Element I – Score 2
Reinventing The Lifejacket

Element I: Testing, data collection and analysis - This entry would be likely to receive a score of 2, based on the EDPPSR.

It is important to bear in mind that the portfolio from which this is one entry was compiled using an older version of the EDPPSR, in which this entry was intended to focus only on analysis of the design based on testing.
However, even when considering evidence from the entries for Elements G and H (including the video showing the testing that took place in water), the score assigned would be a 3 at best. Through the conduct of a few tests for requirements (the priority of which is never stated explicitly but must be inferred from actions taken), the students demonstrate some understanding of testing procedure (whether "adequate" or "partial" may be debated). What keeps the score point level low at present is the absence of documentation of data analysis/explanation of the data in written and/or graphic form (graphs, charts, other visuals). Only the video images provide some evidence of what may be considered support for a general summary of the implications of testing conveyed in the video commentary. Furthermore, there is at present no documentation of any expert review(s).

Collectively, the entries for Component III: Constructing and Testing a Prototype show promise, however. It is likely that were these students to have had access to the current EDPPSR from the outset of their design project, they would have organized information accordingly and noted and omissions in time to gather and present missing information to support this entry and those for Elements G and H as well.

It is worth pointing out that students can be very successful in compiling an entry for Element I while focusing on only a few tests—those for what they deem "high priority" requirements (the ordering of which should be conveyed in the entry for Element C. The students who conducted this project understood the notion of conducting tests "that are reasonable based on instructional contexts." Access to a swimming pool allowed them to conduct operational tests on their flotation device. This element does not require that students test for all requirements or conduct tests that are impractical—or impossible—given available tools, resources and time. However, students ought to consider physical or mathematical modeling and expert review for those attributes of the solution that cannot be tested.

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 I: Testing, data collection and analysis

5 Through the conduct of several tests for high priority requirements that are reasonable based on instructional contexts, or through physical or mathematical modeling, the student demonstrates considerable understanding of testing procedure, including the gathering and analysis of resultant data; the analysis of the effectiveness with which the design met stated goals includes a consistently detailed explanation [and summary] of the data from each portion of the testing procedure and from expert reviews, generously supported by pictures, graphs, charts and other visuals; the analysis includes an overall summary of the implications of all data for proceeding with the design and solving the problem.

4 Through the conduct of several tests for high priority requirements that are reasonable based on instructional contexts, or through physical or mathematical modeling, the student demonstrates ample understanding of testing procedure, including the gathering and analysis of resultant data; the analysis of the effectiveness with which the design met stated goals includes a generally detailed explanation [and summary] of the data from each portion of the testing procedure and from expert reviews, generally supported by pictures, graphs, charts and other visuals; the analysis includes an overall summary of the implications of most if not all of the data for proceeding with the design and solving the problem.

3 Through the conduct of a few tests for high priority requirements that are reasonable based on instructional contexts, or through physical or mathematical modeling, the student demonstrates adequate understanding of testing procedure, including the gathering and analysis of resultant data; the analysis of the effectiveness with which the design met stated goals includes a somewhat detailed explanation [and summary] of the data from each portion of the testing procedure and from expert reviews, at least somewhat supported by pictures, graphs, charts and other visuals; the analysis includes a summary of the implications of at least some of the data for proceeding with the design and solving the problem.

2 Through the conduct of one or two tests for high priority requirements that are reasonable based on instructional contexts, or through physical or mathematical modeling, the student demonstrates partial or overly general understanding of testing procedure, including the gathering and analysis of resultant data; the analysis of the effectiveness with which the design met stated goals includes a partial explanation [and summary] of the data (partially complete and/or partially correct), at least minimally supported by pictures, graphs, charts and other visuals; the analysis includes a partial and/or overly-general summary of the implications of at least some of the data for proceeding with the design and solving the problem.

1 Through the conduct of one or two tests for requirements (which may or may not be high priority) that are reasonable based on instructional contexts, or through physical or mathematical modeling, the student demonstrates minimal understanding of testing procedure, including the gathering and analysis of resultant data; the analysis of the effectiveness with which the design met stated goals includes an attempted explanation [and summary] of the data but may not be supported by any pictures, graphs, charts or other visuals; the analysis may be missing even a partial and/or overly-general summary of the implications of any of the data for proceeding with the design and solving the problem.

0 Any test(s) for requirement(s) or attempts at physical or mathematical modeling fail to demonstrate even minimal understanding of testing procedure, including the gathering and analysis of resultant data; OR there is no evidence of testing or physical or mathematical modeling to address any requirements.

Element I Reflective questions;
_ What did I/we learn from testing about how well this design met the stated design requirements?
_ Why should others believe my/our analysis of the data?

How Testing Affected the Final Design

The final design is shaped the way it is because of our initial testing. In the initial testing we changed where the foam is located and how much foam is used wear. Also as our product evolved we changed the locations of straps and how adjustable the life jacket is.

The first changes we made was add more foam to the front of the jacket. We did this because if the foam was spread evenly throughout the jacket you would not always float face up. We wanted to design our product so that if you fell in you would float face up because you cannot control your breathing when you are on-conscience. If you fell in on-conscience and you float face down you will likely drown unless some one helps you.

Then we added straps to the back instead of having the foam connect to the strap on the waist.We did this so that back could be adjustable. Next we added a strap across the chest so that the life jacket would fit the way it was designed and keep the jacket tight to your chest.

For the final design we purchased clips that were adjustable on both sides so that both foam pillars are centered instead of one being centered and the other being off to the side. The final changed that we made was not fixing the foam to the front straps. The foam is connected in away so that the foam can slide across the chest to always be in the right position.