Technology Education
Foundations of Technology – Grade 9
Student Learning Objective

4-4-13

SLO Component	*Component Description*
Objective Summary Statement	Students enrolled in the Foundations of Technology (FoT) course will increase their skill in the application of the Engineering Design Process, which includes using mathematics (algebraic analysis) to solve engineering design problems.
Student Population Data Review & Baseline Evidence	The data review, conducted by two Technology Education teachers from Alpha Delta High School, focused on the common curriculum for the FoT course and common assessment data. Both teachers use the same FoT curriculum and formative, summative and performance-based assessments. The Foundations of Technology (FoT) course is required of all students to meet the Maryland Graduation Requirement for Technology Education. There are 107 ninth grade students from Alpha Delta High School enrolled in FoT. The International Technology and Engineering Educators Association (ITEEA) provides a pre- and post-assessment (samples attached), as well as, a rubric (attached) for a hands-on design challenge to assess project-based learning and application of the Engineering Design Process. Both assessments are used statewide for the FoT course. Pre- and post-assessment data is currently provided at the class, school and state levels but not at the student level. The student-level data will not be available from the ITEEA until next year. However, for purposes of writing this SLO, each FoT teacher analyzed additional student-level data based on their rosters of students. Pre-assessment data suggests that the student population is diverse in both background and ability. The data suggest that the 107 students' gender and race/ethnicity data closely matches the school population: 46% White, 40% African American, 5% Asian, 9% Hispanic, 47% female, and 53% male. Pre-assessment school-level data indicate that 78 out of 107 students (73%) **are not** familiar with the Engineering Design Process and using algebraic analysis to solve a design problem, and thus, will not be able to master this content to pass the formative assessment for Unit 3 and the end-of-course FoT post assessment without instructional interventions. The data reveal the number of students in each class having difficulty with this content but not the individual identity of the students. Further analysis was conducted by each teacher at the student level using teacher observation and formative assessment data to determine which of their students would be included in this SLO. The student-level data analysis revealed that out of the 78 students who had difficulty applying the Engineering Design Process and algebraic analysis 10 are ELL students, 29 students have Individual Education Plans (IEPs), and 39 (unduplicated) students are female. Upon further review of attendance data, five (5) of the students (4 males and 1 female) had chronic attendance issues in the previous year limiting their instructional time. The assumption is that the limited instructional time the previous year left them unprepared to use the required mathematics (algebraic Analysis) in the course to be successful on the FoT pre-assessment.
Instructional Interval	The instructional interval will be November - May of the 2012–2013 school year and represents a significant portion of the instructional period.

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Learning Content	The content targeted is the Engineering Design Process that uses mathematics (algebraic analysis) to solve and evaluate design problems. Mastery of this content is essential for students to be successful in the FoT course because it is required in 62 % of the course content. This critical content is represented in standard 8h of the FoT curriculum. It is specifically measured in Unit 3, Lesson 2, used as process in Units 4 and 5, measured in 3% of the post assessment, and 40% of the post assessment requires students to use this skill as part of the process to correctly answer questions. In Unit 3, Lesson 2 students are asked to design a solution to an authentic problem and evaluate their design. Students will have to use knowledge of how to apply the Engineering Design Process and use mathematics (algebraic analysis) to solve open-ended problems and evaluate for the best solutions.
Target	Because the results of the pre-assessment do not reveal individual student scores, the teachers could not customize the targets for individual students; therefore, there are no tiered targets set related to performance level scores on the pre-assessment. However, because the data revealed that there are subgroups of students (ELL, Special Education, and Female) who are having difficulty with mastering this content and need additional intervention, a performance level target was set for individual subgroups as follows: **TARGETS for FoT at Alpha Delta High School: (78 Students)** Students with IEPs: 80% (23 out of 29) will correctly apply the Engineering Design Process using mathematics (algebraic analysis), will pass the formative assessment for Unit 3, Lesson 2 and portions of the FoT end-of-course post-assessment that require this skill. ELL Students: 80% (8 out of 10) will correctly apply the Engineering Design Process using mathematics (algebraic analysis), will pass the formative assessment for Unit 3, Lesson 2 and portions of the FoT end-of course post-assessment that require this skill. Female Students: 80% (31 out of 39) will correctly apply the Engineering Design Process mathematics (algebraic analysis), will pass the formative assessment for Unit 3, Lesson 2 and portions of the end-of course FoT post-assessment that require this skill. Meeting the targets above means that 62 out of 78 students included in this SLO will pass the formative assessment for Unit 3, Lesson 2 and most likely will pass portions of the FoT end of course post-assessment that require mastery of the content. Since there are two FoT teachers with separate class rosters (attached), the chart below indicates a breakdown of how the targets above correspond with each teacher's roster of students.

	Mike Nesbitt		**Mickey Dolans**	
Subgroup	**# of Students**	**80%**	**# of Students**	**80%**
Students with IEPs	13	10	16	13
ELL Students	7	6	3	2
Female Students	20	16	19	15
Total	**40**	**32**	**38**	**30**

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Evidence of Growth	Student progress will be measured at periodic intervals using common formative and summative assessments (attached). Teacher observations (sample attached) will also be used to document students' strengths and challenges. Evidence of growth will be recorded in the students' Engineering Design Journal (sample included). Formative data will be captured using the using a common ITEEA assessment rubric for Unit 3 Lesson 2 to accurately measure students' mastery of using mathematics in the engineering Design process (critical content). The rubric outlines each step in the Engineering Design Process as well as how mathematics is applied to solve the problem. Additional ITEEA rubrics will be used for the other lessons in Unit 3 and for subsequent lessons in units four and five where students will have to demonstrate mastery of this content to be successful. The ITEEA FoT formative assessments provide student data at the unit, lesson and standard level. The test data are considered the best available and the pre- and post-assessments are administered nationally.

Strategies	Instructional strategies implemented will address issues related to the various subgroups:
	• Collaborate with special education and ELL instructional specialists to develop supplemental resources for Unit 3, Lessons 2 of the FoT course for students with IEPs and ELL students to address specific learning needs;
	• Collaborate with mathematics teachers to develop integrated instructional lesson plans that scaffold teaching of the required math concepts;
	• Modify subsequent lessons based on data gathered by common formative assessments;
	• Employ principles from Universal Design for Learning:
	  • Content is presented in various learning modalities;
	  • Students will have opportunities for multiple means of expressing comprehension and application of content;
	• Work with the Society for Women Engineers to:
	  • Assist with development of Design Challenges that will appeal to female students;
	• Work with the Student Services Support Team to implement attendance incentives for students with attendance issues and track results; and
	• Meet on a monthly basis to review formative and summative assessment tools and discuss data to inform instructional practice.

Teacher Professional Development and Support	Both Technology Education teachers will participate in the Engineering By Design online office hours where there are opportunities to work with Master Teachers to learn strategies and best practices in instruction for Unit 3. This work will occur prior to developing resources and presenting instruction. Online office hours are provided monthly, there is no cost. Both teachers would like the opportunity to observe and to be observed by technology education Master Teachers so that peer coaching can be employed when content is presented to students. This effort will highlight effective teaching and allow for an on-going discussion on methods to present content.