Completed Rubric for Exit Project Titled

"The effect of different kinds of cooking oils (IV) on the amount of time (DV) it takes to reach 350 degrees Fahrenheit."

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 different kinds of cooking oils (IV) on the amount of time (DV) it takes to reach 350 degrees Fahrenheit.

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 (cooking oils) and the dependent variable (amount of time it takes to reach 350 degrees).

B. Question

Question: How long does it take different kinds of cooking oil to reach 350 degrees Fahrenheit?

Score: 2 – *The question does not make the independent variable and the dependent variable clear, but is testable.*

Comments: While the "Statement of Research Question" does clarify the relationship suggested by the question, the wording of the question itself does not make them clear. Using the format, "What is the effect of _____ on _____?" is one way of wording the investigation question for readers so that they may understand what variable is causing an effect on something else. After reading the "Statement of Research Question," it seems that perhaps a more precise question would have been, "What is the effect of an oils smoke point on the rate at which the oil heats?"

C. Hypothesis

Hypothesis: We predicted that the higher the smoke point, the longer it would take for the oil to heat to 350 degrees Fahrenheit. Based on smoke points, we predicted that peanut oil would take the longest time to reach 350 degrees Fahrenheit, the second longest would be vegetable oil, followed by olive oil and the last canola oil.

Score: 1 – *The hypothesis (1) is a predication that does not frame a relationship between the variables OR (2) DOES NOT explain the reasoning for the prediction using scientific concepts ("because…").*

Comments: No link has been made between smoke points and the rate at which the oil heats using scientific concepts. It is unclear as to why the temperature at which the oil begins to smoke and break down would be related to how long it takes the oil to heat up.

D. Background Research (found throughout the project especially within the hypothesis and discussion/conclusion sections)

Score: 1 – *Background research contains FEW relevant, well-chosen facts, definitions, concrete details, quotations, scientific concepts, or other information and examples that (1) provide information on the IV & DV OR (2) attempts to support the "because" portion of the hypothesis OR (3) attempts to support the "scientific reasoning" of the discussion/conclusion.*

Comments: The students have found relevant information that explains what a smoke point is, and how it differs according to type of oil. This explains how the oils will behave when exposed to specific temperatures. However, the students have not provided information about the time it takes oils to heat. If the questions were about how fast the oil would burn, the information provided may have been sufficient.

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: A very careful and thoughtful effort was made to control the conditions of the experiment so that only one variable was changed during the investigation.

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: The procedure seems complete, except that it made no mention of the 10 minute limit for the oil to reach 350 degrees Fahrenheit.

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 students chose to represent their data in a wide variety of formats. However, it became difficult to follow as the data in all the charts and graphs didn't seem to agree. The first chart had gaps in the data where the blanks indicated that the oil never reached the target temperature (assumingly within 10 minutes), but the temperature of the oil at 10 minutes was also not recorded. Also, in the analysis, the order in which the students claim the oils heated seems to be different from the order shown in the chart. The students appear to have only averaged the temperatures that had full sets of data, which was actually no higher than 300 degrees Fahrenheit although that's not how it is explained in their work.

Ha. Discussion/Conclusion: Scientific Explanation
Score: 1 – *One or two parts of the scientific explanation are complete and accurate ((1) makes an overall claim addressing the original investigation question AND (2) supports the claim with evidence and relevant, accurate data from the investigation AND (3) contains relevant scientific concepts AND (4) uses words, phrases, and clauses that clarify and connect the relationship between the claim, evidence and science concepts AND (5) demonstrates an understanding of the topic.)*
Comments: The student do make a claim that answers the original question and cite evidence, although the evidence is not referenced in the students' actual Scientific Explanation but rather in the Discussion. However, there are no relevant scientific concepts that explain how the smoke point is related to the length of time it takes oil to heat. Therefore, understanding of the topic appears to be limited.

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: All parts of the reflection are present and complete.

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 students could have benefitted from more scholarly or science-based resources in their background research. The information they did gather was cited throughout the project appropriately.

Project Section	Score (0-3)	Weight	Weighted Score
A. Title	**3**	x 1	**= 3**
B. Question	**2**	x 1	**= 2**
C. Hypothesis	**1**	x 2	**= 2**
D. Background Research	**1**	x 2	**= 2**
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	**1**	x 2	**= 2**
Hb. Discussion/Conclusion: Reflections	**3**	x 1	**= 3**
I. Literature Cited	**2**	x 2	**= 4**
		Total weighted score	**= 34 (54 max)**
	Final Score (%) =	**=Total weighted score/54 x 100**	**= 63%**