

Patterns Approach Science Sequence Curriculum and Pedagogy Design Principles

1. Learning is Student-Centered

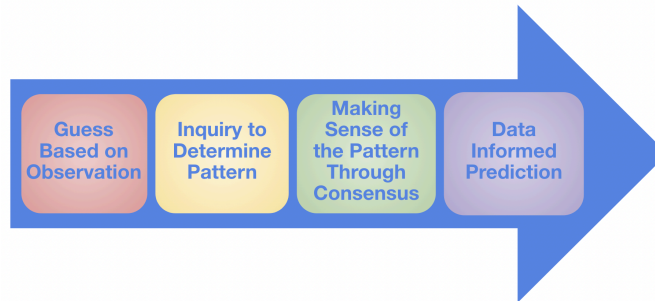
Student scientists are placed at the center of each course, continually immersed in “hands-on, minds-on” opportunities to use the big ideas of science to explain phenomena and solve problems. Students’ cultural and community assets are integral to the learning process as their STEM identity is cultivated. The teacher serves as a facilitator of three-dimensional learning.

2. Science is a Collaborative Process

Student scientists make sense of the world through a systematic, collaborative process. Students develop empathy, leadership abilities, and workplace skills as they support each other and co-construct knowledge. The teacher holds groups and the whole class accountable for making thinking visible and coherent.

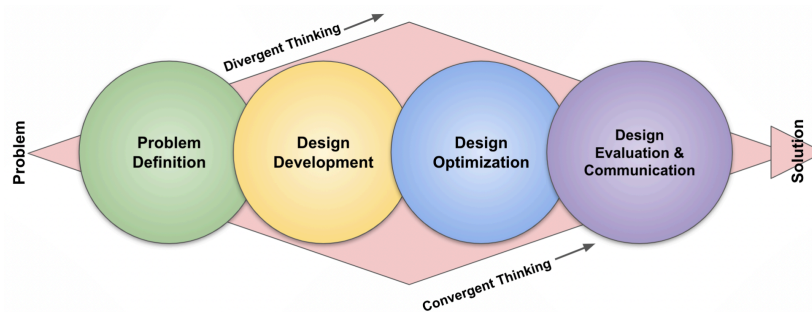
3. Science Uses Inquiry to Discover and Make Sense of Patterns

Student scientists observe, understand, and use patterns and trends in physical and natural systems in order to understand the past, make data-informed decisions in the present, and predict the future. Inquiry activities are designed to take students through a repeated process shown in the diagram to the right.



4. Science and Engineering are Interdependent

Student engineers apply and deepen their knowledge of concepts by investigating problems and designing solutions. Student engineers consider various design processes and methodologies in order to define the problem, develop possible prototypes, and evaluate and optimize solutions based on data and design criteria and constraints.



5. Teaching and Learning Should be Culturally Responsive

Phenomena and design challenges are selected so that student scientists find relevance in the connection between their identities and lives and what is studied in the classroom. Whenever possible, learning should be place-based, using local phenomena as anchors throughout a learning sequence. Students develop the tools they need to participate in civic dialog and take action for social and environmental justice. Teachers work to build caring relationships with students that value the assets students bring with them into the learning environment.

6. Learning is Equitable and Differentiated

Every student scientist succeeds on differentiated, rigorous tasks that will engage and challenge them while also building confidence and identity in doing science. Tasks are designed to be low-floor/high-ceiling, meaning all students can successfully enter the task, and find the appropriate level of intervention or extension as needed.

7. Science Learning is a Language-Rich Experience

Science content is taught in conjunction with language. Curriculum and instruction emphasize speaking, writing, interacting, reading, and listening, thereby increasing the academic language capacity of all students, and in particular English Language Learners. Students are given language supports and organizational resources, and have regular opportunities for facilitated discussion.



8. Assessment and Feedback are Integral Parts of Learning

A balanced system of formative and summative assessment, linked to all three dimensions of the NGSS, provide frequent opportunities for teachers to monitor learning, make instructional adjustments, and assess learning. Assessment opportunities are linked to performance expectations and clear learning objectives, use rubrics to provide feedback, and include opportunities for self- and peer feedback to allow students to take ownership of their learning.

9th Grade :: Physics

Patterns & Inquiry

Energy & Engineering

Engineering a Shoe

Waves & Technology

Power Production and Climate Science

10th Grade :: Chemistry

Kinetic Molecular Theory & Climate

Atomic Structure & the Periodic Table

Nuclear Chemistry

Bonding & Intermolecular Forces

Chemical Reactions

11th Grade :: Biology

Ecosystems & Biodiversity

Biomolecules

Cells to Organisms

Genomics

Evolution

Space & the Universe

Stoichiometry

Ecosystems Matter & Energy

Thermochemistry

Rates & Equilibrium