

Physical science curriculum matrix core document Study Guide

Understanding the Physical Science Curriculum Matrix Core Document

The **physical science curriculum matrix core document** serves as a foundational blueprint for educators, administrators, and curriculum developers dedicated to delivering comprehensive and cohesive physical science education. This document outlines the essential concepts, skills, and standards that students should master at various grade levels, ensuring consistency and alignment across educational settings. By providing a structured framework, the core document facilitates effective planning, instruction, assessment, and continuous improvement within physical science programs.

The Purpose and Importance of the Curriculum Matrix Core Document

Guiding Curriculum Development

The core document acts as a guiding tool that aligns curriculum content with national, state, or local standards. It ensures that all students have access to a rigorous and relevant physical science education by establishing clear learning outcomes.

Promoting Consistency and Equity

One of the primary goals is to promote equity across classrooms by maintaining consistency in what is taught. This ensures that regardless of where a student learns, they are acquiring comparable knowledge and skills.

Supporting Instructional Planning

Teachers utilize the matrix to design lesson plans, select appropriate instructional strategies, and develop assessments aligned with the core competencies outlined in the document.

Facilitating Assessment and Accountability

The document also serves as a benchmark for evaluating student progress and school effectiveness, helping educators identify areas needing improvement and adjust instruction

accordingly.

Key Components of the Physical Science Curriculum Matrix Core Document

Content Domains and Topics

The core document categorizes physical science into several key domains, each encompassing specific topics:

- Forces and Motion
- Energy and Its Forms
- Waves and Electromagnetic Radiation
- Properties of Matter
- Atoms and Atomic Structure
- Chemical Reactions and Bonding
- Environmental and Earth Sciences (if included)

Grade-Level Expectations

The matrix delineates what students should know and be able to do at each grade level, often breaking down the content into elementary, middle, and high school expectations:

- Elementary Grades (K-5): Basic understanding of matter, simple forces, and observable phenomena.
- Middle School (6-8): Introduction to fundamental principles, scientific inquiry, and basic laboratory skills.
- High School (9-12): Advanced concepts, applications, and preparation for college or careers in science.

Skills and Scientific Practices

Beyond content knowledge, the core document emphasizes developing essential scientific skills, including:

- Scientific inquiry and investigation
- Data collection and analysis
- Critical thinking and problem-solving

- Communication of scientific ideas
- Use of scientific tools and technology

Performance Indicators and Benchmarks

To measure student achievement, the document includes specific performance indicators that describe observable skills and understanding, such as:

- Ability to explain the relationship between force, mass, and acceleration
- Demonstrating understanding of energy transfer principles
- Conducting and interpreting simple experiments
- Applying scientific concepts to real-world problems

Structure and Organization of the Core Document

Framework Layout

The core document is typically organized into modules or units aligned with the content domains. Each module includes:

- Learning Objectives
- Key Concepts
- Suggested Activities
- Assessment Tasks
- Resources and References

Alignment with Standards

The document ensures that each component aligns with relevant standards, such as the Next Generation Science Standards (NGSS), state standards, or national benchmarks. This alignment guarantees that curriculum delivery meets recognized educational quality metrics.

Integration of Crosscutting Concepts

In addition to core content, the matrix emphasizes crosscutting concepts that connect various scientific disciplines, including:

- Patterns

- Causality and explanation
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter

Implementing the Physical Science Curriculum Matrix Core Document

Curriculum Planning

Educators use the core document as a foundation for designing curriculum maps and pacing guides, ensuring coverage of all essential topics throughout the academic year.

Instructional Strategies

Effective teaching approaches include:

- Hands-on experiments and laboratory work
- Inquiry-based learning
- Use of multimedia and technology tools
- Real-world problem solving
- Collaborative projects and discussions

Assessment and Evaluation

Assessment tools should align with the performance indicators outlined in the core document. Types of assessments include:

- Formative assessments (quizzes, observations)
- Summative assessments (tests, projects)
- Performance tasks and lab reports
- Portfolios and self-assessment

Professional Development and Continuous Improvement

Teachers and administrators should engage in ongoing professional development to stay current with curriculum updates, instructional strategies, and assessment practices related to the core document.

Benefits of Using the Physical Science Curriculum Matrix Core

Document

Ensures Cohesive Learning Experiences

By providing a unified framework, the core document helps create seamless learning experiences across grade levels and classrooms.

Facilitates Curriculum Alignment and Integration

Curriculum developers can ensure that content across different courses and programs aligns with overarching standards and educational goals.

Supports Data-Driven Instruction

Clear benchmarks enable teachers to monitor student progress effectively and adapt instruction to meet individual needs.

Prepares Students for Future Success

Structured and comprehensive curricula foster critical thinking, scientific literacy, and problem-solving skills vital for higher education and STEM careers.

Challenges and Considerations in Implementing the Core Document

Keeping the Curriculum Up-to-Date

Science is a rapidly evolving field; therefore, the core document must be regularly reviewed and updated to incorporate new discoveries and pedagogical approaches.

Balancing Depth and Breadth

In designing curricula, educators must find a balance between covering all necessary topics and providing in-depth understanding of key concepts.

Addressing Diverse Learner Needs

Effective implementation requires differentiating instruction to accommodate students with varying backgrounds, abilities, and interests.

Resource Availability

Ensuring access to laboratory equipment, technology, and quality instructional materials is essential for successful curriculum delivery.

Conclusion: The Significance of the Physical Science Curriculum Matrix Core Document

The **physical science curriculum matrix core document** is an indispensable tool for shaping high-quality science education. It provides a clear, organized, and standards-aligned framework that guides curriculum development, instructional practices, and assessment strategies. By adhering to this core document, educators can ensure that students develop a robust understanding of physical science concepts, hone essential scientific skills, and become informed citizens capable of engaging with the scientific challenges of the modern world. Continuous reflection, revision, and professional collaboration are vital to maximizing the impact of the curriculum matrix and fostering a vibrant learning environment that inspires curiosity, innovation, and lifelong learning in physical science.

Physical Science Curriculum Matrix Core Document: An In-Depth Review

The Physical Science Curriculum Matrix Core Document serves as a foundational blueprint guiding educators, administrators, and curriculum developers in structuring and implementing physical science education across various levels. It provides a comprehensive framework that delineates essential concepts, skills, and competencies students should acquire, ensuring consistency and rigor in science instruction. As a vital component of educational planning, this document influences how physical science is taught, assessed, and integrated within broader science education initiatives. This review explores the key features, strengths, challenges, and implications of the curriculum matrix core document, offering insights into its role in shaping effective physical science education.

Understanding the Physical Science Curriculum Matrix Core Document

Definition and Purpose

The Physical Science Curriculum Matrix Core Document is a structured guide that aligns learning standards, content areas, and performance expectations for physical science courses. Its primary purpose is to:

- Establish clear learning goals for students at various grade levels.
- Promote consistency across different schools and districts.
- Facilitate curriculum planning and instructional design.
- Support assessment development aligned with learning outcomes.

- Ensure that students develop a solid understanding of fundamental physical science principles.

This document typically integrates core topics such as matter and energy, forces and motion, chemical reactions, and earth sciences, providing a cohesive roadmap for educators.

Scope and Structure

The matrix is organized into several key components:

- Grade-level or course-specific standards: Outlining what students should know and be able to do.
- Content clusters: Grouping related concepts for coherence and progression.
- Performance indicators: Describing observable skills and competencies.
- Suggested instructional practices: Recommending teaching strategies aligned with standards.
- Assessment guidelines: Providing criteria for evaluating student mastery.

The structure promotes vertical alignment (across grade levels) and horizontal coherence (across topics within a grade), facilitating a scaffolded learning experience.

Features and Strengths of the Curriculum Matrix Core Document

Comprehensive and Systematic Framework

One of the most significant strengths of the curriculum matrix is its systematic approach. By clearly defining what students should learn at each stage, it reduces ambiguity and helps educators plan lessons that build logically upon prior knowledge. The explicit performance indicators aid teachers in designing assessments that accurately measure student understanding.

Alignment with Educational Standards

The document aligns with national or state science standards, ensuring that physical science education meets established benchmarks. This alignment supports curriculum consistency and facilitates accountability through standardized assessments.

Facilitation of Curriculum Mapping and Planning

The matrix serves as an invaluable tool for curriculum mapping, allowing educators to visualize the scope and sequence of topics. It helps identify gaps, overlaps, and opportunities for integrating concepts across disciplines, promoting interdisciplinary learning.

Supports Differentiated Instruction

Because the document specifies varied performance levels and learning outcomes, teachers can tailor instruction to meet diverse student needs. It encourages the use of varied instructional strategies, including hands-on experiments, technology integration, and inquiry-based learning.

Focus on Skill Development

Beyond content knowledge, the curriculum matrix emphasizes the development of scientific skills such as critical thinking, data analysis, problem-solving, and scientific communication. This emphasis prepares students for real-world scientific applications and careers.

Challenges and Limitations

While the curriculum matrix core document offers numerous benefits, it also presents certain challenges:

Rigidity and Over-standardization

- Potential for limiting teacher creativity: Strict adherence to the matrix may constrain innovative teaching approaches.
- Reduced flexibility: The prescriptive nature might inhibit adaptations for local contexts or student interests.

Implementation Variability

- Resource disparities: Schools with limited resources may struggle to fully implement the curriculum as designed.
- Teacher training gaps: Effective use requires thorough professional development, which may not always be available.

Curriculum Overload

- The breadth of content outlined can be overwhelming, risking superficial coverage instead of deep understanding.
- Balancing coverage with meaningful engagement remains a challenge.

Assessment Alignment Issues

- Standardized assessments may not fully capture the depth of understanding promoted by the curriculum.
- There is a risk of teaching to the test at the expense of inquiry and experimentation.

Implications for Stakeholders

For Educators

- The matrix provides a clear roadmap for lesson planning and assessment design.
- It encourages alignment with science practices and concepts, fostering comprehensive understanding.
- Teachers need ongoing professional development to interpret and implement the document effectively.

For Curriculum Developers

- The matrix guides the creation of supporting instructional materials and resources.
- It facilitates coherence and consistency across different educational levels and regions.
- Developers can identify areas requiring supplementary resources or enrichment.

For Students

- A well-designed curriculum matrix helps ensure students receive a balanced and progressive science education.
- It promotes skill development necessary for scientific literacy and future careers.
- Clear expectations can boost student motivation and engagement.

For Policymakers and Administrators

- The document offers a framework for evaluating curriculum effectiveness.
- It supports decisions regarding resource allocation and professional development priorities.
- Ensures accountability and standards adherence across schools.

Best Practices and Recommendations

To maximize the benefits of the Physical Science Curriculum Matrix Core Document, stakeholders should consider the following practices:

- Regular Review and Updates: Keep the matrix current with scientific advances and pedagogical research.
- Professional Development: Invest in training teachers to interpret and adapt the matrix effectively.
- Flexible Implementation: Allow room for creative instructional approaches aligned with standards.
- Resource Support: Ensure equitable access to laboratory equipment, technology, and instructional materials.
- Assessment Innovation: Develop diverse assessment tools that reflect the multidimensional goals of the curriculum.

Conclusion

The Physical Science Curriculum Matrix Core Document is a foundational element for structured, consistent, and comprehensive science education. Its strengths lie in providing clarity, alignment, and a focus on both content and skills essential for scientific literacy. However, successful implementation requires balancing standardization with flexibility, ensuring adequate resources, and fostering professional growth among educators. When effectively utilized, this curriculum framework can significantly enhance the quality of physical science instruction, preparing students to understand and engage with the scientific world confidently. As science continues to evolve, ongoing revisions and stakeholder collaboration will be crucial to maintain its relevance and effectiveness in fostering a scientifically literate society.

Question What is the purpose of the Physical Science Curriculum Matrix Core Document? The purpose of the Physical Science Curriculum Matrix Core Document is to provide a structured framework that outlines the key concepts, skills, and standards students should master in physical science, ensuring a cohesive and comprehensive curriculum. How does the Curriculum Matrix facilitate alignment across grade levels? The Curriculum Matrix facilitates alignment by clearly mapping learning objectives and standards across different grade levels, helping educators ensure progression and consistency in physical science instruction. What are the main components included in the Physical Science Curriculum Matrix Core Document? The main components include standards and learning objectives, essential concepts, skills to be developed, suggested instructional strategies, and assessment criteria aligned with physical science topics. How can teachers use the Curriculum Matrix to design their lesson plans? Teachers can use the Curriculum Matrix to identify key learning goals, select appropriate activities, and develop assessments that align with the core standards, ensuring their lessons are targeted and standards-based. Is the Physical Science Curriculum Matrix Core Document adaptable to different educational contexts? Yes, the document is designed to be flexible, allowing educators to adapt the standards and instructional strategies to diverse classroom settings, student needs, and local curriculum requirements.

Related keywords: physical science curriculum, science education standards, core curriculum framework, STEM education, science teaching guidelines, curriculum development, educational standards, science syllabus, instructional design, assessment criteria

physical science creative teaching press physical changes

Physical science creative teaching press physical changes is a vital topic in the realm of science education, especially for educators aiming to foster understanding and curiosity about the fundamental nature of matter. Understanding physical changes is essential for students to grasp how substances transform without altering their chemical composition. This article explores the concept of physical changes in physical science, emphasizing creative teaching methods, key principles, real-world examples, and effective strategies to make learning engaging and comprehensive.

Understanding Physical Changes in Physical Science

What Are Physical Changes?

Physical changes refer to alterations in the form, appearance, or state of a substance that do not modify its chemical identity. These changes are often reversible, meaning the original substance can typically be recovered without chemical reactions taking place.

Examples of physical changes include:

- Melting ice into water
- Boiling water into vapor
- Cutting paper
- Dissolving sugar in tea
- Crushing a can

Key characteristics of physical changes:

- No new substances formed
- Usually reversible
- Involve changes in physical properties like shape, size, or phase

Difference Between Physical and Chemical Changes

While physical changes involve no change in chemical composition, chemical changes result in the formation of new substances with different properties.

Aspect	Physical Change	Chemical Change
Definition	Change in physical form or state	Formation of new substances
Reversibility	Usually reversible	Usually irreversible
Example	Melting ice	Burning wood

Creative Teaching Strategies for Physical Changes

Engaging students in understanding physical changes requires innovative and creative teaching methods. Here are some effective strategies:

Hands-On Experiments and Demonstrations

Practical activities help students visualize and understand physical changes concretely.

Examples include:

- Melting ice cubes and observing the change
- Evaporating saltwater
- Crumpling aluminum foil
- Freezing water to form ice
- Dissolving sugar and salt

Tips for effective experiments:

- Use clear, simple materials
- Encourage students to record observations
- Discuss reversible vs. irreversible changes

Interactive Visual Aids and Simulations

Utilize multimedia tools like animations and virtual labs to demonstrate physical changes that are difficult to observe directly.

Benefits include:

- Enhancing visualization skills
- Providing safe environments for experimentation
- Catering to diverse learning styles

Storytelling and Real-Life Contexts

Integrate stories or real-world examples to make the concept relatable.

Examples:

- How ice melts outside on a sunny day
- How a puddle evaporates after rain
- The process of freezing water into ice cubes at home

Creative Classroom Activities

Engage students through activities that promote exploration and discussion.

Ideas include:

- "Change Detective" game where students identify physical changes around them
- Group projects on different physical changes observed in nature
- Art projects like sculpting or paper folding to demonstrate physical transformations

Key Concepts and Principles of Physical Changes

States of Matter and Phase Changes

Understanding how matter transitions between solid, liquid, and gas states is central to physical science.

Common phase changes:

- Melting (solid to liquid)
- Freezing (liquid to solid)
- Vaporization or boiling (liquid to gas)
- Condensation (gas to liquid)
- Sublimation (solid to gas)

Teaching tip: Use diagrams and models to illustrate these transitions dynamically.

Properties of Materials During Physical Changes

Monitor how physical properties such as shape, volume, density, and color change during physical transformations.

Examples:

- Volume expansion of metal when heated
- Changes in shape during molding or crushing
- Color changes due to temperature effects

Reversibility and Conservation of Mass

Most physical changes are reversible and adhere to the law of conservation of mass, meaning the total mass remains constant during the change.

Discussion points:

- How physical changes do not alter the chemical identity
- Examples demonstrating conservation of mass in physical changes

Real-World Applications of Physical Changes

Understanding physical changes has numerous applications across industries and daily life.

In Manufacturing and Industry

- Metal forging and shaping
- Plastic molding
- Food processing (freezing, boiling, drying)

In Nature and Environment

- Water cycle processes like evaporation and condensation
- Glacial melting
- Weathering of rocks

In Daily Life

- Cooking (boiling, freezing)
- Cleaning (dissolving detergents)
- Recycling materials like aluminum cans

Assessment and Evaluation Strategies

To gauge understanding, educators can implement various assessment tools:

- Quizzes and Worksheets: Focused on identifying physical changes
- Observation and Lab Reports: Documenting experiments
- Group Discussions: Explaining processes and concepts
- Creative Projects: Designing models or presentations illustrating physical changes

Challenges and Solutions in Teaching Physical Changes

Common challenges include:

- Abstract concepts difficult for students to grasp
- Confusing physical changes with chemical changes
- Limited access to laboratory resources

Solutions:

- Use visual aids and models extensively
- Reinforce concepts with real-life examples
- Incorporate virtual labs and simulations
- Encourage critical thinking and questioning

Conclusion

Teaching physical science with a focus on physical changes demands creativity, engagement, and clarity. By employing hands-on experiments, visual tools, storytelling, and real-world contexts, educators can foster a deep understanding of physical changes among students. Recognizing the importance of these concepts not only enhances scientific literacy but also prepares learners to appreciate the dynamic nature of matter in everyday life and various industries. As educators continue to innovate in their teaching approaches, the topic of physical changes remains a fundamental and exciting area of physical science education.

Keywords for SEO Optimization:

- Physical science
- Creative teaching methods
- Physical changes
- Science education
- Phase changes
- Reversible changes
- Hands-on science experiments
- Teaching physical science effectively
- Real-world science applications

Physical Science Creative Teaching Press Physical Changes: A Comprehensive Guide to Engaging Science Education

In the realm of physical science education, understanding the concept of physical changes is fundamental. When educators utilize resources from the Creative Teaching Press, particularly their materials on physical science, they open doors to innovative, hands-on learning experiences. This guide delves into the essence of physical changes, exploring how teachers can effectively introduce, demonstrate, and assess this critical scientific concept using creative teaching strategies and resources.

Understanding Physical Changes in Science

Physical changes refer to alterations in the state or appearance of a substance without changing its chemical composition. These changes are often reversible and are fundamental to students' grasp of material properties, states of matter, and the nature of physical phenomena.

Key Characteristics of Physical Changes:

- No new substance forms
- Usually reversible
- Changes involve physical properties like shape, size, phase, or texture
- Do not affect the chemical identity of the substance

Examples include melting, freezing, boiling, condensation, breaking, and dissolving.

Why Focus on Physical Changes?

Teaching about physical changes lays the groundwork for understanding more complex topics like chemical reactions and molecular structure. It also encourages observational skills, critical thinking, and science process skills such as hypothesizing, experimenting, and analyzing.

Using creative teaching methods, including hands-on activities, visual aids, and real-world applications, enhances student engagement and comprehension.

Effective Strategies for Teaching Physical Changes

- Hands-On Experiments and Demonstrations

Experiments are the cornerstone of science teaching. Engaging students with tangible experiences helps solidify abstract concepts.

Sample Activities:

- Melting Ice: Show how ice melts into water when heated, emphasizing phase change from solid to liquid.
- Dissolving Salt or Sugar: Demonstrate solubility and how substances can undergo physical changes without chemical reactions.
- Crushing or Breaking: Break chalk or plastic to illustrate physical alteration, emphasizing that the material remains the same.

Tips:

- Use clear, simple materials.
- Encourage students to record observations and hypothesize outcomes.
- Discuss reversibility after each activity.

- Visual Aids and Graphic Organizers

Visual tools help students visualize the concept and organize their understanding.

Examples:

- Charts comparing physical and chemical changes
- Diagrams illustrating phase changes
- Flowcharts depicting the steps in various physical processes

- Incorporate Creative Media and Resources

Creative Teaching Press offers a suite of resources, including posters, activity books, and digital content, designed to make learning about physical changes interactive and memorable.

Utilize:

- Illustrated posters showing different physical changes
- Interactive worksheets that challenge students to classify changes
- Story-based scenarios that involve physical change concepts

- Real-Life Applications and Contextual Learning

Connecting science to students' everyday experiences makes lessons relevant and meaningful.

Examples:

- Melting ice in a beverage
- Freezing water to make ice cubes
- Dissolving sugar in coffee or tea
- Physical alterations in manufacturing or cooking

Classroom Activities and Lesson Plans

Here's a sample outline for a comprehensive lesson:

Lesson Title: Exploring Physical Changes

Objectives:

- Define physical change
- Identify different types of physical changes
- Conduct simple experiments to observe physical changes

Materials Needed:

- Ice cubes
- Water
- Salt
- Sugar
- Plastic or glass containers
- Crayons or chalk
- Safety goggles

Procedure:

- Introduction (10 minutes): Discuss what physical changes are, using visuals.
- Demonstration (15 minutes): Melting ice and dissolving salt/sugar.
- Student Activity (30 minutes): Students perform experiments:
 - Observe ice melting
 - Dissolve sugar in water
 - Break chalk into pieces
 - Freeze water and observe ice formation
- Discussion (15 minutes): Students share observations, compare results, and classify each change.
- Assessment (10 minutes): Quiz or worksheet to reinforce understanding.

Assessment Tips:

- Use questioning strategies to assess understanding.
- Have students draw diagrams of their experiments and label physical changes.

Assessing Understanding of Physical Changes

Assessment should gauge both conceptual understanding and practical skills.

Methods:

- Observation during activities
- Student reflections and explanations
- Quizzes with multiple-choice and short-answer questions
- Concept maps illustrating types of changes

Common Misconceptions and How to Address Them

- Misconception: Physical changes always involve a change in the substance's chemical identity.

Correction: Emphasize that physical changes do not alter the chemical structure, using examples like melting ice or tearing paper.

- Misconception: All physical changes are reversible.

Correction: Clarify that some physical changes, like breaking or cutting, are reversible, but others, like tearing or dissolving, may not be easily reversible.

Integrating Creative Teaching Press Resources

Creative Teaching Press provides various materials tailored for physical science instruction, which can elevate your teaching approach:

- Activity Books: Ready-made experiments and activities that align with standards.
- Posters and Visuals: Engaging images that reinforce concepts.
- Interactive Worksheets: Opportunities for students to classify and analyze physical changes.
- Digital Resources: Online games and quizzes to supplement lessons.

Strategies for Integration:

- Use posters as classroom decor to continually reinforce concepts.
- Incorporate activity books into small-group work or centers.
- Assign digital quizzes as formative assessments.

Extending Learning Beyond the Classroom

Encourage students to observe physical changes in their environment.

Assignments:

- Keep a science journal recording physical changes observed at home or outdoors.
- Research and present on real-world applications of physical changes in industries.
- Design their own experiments related to physical changes and share findings.

Conclusion

Understanding physical changes is a vital component of physical science education. By leveraging creative teaching strategies and resources, such as those provided by Creative Teaching Press, educators can foster curiosity, deepen understanding, and nurture scientific literacy among students. From hands-on experiments to visual aids and real-world connections, teaching physical changes effectively prepares students for more advanced topics and encourages a lifelong appreciation for science.

Remember: The goal is to make science accessible, engaging, and relevant. Through creative teaching approaches, educators can inspire the next generation of scientists and thinkers to explore the fascinating world of physical science.

Question What are some effective creative teaching strategies for explaining physical changes in science classes? Creative strategies include hands-on experiments, visual demonstrations, interactive models, and storytelling to help students grasp concepts like melting, freezing, and condensation in engaging ways. How can teachers make the concept of physical changes more relatable to students? Teachers can use everyday examples such as ice melting, boiling water, or folding paper to illustrate physical changes, making the concepts more familiar and easier to understand. What role does the Physical Science Creative Teaching Press play in improving science education? The Physical Science Creative Teaching Press provides innovative resources, lesson plans, and activities designed to foster creativity and enhance student understanding of physical science concepts like physical changes. What are some common misconceptions students have about physical changes, and how can creative teaching address them? Students often confuse physical changes with chemical changes. Creative teaching methods like experiments and visual aids can clarify that physical changes do not alter the substance's

identity, helping to correct misconceptions. Can technology enhance teaching about physical changes in physical science? If so, how? Yes, technology such as virtual labs, simulations, and interactive videos can provide dynamic and visual representations of physical changes, making abstract concepts more accessible and engaging for students.

Related keywords: physical science, creative teaching, physical changes, science education, hands-on experiments, teaching resources, science curriculum, classroom activities, scientific concepts, educational publishing

Read the full article online: [Physical Science Creative Teaching Press Physical Changes](#)