™ program mission is to provide courses of study enabling students to meet local, state, and national standards for technological literacy. The program currently consists of 10 standards-based courses starting in the sixth grade and continuing through college-level coursework.

*Foundations of Technology* is the cornerstone high school Engineering by Design™ course. The course focuses on three dimensions of technological literacy, "knowledge, ways of thinking and acting, and capabilities" (ITEA, 2006,



Standards-Based STEM Model for Grades K-12.

p. 12). The course addresses 12 standards from ITEA's *Standards for Technological Literacy: Content for the Study of Technology* (ITEA, 2000/2002/2007), 17 National Council of Teachers of Mathematics technological issue benchmarks (NCTM, 2000), and 23 American Association for the Advancement of Science technological issue benchmarks (AAAS, 1993).

*Foundations of Technology* is constructed with eight units of study. Each unit contains an overview, standards, and benchmarks addressed in the unit, a unit "big idea," list of objectives, a pretest, lessons, and posttest. Table 1 identifies the *Foundations of Technology* course content outline.

## Teacher Survey

Sixteen Maryland high schools offered the course during the fall 2007 semester. An evaluation of the course was necessary to ensure that, "students are provided with relevant, rigorous, and contextual connections to the technological world" (ITEA, 2003, p. 82). A survey was sent to *Foundations of Technology* teachers to gain their opinions of the course concerning its ease of understanding, presentation, and if they felt it would increase student science, technology, engineering, and mathematics (STEM)

literacy. The survey consisted of 21 closed-form and five open-form questions. For the purposes of this article, only 10 questions and responses are addressed. The 10 selected questions are representative of the overall survey and the teachers' answers. The questions were:

1. I enjoyed teaching the *Foundations of Technology* course.
2. In my opinion, the majority of the students enjoyed the course.
3. The course guide was correctly organized.
4. The course guide was easy to follow.
5. I had sufficient time to complete each lesson of each unit.
6. Lessons provided scenarios relevant to students' lives.
7. The course content was too difficult for students to understand.
8. The use of mathematics was clearly required for students to complete their activities.
9. The use of science was clearly required for students to complete their activities.
10. My overall feelings about the *Foundations of Technology* course are…

**Table 1.** **Foundations of Technology** *Course Content Outline*

| Unit | Unit title and topics | Unit | Unit title and topics |
|------|----------------------|------|----------------------|
| I | History of Technology<br>A. Historical periods of technological evolution<br>B. Significance of technological advancements<br>C. Influence of technology on history | V | Construction Technologies<br>A. The nature of manufacturing<br>B. Bridge building<br>C. Construction management |
| II | The Relationships Among Technologies and Connections With Other Fields of Study<br>A. Relationships among technologies<br>B. Technology's relationships with other fields of study | VI | Energy and Power Technologies<br>A. The nature of energy and power technologies<br>B. Energy and cars: What does the future hold?<br>C. The great energy debate |
| III | Engineering Design<br>A. What is engineering?<br>B. Principles of design<br>C. Engineering resources (core technologies)<br>D. The engineering design process<br>E. Project management | VII | Information and Communication Technologies<br>A. The nature of information and communication technologies<br>B. Communication systems<br>C. Global positioning system |
| IV | Manufacturing Technologies<br>A. The nature of manufacturing<br>B. What's new in manufacturing<br>C. "Stuff"—what we use to make "things" | VIII | Systems Thinking: Putting It All Together<br>A. The nature of systems thinking<br>B. Core concepts of technology<br>C. Tools for systems thinking |

From *Foundations of Technology: A Standards-based High School Model Course Guide,* p. 14.

## Questionnaire Results

Eight of 16 teachers (50%) responded to the survey. Table 2 contains the questions and teacher responses.

**Table 2. Survey Questions and Teacher Responses**

| Question | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree | Mean | Indicator |
|---|---|---|---|---|---|---|---|
| Q1. I enjoyed teaching the *Foundations of Technology* course. | 0% | 0% | 12.5% | 37.5% | 50% | 4.38 | Agree |
| Q2. In my opinion, the majority of the students enjoyed the course. | 0% | 0% | 12.5% | 37.5% | 50% | 4.38 | Agree |
| Q3. The course guide was correctly organized. | 0% | 0% | 25% | 62.5% | 12.5% | 3.88 | Agree |
| Q4. The course guide was easy to follow. | 0% | 12.5% | 0% | 50% | 37.5% | 4.13 | Agree |
| Q5. I had sufficient time to complete each lesson of each unit. | 0% | 12.5% | 0% | 75% | 12.5% | 3.63 | Agree |
| Q6. Lessons provided scenarios relevant to students' lives. | 0% | 0% | 25% | 62.5% | 12.5% | 3.88 | Agree |
| Q7. The course content was too difficult for students to understand. | 12.5% | 50% | 37.5% | 0% | 0% | 2.25 | Disagree |
| Q8. The use of mathematics was clearly required for students to complete their activities. | 0% | 0% | 0% | 87.5% | 12.5% | 4.13 | Agree |
| Q9. The use of science was clearly required for students to complete their activities. | 0% | 0% | 12.5% | 62.5% | 25% | 4.13 | Agree |

Note: Mean score was used to determine teachers' overall level of agreement/disagreement.

Teachers were asked to complete an open-form question. Six of the eight (75%) responded. The question and their responses were:

Q10: My overall feelings about the *Foundations of Technology* course are…
- "A step in the right direction to help implement the STEM initiatives nationwide—more direct involvement with math and science objectives."
- "Great!"
- "A good foundation, but needs to be enhanced for a high school course."
- "The course is easy to teach and the students enjoy the "hands-on" aspects of the class. Students are able to attach personal meaning to the lessons."
- "It is a good course. I skip around in it to mix up the hands-on activities, but I like the course."
- "Overall *FOT* is a well-planned course that is teacher friendly and standards driven."

## Conclusions

Based on responses to every question, *Foundations of Technology* teachers liked the course and agreed on many conclusions. Teachers agreed that they enjoyed teaching it and that the majority of their students enjoyed taking the course. They agreed that the course guide was correctly organized and easy to follow. They agreed that they had sufficient time to complete each lesson and that the lessons were relevant to students' lives. They agreed that mathematics and science were clearly required for students to complete their activities and that the course content was not too difficult for students to understand. Teachers were equally supportive of the course when indicating their overall feelings concerning the course. One teacher indicated that the course was, "a step in the right direction to help implement the STEM initiatives nationwide." Another teacher stated that, "The course is easy to teach, and the students enjoy the 'hands-on' aspects of the class. Students are able to attach personal meaning to the lessons." Even the most critical response was supportive, one teacher stated: "A good foundation, but needs to be enhanced for a high school course." Teachers' feelings may be summed up from another teacher's input: "great."

The next step in the validation of the *Foundations of Technology* course is to conduct a study to determine if the course actually raises student STEM literacy. School districts offering the *Foundations of Technology* course should be asked to provide mathematics and science standardized exam scores for students who did and did not take the course. The scores of those two groups of students should be compared. The hypothesis would be that those students who took the *Foundations of Technology* course will perform better on their standardized mathematics and science exams than those students who did not take the course.

Ninety-two schools offered *Foundations of Technology* during the fall semester of 2008. School district leaders interested in the Engineering byDesign™ program should access the following website: www.iteaconnect.org/EbD/ ebd.htm.

## References

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**Johnny J Moye** *is Supervisor of Career and Technical Education in Chesapeake, VA and a Ph.D. student at Old Dominion University. He may be reached at jmoye003@odu.edu.*