

This excerpt is from the project entitled “The Design and Creation of a Modified Posture Corrective Apparatus for Adolescent Females”

Element G: Construction of a testable prototype

This entry would be likely to receive a **score of 2**, based on the EDPPSR. The students have provided instructions on how to construct a prototype. These instructions are only somewhat clear and complete, missing such information as the temperature to which the oven should be set and specifications for the PVC pipe that is used. The photograph that is included provides an illustration of the completed prototype but does not provide elaboration/support for the step-by-step description of the construction of the prototype or for how various attributes (sub-systems) could be tested.

Based on this prototype, it is likely that data on a few design requirements could be determined. The team of engineering educators who scored this entry noted, however, that it was hard to relate the details about prototype construction back to testability.

Engineering Design Process Portfolio Scoring Rubric Component and Element Titles

Component I: Presenting and Justifying a Problem and Solution Requirements

- Element A: Presentation and justification of the problem
- Element B: Documentation and analysis of prior solution attempts
- Element C: Presentation and justification of solution design requirements

Component II: Generating and Defending an Original Solution

- Element D: Design concept generation, analysis, and selection
- Element E: Application of STEM principles and practices
- Element F: Consideration of design viability

Component III: Constructing and Testing a Prototype

- **Element G: Construction of a testable prototype**
- Element H: Prototype testing and data collection plan
- Element I: Testing, data collection and analysis

Component IV: Evaluation, Reflection, and Recommendations

- Element J: Documentation of external evaluation
- *Element K: Reflection on the design project*
- Element L: Presentation of designer’s recommendations

Component V: Documenting and Presenting the Project

- Element M: Presentation of the project portfolio
- Element N: Writing like an Engineer

Please Note: Elements M and N require no submission from the portfolio author(s) and are intended to be scored based on the portfolio work as a whole from what has been submitted from Elements A through L

Element G: Construction of a testable prototype

5 The final prototype iteration is clearly and fully explained and is constructed with enough detail to assure that objective data on all or nearly all design requirements could be determined; all attributes (sub-systems) of the unique solution that can be tested or modeled mathematically are addressed and a well-supported justification is provided for those that cannot be tested or modeled mathematically and thus require expert review.

4 The final prototype iteration is clearly and adequately explained and is constructed with enough detail to assure that objective data on many design requirements could be determined; most attributes (sub-systems) of the unique solution that can be tested or modeled mathematically are addressed and a generally supported justification is provided for those that cannot be tested or modeled mathematically and thus require expert review.

3 The final prototype iteration is clearly and adequately explained and is constructed with enough detail to assure that objective data on some design requirements could be determined; some attributes (sub-systems) of the unique solution that can be tested or modeled mathematically are addressed and an adequately supported justification is provided for those that cannot be tested or modeled mathematically and thus require expert review.

2 The final prototype iteration is explained only somewhat clearly and/or completely and is constructed with enough detail to assure that objective data on at least a few design requirements could be determined; a few attributes (sub-systems) of the unique solution that can be tested or modeled mathematically are addressed but there may be insufficient justification for those that cannot be tested or modeled mathematically and thus require expert review.

1 The final prototype iteration is only minimally explained and/or is not constructed with enough detail to assure that objective data on at least one design requirements could be determined; no more than one attribute (sub-system) of the unique solution that can be tested or modeled mathematically is addressed and any attempt at justification for those that cannot be tested or modeled mathematically and thus require expert review is missing.

0 Any attempt to explain the final prototype iteration is unclear or is missing altogether; there is no evidence that the prototype would facilitate testing by suitable means for any of the design requirements.



Procedure of Build (Prepping)

1. Cut the PVC pipes into a length less than 22" (this due to the size of the oven).
2. Cut a slit down the length of the pipe and place it in the oven for about 30 minutes.
3. Take out the pipes, one at a time, and insert the nozzle of the heat gun (set to 8-9) inside the pipe.
4. As the PVC starts to collapse, open it up and flatten it out using wooden planks.
5. Heat uneven areas and flatten again.

Construction of the Brace

1. Mark the mannequin with masking tape and cover it with a towel.
2. Each section must be re-marked off on the towel.
3. Cut out pieces of PVC from the flattened sheets and lay it on top of the towel.
4. Use the heat gun and mold the parts against the mannequin.
5. Once all of the parts are completed, roughly tape them to the mannequin and cut away excess material.
6. Bind these pieces using a butt attachment with reinforcement. (It is recommended that PVC cement be used but I used the hot glue gun because it was not working.)
7. Cut through the chest and back pieces
8. Place strips of Velcro on each part that needs to be attached. (This creates multiple flexible joints.)

Picture of the Final Prototype



