The Tau Beta Pi Association was founded at Lehigh University in 1885 by Edward Higginson Williams Jr. to mark in a fitting manner those who have conferred honor upon their Alma Mater by distinguished scholarship and exemplary character as students in engineering, or by their attainments as alumni in the field of engineering, and to foster a spirit of liberal culture in engineering colleges. —Preamble to the Constitution

MindSET for Keeping Our Chapters Moving

The need for better preparation of our K-12 students in math and science, along with the interest in encouraging more of them to pursue careers in science, technology, engineering, and mathematics, has become a regular part of our national debates in the United States. It has been clearly recognized that, without improvement in this area, the U.S. will not be able to compete successfully in the global marketplace. This consideration is of paramount importance, if we are to rebuild our economy in this age of technology and increased global competition.

During the past two years, Tau Beta Pi has worked diligently to establish the foundation for implementing a National K-12 Program, with the goal of increasing the number of students in the K-12 system who successfully complete higher level math and science courses prior to graduation from high school. Specifically, our program seeks to ensure that more 8th graders will complete Algebra I and more 12th graders will complete calculus before graduation. These metrics are used because students will not reach calculus by the 12th grade unless they finish Algebra I by the 8th grade, due to the course sequencing needed. Furthermore, without a mastery of math, it is difficult for students to perform adequately in higher level science courses.

Since the start of our initiative, there has been much discussion about the subject, and several states have sought to find ways of dealing with these challenges. California, now requires 8th grade Algebra I completion, and many others have introduced interventions to address the situation. We recognize that we are dealing with a very complex issue for which there are no simple solutions. However, it is an issue for which we must all assume a portion of the responsibility, if a solution is to be found. Tau Beta Pi's perspective is that in our Society we have some of the best brains in the country, distributed among the chapters and our alumni in corporate America. It is this tremendous resource that we seek to make available to our country through our involvement in local communities.

The MindSET (Math, Science, Engineering, and Technology) Program has been designed around the use of kinesthetics in classroom instruction, as well as in demonstrating application of math and science concepts in engineering design. The program uses as its model the Engineering GatorTRAX program developed at the University of Florida, and available modules are used with permission. To date we have established a management structure comprising the Executive Council (EC), a nine-member National Management Committee (NMC), and four 16-member Regional Management Committees with four Districts each. In addition, we recommend that each District establish a K-12 program oversight committee and each chapter (or group of chapters) establish a Chapter Implementation Team.

Program demonstrations of classroom instructional modules and engineering lab modules were held at the Conventions in 2006, 2007, and 2008. A pilot training session for 83 elementary, middle, and high-school teachers was conducted in Rapid City, with support of the South Dakota School of Mines & Technology and the South Dakota Alpha Chapter. Training sessions in the use of these modules have been offered to ΤΒΠ National Officials in 2007 and 2008, and a list of Frequently Asked Questions (FAQs) has been posted online. Significant feedback has been received from our membership and used in refining program development.

A survey was conducted to determine the level of current engagement of chapters in the K-12 system and interest in participating in the initiative. There was overwhelmingly positive response from the chapters, several of which are interested in starting MindSET projects.

A chapter MindSET Project comprises classroom instruction, monthly parent sessions, student engineering lab sessions (recommend maximum of five three-hour labs in each semester), and tracking of data each semester. Project development requires the following considerations:

1. Identify a potential school district with which to work;
2. Inform the NMC of your interest in a project;
3. Begin with no more than three or four schools—more can be added later;
4. Establish a Chapter Implementation Team (two or more chapters may decide to work together);
5. Conduct initial research on performance of target school district and schools in math and science (note that much of this information is online);
6. Investigate what K-12 math and science programs are currently being offered in your area:
7. When you are ready, arrange with the NMC for assistance in meeting with school-district administrators to present ideas about partnering with schools to improve math and science performance;
8. Meet with principal and math/science faculty in target schools, discuss the proposed program (your faculty advisors will be great assets at this stage), and emphasize the benefits to the students, schools, and school district.
9. When the target schools are on-board, make arrangements with the NMC for training the math/science teachers in kinesthetic instructional delivery;
10. While you may use existing lab modules, you could also explore development of modules by your chapter for contribution to the national module bank;

11. Create a budget for your proposed operation, including module development—working with teachers on learning outcomes for different grade levels is essential at this stage;

12. Arrange a town-hall meeting with the parents and students of the target schools to explain the program to them, emphasizing the benefits to participants and registering students for the program; and

13. Once teacher training has been completed, you are ready to move ahead with your lab sessions. These should be coordinated as much as possible with the lesson progress in the classroom. Your teachers will assist with the required information and, where possible, should be involved in the lab sessions. Some teachers have expressed interest in using the lab modules in the classroom during regular lectures, which is strongly encouraged.

In order to get your programs moving, existing lab modules are available for use courtesy of the Engineering GatorTRAX program. However, chapters are encouraged to develop modules as a part of their programmatic activities. The design of engineering lab modules for math and science concept demonstration requires the following considerations:

1. Engineering lab modules are used for hands-on demonstration of math/science concepts taught in the classroom;

2. Grade levels being targeted and the math/science curriculum being taught must become the drivers for module design. Note that a single module with appropriate adjustments can be used to teach introductory, intermediate, or advanced concepts encompassing all grade levels.

3. Consider modules that demonstrate math/science applications in various engineering disciplines;

4. Modules should be designed for demonstration of design variables including angles, distance, force, speed, algebra, coordinate systems, expressions, and equations based on grade-level learning outcomes;

5. Other math considerations for incorporation in designs include patterns, relationships, linear equations, exponential equations, and functions;

6. Have your modules tested by the teachers, who will be able to provide great feedback;

7. Use feedback received for module improvement;

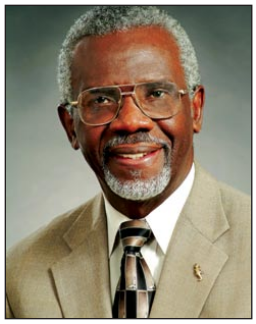
8. Before finishing your module, have it tested by the target audience;

9. Modules should provide fun and learning while they are assembled and used by the students;

10. Keep your module projects as low in cost and as simple as possible; and

11. If reimbursement of cost for module development will be sought from ΤΒΠ, then prior approval of a cost estimate must be obtained from the EC, through the NMC;

This information has been prepared to assist chapters in starting their programs. More detailed information about program start-up is available from the FAQs posted at *tbp.org*. You may also contact *tbpmindset@tbp.org*. We are excited about the challenges presented by the MindSET Program and are confident of the potential that this program has for improving the lives of many students. We shall advance the cause of our profession and provide ΤΒΠ members with opportunities to make a difference in the lives of students, parents, and teachers, while positively impacting our communities and our nation's competitive capabilities in the global marketplace.



—**Dr. Jonathan F.K. Earle,** P.E., *Florida Alpha '65*, Councillor

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