This project was evaluated using the point scale of 0-1-2-3. The project was evaluated based on the visible information in the project photograph; some more information may have been on the additional sheets.

A. Title
Title: The effect of the shape of the fish on the speed of the fish
Score: 3 – *The title correctly states the independent variable and the dependent variable and is NOT worded as a question.*
Comments: This title states both an independent variable (shape of the fish) and the dependent variable (speed of the fish). The independent variable could have been made a bit more specific by saying "fish body shape".

B. Question
Question: How does the shape of the fish affect the speed of the fish?
Score: 3 – *The question states the independent variable and the dependent variable, and is testable.*
Comments: This question correctly states the independent and dependent variable. The independent variable could have been made a bit more specific by saying "fish body shape".

C. Hypothesis
Hypothesis: The fish with a compressed shape (a fish with a slimmer, and thinner shape at both sides), will move quicker than the fish with a fusiform body shape (a fish with a rounder, thicker shape). As stated in the New York Aquarium Fish Body Shape Investigation article, compressed fish can "easily maneuver around obstacles and coral reefs." They can also, as stated in the same article, "turn with ease and move quickly". Another piece of evidence that supports our hypothesis is from the PowerPoint "Fish Morphology (Bony Fish)", "The body shape is well designed for making quick turns and quick bursts of speed over short distances."
Score: 3 – *The hypothesis (1) predicts the effect that changing the independent variable will have on the dependent variable, AND (2) explains the reason for the prediction using scientific concepts ("because…").*
Comments: The students chose evidence to support their hypothesis that came directly from the readings and thoroughly cited their sources. Although this was not in the typical "If..then..because" format, it is still correct. Nicely done.

D. Background Research (found throughout the project especially within the hypothesis and discussion/conclusion sections)
Score: 2 – *Background research is accurate, containing SOME relevant, well-chosen facts, definitions, concrete details, quotations, scientific concepts, or other information and examples that (1) provide information on the IV & DV AND (2) attempts to support the "because" portion of the hypothesis OR (3) attempts to support the "scientific reasoning" of the discussion/conclusion.*
Comments: The background research can be found in the hypothesis and discussion sections, despite not having its own solitary section. The students do well to attempt to support their hypothesis and their scientific reasoning. Further explaining the relationship body shape has on speed (drag, friction, surface area, etc.) would bring this up to a 3.

E. Investigation Design (ID)
Score: 3 – *All 5 components of the investigation's design (or ID) are stated correctly and explicitly, AND only one independent variable (or IV) is allowed to change at a time, AND there are multiple trials.*

Comments: The students correctly identify all 5 components of the ID. One note: The procedure mentions putting a focus on similar size fish (which is great!). That should be mentioned as a constant in the investigation design.

F. Procedure
Score: 2 – *The Procedure accurately and completely satisfies two or three of the above. (The procedure is (1) a step-by-step description of how the investigation was done AND (2) uses precise language and scientific vocabulary to describe both the sequence of actions taken and materials used AND (3) is sufficiently detailed to enable the reader to replicate the investigation AND (4) is consistent with the Investigation Design Diagram (IDD) and is an appropriate test of the hypothesis.)*
Comments: This procedure is good but needs a couple improvements. It is not as specific in the details as it could be. For example, in Step 8, how were the fish timed? It can be assumed a stopwatch was used but this should be specified. What kind of route did the fish have to take? What happened if they veered off the test path? From "nose to nose" meaning hitting the Post-It notes? What is the job of the collector? A few more details would enable to reader to replicate the investigation.

G. Data/Results
Score: 2 – *Most parts of the data graphs and tables are present, complete and accurate. Data analysis is attempted but may not be accurate.*
Comments: The data and graph appear accurate and do address the hypothesis and original question. Data analysis has been attempted but the interpretation could be improved. It cannot be stated that, "…the data significantly supports our hypothesis" since no tests of significance were performed and the standard deviations overlap according to the graph. This should make the observer question whether the two sets of data are actually significantly different. Finding standard deviation is a great attempt at analyzing this data, though. Side note: Starting over because a scuba diver interfered is good practice. However, it should be noted that accuracy cannot be assumed here.

Ha. Discussion/Conclusion: Scientific Explanation
Score: 2 - *Three or four parts of the Scientific Explanation are complete and accurate. A scientific explanation consists of a statement that makes an overall claim addressing the original investigation question AND supports the claim with evidence and relevant, accurate data from the investigation AND contains relevant scientific concepts AND uses words, phrases and clauses that clarify and connect the relationships between claim, evidence and science concepts AND demonstrates an understanding of the topic.*
Comments: This scientific explanation contains proper components and answers the investigation question. Improvement could be made under "demonstrates an understanding of the topic." In the article cited, fusiform shaped fish are said to travel at higher speeds, not compressed shaped. Some of the reasoning chosen to support their evidence goes against the science concepts. Students would just need to clarify their understanding of the resource texts.

Hb. Discussion/Conclusion: Reflection
Score: 3 – *Conclusion contains thoughtful, relevant, and reasonable reflections including: 1) states whether the hypothesis was or was not supported AND 2) a description of possible sources of error AND 3) suggested solutions to these sources of error AND 4) "Next Steps" determined as a result of this investigation.*
Comments: Very nicely done. This is an exemplary example of a reflection section of a long-term investigation project.

I. Literature Cited
Score: 2 – *Most parts of the Literature Cited are complete and accurate. Bibliography is present, but references are not cited in the text of the investigation.*
Comments: The literature cited section and in-text citations are not in the correct formats. Check sites like https://owl.english.purdue.edu/owl/ for how to properly write these.

Project Section	Score (0-3)	Weight	Weighted Score
A. Title	3	x 1	= 3
B. Question	3	x 1	= 3
C. Hypothesis	3	x 2	= 6
D. Background Research	2	x 2	= 4
E. Investigation Design (ID)	3	x 2	= 6
F. Procedure	2	x 2	= 4
G. Data/Results	2	x 3	= 6
Ha. Discussion/Conclusion: Scientific Explanation	2	x 2	= 4
Hb. Discussion/Conclusion: Reflections	3	x 1	= 3
I. Literature Cited	2	x 2	= 4
		Total weighted score	= 43 (54 max)
	Final Score (%) =	=Total weighted score/54 x 100	= 80%