Junior Cycle Science - First Year

NCCA
An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment

Investigating ✓ Communicating ✓ Knowledge and understanding

An experimental investigation: How far can I travel in 10 seconds?

Learning outcomes in focus

Students should be able to:

NS3 design, plan and conduct investigations; explain how reliability, accuracy, precision, fairness, safety, ethics, **and selection of suitable equipment have been considered.**

NS4 produce and select data (qualitatively/quantitatively), critically analyse data to identify patterns and relationships, identify anomalous observations, **draw and justify conclusions.**

NS5 review and reflect on the skills and thinking used in carrying out investigations, and apply their learning and skills to solving problems in unfamiliar contexts.

NS7 organise and communicate their research **and investigative findings in a variety of ways fit for purpose and audience, using relevant** scientific terminology and **representations.**

PW1 select and use appropriate measuring instruments.

PW2 identify and measure/calculate **length**, mass, **time**, temperature, area, volume, density, speed, acceleration, force, potential difference, current, resistance, electrical power.

PW3 investigate patterns and relationships between physical observables.

Learning intentions

We are learning to:

- design, plan, conduct and report an investigation.
- plan a safe experiment to give accurate, reliable results by choosing suitable measuring equipment and controlling key variables.
- accurately measure physical quantities such as length and time.
- evaluate the reliability and quality of our data and, if appropriate, suggest improvements that could be made to our experimental design.

Teaching and learning context

First year students were asked the question, How far can you travel in 10 seconds? They were then asked to plan, conduct and record the method and results of their experiment to answer the question. One class was allocated for discussion and preparation, with an emphasis on measurement and error. Two classes were allocated for data collection. Homework was set and completed over two evenings, namely the production of graphs and a conclusion relating to the patterns in the data. Open access to necessary resources was provided and a written end product expected.

Task

Plan and conduct an experiment to answer the question "How far can I travel in 10 seconds?" Pay particular attention to accuracy. Record your method and results and present your graphs and conclusions.

Success Criteria

I can:

SC1: make a prediction based on the variables I am going to measure.

SC2: identify key variables

SC3: select appropriate equipment to accurately measure values for distance and time

SC4: record, organise and present the method and results of my experiment with appropriate units in a way that makes sense to others

SC5: draw and justify conclusions from my observations or graphs.

SC6: review my investigation design, referring to errors, extensions and/or improvements to promote accuracy and precision.

An experimental investigation: How far can I travel in 10 seconds?

Planning a Scientific Investigation Name:

How far can you go in 10 seconds?

What are you going to investigate?

We are going to run for ten seconds which will be measured by a stopwatch, and when the 10 seconds are over we are going to measure the distance.

List the variables you think might affect how far you can go in 10 seconds.

The weather conditions. Energy.
Asthma. Grip on the shoes.
Accurate time measuring.
Slope, Wind direction.
Surface. Fitness.

Decide which variables you are going to measure. Explain how these variables might affect how far you can go in 10 seconds.

Surface. We are going to measure the distance achieved in 10 sec. on grass and tarmac. Further on tarmac

Wind direction. We are going to run with the wind and then against the wind.

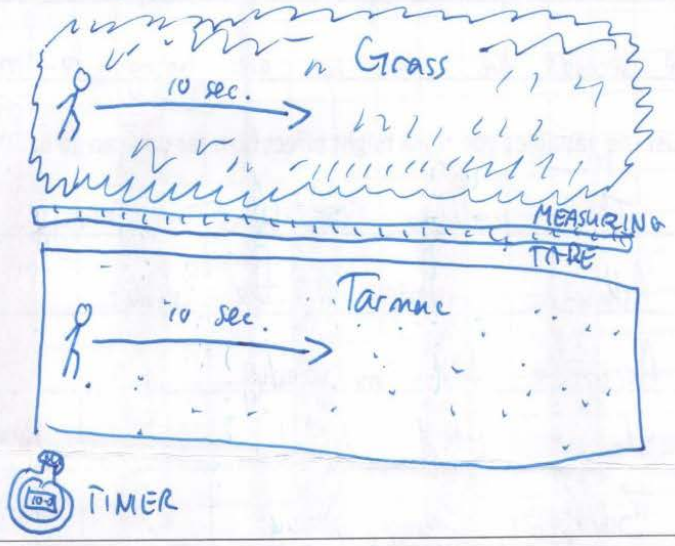
* Further on tarmac because there is more grip.
* Further with the wind because it will push you.

Put your experiment design into action. Assemble the equipment as you see fit and collect your data. Think carefully about how you will analyse and present your data. Show all of your work in this booklet and attach any extra sheets you may use.

SC2: Key variables are identified.

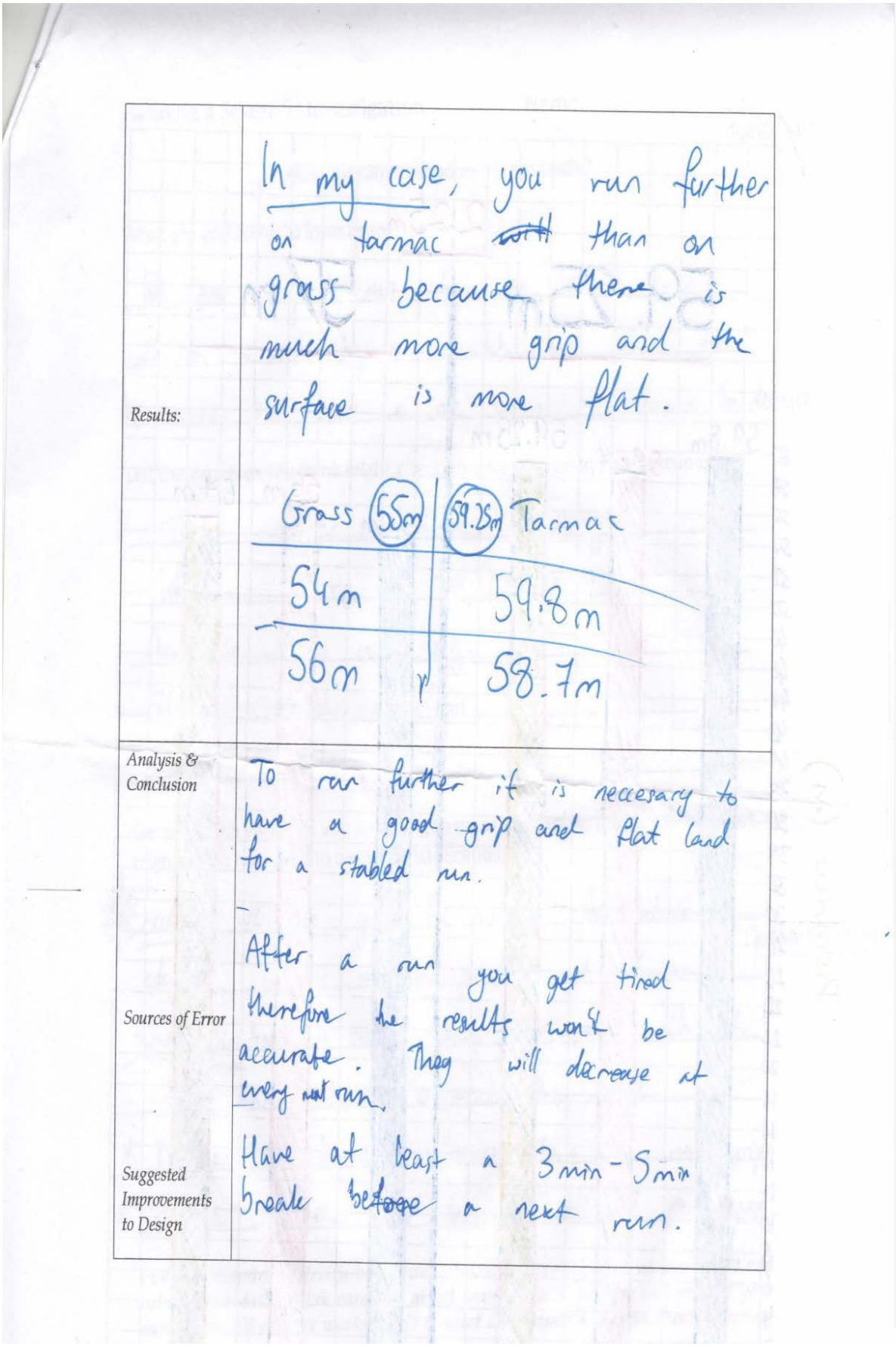
SC1: Presents two simple predictions that are relevant to the task and examines the first in the experiment that follows.

An experimental investigation: How far can I travel in 10 seconds?

Experiment Title:	How far can I run in 10 sec's.?
List of Apparatus:	Timer, measuring tape, shoes (for) and runners
Diagram:	
Method:	• Set up the measuring tape to at least 80m. • Get a person to run and another person to time. • Measure the distance made in 10 sec. * Run twice on tarmac and on grass to get an average distance.

SC3: Selects appropriate equipment to measure distance and time and records 4 results in a simple table.

An experimental investigation: How far can I travel in 10 seconds?



Results:

In my case, you run further on tarmac ~~with~~ than on grass because there is much more grip and the surface is more flat.

Grass	Tarmac
55m	59.3m
54m	59.8m
56m	58.7m

Analysis & Conclusion:

To run further it is necessary to have a good grip and flat land for a stabled run.

Sources of Error:

After a run you get tired therefore the results won't be accurate. They will decrease at every next run.

Suggested Improvements to Design:

Have at least a 3min - 5min breake ~~before~~ a next run.

SC4: Results and method recorded. Averages are correctly calculated in the table, though not identified as such. There are errors in the graph.

SC5: Draws a relevant conclusion

SC6: Makes a comment about accuracy, reliability and fairness in relation to getting tired. Improvements are suggested.

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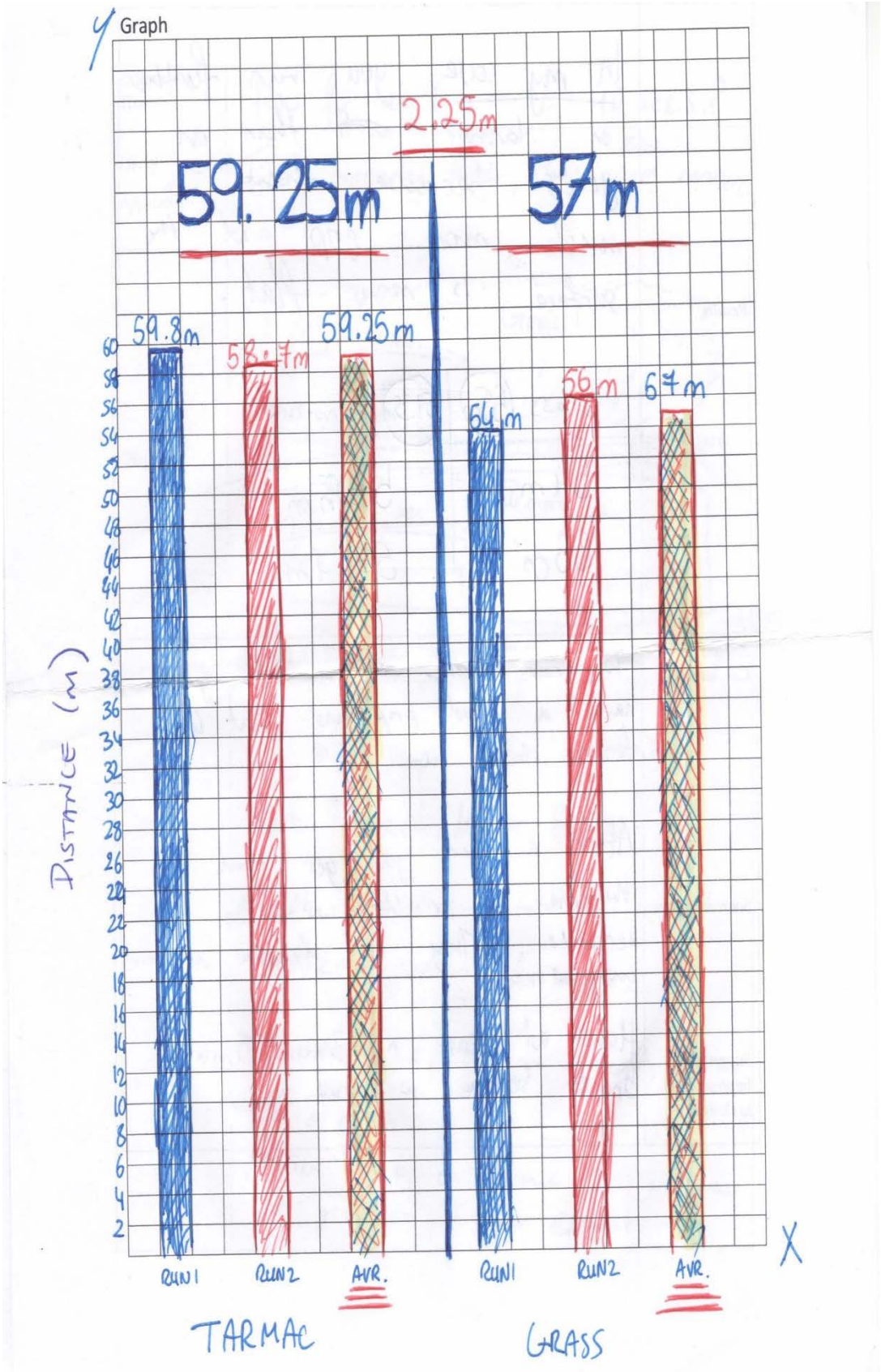

Overall judgement: In Line With Expectations