Completed Rubric for Exit Project Titled

"The effect of a hydroponic nutrient solution vs. a soil-like growing medium on lime basil growth rate"

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.

Summary: This is a controlled investigation using simple homemade hydroponic growing equipment. The project could have been strengthened with the addition of multiple trials, which would have provided more data to support the claim. Citations from background research would support and strengthen the scientific reasoning section. Sources of error and next steps could also be added to provide the reader with ideas of how to further study this concept.

A. Title
Title: The effect of a hydroponic nutrient solution vs. a soil-like growing medium on lime basil growth rate (Giving Plants Another Chance)
Score: 1 – *The title is present but does NOT correctly state the independent variable or the dependent variable.*
Comments: A 3-point title for this project could read, "The effect of a hydroponic nutrient solution vs. a soil-like growing medium on lime basil growth rate".

B. Question
Question: Does a plant growing hydroponically grow faster than a plant growing in a soil like material?
Score: 3 – *The question states the independent variable and the dependent variable, and is testable.*
Comments: For consistency this question could be rephrased as, "How does hydroponic nutrient solution vs. a traditional soil-like material affect the growth rate of a lime basil plant?"

C. Hypothesis
Hypothesis: If we grow a lime basil plant hydroponically, then it will grow faster than in soil-like material because nutrient enriched water (hydroponic solution) is cleaner than soil and is proven to allow plants to obtain more nutrients necessary for its maximal growth in the shortest time.
Score: 3 – *The hypothesis (1) predicts the effect that changing the independent variable will have on the dependent variable AND (2) explains the reasoning for the prediction using scientific concepts ("because...")*
Comments: None

D. Background Research (found throughout the project especially within the hypothesis and discussion/conclusion sections)
Score: 1 – *Background Research contains inaccurate or 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 background research thoroughly discussed hydroponics and hydroponic growing systems (IV), but did not provide information about lime basil (DV). In addition, pages were stapled onto this section, which made it difficult to review all materials provide by the student.

E. Investigation Design (ID)
Score: 2 – *Four of the 5 components of the ID are stated correctly, OR more than one IV is changing at a time OR there are not multiple trials.*

Comments: To receive a three the student should explicitly list the levels and number of trials. In addition, the student only grew one plant in each growing medium. Setting up at least three trials (three plants) in each growing medium would have strengthened this project.

F. Procedure
Score: 3 – *The procedure (1) is 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 required additional pages, which could not be viewed. The reader must assume that the thorough quality showcased on the first page of the procedure continued onto additional pages.

G. Data/Results
Score: 3 – *Data table(s) and graphs(s) (1) are accurate and include labels (titles, axes with units of means) AND (2) address the hypothesis and have been chosen to clearly address the original question AND (3) data analysis identifies and accurately summarizes trends or patterns in the data.*
Comments: None

Ha. Discussion/Conclusion: Scientific Explanation
Score: 1 – *One or two parts of the Scientific Explanation are complete and accurate.*
Comments: To strengthen the scientific explanation, the student should use words, phrases, and clauses that clarify and connect the relationship between the claim, evidence, and reasoning. Additionally, citations from background research should be included in this section to support the students' scientific argument.

Hb. Discussion/Conclusion: Reflection
Score: 1 – *One part of the Reflection is complete and accurate.*
Comments: The reflection section does not show "Next Steps" and does not discuss possible sources of error. To strengthen this project, the student could have identified that multiple trials along with more extensive data collection would have strengthened their claim.

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 student listed their resources and used proper citation methods, but there are no in-text citations. Additionally, the literature cited could have been stronger with a more varied selection of background resources.

Project Section	Score (0-3)	Weight	Weighted Score
A. Title	**1**	x 1	**= 1**
B. Question	**3**	x 1	**= 3**
C. Hypothesis	**3**	x 2	**= 6**
D. Background Research	**1**	x 2	**= 2**
E. Investigation Design (ID)	**2**	x 2	**= 4**
F. Procedure	**3**	x 2	**= 6**
G. Data/Results	**3**	x 3	**= 9**
Ha. Discussion/Conclusion: Scientific Explanation	**1**	x 2	**= 2**
Hb. Discussion/Conclusion: Reflections	**1**	x 1	**= 1**
I. Literature Cited	**2**	x 2	**= 4**
		Total weighted score	**= 38 (54 max)**
	Final Score (%) =	**=Total weighted score/54 x 100**	**= 70%**