

FEASIBILITY REPORT REGARDING INSTRUCTIONS FOR CREATION OF “FREE WILLY” PAPER AIRPLANE

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INTRODUCTION

Purpose

The purpose of this report is to evaluate the feasibility of utilizing *Instructions for Constructing the “Free Willy” Paper Airplane* [1] to aid in the creation of paper airplanes for a physics experiment to be conducted at Ames Middle School.

Problem

At Ames Middle School, teachers are constantly expected to help students improve their standardized test scores. To help aid their students in the achievement of increased concept understanding and information retention, the science teachers have been collaborating to design a new physics experiment for their students. They have decided to design an experiment related to paper airplanes so that students can continue learning more about aerodynamics. For this experiment, the students will be given a set of instructions that will teach them how to create their paper airplane, and then they will run trials based on improvements that they make to the original design. The plane created with the original instructions has been designed to complete a flip during flight, and each group will determine their own criteria for improvement.

Before formally implementing this experiment into the course plan, the teachers need to ensure that the instructions provided to help the students create the experimental control are sufficient. For this reason, this feasibility report has been developed by a third party to illustrate whether the previously drafted instructions are adequate enough to guide students in the creation of the experimental control plane.

Scope

This feasibility report focuses on the document, *Instructions for Constructing the “Free Willy” Paper Airplane* [1]. The airplane instructions were evaluated based on the following criteria: *Simplicity, Time to Build, and Completion of Flip.*

DISCUSSION

Simplicity

Explanation

For this experiment to be successful, seventh-grade students must be able to create the airplane based on the instructions provided to them. This means that the instructions need to be clear, concise, and easy to follow.

To determine the simplicity of the instructions, thirty people, with ages ranging from twelve to eighty-five, were chosen as examiners. Each examiner was supplied with a copy of the instructions and was asked to follow the directions given within the document. When each person reached the end of the instructions, he or she was given a survey and was asked to give their honest feedback.

On the survey provided, the examiners were prompted with statements regarding the simplicity of the instructional document and were asked to select a value between 1 and 5 for each statement. On the survey, a value of 1 indicated that the examiner strongly disagreed with the statement, and a value of 5 indicated that the examiner strongly agreed with the statement. Statements on the survey regarding simplicity are as follows:

1. The instructions were simple to follow.
2. The instructions were concise (few unnecessary details, wordiness kept to a minimum.)
3. The visual aids provided on the instructions were adequate in clarifying the textual instructions.

Responses based on the above statements can help us determine whether or not a wide variety of examiners believe that the instructions are concise and simple to follow. To evaluate this criterion, it was determined that average values of 4 and 5 for the responses to the above statements would indicate that the instructions are adequately simple. On the other hand, average responses of 1, 2, or 3 would indicate that there is a lack of clarity, and therefore, room for improvement in this regard. These values were chosen based on the understanding that the instructions must be definitively simple so that seventh-grade students can successfully complete the plane based on the information given.

Data

Figure 1 shows the average response values from the thirty survey participants regarding the simplicity of the instructions. Error bars indicate the standard deviation range.

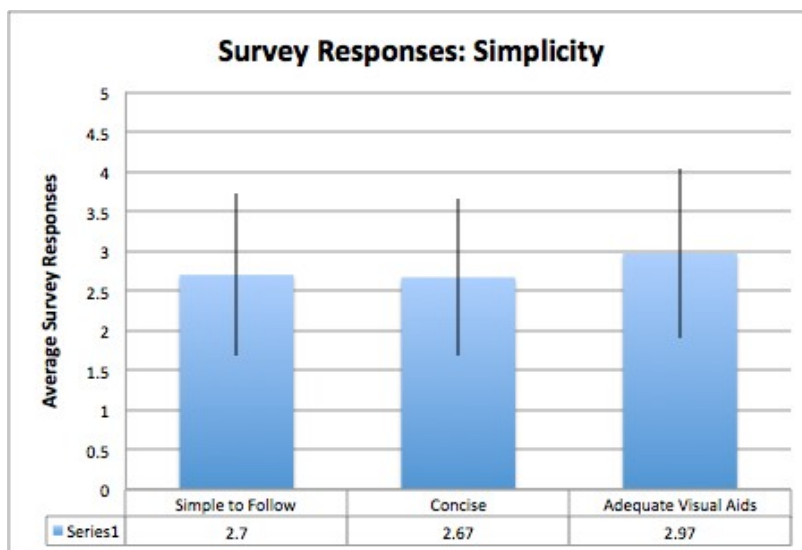


Figure 1: Average survey results based on thirty responses to the statements regarding instruction simplicity.

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Interpretation

As seen in Figure 1, the average values of the responses obtained on the survey regarding simplicity are below the minimum desired value of 4, so our results do not definitively indicate that the paper airplane instructions are viewed as simple and concise. Therefore, we cannot conclude that the instructions are adequate in this consideration.

Time to Build

Explanation

For this experiment, students will create a control airplane and then they will develop, create, and test new improvement designs. Finally, they will interpret and summarize the results. In order for the students to complete this experiment during a one hour class period, it is necessary that the creation of the experimental control does not consume a large amount of the available time. As a general guideline, it was decided that a realistic and acceptable average building time would lie below six minutes because the building of the control airplane should not consume more than ten percent of the class period.

Data

To determine whether the instructions would allow the students to produce the paper airplanes in a reasonable timespan, the duration of time that elapsed while each of the thirty examiners followed the instructions was recorded and is shown in Table 1 below.

Table 1: Information regarding time spent producing the control airplane based on the instructions provided. Data collected from 30 examiners.

Time to Build (Minutes)		
Average	Minimum	Maximum
8.89	4.77	12.65

Interpretation

As shown in Table 1, the average time spent creating the control paper airplane based on thirty trials exceeds the predetermined acceptable value of six minutes, so the instructions cannot be deemed feasible in this regard. Although the minimum time to complete the airplane is below six minutes, the average time value indicates that it cannot be assured that a majority of people would be able to complete the development of the control airplane within ten percent of the class period. In addition, the fact that certain examiners spent more than twelve minutes on the creation of the airplane shows that this aspect of the experiment has been shown to consume a time equivalent of twenty percent of a class period.

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Completion of Flip

Explanation

The “Free Willy” paper airplane was designed to complete a flip during flight. One way of indicating that a plane is created according to the design specifications would be to verify that it can complete a flip while it is in the air. If a plane is able to complete a flip, it can be concluded that the instructions aided in the creation of a plane that matches performance specifications. This is an indicator of instructional success. It was determined that successful instructions would allow those who follow to produce airplanes that are able to complete a flip at least seventy-five percent of the time.

Data

To evaluate this criterion, each examiner was asked to throw their plane five separate times. The number of trials that resulted in the plane completing a flip was recorded, and the related percentage of trials that resulted in a flip are shown in Figure 2.

Table 2: Average percentage of trials where the plane completed a flip.

Average Percentage of Trials that Resulted in a Flip

66.00%

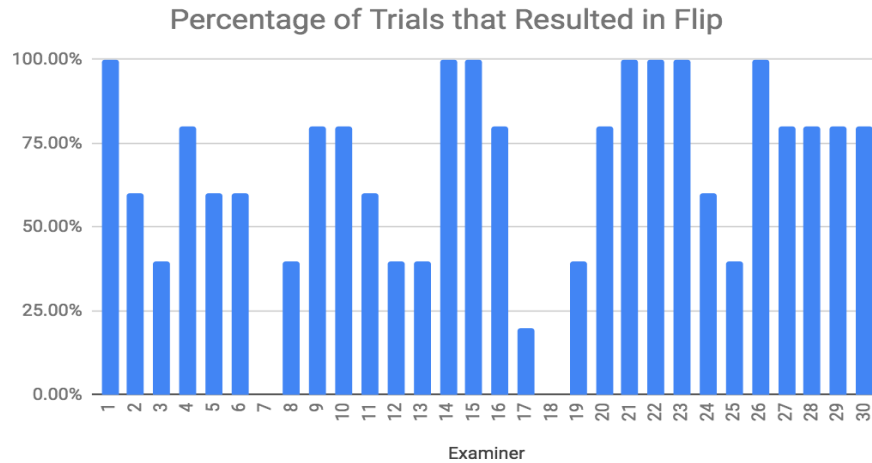


Figure 2: Percentage of trials that resulted in a flip based on five trials completed by each of the thirty examiners.

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Interpretation

Based on the average results, as shown in Table 2, it cannot be concluded that the instructions are adequate in aiding users to successfully create airplanes that result in a flip at least seventy-five percent of the time. In addition, as shown in Figure 2, it can be seen that some examiners were never able to get their plane to flip. For these reasons, we can see that there is room for improvement in the explanation of the details necessary to repeatedly achieve a flip.

CONCLUSION

Summary

Based on data collected from thirty test subjects, it has been found that the document, *Instructions for Constructing the “Free Willy” Paper Airplane* [1], in its current state, is not adequate in terms of the following criteria: Simplicity, Time to Build, and Completion of a Flip. Therefore, It would not be feasible for Ames Middle School to implement the document into their experimental curriculum at this time.

Recommendations

If certain modifications are made regarding the simplicity of the instructional document as a whole, Ames Middle School Science Department should be able to successfully implement the instructions into their experiment schedule. For example, certain examiners believed that the instructions are somewhat confusing, particularly at “Step 7,” and it was also noted that “Step 8” is missing on the document. If clarifications were made, it may be easier for students to follow the instructions, and ultimately complete the plane accurately in a shorter timespan. The video is helpful in clarifying some confusion, however,

students may not have time to read fully through the document and then spend six minutes watching the video. Overall, we are recommending simplification of the document so that students will be able to use the document with ease. Once improvements have been made, we recommend that studies similar to those highlighted in this report are conducted with an audience that is primarily seventh-grade age. This will help ensure that the document is clear enough for seventh graders to be successful in the initial stages of the experiment.

REFERENCES

[1] Group 2, English 314 Section 4, *Instructions for Constructing the “Free Willy” Paper Airplane*, Ames, IA: Iowa State University, 2018

