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Excellent Work

PO BOX 123
University of Papua New Guinea, WAIGA
Papua New Guinea
Phone: (675) 78999972/73454356
Email: natzman21@gmail.com
Website: https://stemresourcesandtraining.com

Name: Malcolm Auro **SCHOOL:** George Brown Secondary **Due Date**: 23/09/2025

Unpacking of the science content standard using the steps from Table 2.4. I've scaffolded each phase to align with your interdisciplinary STEM approach and your emphasis on inquiry, creativity, and real-world relevance.

Step 1: Identify Big Ideas (Main Concepts)

Content Standard:

Students will be able to explain the nature and the processes of scientific inquiry and use the modes of scientific inquiry and habits of mind to investigate and interpret the world around them.

Breakdown:

- Nature of scientific inquiry
- Processes of scientific inquiry
- Modes of inquiry (e.g., observation, experimentation, modeling)
- Habits of mind (e.g., curiosity, skepticism, perseverance)
- Investigating and interpreting the natural world

Step 2: Unpack Big Ideas into Benchmarks / Performance Standards

Benchmarks / Performance Standards:

1. Describe the characteristics of scientific inquiry (e.g., empirical, systematic, iterative).
2. Demonstrate the use of observation and questioning to initiate investigations.
3. Design and conduct simple experiments to test hypotheses.

4. Analyze and interpret data using appropriate tools and reasoning.

5. Communicate findings using scientific language and formats.

6. Reflect on the role of habits of mind in scientific thinking.

Step 3: Select One Benchmark and Unpack into Topics & Objectives

Selected Benchmark:

Design and conduct simple experiments to test hypotheses.

Lesson Topics / Titles:

- "Investigating Plant Growth Variables"
- "Testing Water Filtration Methods"
- "Exploring Heat Transfer in Materials"

Lesson Title Chosen:

"Investigating Plant Growth Variables"

Lesson Objectives:

- Identify independent, dependent, and controlled variables.
- Formulate a testable hypothesis.
- Design and carry out a fair test.
- Record and interpret results using tables and graphs.

Step 4: Unpack Lesson Title into KSAVs, Key Questions, Strategies

KSAVs:

Knowledge	Skills	Attitudes	Values
Scientific method variables data recording	Hypothesis formulation experiment design data analysis	Curiosity persistence openness to revision	Respect for evidence collaboration ethical inquiry

Essential Questions:

- What makes an experiment fair?
- How do variables affect outcomes?
- Why is it important to test one variable at a time?

Teaching & Learning Strategies:

- Inquiry-based learning
- Group experiment design
- Guided data collection
- Peer review and reflection

Assessment Strategies:

- Observation checklists
- Lab reports
- Group presentations
- Self-assessment rubrics

Step 5: Develop SBC Lesson or Project Plan

Project plan based on the unpacked science content standard, structured according to the format you provided. This version is designed to support inquiry-based learning, STEM integration, and student empowerment—perfect for your teaching philosophy.

Project Plan: Investigating Plant Growth Variables

Step 1: Project Identification (Challenges / Issues)

Challenge:

Students often observe plant growth in their environment but rarely question the factors that influence it. This project addresses the challenge of helping students move from passive observation to active investigation. It encourages them to:

- Identify and isolate variables that affect plant growth (e.g., sunlight, water, soil type, temperature).
- Design and conduct fair tests to explore cause-effect relationships.
- Interpret data to draw evidence-based conclusions.

- Reflect on how scientific inquiry helps us understand and improve agricultural practices, especially in local contexts like PNG.

Real-World Relevance:

This project connects directly to local agricultural practices, food security, and environmental sustainability. Students can apply their findings to improve gardening techniques at home or in the community, making science meaningful and impactful.

Step 2: Curriculum Connections

Subject: Science

Strand: Scientific Inquiry and Investigation

Content Standard:

Students will be able to explain the nature and the processes of scientific inquiry and use the modes of scientific inquiry and habits of mind to investigate and interpret the world around them.

Performance Standard:

Design and conduct simple experiments to test hypotheses.

Cross-Curricular Links:

- Mathematics: Measuring plant growth, calculating averages, graphing results.

- English: Writing hypotheses, lab reports, and reflections; presenting findings.

- Entrepreneurship: Applying results to improve local farming or gardening practices, potentially developing small-scale agricultural innovations.

Step 3: Assessment Ideas

Formative Assessments:

- Hypothesis Justification: Students write and explain their hypothesis.

- Experimental Design Plan: Teams submit a plan outlining variables, materials, and procedures.

- Observation Logs: Students record daily or weekly plant growth data.

- Peer Feedback: Teams review each other's experiment setup and provide constructive feedback.

Summative Assessment:

- Group Presentation: Teams present their findings using visuals (graphs, photos).

- Lab Report: Includes hypothesis, method, data, analysis, and conclusion.

- Reflection Journal: Individual students reflect on their learning process and inquiry habits.

Rubric Criteria:

- Clarity and testability of hypothesis
- Fairness and logic of experimental design
- Accuracy and organization of data
- Depth of interpretation and conclusion
- Communication skills and teamwork

Step 4: Teaching and Learning Process

Phase 1: Ask – Defining and Understanding

Activity: Brainstorming session—"What affects how plants grow?"

Discussion: Introduce the concept of variables (independent, dependent, controlled).

Essential Questions:

- What makes an experiment fair?
- Why is it important to test one variable at a time?
- How can we use inquiry to solve real-world problems?

Phase 2: Imagine – Investigating and Researching

- Activity: Students research plant growth factors using books, internet, or interviews with local farmers.
- Task: Explore examples of fair tests and scientific investigations.
- Extension: Invite a local gardener or agricultural expert to share insights.

Phase 3: Plan – Designing and Planning the Preferred Solution

- Activity: In teams, students choose one variable to test (e.g., amount of sunlight).
- Task: Write a testable hypothesis and design a fair experiment.
- Output: Submit a detailed experimental plan including materials, steps, and data collection tools.

Phase 4: Create – Producing the Preferred Solution

- Activity: Students set up their experiments and monitor plant growth over 2–3 weeks.
- Task: Record observations, take measurements, and document with photos.
- Output: Create data tables and graphs to visualize results.

Phase 5: Improve – Evaluating the Solution

- Activity: Teams compare results and discuss what worked and what didn't.
- Task: Reflect on the reliability of their data and the fairness of their test.
- Extension: Revise experiment design or propose improvements.
- Real-World Link: Discuss how findings could improve local gardening or farming practices.

Step 5: Reflection

Individual Reflection Prompts:

- What did I learn about designing fair tests?
- How did my habits of mind (e.g., curiosity, perseverance) help me during this project?
- What challenges did I face and how did I overcome them?
- What would I do differently next time?

Team Reflection Prompts:

- How well did we collaborate and communicate?
- What did we learn from each other?
- How can our findings be applied in real life?
- What new questions do we have after completing this project?

This project plan not only aligns with your curriculum but also empowers students to think critically, collaborate effectively, and connect science to their everyday lives.

Step 6: Identify Assessment Tasks for Each Activity

Activity	Assessment
Brainstorming	Group mind map submission
Hypothesis Formulation	Written hypothesis with justification
Experiment Design	Experiment plan with variable identification
Monitoring growth	Observation log and photo documentation
Data recording	Completed data table and graph
Presentation	Oral presentation with visual aids
Reflection	Written reflection on inquiry process

Step 7: Develop Summative Assessment Rubric

Summative Task: Group Presentation of Experimental Findings

Criteria	Excellent (4)	Very good (3)	Good (2)	Needs improvement (1)
Clarity of hypothesis	Clear, testable, well- justification	Mostly clear and testable	Basic clarity, limited justification	Unclear or missing
Experimental design	Logical, fair test, well controlled	Mostly logical some control	Basic design, minimal control	Poorly structured
Data presentation	Accurate, well organized visuals	Mostly accurate visuals	Basic visuals, some errors	Disorganized or missing
Interpretation	Insightful, evidence based conclusions	Reasonable conclusions	Basic interpretation	Misinterpretation or missing
Communication	Engaging, confident, collaborative	Clear collaborative	Basic delivery	Unclear or disjoined

Step 8: Group Presentation

To present my project plan, it follow the general outline below

- Objectives and rationale
- Activities and inquiry process
- Findings and reflections
- Assessment evidence