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

Date	**4/19/2022**
Student Name	**Om Patel**
Subject	**Engineering & Robotics**
Instructor's Name	**Mr. Rhodes**
Instructor's Signature	

In this project I was challenged to design, model, and test a CO_2 car from scratch. The first step was to measure the wheels, axles, and other car parts that were given to me. Using a dial caliper, I recorded precise measurements and used them as the foundation for my digital model in Inventor. Once I had accurate dimensions for the standard parts, I began brainstorming different car body designs. I sketched multiple ideas and compared them using a decision matrix. This helped me evaluate each option not just on appearance but also on aerodynamics, manufacturability, and compliance with project constraints. In the end I selected the design that I believed would be both efficient and competitive.

My goal was to create a body that was sleek and aerodynamic. I tried to eliminate flat edges so that air resistance would be reduced, and I added a spoiler to help keep the car stable on the track after being launched. The design process was not simple because there were strict constraints for size, shape, and safety. Working within those boundaries taught me how to be creative while still following rules. Once I finalized the design in Inventor, I created the axles, washers, and wheels and then assembled the car digitally. To prove that my design met all requirements, I created dimensioned drawings of each part along with a full assembly drawing. These drawings were important not only for grading but also for ensuring the car could be manufactured without errors.

After the design was approved, I prepared it for 3D printing on the MakerBot. This was the first time I had to adjust printer settings on my own, and I learned about features such as infill percentage and the number of shells. These decisions mattered because they affected the strength and weight of the final product. Once printed, I installed the wheels, axles, and other components into the body. Holding the physical car after so much time in digital design was a rewarding moment because it connected the abstract work in Inventor with a real prototype I could race.

The testing stage was exciting and competitive. Our class held races to see which cars performed best. I won a few rounds but eventually lost, and I discovered that weight was one of the biggest factors in speed. My car ended up heavier than many others, which slowed it down despite its aerodynamic shape. This experience was a clear reminder that good engineering is about balance. A design can look fast and aerodynamic, but if it carries too much mass, performance will suffer.

Looking back, I see this project as one of my first real lessons in tradeoffs and engineering judgment. I had to balance aerodynamics, weight, manufacturability, and design rules all at once. It also introduced me to the importance of testing and iteration. Losing in the races was disappointing, but it showed me how much there is to learn from failure. If I were to redesign the car today, I would pay more attention to reducing weight without sacrificing strength, and I would experiment more with 3D printing settings to optimize performance.

Most importantly, this project taught me patience and problem solving. Every step, from sketches to CAD to testing, required attention to detail. I also began to understand how engineering projects are rarely about a single skill. Success required accurate measurement, digital modeling, technical documentation, fabrication, and competition analysis. Together these skills built a foundation that I continue to use in larger projects, where the stakes are higher but the process is very similar.

Technical competencies and academic skills demonstrated by completing this assignment.

Standard	Description
2.B.01.06	Develop best solution, sketch and model idea, survey market and customers, produce a timeline, develop industry support, report results periodically, re-evaluate solution, develop criteria and limitations and produce initial drawings.
2.B.01.09	Develop testing protocol, test and evaluate prototype, assess performance and function, and modify design based upon results.
2.D.02.06	Create and edit a solid model using a 3-D modeling program, based upon design sketches. Utilize appropriate materials, measurements, fits, appearances, processes and functions.
2.B.01.02	Brainstorm ideas; develop and evaluate solutions; create documentation; build and test prototype; and present design.
Embedded Academics	**Description**
2.B,08.01.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
2.B.01.2.2	Demonstrate methods of representing solutions to a design problem, e.g.,, sketches, orthographic projections, multiview drawings.
2.B.01.06.7	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.01.02	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.