

APPLY TECHNOLOGICAL DESIGN AND SCIENTIFIC HABITS OF MIND

Performance Standard 11B/13A/13B.G

Students will apply the concepts, principles and processes of technological design within classroom investigations accordingly:

- *Knowledge*: Understand the concepts, principles and processes of technological design.
- *Application*: Apply the appropriate scientific habits of mind when investigating science concepts.
- *Communication*: Incorporate the scientific technologies and processes of technological design into classroom investigations and reports.

Note to teacher: These concepts could be embedded into historic technological design investigations.

Suggested activities for standards 12 B, C, D and 13B at stage G, incorporate many of the performance descriptions for Standard 11B in an historic context.

Procedures

1. ***In order to know and apply the concepts, principles and processes of technological design (11B) and the accepted practices of science (13A) and the concept that describe the interaction between science, technology and society (13B)***, students should experience sufficient learning experiences to develop the following:
 - Identify **an important historic innovation** or model of a technological design from curricular studies.
 - Examine applicable curricular inventions or entrepreneurial events.
 - Research pertinent contextual foundation related to the historical period.
 - Suggest available resources and barriers for success that were encountered in the historic setting.
 - Determine the success criteria, design constraints and testing logistics that were encountered.
 - Sketch the purported progression of design stages and prototypes.
 - Propose the logical sequence of steps in design construction.
 - Identifying original and comparable simulation materials for construction.
 - Predict proportional scale for actual parameters and materials.
 - Complete the assembly of the model of the innovation, following all safety precautions and classroom rules for preparation, procedures and clean-up.
 - Select appropriate graphic display of data to show relation of tested success criteria variables,
 - Test prototype by conducting multiple trials according to success criteria, scale and design constraints.
 - Collect reliable and precise data from collecting instruments in selected format.
 - Record anecdotal observations.
 - Analyze available historic data from original investigations.
 - Analyze data from multiple trials from model investigation.
 - Correlate historic conditions to model testing, identify faulty procedural steps which could become sources of error or design flaws.
 - Communicate an evaluation report on the historical significance of original innovation and the tested model, its original and current constraints and conditions.
 - Generate design modifications which could have been considered historically,
 - Identify how scientific habits of mind (scientific reasoning, insight, skill, creativity, intellectual honesty, tolerance of ambiguity, skepticism, persistence and openness to new ideas) were integral in the original investigation.
 - Compare the knowledge, skills and methods of early and modern scientists who addressed this innovation.
 - Analyze how the introduction of the innovation affected human activities.
 - Associate personal biographic information about the scientist or innovator.
2. Separated assessment of 11B may not be practical. Significant research has demonstrated the value of inquiry-based, hands-on, life-long learning for students. The emphasis of technological design is incorporated into the wording of all performance descriptions for Goal 12, in stages A-J. A spiraling, inquiry-based curriculum is encouraged for all classrooms. Specific performance descriptions may be emphasized in different technological design investigations in order to build mastery of each concept or process of technological design.
3. See suggested procedures for 12 B, C, D and 13B at stage G for specific assessment features about historic innovations.

Examples of Student Work not available

Time Requirements

- Initial introduction of processes may require additional time as needed by students.