Blackstone Valley Regional Vocational Technical High School
Student Portfolio- Project Reflection

Date	**March 3, 2022**
Student Name	**Om Patel**
Subject	**Engineering & Robotics**
Instructor's Name	**Mr. Rhodes**
Instructor's Signature	

The focus of this project was to model a carabiner shuttle pen in Inventor, starting with a detailed functional and structural analysis of the actual product. At first, I completed a black box model and functional analysis to break the pen down into its inputs, outputs, and purpose. This step helped me understand the product beyond surface-level design and pushed me to think about how engineers reverse-engineer objects to study how they work. From there, I conducted a structural analysis by disassembling the pen and recording important information such as material, weight, density, texture, and dimensions. I used a dial caliper for small measurements, a scale for weight, and water displacement for volume. Creating a product disassembly chart gave me a clear reference sheet to guide the CAD work that came later.

The modeling process in Inventor came with several challenges. Some parts, like the torsion spring and upper body, were complex because they required the use of features and tools I had not used before. To overcome these difficulties, I learned new functions such as section views, the coil feature, and the sweep tool. For example, creating the torsion spring required me to think differently about how to model three-dimensional geometry. The process was frustrating at times, but each problem taught me a new skill that I later applied to other projects. This step showed me how important adaptability is in engineering.

After I modeled each part, I created assemblies to bring the pen together digitally. This required attention to detail, since every dimension had to be exact for the parts to align. Once the pen was assembled, I generated an exploded view, which allowed me to visually demonstrate how each component fit together. I then created multiview drawings for every piece, complete with dimensions and annotations. This stage reinforced how engineering design is as much about communication as it is about modeling. A drawing set serves as the universal language that other engineers and manufacturers can use to recreate a product without ever having to see the original.

Looking back, this project was more than just modeling a pen. It gave me practice in breaking down a complex object into smaller, manageable parts and then rebuilding it digitally. It also taught me how to combine analysis, measurement, and CAD modeling into one process. I started to appreciate how engineering projects often require both analytical and creative thinking. The functional analysis taught me to think about purpose, the structural analysis made me focus on details, and the modeling in Inventor tied everything together into a finished product.

This was one of the first projects where I began to see myself grow from simply following steps to actually thinking like an engineer. I learned how to troubleshoot problems in Inventor on my own, when to use resources such as tutorials, and how to stay patient when a part did not work the first time. These lessons have stayed with me as I moved into more advanced projects involving buildings, site layouts, and circuits. In all of those, I rely on the same habits I built here: measure carefully, document clearly, and refine until the design works.

Technical competencies and academic skills demonstrated by completing this assignment.

Framework Standard	Description
2.B.04.02	**Maintain engineering logs/notebooks/journals and portfolios for projects**
2.B.06.03	**Identify parts and materials for product.**
2.B.01.01	**Identify a problem to be solved based on identifying customer needs.**
2.B.01.02	**Brainstorm ideas; develop and evaluate solutions; create documentation; build and test prototype; and present design.**
Embedded Academics	**Description**
2.B.01.06	**Conduct short as well as more sustained research projects to answer a question (including a selfgenerated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.**
2.B.09.02	**Apply geometric methods to solve design problems (e.g.,, designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).**
2.b.01- 2.B.10	**Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.**
2.B.01.1.5	**Interpret plans, diagrams, and working drawings in the construction of prototypes or models.**