ENGINEERS WEEK 2022

DiscoverE works to ensure people everywhere understand how engineers, technicians, and technologists make the world a better place. Thirty years ago we were the first to call on the engineering community to volunteer in their local schools and help young students discover engineering. Now we lead a growing volunteer and educator movement recognized worldwide. Help celebrate our legacy and build for the future.

REIMAGINING THE POSSIBLE

This year our theme is Reimagining the Possible! Engineers create new possibilities all the time. From green buildings to fuel-efficient cars to life-saving vaccines, engineers work together to develop new technologies, products, and opportunities that change how we live. Let’s inspire the next generation by celebrating all the ways engineers turn dreams into reality by reimagining what seems impossible to become the Possible!

Engineers Week is a great time for educators to connect with engineer volunteers and use DiscoverE’s free resources for outreach to students, parents, and community leaders. Be sure to visit www.DiscoverE.org for all the ways you and your students can make the most of Engineers Week 2022. And, we invite you to join in our social media celebration at #Eweek2022.

To strengthen the connection between ITEEA and Engineers Week, ITEEA’s STEM Center for Teaching and Learning™ has created a series of design briefs for use by technology and engineering educators at the elementary, middle, and high school levels that appear on the following pages.

Engineering by Design™ (EbD™) is built on the belief that the ingenuity of children is untapped, unrealized potential that, when properly motivated, will lead to the next generation of technologists, innovators, designers, and engineers.

The EbD™ curricula infuses project- and problem-based learning enabling students to get the authentic experiences of hands-on learning. The authentic experiences are portrayed and assessed via their designs. The design briefs entail the overall context and content utilized to drive the EbD™ primary and preliminary challenges in the newly revised middle and high school level courses as well as the projects at the elementary level within the respective curriculum. The EbD™ curricula engage students in learning concepts and principles in an authentic problem-/project-based environment through a flexible, affordable, and accountable Standards-Based Curriculum Model.

The provided design briefs provide an overview of the content’s lesson plan/learning cycle within a specific course. Within the courses are the complete learning cycle/lesson plans. To access to the curricula, materials, and resources from EbD™, follow the steps below:

2. Click on your state.
3. Click on Accessing EbD™ Curriculum.
4. Follow the steps listed on the state page to learn how to access the Media Rich Edition, and/or Standard Edition for the EbD™ curricula.

For more information about any of the EbD™ PreK-12 curricula, please visit www.iteea.org/STEMCenter/EbD.aspx, and/or email Ryan Novitski at rnovitski@iteea.org with any further questions/comments.

Additionally, ITEEA is asking its members to take part in Introduce a Girl to Engineering Day (Girl Day) on February 24, 2021.

Introduce a Girl to Engineering, or Girl Day, is a time when volunteers, educators, and others act as role models, facilitate engineering activities, and show girls how engineers change our world. DiscoverE’s Despite the Odds research found that this simple formula helps girls develop an interest in engineering, builds their confidence in their problem-solving skills, and creates a STEM identity. You can make a difference in a girl’s life.
Course Objective: EbD-TEEMS NxtGen introduces basic aspects of engineering and technology. One of the many skills that are needed is coding: organization and prioritization with the understanding that robots follow commands directly and specifically. Robots will only do what they are asked to do.

Context: Coding is becoming an increasingly fundamental skill being added to school curriculum. Early connections to coding and robotics will be beneficial to adding to the acceptance and comfort of students. At the younger grade levels, while students are learning language, coding can be limited without a grasp of reading and spelling. Sphero’s Indi robot allows for coding with the use of color-coded cards that the robot can read.

This is good for English Language Learners as well since the coding doesn’t require knowledge of reading, but rather an understanding of the actions of the robot based on the colors it reads.

Challenge: Build a route that the robot can take to start from the beginning and make it to the final stop card. As students are able to get to the stop card, add extra cards to make the route more complex.

Criteria: Students are expected to see how the colors tell the robot a specific command that the robot will do precisely. By changing colors and placement within the robot's path, the robot will do new actions. Explain how the robot sees with a sensor on its underside.

Materials:
- Sphero Indi Robot
- Color-coded cards

Time Frame: 55 minutes

Evaluation: Do the students get the Indi to the stop card?

ITEEA EbD-TEEMS NxtGen: www.iteea.org/EbD_Course_Descriptions.aspx

ThisEbD™ Elementary School Design Brief was authored by Scott Weiler.
MIDDLE SCHOOL DESIGN BRIEF

Technological Systems: Designing a System

Context: The systems model teaches students that a system requires an input, process, output, and feedback. Systems must be maintained to continue functioning properly. However, even with proper parts and continuous maintenance, system components may malfunction or fail. Troubleshooting is a necessary process to determine system malfunctions and failures.

Course Objective: Technological Systems is intended to teach students how systems work together to solve problems and capture opportunities. A system can be as small as two components working together (technical system/device level) or can contain millions of interacting devices (user system/network level). We often break down the macro systems into less complicated micro systems to understand the entire system better. However, technology is becoming more integrated, and systems are becoming ever more dependent upon each other.

Challenge: Your Engineering Design Team was contracted to redesign the traditional gumball machine. Teams must address current mechanical issues and create innovative solutions for addressing the problem.

Criteria: Students must work collaboratively through the engineering design process to research, plan, sketch, prototype, test, and redesign a solution. Students must document the entire process in Engineering Design Journals. Students must follow all safety procedures throughout the prototyping and testing of the solution.

Materials: Using a makerspace style set up, the students will be provided with cups, bowls, file folders, bamboo skewers, toothpicks, straws, cardboard, clothespins, construction paper, recycled materials, tape, hot glue, scissors, rulers, and gumballs (gumballs can be substituted with marbles).

Time Frame: 4 hours

Evaluation: The students’ knowledge, skills, and attitudes are assessed using Engineering Design Journals and Performance Rubric.


This EbD™ Middle School Design Brief was authored by Blaire Thrasher.

Images by Blaire Thrasher.
Context: Creating complex assemblies in CADD software is an important step in product development. Anyone seeking Associate Certification in Onshape will need to be proficient in creating assemblies within Onshape.

Course Objective: The Onshape Certification byDesign course is specifically designed to prepare students to pass the Onshape Certified Associate Exam. The course is broken into three units, each containing five learning cycles, a preliminary challenge, and a primary challenge. Students learn sketching, extrusion, assemblies, and engineering drawings.

Challenge: In Unit 3 Learning Cycle 5, students create an assembly model of a caster. Students model all of the non-standard content in the previous learning cycle. By combining their models and standard content, a functional three-dimensional model is created. Mates are used to apply real-world constraints to the model to make it functional just like the real thing. Students must select the appropriate mates for each application as to properly define the interactions between all of the parts within the assembly.

Criteria: Students need to understand how all of the parts interact with each other and apply the appropriate mates to create a fully functional three-dimensional model. Students must use the parts they modeled in the previous learning cycle to create their assembly. The properties (materials, part numbers, and description) of each model must be applied correctly as specified in the Bill of Materials (BOM). The mass properties tool will be used to collect data about the entire assembly.

Materials: Onshape is a browser-based three-dimensional parametric modeling system that is free for education. We recommend the use of an Educational Enterprise account, but it is not required. Onshape can run on iOS, Android, Chromebooks, or any device that runs a modern web browser.

Time Frame: 4 hours

Evaluation: Students are evaluated on their selection and application of mates for each part in the assembly. The instructor will check the function of the assembly after the document is shared using Onshape’s Sharing and Collaboration tools.

ITEEA EbD Technological Design:
www.iteea.org/EbD_Course_Descriptions.aspx

This EbD™ High School Design Brief was authored by Brad Fessler. Model/Drawing Images from Onshape by Brad Fessler