# Seymour Public Schools Curriculum

## Grade Six Science, Technology, Engineering & Math (STEM) Curriculum

The purpose of this class is to introduce students to science, technology, engineering and math skills with hands-on experiences and real-world applications.

### Unit 1 – Orientation

Students will learn how to interpret a graph and conduct reliable research. This will also allow students to become acclimated to the Synergy In the Cloud (ITC) program.

### Unit 2 – Graphic Communications

Students will learn the fundamentals of drafting and communication of technical information. They will also learn to use the related tools needed to complete various drawings. Design and measurement skills will also be emphasized. The skills introduced in this unit will assist students throughout their lives.

### Unit 3 – Computer-Aided Drafting & Design

Students will use computer-aided drafting (CAD) software to explore the fundamentals of drafting. Students will use CAD software to create multiview drawings of a geometric solid and to complete a set of floor plans. The floor plans will be based on standards for architectural drawings.

### Unit 4 – Research & Design

Students will design, manufacture, and race a model $CO_2$-powered dragster car. Students will design their cars to meet certain specifications and limitations so that it qualifies as a legal car on race day. They will learn the concepts and terms in the design process as well as gain an understanding of lift and drag on an object. After they finish their cars, students will test them in several ways and predict the cars' performance.

# Seymour Public Schools Curriculum

UNIT 1- Orientation

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| **Subject:**<br>**Grade:**<br>**Time Frame:** | **STEM**<br>**6**<br>**August-September (3 Weeks)** |
| **CCSS**<br><br>**Overarching Standards** | **Literacy Standards**<br>CCSS.ELA-LITERACY.RST.6-8.10<br>By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.<br>**Math Standards**<br>CCSS.MATH.CONTENT.6.SP.B.5<br>Summarize numerical data sets in relation to their context. |
| **Enduring Understanding** | Data found in graphical and statistical representations can be analyzed to find trends.<br>Graphical and statistical representations can be used to make interpretations and predictions involving real world situations.<br>When conducting any type of research, sources must be evaluated for validity and reliability. |
| **Essential Questions** | How does a change in the data set influence central tendency?<br>How can data representation influence conclusions and predictions?<br>How can a source be deemed reliable? |
| **Priority Standards** | **Connecticut Technology Education Standards**<br>EKS.02.04 - Evaluate oral and written information for: accuracy, adequacy/sufficiency, appropriateness, clarity, conclusions/solutions, fact/opinion, propaganda, relevancy, validity, and relationship of ideas.<br>**Common Core State Standards**<br>CCSS.ELA-LITERACY.RST.6-8.7<br>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). |
| **Supporting Standards** | CCSS.ELA-LITERACY.RST.6-8.2<br>Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.<br>CCSS.ELA-LITERACY.RST.6-8.3<br>Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.<br>CCSS.ELA-LITERACY.RST.6-8.4<br>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.<br>CCSS.MATH.CONTENT.6.RP.A.3<br>Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. |

# Seymour Public Schools Curriculum

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| | CCSS.MATH.CONTENT.6.RP.A.3.C<br>Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.<br>CCSS.MATH.CONTENT.6.RP.A.3.D<br>Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.<br>CCSS.MATH.CONTENT.6.EE.B.7<br>Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers. |

| **Strategies/Modes** | **Materials/Resources** | **Assessments** |
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| ➢ Modeling<br>➢ Guided practice<br>➢ Class/small-group discussions<br>➢ Student-determined pacing<br>➢ Strategies for interpreting & analyzing graphical images (tips & tricks) | ➢ Synergy ITC presentations<br>➢ Teacher-created supplemental materials<br>➢ Graphic organizers<br>➢ Calculators | <u>Summative Assessment</u><br>➢ End of unit questions from Synergy ITC, combined with a performance task in which students demonstrate their ability to interpret a graph and conduct research.<br><br><u>Formative Assessments</u><br>➢ Pre-test<br>➢ Research, Challenge & Application (RCA): quizzes throughout the unit<br>➢ Mini Performance Assessments<br>➢ Verbal Questioning/Conferencing with students<br>➢ Agree/Disagree<br>➢ Fist to Five<br>➢ Exit Slips |

# Seymour Public Schools Curriculum

UNIT 2- Graphic Communications

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| **Subject:**<br>**Grade:**<br>**Time Frame:** | **STEM**<br>**6**<br>**September-October (4 Weeks)** |
| **CCSS**<br><br>**Overarching Standards** | **Literacy Standards**<br>CCSS.ELA-LITERACY.RST.6-8.4<br>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.<br>CCSS.ELA-LITERACY.RST.6-8.10<br>By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.<br>**Math Standards**<br>CCSS.MATH.CONTENT.6.G.A.1<br>Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.<br>CCSS.MATH.CONTENT.6.RP.A.3<br>Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. |
| **Enduring Understanding** | Drafting is a form of communication.<br>Using drafting tools properly greatly impacts the outcome of a design.<br>Geometry is the branch of mathematics that deals with the properties, measurement, and relations of points, lines, angles, surfaces, and solids. |
| **Essential Questions** | Why is drafting called the “language of industry”?<br>What would happen if a design was created with inaccurate measurements or improperly used equipment?<br>Why is a basic understanding of geometry important for drafting? |
| **Priority Standards** | **Connecticut Technology Education Standards**<br>DD.03.03 Explain that the use of symbols, measurements, and drawings promotes clear communication by providing a common language to express ideas<br>**Common Core State Standards**<br>CCSS.ELA-LITERACY.RST.6-8.3<br>Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.<br>CCSS.ELA-LITERACY.RST.6-8.7<br>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). |

# Seymour Public Schools Curriculum

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| **Performance Expectations**<br><br>**(Student outcomes)** | ➢ Use basic drafting tools: T square, drawing board, triangle, scale, and compass.<br>➢ Learn and apply the alphabet of lines and various drafting symbols.<br>➢ Demonstrate measurement knowledge by correctly using a scale.<br>➢ Gain drafting experience by completing various types of drawings.<br>➢ Demonstrate knowledge of proper techniques used for dimensioning.<br>CCSS.MATH.CONTENT.6.RP.A.3.D<br>Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.<br>CCSS.MATH.CONTENT.6.EE.A.2.C<br>Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length s = ½. |

| **Strategies/Modes** | **Materials/Resources** | **Assessments** |
|---|---|---|
| ➢ Modeling<br>➢ Class/small-group discussions<br>➢ Hands-on drafting activities<br>➢ Student-determined pacing<br>➢ Demonstration of proper use of equipment | ➢ Synergy ITC<br>➢ Online dictionary<br>➢ Teacher-created supplemental materials<br>➢ Graphic organizers<br>➢ Drafting equipment (drawing boards, T squares, rulers, compasses, triangles, pencils, masking tape)<br>➢ Student Module Notebook<br>➢ Drafting activity worksheets<br>➢ Wooden geometric shapes<br>➢ Calculators | <u>Summative Assessment</u><br>➢ End of unit questions from Synergy ITC and a performance task in which students must demonstrate appropriate use of drafting equipment.<br><u>Formative Assessments</u><br>➢ Module Guide (pre-test)<br>➢ Research, Challenge and Application (RCA): quizzes throughout the unit<br>➢ Performance Assessments<br>➢ Fist to Five<br>➢ Verbal questioning/conferencing with students<br>➢ Student work<br>➢ Exit Slips |

# Seymour Public Schools Curriculum

UNIT 3- Computer-Aided Drafting & Design

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| **Subject:**<br>**Grade:**<br>**Time Frame:** | **STEM**<br>**6**<br>**October - November (5 Weeks)** |
| **CCSS**<br><br>**Overarching Standards** | **Literacy Standards**<br>CCSS.ELA-LITERACY.RST.6-8.10<br>By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.<br>**Math Standards**<br>CCSS.MATH.CONTENT.6.G.A.1<br>Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. |
| **Enduring Understanding** | There are many different types of lines used in drafting, each of which has a different function.<br>Orthographic projection is the method used to show a three-dimensional object on a two-dimensional plane.<br>When creating a floor plan, an architect must consider architectural standards and functionality of the building. |
| **Essential Questions** | Why are there so many different types of lines in drafting?<br>Why would someone need to show a three-dimensional object on a two-dimensional plane?<br>What criteria are essential when creating a floor plan for a house? |
| **Priority Standards** | **Common Core State Standards**<br>CCSS.MATH.CONTENT.6.G.A.3<br>Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.<br>CCSS.ELA-LITERACY.RST.6-8.4<br>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. |
| **Performance Expectations**<br><br>**(Student outcomes)** | ➢ Explore careers related to drafting.<br>➢ Work with the alphabet of lines.<br>➢ Create a pattern for a model soapbox racer.<br>➢ Measure the dimensions of geometric solids.<br>➢ Create, dimension, and print multiview drawings of geometric solids using CAD software.<br>➢ Create cutaway drawings.<br>➢ Complete an architectural drawing. |

# Seymour Public Schools Curriculum

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| | CCSS.ELA-LITERACY.RST.6-8.3<br>Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.<br>CCSS.ELA-LITERACY.RST.6-8.7<br>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).<br>CCSS.MATH.CONTENT.6.EE.A.2.C<br>Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas V = s3 and A = 6 s2 to find the volume and surface area of a cube with sides of length s = 1/2. |

| **Strategies/Modes** | **Materials/Resources** | **Assessments** |
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| ➢ Student-determined pacing<br>➢ Model how to use software<br>➢ Software tips & tricks<br>➢ Class/small-group discussions<br>➢ Jeopardy | ➢ Synergy ITC<br>➢ Online dictionary<br>➢ Teacher-created supplemental materials<br>➢ Graphic Organizers<br>➢ TV monitor (connected to computer)<br>➢ DesignCAD software<br>➢ Punch! Home and Landscape software<br>➢ Wooden geometric shapes<br>➢ Rulers<br>➢ Calculators | <u>Summative Assessment</u><br>➢ End of unit questions and performance assessment in which students explain their floor plans<br><u>Formative Assessments</u><br>➢ Module Guide (pre-test)<br>➢ Research, Challenge & Application (RCA): quizzes throughout unit<br>➢ Fist to Five<br>➢ Performance Assessments<br>➢ Student Work<br>➢ Jeopardy<br>➢ Exit Slips |

# Seymour Public Schools Curriculum

UNIT 4- Research & Design

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| **Subject:**<br>**Grade:**<br>**Time Frame:** | **STEM**<br>**6**<br>**November - January (6 Weeks)** |
| **CCSS**<br><br>**Overarching Standards** | **Literacy Standards**<br>CCSS.ELA-LITERACY.RST.6-8.10<br>By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.<br>**Math Standards**<br>CCSS.MATH.CONTENT.6.RP.A.3<br>Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. |
| **Enduring Understanding** | The design process requires multiple drafts and revisions of a design before the product can be manufactured.<br>A lack of precision in the design process can result in an ineffective product, loss of time, and loss of money.<br>Performance of a product can be predicted using a formula, and predictions can be tested for accuracy. |
| **Essential Questions** | Why is it important to create drafts and make multiple revisions of a design before having the product manufactured?<br>What steps are involved in the design process?<br>How can the quality of a product impact its performance?<br>How can the performance of a product be predicted? |
| **Priority Standards** | **Connecticut Technology Education Standards**<br>DD.02 Explore the engineering design.<br>➢ DD.02.01 Demonstrate that evaluating, modeling, modifying and testing can be used to transform ideas into practical solutions.<br>➢ DD.02.02 Gather information to gain background knowledge related to a problem.<br>➢ DD.02.04 Select and use appropriate materials, tools and machines.<br>➢ DD.02.05 Construct tables, charts, databases, spreadsheets, and graphs to display data.<br>➢ DD.02.06 Relate the design process beyond the classroom.<br>➢ DD.02.07 Create various graphic representations or drawing of the design solution.<br>➢ DD.02.12 Evaluate the effectiveness of a model and recommend necessary changes. |
| **Performance Expectations**<br><br>**(Student outcomes)** | ➢ Understand the relevance of specifications to the design process.<br>➢ Follow the design process to design and build a $CO_2$-powered dragster car.<br>➢ Use a band saw, drill press, sandpaper, and paint to produce a completed $CO_2$ dragster.<br>➢ Test the performance design of a dragster.<br>➢ Explore the concepts of aerodynamics.<br>➢ Learn how mass affects the performance of a $CO_2$-powered dragster. |

# Seymour Public Schools Curriculum

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| | CCSS.ELA-LITERACY.RST.6-8.3<br>Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.<br>CCSS.ELA-LITERACY.RST.6-8.7<br>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).<br>CCSS.MATH.CONTENT.6.EE.B.6<br>Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.<br>CCSS.MATH.CONTENT.6.EE.B.7<br>Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers<br>CCSS.MATH.CONTENT.6.EE.C.9<br>Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.<br>CCSS.ELA-LITERACY.RST.6-8.4<br>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. |

| **Strategies/Modes** | **Materials/Resources** | **Assessments** |
|---|---|---|
| ➢ Student-determined pacing<br>➢ Class/small-group discussions<br>➢ Learning Stations (motion & forces)<br>o Solve math problems<br>o Conduct mini-experiments<br>o Analyze images<br>➢ Provide immediate feedback/recommendations for revisions of designs<br>➢ Hands-on learning | ➢ Synergy ITC<br>➢ Online dictionary<br>➢ Teacher-created supplemental materials<br>➢ Graphic organizers<br>➢ Rulers<br>➢ Calculators<br>➢ Electronic balance<br>➢ Race track<br>➢ Dragster kits<br>➢ Sandpaper<br>➢ Drill press<br>➢ Band saw or jigsaw<br>➢ Safety glasses<br>➢ Face masks<br>➢ Roll ramps | <u>Summative Assessment</u><br>➢ End of unit questions and performance assessment in which students race their dragster cars. A rubric will be provided to students for the performance assessment.<br><u>Formative Assessments</u><br>➢ Module Guide (pre-test)<br>➢ Research, Challenge & Application (RCA): quizzes throughout unit<br>➢ Fist to Five<br>➢ Performance Assessments<br>➢ Student Designs<br>➢ Manufactured products<br>➢ Exit Slips<br>➢ Predictions vs. Results |