ITEEA
Technology and Engineering bring STEM to Life!
International Technology and Engineering Educators Association

Talking Points

The Learn Better by Doing (LBbD) Study provides the basis for many talking points supporting the importance of technology and engineering courses and programs. The following points are gleaned directly from study results. These points illustrate how students may directly benefit from taking technology and engineering courses. Use these talking points to communicate with teachers, school administrators, parents, government officials (local, state, and national) as well as local business and industry representatives.

The information will be presented by identifying the talking point and then specifying the LBbD page on which the information can be found.

- Teachers feel that students learn by doing hands-on activities in their classrooms and students are doing more hands-on activities in technology and engineering classrooms (pp. 6-7).

  Who are better judges than teachers to determine how students learn? Science and mathematics teachers feel students learn by doing activities, but do not have the time and/or resources to assign more doing experiences. With this point in mind, it seems reasonable that students should be doing more standards-based, hands-on, activities in their classrooms.

  Where other courses may not have the time and available resources (p. 6), technology and engineering courses provide students opportunities to learn using the three domains of learning: Cognitive, Affective, and Psychomotor.
  - Cognitive: Technology and engineering lessons and activities easily applies science, technology, engineering, mathematics, language arts, social studies, and other content (p. 6-7).
  - Affective: Technology and engineering courses provide students with opportunities to work in teams. Teamwork may help students develop positive attitudes and self-esteem. The 49th Phi Delta Kappan/Gallup Poll of Public's Attitudes Towards the Public Schools found that 82% of Americans, "feel that taking technology and engineering classes and developing interpersonal skills are the two most important aspects of school quality" (p.3). Technology and engineering students frequently work in teams, using engineering design processes to consider how they would solve real-world problems.
  - Psychomotor: Technology and engineering courses provide students with opportunities to use hands-on activities, exercising their creativity and problem-solving skills in effort to solve-real world problems (pp. 7-9).

- Quoting the Phi Delta Kappa 49th Poll of Public's Attitude Towards the Public Schools, "Students need to take more technology and engineering courses to prepare them for life" (p. 3).

- Students in science, technology, engineering, and mathematics classes do activities that address the same national standards (*Standards for Technological Literacy* (*STL*), *Next Generation Science Standards* (NGSS), and *Common Core State Standards for Mathematics* (CCSSfM) in their courses. However, technology and engineering students are completing what could be considered STEM activities more frequently than are science and mathematics students (pp. 6-7). Students not enrolled in technology and engineering courses are missing opportunities to use hands-on activities that bring STEM to life.

- Elementary Students Learn Engineering Design by Planning and Using Tools to Manipulate Materials.

  The literature tells us that scientists, technologists, engineers, and mathematicians use some form of engineering design process to solve problems. The engineering design process involves determining and solving problems, many times by designing and making prototypes or models. Elementary students who learn and use an engineering design process will be able to use this method of doing to guide them in their future school and life experiences (pp. 7-8).

- Designing and modeling are key components in an engineering design process. By using a design process, students "can integrate various skills and types of thinking—analytical and synthetic" (p. 8). An engineering design process is a tool used by engineers, scientists, etc. Students enrolled in technology and engineering courses have more exposure to and learn by using engineering design processes. This exposure provides students with opportunities to learn and practice this valuable problem-solving tool (p. 9).

- Technology and engineering activities promote female (as well as other students') interest and participation in STEM-related education and occupations. Research shows that female students enjoy studies and occupations that directly benefit society and/or individual needs and wants. Technology and engineering courses present students (male and female) with more interesting and challenging real-world scenarios involving societal and/or individual needs and wants (pp. 9-10).

- The LBbD Study found that the percentage of doing decreased from middle to high school in each content area during each year of this study. However, the percentage of doing decreased less in technology and engineering classrooms than it did in science and mathematics classrooms.

  Many students become less interested in their studies while in high school. Could there be a correlation between the decrease of doing hands-on activities and students losing interest in school? If so, technology and engineering courses could help promote secondary education students' interest and academic success (pp. 9-10).