**Lehighton Area School District**
**Curriculum Framework**

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| **Course Title:** | Project and Research Science |
| **Content Area:** | Science and Technology |
| **Grade Level(s):** | 10-12 |
| **Course Overview:** | This course will provide students with the opportunity to develop, conduct and present an original research project. In addition, students will design, construct, and test multiple design challenges. Experimental design will include mathematics and the use of technology to gain data and display information. Participants in this class are encouraged to compete in Science Olympiad. |
| **PA Core Standards:** | PA STEELS Standards |
| **Key Course Text and Materials:** | |
| **Key Assessments/Projects:** | Project Based |

| **Big Idea/Unit:** | **Ideal House / Students actively and skillfully interpret, analyze, evaluate, and synthesize information** | | | |
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| **Pacing:** | 6 weeks | | | |
| **Standards** | **Objective/Skill** | **Vocabulary** | **Additional Resources** | **Assessment/Project** |
| 3.5.9-12.A<br>3.5.9-12.B<br>3.5.9-12.C<br>3.5.9-12.F<br>3.5.9-12.N<br>3.5.9-12.O<br>3.5.9-12.P<br>3.5.9-12.U<br>3.5.9-12.V | Identify standard house layouts<br>Draw sketches<br>Evaluate design and structure<br>Create blueprints<br>Construct the house<br>Apply finishes<br>Evaluate efficiency, aesthetic, and comfort of the home | Ranch style<br>Victorian<br>Tiny house<br>Cabin<br>Farmhouse<br>Split level<br>Scale<br>Sustainability<br>Efficiency<br>Utility Knife<br>Hot glue<br>T-square | Sketch examples<br>Blueprint examples<br>Hot Glue gun and glue sticks<br>Utility knives and cutting boards<br>Drawing boards and tools<br>Cardboard<br>wood | Quizzes and tests:<br>Matching<br>Participation daily grade<br>Blueprints<br>Project presentation<br>Portfolio |

| **Big Idea/Unit:** | 3-D Printing / Students actively and skillfully interpret, analyze, evaluate, and synthesize information | | | |
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| **Pacing:** | 6 weeks | | | |
| **Standards** | **Objective/Skill** | **Vocabulary** | **Additional Resources** | **Assessment/Project** |
| 3.5.9-12.A<br>3.5.9-12.B<br>3.5.9-12.C<br>3.5.9-12.F<br>3.5.9-12.M<br>3.5.9-12.N<br>3.5.9-12.O<br>3.5.9-12.P<br>3.5.9-12.U<br>3.5.9-12.V | Parts of the 3-d printer<br>printing a pre designed part.<br>3-d Sketching<br>3-d drawing software<br>Design Factors | Build Plate<br>Leveling screws<br>Extruder<br>Hotend<br>Stepper motor<br>Z-axis rod<br>Filament runout sensor<br>Filament spool holder<br>PTFE tube<br>.3mf<br>.stl | Flashforge 3-d printer<br>Dremel 3-d printer<br>Bambu labs 3-d printer<br>PLA<br>OnShape<br>Video tutorial | Quizzes and tests:<br>Matching<br>Participation daily grade<br>Project presentation<br>Portfolio |

| **Big Idea/Unit:** | 3-D Drawing and printing - Marketplace design / Students actively and skillfully interpret, analyze, evaluate, synthesize, and apply information | | | |
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| **Pacing:** | 6 weeks | | | |
| **Standards** | **Objective/Skill** | **Vocabulary** | **Additional Resources** | **Assessment/Project** |

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| 3.5.9-12.M<br>3.5.9-12.N<br>3.5.9-12.O<br>3.5.9-12.P<br>3.5.9-12.U<br>3.5.9-12.V | Sketching in 3-d<br>Introduction to OnShape<br>Navigation in design space<br>Drawing 3-d puzzles<br>Brainstorm for marketable items<br>Design<br>Iteration<br>Final product | Navigation<br>Orthogonal<br>Sketch plane<br>Sketch<br>Object<br>XYZ planes<br>Pan<br>Zoom<br>Rotate<br>Extrude<br>Revolve<br>Sweep<br>Loft<br>Fillet<br>Chamfer<br>Shell<br>Construction plane<br>Offset face<br>midpoint | Mac desktops<br>chromebooks<br>Ipads<br>OnShape web based design space<br>Bambu labs printer<br>PLA | Participation daily grade<br>Project presentation<br>Portfolio |

**Big Idea/Unit:** Competition Project / Students actively and skillfully interpret, analyze, evaluate, synthesize, and apply information.
**Pacing:** 6 weeks

| Standards | Objective/Skill | Vocabulary | Additional Resources | Assessment/Project |
|---|---|---|---|---|
| 3.5.9-12.N<br>3.5.9-12.O<br>3.5.9-12.P<br>3.5.9-12.Q<br>3.5.9-12.U<br>3.5.9-12.V | Mouse trap vehicle introduction<br>brain storming ideas<br>mousetrap testing<br>Simple machines<br>prototyping<br>Final product construction<br>Testing<br>Iteration<br>More testing<br>Competition | Potential energy<br>force<br>torque<br>Lever<br>Fulcrum<br>wheel and axle<br>pulley<br>Iteration | Construction tools<br>Construction materials<br>3d printer<br>PLA | Participation daily grade<br>Project presentation<br>Portfolio |

**Big Idea/Unit:** Experimental Design / Students actively and skillfully interpret, analyze, evaluate, synthesize, and apply information.
**Pacing:** 6 weeks

| Standards | Objective/Skill | Vocabulary | Additional Resources | Assessment/Project |
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| 3.5.9-12.U<br>3.5.9-12.V<br>3.5.9-12.W<br>3.5.9-12.X<br>3.5.9-12.Z<br>3.5.9-12.AA<br>3.5.9-12.BB | Flex your brain activity (pendulums)<br>Identify experimental variables<br>Data collection - Tables<br>Graphing activities<br>Statistical tools<br>Sample calculations<br>Drawing conclusions<br>Self directed experimental design | Hypothesis<br>Independent variable<br>dependent variable<br>Constant<br>Control<br>data table<br>headings<br>Units<br>Line graph<br>Bar graph<br>pie graph<br>trendline<br>sample calculation<br>mean, median, mode<br>Conclusion<br>Sources of error | lab supplies<br>Experimental design event description<br>Practice materials | Participation daily grade<br>Experiment presentation<br>Portfolio |

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| **Big Idea/Unit:** | Model Rocketry / Students actively and skillfully interpret, analyze, evaluate, synthesize, and apply information. |
| **Pacing:** | 6 weeks |

| Standards | Objective/Skill | Vocabulary | Additional Resources | Assessment/Project |
|---|---|---|---|---|
| 3.5.9-12.M<br>3.5.9-12.N<br>3.5.9-12.O<br>3.5.9-12.P<br>3.5.9-12.U<br>3.5.9-12.V | Rocket construction<br>fin attachment<br>Engine mount<br>Nose cones<br>Recovery method<br>Rocket decoration/finish<br>Engine analysis<br>Flight Field descriptions<br>Rocket Launch | Newton's third law<br>Impulse<br>Nozzle<br>Root edge<br>Leading edge<br>Launch lug<br>Altitude<br>Ejection delay | Model rocket kit<br>engines<br>painting supplies<br>Launch materials | Participation daily grade<br>Rocket construction<br>Portfolio |