

smarter science éducation sciences

INITIATE & PLAN

- Identifying a problem or need through curious observation
- Defining testable questions, researching and considering possible answers and solutions
- Revisiting observations and predictions to improve testable question

Observing

Using the 5 senses to find out about objects and events: their characteristics, properties, differences, similarities, and changes. Observation can be made directly with the senses or indirectly through the use of simple or complex instruments.

Questioning

A strategy to make meaning or wonder about uncertainties.

Searching

Gathering information from a variety of sources, developing self-reliance in acquiring library and internet skills.

Interviewing

Asking and corresponding to gain primary information.

Inferring

Using logic to draw conclusions from the results of investigating/problem-solving.

Predicting

Predictions are not random guesses but speculations of what may occur in the future based on prior knowledge, observations, and reasoning.

Hypothesizing

Making educated guesses or predictions based on evidence that must be tested through experimentation to establish credibility. Hypotheses guide investigations from which further predictions can be made. Hypotheses generally follow an "If..., then..., because..." statement format.

Modeling

Constructing physical/concrete or abstract representations of ideas, objects or events to clarify explanations or demonstrate relationships. Models are used to reinforce concepts, demonstrate learning, and/or illustrate phenomena which cannot be directly observed.

Selecting

Choosing an action from various alternatives based on justifiable reasons.

PERFORM & RECORD

- Developing and safely carrying out an investigation
- Observing, collecting, and recording results

Using Instruments

Knowing the instrument's parts, how it works, how to adjust it, its proper use for a given task, its limitations; knowing how to store it and transport it safely.

Calibrating

Checking, adjusting, or determining by comparison with a standard (e.g., calibrating a thermometer, balance, timer or other instrument).

Measuring

Assigning numbers to observations, e.g., metric units, time, student-generated units, using appropriate measuring devices and techniques.

Recording

Noting, documenting, tabulating, charting; working systematically, working regularly.

Planning

Working systematically, regularly organizing for future, seeing possible results.

Designing

The overall plan or strategy by which hypotheses / research questions and technological problems are answered (with or without innovation).

Gathering Data

Collecting evidence through measurements, facts, figures, pieces of information, statistics (either historical or derived by calculation), experimentation, surveys, etc.

Demonstrating

Setting up apparatus, making it work, describing parts and functions, illustrating scientific principles.

Constructing

Putting together component parts; to build or erect.

Inventing

Designing something useful, for the first time, through the use of the imagination, ingenious thinking and/or experimentation.

Experimenting

Carrying out a designed investigation to test a hypothesis or answer a question.

ANALYZE & INTERPRET

- Reviewing results carefully by examining data and identifying patterns
- Deciding what the results mean
- Evaluating and refining solutions

Comparing

Looking for similarities.

Contrasting

Looking for differences.

Classifying

Putting things into groups and subgroups, identifying categories, deciding between alternatives.

Outlining

Employing major headings and subheadings; using sequential, logical organization.

Graphing

Visually representing data.

Reviewing

Picking out important items, memorizing, associating.

Analyzing

Seeing implications and relationships, discerning causes and effects, locating new problems.

Evaluating

Recognizing good and poor features; judging and assessing.

COMMUNICATE

- Explaining procedures and results through writing, speaking, visual or electronic means
- Reflecting on the process and checking with peers

Discussing

Engaging in oral, written, or any other appropriate form of communication with others.

Explaining

Clearly describing, clarifying main points and focusing on the "why" and/or "how" of the issue, concept or idea.

Reporting

Organizing and presenting information in a written or oral format.

Writing

Conveying information (e.g., questions, observations, experimental report) by graphical means.

Reflecting

The activity of either an individual or group that involves analyzing, judging the importance of, and making connections to the learning experience.

Defending

Supporting any and all aspects of inquiry using logical arguments backed up with evidence.

Teaching

Making meaning of concepts or processes by organizing them into key facts and ideas and clearly conveying them to others.

BEGINNING

EXPLORING

EMERGING

COMPETENT

PROFICIENT

ENGAGE

EXPLORE

EXPLAIN

EXTEND

ASSESS & EVALUATE

Adapted from research by Trowbridge, Bybee and Powell 2000

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