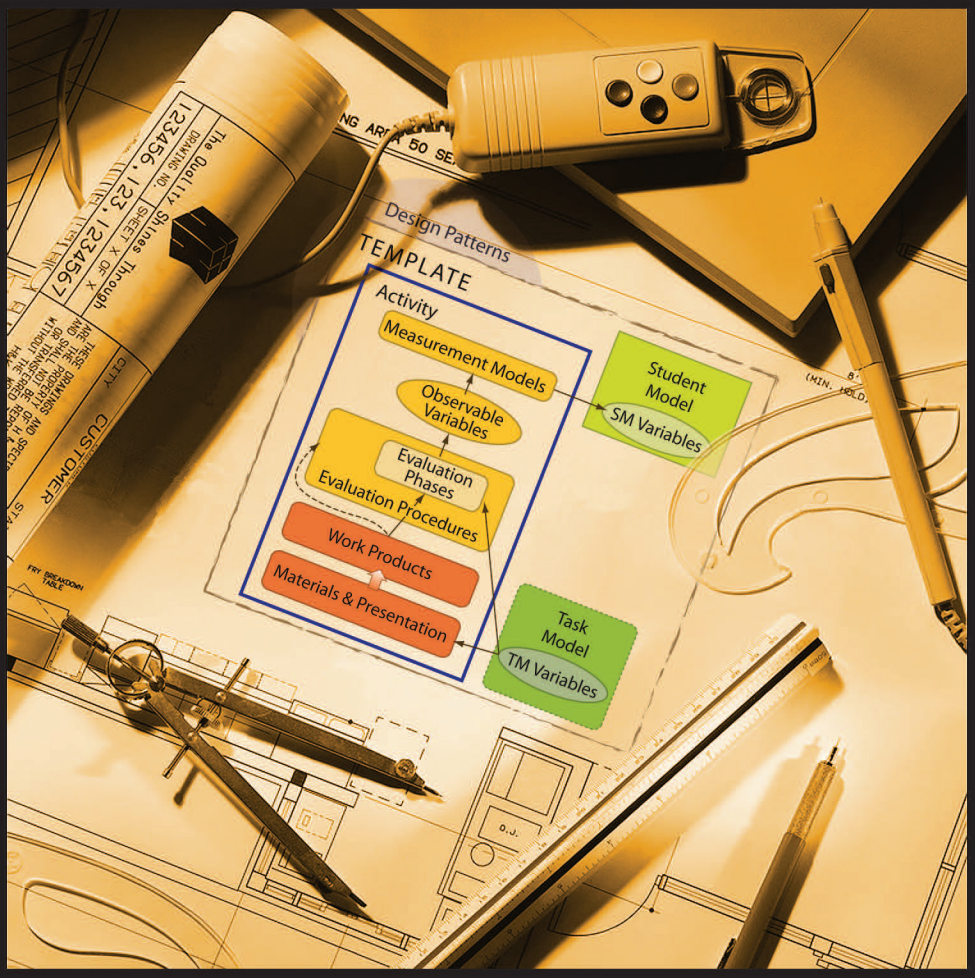

Assessment for Students with Disabilities
Technical Report 3 | June 2010

Integration of Evidence-Centered Design and Universal Design Principles Using PADI, an Online Assessment Design System

Project: Principled Science Assessment Designs for Students with Disabilities

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TECHNICAL REPORT 3

Integration of Evidence-Centered Design and Universal Design Principles Using PADI, an Online Assessment Design System

June 2010

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ABSTRACT

After giving background on evidence-centered design, this report illustrates how the principles of universal design were incorporated into the PADI online assessment system *design patterns* (specifically, the two attributes of Additional Focal Knowledge, Skills, and Abilities and Variable Features). The report then describes the project's collaborations with four states (Kansas, Kentucky, Nevada, and South Carolina) to develop 13 new UDL-infused *design patterns* that aligned with each state's standards.

1.0 Introduction

The No Child Left Behind Act requires that students with disabilities be included in state assessments and accountability. However, the use of accommodations, modifications, and alternate assessments to permit the inclusion of students with disabilities has given rise to a number of issues related to fairness and test validity. Recently, researchers have begun to explore whether tests can be designed from the outset to be more accessible and valid for a wider range of students; this approach is termed "universal design." The researchers on the project, Principled Assessment Designs for Students with Disabilities, are studying the use of universal design paired with an approach termed "evidence-centered design" (ECD) to redesign or develop items that can more accurately evaluate the knowledge and skills of all students on statewide assessments. The academic content focus of this study is middle school science, but if successful the approach can be applied to other topics and age ranges. This technical report introduces background on evidence-centered design, an ECD web-based tool called the PADI assessment system, and the key principles of universal design. The report then illustrates how the universal design principles were incorporated into the PADI online assessment system *design patterns* (specifically, the two attributes of Additional Focal Knowledge, Skills, and Abilities and Variable Features). Finally, the report describes the project's collaborations with four states (Kansas, Kentucky, Nevada, and South Carolina) to develop 13 new UDL-infused *design patterns* that aligned with each state's standards.

2.0 Evidence-Centered Design

Evidence-centered assessment design (ECD) was formulated by Robert Mislevy, Linda Steinberg, and Russell Almond (2003) at Educational Testing Service. ECD builds on developments in fields such as expert systems (Breese, Goldman, & Wellman, 1994), software design (Gamma, Helm, Johnson, & Vlissides, 1994), and legal argumentation (Tillers & Schum, 1991) to make explicit, and to provide tools for, building assessment arguments that help both in designing new assessments and understanding familiar ones (Mislevy & Riconscente, 2005). Two complementary ideas organize the effort. The first is an overarching conception of assessment as an argument from imperfect evidence. Specifically, it involves making explicit the claims (the inferences that one intends to make based on scores) and the nature of the evidence that supports those claims (Hansen & Mislevy, 2007). The second idea is distinguishing layers at which activities and structures appear in the assessment enterprise, all to the end of instantiating an assessment argument in operational processes. By making the underlying evidentiary argument more explicit, the framework makes operational elements more amenable to examination, sharing and refinement. Making the argument more explicit also helps designers meet diverse assessment needs caused by changing technological, social, and legal environments (Hansen & Mislevy, 2007).

In ECD, assessment is expressed in layers that provide structure for different kinds of work and information at different stages of the process. In the *Domain Analysis* layer, research and experience about the domains and skills of interest are gathered—information about the knowledge, skills, and abilities of interest, the ways people acquire KSAs and use them, the situations under which the KSAs are employed, and the indicators of successful application of the KSAs.

In the *Domain Modeling* layer, information from *Domain Analysis* is organized to form the assessment argument. *Domain Modeling* structures the outcomes of *Domain Analysis* in a form that reflects the narrative structure of an assessment argument, in order to ground the more technical models in the next layer. The PADI Online Assessment Design System uses objects called *design patterns* to assist task designers with domain modeling. *Design patterns* play a key role in the present project, as we consider the impact of universal design principles and accommodations on task design and evaluation.

The *Conceptual Assessment Framework* (CAF) layer concerns technical specifications for operational elements including measurement models, scoring methods, test assembly specifications, and requirements and protocols for assessment delivery. An assessment argument laid out in narrative form at the *Domain Modeling* layer is here expressed in terms of coordinated pieces of machinery: specifications for tasks, measurement models, scoring methods, and delivery requirements within templates. The central models within the CAF are the Student Model, Evidence Model, and Task Model. In addition, the Assembly Model determines how tasks are assembled into tests, the Presentation Model

indicates the requirements for interaction with a student (e.g., simulator requirements), and the Delivery Model specifies requirements for the operational setting. Details about task features, measurement-model parameters, stimulus material specifications, and the like are expressed in the CAF model templates in terms of knowledge representations and data structures, which guide their implementation and ensure their coordination. These templates are essentially blueprints that specify, at a meta-level, the necessary element for tasks. The present project will include some work at the CAF layer, as we develop example templates that demonstrate how tasks can be developed in accordance with UDL principles and modified in accordance with student needs.

The work in the *Assessment Implementation* layer includes activities in preparation for testing examinees such as authoring tasks, calibrating items, finalizing rubrics, producing materials, producing presentation environments, and training interviewers and scorers, all in accordance with the assessment arguments and test specifications created in previous layers of ECD. The ECD approach links the rationales for each layer back to the assessment argument, and provides structures that provide opportunities for reuse and interoperability.

The work in the *Assessment Delivery* layer includes activities, such as presenting tasks to examinees, evaluating performances to assign scores, and reporting the results to provide feedback to students themselves, teachers, decision-makers, or other stakeholders.

The ECD framework described in this report applies principles of evidentiary reasoning to handle the complexities of the validity argument (Spearman, 1940; Cronbach & Meehl, 1955; Messick, 1989, 1994; Kane, 1992) associated with accessibility features. The key idea is to lay out the evidentiary structures, what may be termed the validity argument (or what may be termed the “validation argument” (National Research Council, 2004, p. 104). An assessment argument can be summarized as comprising: (a) a claim about a person possessing at a given level a certain targeted proficiency, (b) the data (e.g., scores) that would likely result if the person possessed, at a certain level, the targeted proficiency, (c) the warrant (or rationale, based on theory and experience) that tells why the person’s level of the targeted proficiency would yield the expected score, and (d) “alternative explanations” for the person’s high or low scores (i.e., explanations other than the person’s level of the targeted proficiency). The existence of *alternative explanations* that are both significant and credible might indicate that *validity* is threatened or being *compromised* (Messick, 1989).

Much of the analysis that is the focus of this project has to do with these alternative explanations, factors that can hinder an assessment from yielding valid inferences. When such alternative explanations are recognized at the earliest stages of test design, then later rework and retrofitting can be avoided. The existence of alternative explanations that are both significant and credible might indicate that validity has

been compromised. The ECD accessibility effort has focused on building argument structures that might help anticipate and address key details of these alternative explanations particularly as they relate to test takers with disabilities (Hansen & Mislevy, 2007).

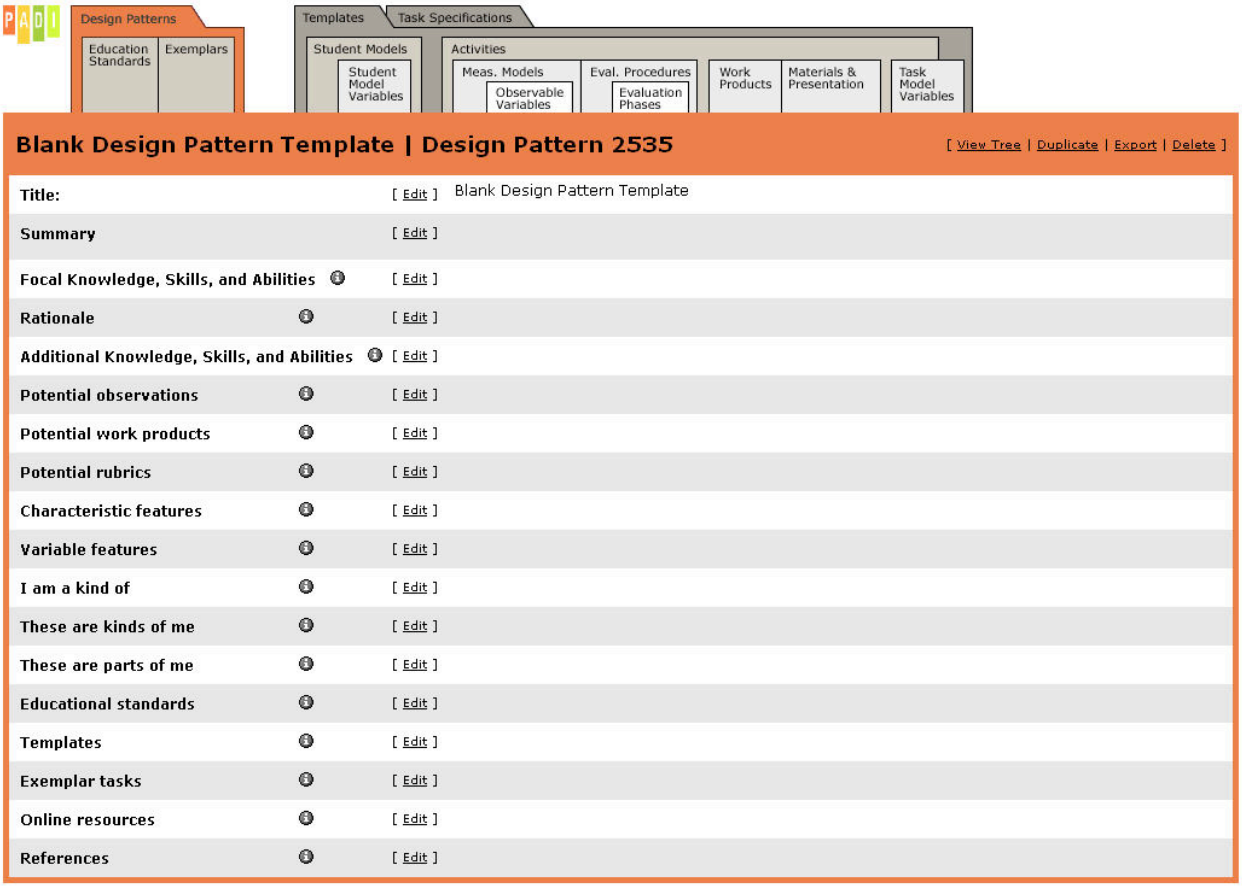
2.1 PADI Design System

Principled Assessment Designs for Inquiry (PADI) is a project supported by the National Science Foundation to improve the assessment of science inquiry (through the Interagency Educational Research Initiative under grant REC-0129331). The PADI project has developed a design framework for assessment tasks, based on the evidence-centered design (ECD) framework. PADI was developed as a system for designing blueprints for assessment tasks, with a particular eye toward science inquiry tasks—tasks that stress scientific concepts, problem solving, building models, using models, and cycles of investigation. The PADI framework guides an assessment developer's work through design structures that embody assessment arguments and take advantage of the commonalities across the assessments for sharing and re-using conceptual and operational elements (Mislevy & Haertel, 2006). PADI provides a conceptual framework, data structures, and software supporting tools for this work. The PADI online assessment design system is fully operational.

ECD seeks to integrate the processes of assessment design, authoring, delivery, scoring, and reporting. Work within PADI, however, is focused on design layers that lie above the level of specific environments for task authoring and assessment delivery. The key PADI design objects that will be involved in the present project are *design patterns* and *templates*.

PADI assessment *design patterns* (analogous to those in architecture and software engineering) capture design rationale in a re-usable and generative form in the domain modeling layer of assessment. They help designers think through substantive aspects of an assessment argument in a structure that spans specific domains, forms, grades, and purposes (Mislevy et al., 2003). Assessment designers working with the PADI design system use the web-based design interface illustrated for *design patterns* (see Figure 1)

Figure 1. Design Pattern Template



In a *design pattern*, four key attributes, namely Focal Knowledge, Skills, and other Abilities (Focal KSAs), Additional KSAs, Characteristic Features, and Variable Features, are particularly important for building the assessment argument for students with or without disabilities. Hansen and Mislevy (2007, p.12) describe these four key attributes as follows:

1. **Focal KSAs** consist of the primary knowledge/skills/abilities of students that are addressed by assessment (Mislevy et al., 2003). Comparability of scores between individuals with and without disabilities is important, which suggests that one should seek evidence about the same set of Focal KSAs, regardless of whether the test taker has a disability or not.

2. **Additional KSAs**. The other knowledge/skill/abilities that may be required in a task (Mislevy et al., 2003). For tests of academic subjects, the abilities to "see" and "hear" are typically Additional KSAs. On the other hand, for assessment of sight and hearing, respectively, sight and hearing are likely to be defined as Focal KSAs. Notice that there are many disabilities that involve impairments of sight, hearing, or both (e.g., blind, low vision, color-blind, deaf, hard to hear, deaf-blind). Cognitive issues such as attention deficit and executive processing limitations can also be addressed. Deficits

in such Additional KSAs can cause unduly low scores among test takers with disabilities.

3. **Characteristic Features**. Characteristic Features of the assessment consist of the feature that must be present in a situation in order to evoke the desired evidence about the Focal KSAs (Mislevy et al., 2003).

4. **Variable Features.** Variable Features are described as features that can be varied to shift the difficulty or focus of tasks (Mislevy et al., 2003). Variable Features have a particular significant role with respect to test takers with disabilities and other sub-populations (e.g., speakers of minority language). Much of our attention will be on manipulating Variable Features to reduce or eliminate demands for Additional KSAs in which there may be a deficit while making sure (to the extent possible) that demands for Focal KSAs have not been changed.

3.0 Universal Design for Learning

Universal Design for Learning (UDL) helps to meet the challenge of diversity by suggesting flexible assessment materials, techniques, and strategies (Dolan, Rose, Burling, Harris & Way, 2007). The flexibility of UDL empowers assessors to meet the varied needs of students and to accurately measure student progress. Listed below are the three primary principles that guide UDL and provide structure for the infusion of UDL into the *design patterns*:

Principle I. Provide Multiple Means of Representation (the "what" of learning)

Students differ in the ways that they perceive and comprehend information that is presented to them. For example, those with sensory disabilities (e.g., blindness or deafness); learning disabilities (e.g., dyslexia); language or cultural differences, and so forth may all require different ways of approaching content. Others may simply grasp information better through visual or auditory means rather than printed text. In reality, there is no one means of representation that will be optimal for all students; providing options in representation is essential.

Principle II: Provide Multiple Means of Expression (the "how" of learning).

Students differ in the ways that they can navigate a learning environment and express what they know. For example, individuals with significant motor disabilities (e.g. cerebral palsy), those who struggle with strategic and organizational abilities (executive function disorders, ADHD), those who have language barriers, and so forth approach learning tasks very differently and will demonstrate their mastery very differently. Some may be able to express themselves well in writing text but not oral speech, and vice versa. In reality, there is no one means of expression that will be optimal for all students; providing options for expression is essential

Principle III: Provide Multiple Means of Engagement (the "why" of learning).

Students differ markedly in the ways in which they can be engaged or motivated to learn. Some students are highly engaged by spontaneity and novelty while other are disengaged, even frightened, by those aspects, preferring strict routine. In reality, there is no one means of representation that will be optimal for all students; providing multiple options for engagement is essential.

4.0 Infusing UDL into PADI Design Patterns

The project team reviewed relevant background information on ECD and UDL to determine the intersection between UDL principles and PADI *design patterns*. Based on this analysis, UDL categories derived from UDL Principles I, II, and III are now used to categorize types of construct-irrelevant Additional Knowledge, Skills, and Abilities (Additional KSAs) that are likely to influence student performance. Definitions of UDL categories are provided in Table 1.

The project team added additional UDL-based Variable Task Features into *design patterns* that were motivated by these categories of Additional KSAs within each of the six UDL categories. Once test developers decide which of the afore-mentioned six categories may be challenging for certain students, developers can choose to support these different categories through a variety of Variable Task Features. For example, if vocabulary is a Non-Focal KSA, the assessment designer could draw from the list of Variable Task Features for Language and Symbols in order to find strategies to support vocabulary (e.g., embedded support for key terms through the use of a technical glossary, hyperlinks or footnotes to definitions, etc.). If organizational skills are a Non-Focal KSA, the designer could access the list of Variable Task Features for Executive Function and find strategies such as checklists, planning templates, and embedded prompts for categorizing and systematizing information (See Figure 2).

The six categories within Additional Knowledge, Skills, and Abilities along with the accompanying UDL Variable Task Features guide designers to consider the diverse needs of all students. A similar extension of Potential Work Products that would support a range of ways of responding to tasks is being developed and linked with appropriate UDL-motivated KSAs. By infusing UDL into the PADI design system, assessment designers are able to create flexible design patterns that will provide a more accurate measure of student learning.

Table 1. Definitions of Six UDL Categories by Principle

Principle 1 – Multiple Means of Representation	
UDL Category Name	**Definition**
Perceptual	To reduce barriers to accurate assessment it is important to ensure that key information is equally perceptible to all students by: 1) providing the same information through different sensory modalities (e.g. through vision, or hearing, or touch); 2) providing information in a format that will allow for adjustability by the user (e.g., text that can be enlarged, sounds that can be amplified). Such multiple representations not only ensure that information is accessible to students with particular sensory and perceptual disabilities, but also easier to access for many others.
Language and Symbols	Students vary in their facility with different forms of representation – both linguistic and non-linguistic. As a result, inequalities arise when information is presented to all students through a single form of representation. An important assessment strategy is to ensure that alternative representations are provided not only for accessibility but also for clarity and comprehensibility for all students.
Cognitive	Individuals differ greatly in their information processing skills and in their access to prior knowledge by which they can assimilate new information. Proper design and presentation of information can help to ensure that assessments accurately measure student knowledge.
Principle II –Multiple Means of Action and Expression	
Skill and Fluency	It is important to provide materials with which all students can interact, yet there is no medium of expression that is equally suited for all students or for all kinds of communication. Assessments should be designed so that the medium of response to questions does not interfere with an accurate demonstration of knowledge.
Executive	Executive functions include setting and maintaining goals, developing plans of action, managing information, and monitoring progress toward a goal, using working memory to assist in the process. Although many assessments may want to include measures of these skills, it is important to decide if any are essential to the focal KSA.
Principle III – Multiple Means of Engagement	
Affect	Students differ markedly in the ways in which they can be engaged or motivated. In assessment, it is important that students be willing to engage in the task. The level of challenge, students' interest in a topic, the provision of choice, and students' level of frustration can all impact student motivation. To prevent a lack of engagement from influencing the construct being measured, it is important to provide multiple ways in which to engage all students.

Figure 2. Variable Features by UDL Category

Perceptual Features

- (1): Representational Format
  - Flexible size of text and images
  - Flexible amplitude of speech or sound
  - Adjustable contrast
  - Flexible colors
  - Flexible layout
- (2): Auditory Information
  - Text equivalents (e.g. captions, automated speech to text)
  - Visual graphics or outlines
  - Virtual manipulatives, video animation
  - Verbal descriptions
  - Tactile graphics, objects
- (3): Visual Information
  - Spoken equivalents for text and images
  - Automatic text to speech
  - Tactile graphics
  - Braille

Language and Symbols

- (1): Supports for Vocabulary and Symbols
  - Pre-taught vocabulary and symbols
  - Embedded support for key terms (e.g. technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
  - Embedded support for non-technical terms (e.g. non-technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
  - Embedded alternatives for unfamiliar references (e.g. domain specific notation, jargon, figurative language, etc.)
- (2): Supports for Syntactic Skills and Underlying Structure
  - Alternate syntactic levels (simplified text)
  - Grammar aids
  - Highlighted syntactical elements (e.g. subjects, predicates, noun-verb agreement, adjectives, phrase structure, etc.)
  - Highlight structural relations or make them more explicit
- (3): Supports for English Language
  - All key information in the dominant language (e.g. English) is also available in prevalent first languages (e.g. Spanish) for second language learners and in ASL for students who are deaf
  - Key vocabulary words have links to both dominant and non-dominant definitions and pronunciations
  - Domain-specific vocabulary (e.g. "matter" in science) is translated for both special and common meanings
  - Electronic translation tools, multi-lingual glossaries
- (4): Supports for Decoding and Fluency
  - Digital text with automatic text to speech
  - Digital Braille with automatic Braille to speech

Figure 2. Variable Features by UDL Category (continued)

Cognitive Features

- (1): Supports for Background knowledge
  - Advanced organizers, pre-teaching, relevant analogies and examples
  - Links to prior knowledge (e.g. hyperlinks to multimedia, concrete objects in students' environments)
  - Provision of an example
- (2): Supports for Critical features, Big Ideas, and Relationships
  - Concept maps, graphic organizers, outlines
  - Highlight features in text, diagrams, graphics, and illustrations
  - Reducing the field of competing information or distractions, masking
  - Using multiple examples and non-examples to emphasize critical concepts
- (3): Options that Guide Information Processing
  - Explicit prompts for each step in a sequential process
  - Interactive models that guide exploration and inspection
  - Graduated scaffolds that support information processing strategies
  - Multiple entry points and optional pathways through content
  - Chunking information into smaller elements, progressive release of information, sequential highlighting
  - Discrete question (s) or scenario-based text presentation
  - Complexity of the scientific investigation presented in the scenario
  - Cognitive complexity (Webb's Depth of Knowledge Levels)
  - If selected response, distractors based on misconceptions/typical errors vs. non-misconceptions
- (4): Supports for Memory and Transfer
  - Checklists, organizers, sticky notes, electronic reminders
  - Prompts for using mnemonic strategies and devices
  - Templates, graphic organizers, concept maps to support note-taking
  - Scaffolding that connects new information to prior knowledge
  - Embedding new ideas in familiar ideas and contexts, use of analogy, metaphor, example

Skill and Fluency

- (1): Supports for Manipulations
  - Virtual manipulatives, Snap-to constraints
  - Nonstick mats, Larger objects
- (2): Supports for Navigation
  - Alternatives for physically interacting with materials: by hand, by voice, by single switch, by keyboard, by joystick, by adapted keyboard
- (3): Alternatives to Writing
  - Voice recognition, Audio taping, Dictation, Video, Illustration
- (4): Supports for Composition
  - Keyboarding and alternative keyboards, Onscreen keyboard,
  - Wider lines, Larger paper, Pencil grips
  - Drawing tools - with shapes, lines, etc.
  - Blank tables, charts, graph paper
  - Spellcheckers, calculators, sentence starters, word prediction, dictation (voice recognition or scribe), symbol-to-text, sentence strips

Figure 2. Variable Features by UDL Category (continued)

Executive Features

- (1): Support for Goal and Expectation Setting
  - Prompts and scaffolds to estimate effort, resources, and difficulty
  - Animated agents that model the process and product of goal-setting
  - Guides and checklists for scaffolding goal-setting
- (2): Supports for Goal Maintenance and Adjustment
  - Maintain salience of objectives and goals (e.g. reminders, progress charts)
  - Adjust levels of challenge and support (e.g. adjustable leveling and embedded support, alternative levels of difficulty, alternative points of entry)
- (3): Supports for Planning and Sequencing
  - Embedded prompts to "stop and think" before acting
  - Checklists and project planning templates for setting up prioritization, schedules, and steps
  - Guides for breaking long-term objectives into reachable short-term objectives
- (4): Supports for Managing Information
  - Graphic organizers and templates for organizing information
  - Embedded prompts for categorizing and systematizing
  - Checklists and guides for note-taking
- (5): Supports for Working Memory
  - Note-taking, mnemonic aids
  - Locate items near relevant text
- (6): Supports for Monitoring Progress
  - Guided questions for self-monitoring
  - Representations of progress (e.g. before and after photos, graphs and charts)
  - Templates that guide self-reflection on quality and completeness
  - Differentiated models of self-assessment strategies

Affect Features

- (1): Supports for Intrinsic Motivation (Challenge and/or Threat)
  - Offer individual choice
  - Enhance relevance, value, authenticity (e.g. contextualize to students' lives, provision of an example)
  - Options to vary level of novelty and risk (e.g. options in peer and adult support, alternatives to competition, alternatives to public display or performance, alternative consequences)
  - Options to vary sensory stimulation (e.g. shortened work periods, frequent breaks, noise buffers, optional headphones, alternative settings, presentation of fewer items at a time)
- (2): Supports for Sustaining Effort and Persistence
  - Maintain salience of goals (e.g. explicit display of goals, periodic reminders, replacement of long-term goals with short-term objectives, prompts for visualization)
  - Adjustable levels of challenge and support
  - Encourage collaboration and support
  - Communicate on-going, mastery-oriented feedback
- (3): Support for Self-regulation
  - Guide motivational goal-setting
  - Scaffold self-regulatory skills and strategies
  - Develop emotional self-assessment and reflection

5.0 Design Patterns for Large-Scale State Science Assessments

Collaborations with four states (Kansas, Kentucky, Nevada, and South Carolina) were established to co-design new UDL-infused PADI *design patterns*. The project focuses on science assessment at the middle school level.

Each of the states participating in the project has developed a set of standards upon which their assessments are based. They serve as the basis for the selection of exemplar sets of standards for developing *design patterns*. The basis of the selections of standards for exemplar *design patterns* were those that (1) would be useful to the state (in terms of important standards); (2) raised interesting UDL/accommodations issues, such as representational forms or model-based reasoning; and (3) showed connections with National Science Education Standards emphases, such as inquiry or model-based reasoning, or building scientific explanations.

A total of thirteen *design patterns* were developed for the four states. Tables 2-5 present detailed information about each of the *design patterns* that were created for the four states and the state standards aligned with each *design pattern*. The Appendix A includes examples of four *design patterns*; one for each participating state.

Table 2. Kansas Design Patterns with Associated State Standards

Design Pattern Title	Relevant State Standards
1. Designs and Conducts Scientific Investigations Using Appropriate Methodology (11/19)	**Inquiry Standard S.7.1.1.2:** The student designs and conducts scientific investigations safely using appropriate tools, mathematics, technology and techniques to gather, analyze, and interpret data.
2. Identifying Questions that can be Answered through Scientific Investigations (11/19)	**Inquiry Standard S.7.1.1.1:** The student identifies questions that can be answered through scientific investigations.
3. Identifying the relationship between evidence and logical conclusions (12/5) – DP2058	**Inquiry Standard S.7.1.1.3:** The student identifies the relationship between evidence and logical conclusions.
4. Critiquing the work of others with topic states of matter (4/9) – DP2091	**Inquiry Standard S.7.1.3.2:** The student evaluates the work of others to determine evidence which scientifically supports or contradicts the results, identifying faulty reasoning or conclusions that go beyond the evidence and/or are not supported by data. **Physical Science Standard S.7.2.1.1:** The student compares and classifies that states of matter: solids, liquids, gases, and plasma.

Table 3. Kentucky Design Patterns with Associated State Standards

Design Pattern Title	Relevant State Standards
1. Creation of a Model to Classify Elements and Compounds According to their Properties (12/10)	**Big Idea: Structure and Transformation of Matter (Physical Science) Grade 7:** A basic understanding of matter is essential to the conceptual development of other big ideas in science. During the middle years, physical and chemical changes in matter are observed, and students begin to relate these changes to the smaller constituents of matter—namely, atoms and molecules. The use of models (and an understanding of their scales and limitations) is an effective means of learning about the structure of matter. Looking for patterns in properties is also critical to comparing and explaining differences in matter. **Academic Expectations 2.4:** Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed. **Related Core Content for Assessment:** Students will: (1) Classify substances according to their chemical/reactive properties, and (2) Infer real life applications for substances based on chemical/reactive properties. In chemical reactions, the total mass is conserved. Substances are often classified into groups if they react in similar ways. The patterns, which allow classification, can be used to infer or understand real life applications for those substances.
2. Identifying Testable Questions about the Structure and Transformation of Matter that Can be Answered Through Scientific Investigation (12/10)	**Big Idea: Structure and Transformation of Matter (Physical Science) Grade 7:** A basic understanding of matter is essential to the conceptual development of other big ideas in science. During the middle years, physical and chemical changes in matter are observed, and students begin to relate these changes to the smaller constituents of matter—namely, atoms and molecules. The use of models (and an understanding of their scales and limitations) is an effective means of learning about the structure of matter. Looking for patterns in properties is also critical to comparing and explaining differences in matter. **Academic Expectations 2.1:** Students understand scientific ways of thinking and working and use those methods to solve real-life problems. **Program of Studies: Skills and Concepts: SC-7-STM-S-3 (No Related Core Content for Assessment):** Students will generate investigable questions and conduct experiments or non-experimental research to address them.

3. Explaining Cause and Effect Relationships Between Motion and Forces (2/11 and 4/14) - DP2092	**Big Idea: Structure and Transformation of Matter (Physical Science) Grade 7:** Whether observing airplanes, baseballs, planets, or people, the motion of all bodies is governed by the same basic rules. At the middle level, qualitative descriptions of the relationship between forces and motion will provide the foundation for quantitative applications of Newton's Laws. **Academic Expectations 2.1:** Students understand scientific ways of thinking and working and use those methods to solve real-life problems. **Program of Studies: Understandings SC-7-MF-U-1:** Students will understand that an object remains at rest or maintains a constant speed and direction of motion unless an unbalanced force acts on it (Inertia). **Program of Studies: Understandings SC-7-MF-U-2:** Students will understand that forces acting against each other can be balanced, canceling each other out and having no net effect. **Program of Studies: Skills and Concepts: SC-7-MF-S-2:** Students will test the cause and effect relationship between straight-line motion and unbalanced forces **Program of Studies: Skills and Concepts: SC-7-MF-S-4:** Students will make inferences and draw conclusions about the motion of objects, and predict changes in position and motion as related to the mass or force. **Related Core Content for Assessment: SC-07-1.2.1:** Students will explain the cause and effect relationship between simple observable motion and unbalanced forces. An object remains at rest or maintains a constant speed and direction of motion unless an unbalanced force acts on it (e.g., gravity). When an unbalanced force acts on an object, the change in speed or direction depends on the size and direction of the force.

Table 4. Nevada Design Patterns with Associated State Standards

Design Pattern Title	Relevant State Standards
1. Interpreting Data in Tables, Charts, and Graphs (11/7)	**Inquiry Standard N.8.A.1:** Students know how to identify and critically evaluate information in data, tables and graphs.
2. Using Data to Communicate an Argument (11/7)	**Inquiry Standard N.8.A.1:** Students know how to identify and critically evaluate information in data, tables and graphs.
3. Use of Model-based Reasoning in Conservation of Matter (12/6) - DP2090	**Content Standard P.8.A.5:** Students know mass is conserved in physical and chemical changes. **Unifying Concept A:** Scientific inquiry is the process by which humans systematically examine the natural world. Scientific inquiry is used to formulate and test explanations of nature through observation, experiments, and theoretical or mathematical models.

Table 5. South Carolina Design Patterns with Associated State Standards

Design Pattern Title	Relevant State Standards
1. Using Appropriate Tools Safely and Accurately when Conduction and Investigation (11/30)	**Inquiry Indicator7-1.1:** Use appropriate tools and instruments (including a microscope) safely and accurately when conducting a controlled scientific investigation.
2. Explaining Relationships between Variables Using Representational Forms (11/30)	**Inquiry Standard 7-1.5:** Explain the relationships between independent and dependent variables in a controlled scientific investigation through the use of appropriate graphs, tables, and charts.
3. Using the Periodic Table to Reason about Properties of Elements (12/17) – DP2089	**Content Standard 7-5:** The student will demonstrate an understanding of the classifications and properties of matter and the changes that matter undergoes. **Content Indicator 7-5.4:** Use the periodic table to identify the basic organization of elements and groups of elements (including metals, nonmetals, and families).

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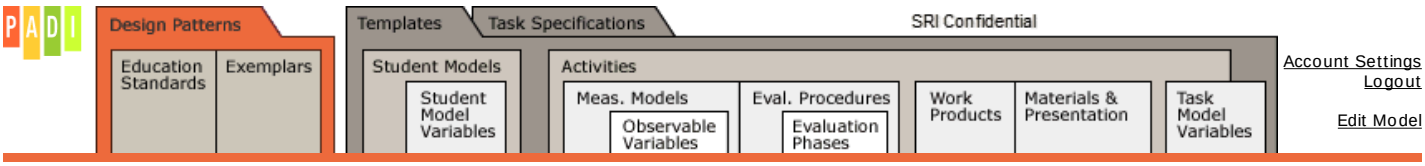
Appendix A



[KS] Critiquing the Work of Others with Topic States of Matter - UDL | Design Pattern 2091

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Title [Edit] [KS] Critiquing the Work of Others with Topic States of Matter - UDL

Overview [Edit] A student is presented with an abstract of a scientific study about the states of matter that describes the research question or hypothesis, procedures and findings and is asked to critique the study using a set of criteria. This study description could be produced by the test developer or a student. Is the student taking the test able to critique the scientific work? details

Focal Knowledge, Skills, and Abilities [Edit]

FK1. Ability to understand concepts related to states of matter: solids, liquids, and gases details

FK2. Ability to apply one or more established scientific criteria to the study description details

FK3. Ability to critique the ideas of others and communicate the critique details

Rationale [Edit]

R1. Real-world science involves the sharing and critiquing of scientific findings and procedures among members of the scientific community. For example, scientists frequently present their ideas and supporting evidence to other scientists at conferences and in peer-reviewed journals. The quality of scientific work is improved and scientific advances may be accelerated, in part, as a result of the critique provided by peers. details

Additional Knowledge, Skills, and Abilities [Edit]

AK1. ==========
The following Additional KSAs are prerequisite knowledge that can be required for tasks that address the Focal KSAs. Whether they are to be supported or not (e.g., glossary, background facts, equation list) is a decision to be made -- either by the assessment design team, either at the level of the testing program or at the level of the individual task if that is appropriate in the testing program.
==========

AK2. Inquiry skills included in the study description details

AK3. Knowledge of states of matter topical content required to judge the satisfactory application of established scientific criteria details

AK4. Knowledge of what a criterion is details

AK5. Concepts related to states of matter details

AK6. ==========
The following group of additional KSAs are generally construct-irrelevant knowledge, skills, or other attributes that may be involved in tasks generated under this design pattern. The task author can consider offering supports, presenting material, or getting work products that reduce or avoid requirements for these Additional KSAs, either through accommodated forms of a task or UDL principles. Many of these Additional KSAs are linked to Variable Task Features or Potential Work Products for suggestions on how to do this.
==========

AK7. Perceptual
. vision
. hearing
. touch details

AK8. Language and symbols
. vocabulary and symbols
. syntax and underlying structure
. English-language proficiency
. decoding text or math notation
. decoding charts, graphs, or images

AK9. Cognitive
. background knowledge
. concepts and categories
. information processing strategies
. memory and transfer

AK10. Skill and fluency
. dexterity, strength, and mobility
. navigation and object manipulation
. automaticity (e.g., calculations, writing)
. familiarity with media
. facility with tools

AK11. Executive (problem solving)
. goal and expectation setting
. goal maintenance and adjustment
. planning and sequencing steps in a process
. managing information and resources
. working memory
. monitoring progress

AK12. Affective
. intrinsic, task-specific motivation (challenge and/or threat, interest)
. sustaining effort and persistance
. coping skills and frustration management

Potential observations [Edit]

Po1. Relevance and appropriateness of the scientific criteria selected to critique the study description details

Po2. Completeness/accuracy with which the study description is matched to the selected scientific criteria details

Po3. Correctness of logical or substantive flaws identified in the study design as described details

Po4. Relevance and appropriateness of the scientific criteria generated to critique the study description details

Po5. Coherence and completeness of critique of the study description that addresses each of the scientific criteria details

Po6. Suitably of communication for the needs/ abilities/ understandings of the student whose work is being critiqued details

Po7. Suitability of clarifying questions in the critiquing process details

Po8. To what degree are shared understandings constructed through discussion and clarification of ideas? details

Po9. Effectiveness of examinee's feedback for helping to improve the study description details

Po10. Are substantive assertions, explanations, or alternative hypotheses presented that challenge or refute the findings of the written description, and if so, what is their quality? details

Po11. Are solutions proposed to resolve conflicts that emerge during the review process? details

Po12. Does critique (a) recognize and (b)resolve contradictions between the perspective of the study designer and the student reviewer? details

Potential work products [Edit]

Pw1. Identification of errors and/or omissions in work of others (multiple choice)

Pw2. Selection of one of several study descriptions that meet specified scientific criteria (multiple choice)

Pw3. Selection of one or more criteria, from a list of potential scientific criteria, that a study description meets (multiple choice)

Pw4. Direct interaction between the student and the reviewer regarding the study design that is observed and recorded by the teacher.

Pw5. Identification of errors and/or omissions in work of others (written or oral explanation)

Pw6. Oral presentation by the reviewer critiquing the study description

Pw7. A study description that is annotated in terms of the specified scientific criteria.

Pw8. Student-produced rubrics/criteria for critiquing the study design

Pw9. Written report applying the criteria to the study description

Pw10. The creation or filling in of a table, or creating a new table details

Potential rubrics [Edit]

Characteristic features [Edit]

Cf1. The description of a study or some elements of a study must be provided in sufficient detail to judge the appropriateness of the research questions/hypotheses, the research design, or the interpretation of results. details

Cf2. The study design or elements of the study must be situated in a context that revolves around states of matter. details

Variable features [Edit]

Vf1. Pre-established scientific criteria taken from an established external source vs student-identified scientific criteria/rubrics

Vf2. Perceptual Features (1): Representational Format
- Flexible size of text and images
- Flexible amplitude of speech or sound
- Adjustable contrast
- Flexible colors
- Flexible layout

Vf3. Perceptual Features (2): Auditory Information
- Text equivalents (e.g. captions, automated speech to text)
- Visual graphics or outlines
- Virtual manipulatives, video animation
- Verbal descriptions
- Tactile graphics, objects

Vf4. Perceptual Features (3): Visual Information
- Spoken equivalents for text and images
- Automatic text to speech
- Tactile graphics
- Braille

Vf5. Language and Symbols (1): Supports for Vocabulary and Symbols
- Pre-taught vocabulary and symbols
- Embedded support for key terms (e.g. technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
- Embedded support for non-technical terms (e.g. non-technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
- Embedded alternatives for unfamiliar references (e.g. domain specific notation, jargon, figurative language, etc.)

Vf6. Language and Symbols (2): Supports for Syntactic Skills and Underlying Structure
- Alternate syntactic levels (simplified text)
- Grammar aids
- Highlighted syntactical elements (e.g. subjects, predicates, noun-verb agreement, adjectives, phrase structure, etc.)
- Highlight structural relations or make them more explicit

Vf7. Language and Symbols (3): Supports for English Language
- All key information in the dominant language (e.g. English) is also available in prevalent first languages (e.g. Spanish) for second language learners and in ASL for students who are deaf
- Key vocabulary words have links to both dominant and non-dominant definitions and pronunciations
- Domain-specific vocabulary (e.g. "matter" in science) is translated for both special and common meanings
- Electronic translation tools, multi-lingual glossaries

Vf8. Language and Symbols (4): Supports for Decoding and Fluency
- Digital text with automatic text to speech
- Digital Braille with automatic Braille to speech

Vf9. Cognitive Features (1): Supports for Background knowledge
- Advanced organizers, pre-teaching, relevant analogies and examples

- Links to prior knowledge (e.g. hyperlinks to multimedia, concrete objects in students' environments)
- Provision of an example

Vf10. Cognitive Features (2): Supports for Critical features, Big Ideas, and Relationships
- Concept maps, graphic organizers, outlines
- Highlight features in text, diagrams, graphics, and illustrations
- Reducing the field of competing information or distractions, masking
- Using multiple examples and non-examples to emphasize critical concepts

Vf11. Cognitive Features (3): Options that Guide Information Processing
- Explicit prompts for each step in a sequential process
- Interactive models that guide exploration and inspection
- Graduated scaffolds that support information processing strategies
- Multiple entry points and optional pathways through content
- Chunking information into smaller elements, progressive release of information, sequential highlighting
- Discrete question (s) or scenario-based text presentation
- Complexity of the scientific investigation presented in the scenario
- Cognitive complexity (Webb's Depth of Knowledge Levels)
- If selected response, distractors based on misconceptions/typical errors vs. non-misconceptions

Vf12. Cognitive Features (4): Supports for Memory and Transfer
- Checklists, organizers, sticky notes, electronic reminders
- Prompts for using mnemonic strategies and devices
- Templates, graphic organizers, concept maps to support note-taking
- Scaffolding that connects new information to prior knowledge
- Embedding new ideas in familiar ideas and contexts, use of analogy, metaphor, example

Vf13. Skill and Fluency (1): Supports for Manipulations
- Virtual manipulatives, Snap-to constraints
- Nonstick mats, Larger objects

Vf14. Skill and Fluency (2): Supports for Navigation
- Alternatives for physically interacting with materials: by hand, by voice, by single switch, by keyboard, by joystick, by adapted keyboard

Vf15. Skill and Fluency (3): Alternatives to Writing
- Voice recognition, Audio taping, Dictation, Video, Illustration

Vf16. Skill and Fluency (4): Supports for Composition
- Keyboarding and alternative keyboards, Onscreen keyboard,
- Wider lines, Larger paper, Pencil grips
- Drawing tools - with shapes, lines, etc.
- Blank tables, charts, graph paper
- Spellcheckers, calculators, sentence starters, word prediction, dictation (voice recognition or scribe), symbol-to-text, sentence strips

Vf17. Executive Features (1): Support for Goal and Expectation Setting
- Prompts and scaffolds to estimate effort, resources, and difficulty
- Animated agents that model the process and product of goal-setting
- Guides and checklists for scaffolding goal-setting

Vf18. Executive Features (2): Supports for Goal Maintenance and Adjustment
- Maintain salience of objectives and goals (e.g. reminders, progress charts)
- Adjust levels of challenge and support (e.g. adjustable leveling and embedded support, alternative levels of difficulty, alternative points of entry)

Vf19. Executive Features (3): Supports for Planning and Sequencing
- Embedded prompts to "stop and think" before acting
- Checklists and project planning templates for setting up prioritization, schedules, and steps
- Guides for breaking long-term objectives into reachable short-term objectives

Vf20. Executive Features (4): Supports for Managing Information
- Graphic organizers and templates for organizing information
- Embedded prompts for categorizing and systematizing
- Checklists and guides for note-taking

Vf21. Executive Features (5): Supports for Working Memory
- Note-taking, Mnemonic aids
- Locate items near relevant text

Vf22. Executive Features (6): Supports for Monitoring Progress
- Guided questions for self-monitoring
- Representations of progress (e.g. before and after photos, graphs and charts)
- Templates that guide self-reflection on quality and completeness
- Differentiated models of self-assessment strategies

Vf23. Affect Features (1): Supports for Intrinsic Motivation (Challenge and/or Threat)
- Offer individual choice
- Enhance relevance, value, authenticity (e.g. contextualize to students' lives, provision of an example)
- Options to vary level of novelty and risk (e.g. options in peer and adult support, alternatives to competition, alternatives to public display or performance, alternative consequences)
- Options to vary sensory stimulation (e.g. shortened work periods, frequent breaks, noise buffers, optional headphones, alternative settings, presentation of fewer items at a time)

Vf24. Affect Features (2): Supports for Sustaining Effort and Persistence
- Maintain salience of goals (e.g. explicit display of goals, periodic reminders, replacement of long-term goals with short-term objectives, prompts for visualization)
- Adjustable levels of challenge and support
- Encourage collaboration and support
- Communicate on-going, mastery-oriented feedback

Vf25. Affect Features (3): Support for Self-regulation
- Guide motivational goal-setting
- Scaffold self-regulatory skills and strategies
- Develop emotional self-assessment and reflection

I am a kind of [Edit]

These are kinds of me [Edit]

These are parts of me [Edit]

Educational standards [Edit]

KS (5) Flipchart Inquiry Standard S.7.1.3.2. The student evaluates the work of others to determine evidence which scientifically supports or cont…

KS (6) Flipchart Physical Science Standard S.7.2.1.1. The student compares and classifies the states of matter: solids, liquids, gases, and plasma.

NSES 8ASI1.7. Communicate scientific procedures and explanations. With practice, students should become competent …

Unifying Concepts 1.2. Evidence, models, and explanation

Templates [Edit]

Exemplar tasks [Edit]

Online resources [Edit]

Or1. CRESST publications http://cresst96.cse.uc… details

References [Edit]

R1. Greeno, Pearson, and Schoenfeld ((1996). Implications for NAEP of research on learning and cognition. National Academy of Education.

Tags [Add Tag]

(No tags defined.)

List of Examples:

Activity Continuous Zone Design Pattern Educational Standard Evaluation Phase Evaluation Procedure (rubric) Materials and Presentation Measurement Model Observable Variable Student Model Student Model Variable Task Exemplar Task Model Variable Task Specification Template Work Product

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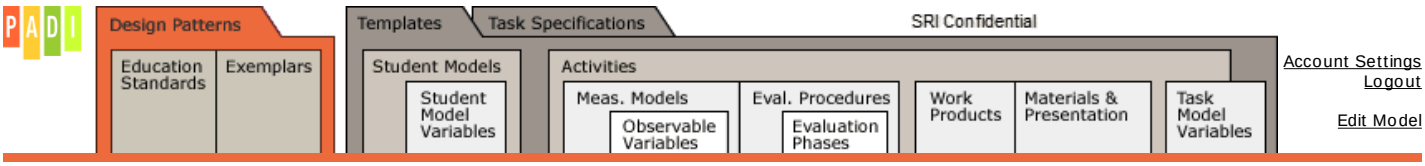

[KY] Explaining Cause and Effect Relationships Between Motion and Forces - UDL | Design Pattern 2092

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Title [Edit] [KY] Explaining Cause and Effect Relationships Between Motion and Forces - UDL

Overview [Edit] Students are given a situation related to the motion of an object and must use cause and effect reasoning to predict the outcome of the object's motions (i.e. speed, distance, and direction). Can the student use the concepts of cause and effect to explain and/or predict the motion of an object?

Focal Knowledge, Skills, and Abilities [Edit]

FK1. Knowledge that there are scientific explanations for observable events and phenomena in the real world details

FK2. Knowledge that changes in the real world can be the result of predictable influences (laws of science) details

FK3. Knowledge that the linkage between a cause and its predicted effect is based on evidence details

FK4. Knowledge that cause/effect relationships can be tested through repeatable procedures details

FK5. Knowledge that effects can be predicted based on prior evidence or observations details

FK6. Ability to explain why an object changes speed or direction

FK7. Ability to explain how forces impact the speed or direction of an object

FK8. Ability to understand that objects at rest will stay at rest and objects in motion will stay in motion unless acted on by an outside force

FK9. Ability to understand that forces acting against each other can be unbalanced, impact each other, and affect the motion of an object

FK10. Ability to understand that gravity can influence the motion of objects

Rationale [Edit]

R1. Students need to be able to think in scientific ways and reason about phenomena. Understanding cause and effect relationships and being able to explain them is an essential skill for predicting outcomes, interpreting observations, and drawing conclusions about motion and unbalanced forces.

Additional Knowledge, Skills, and Abilities [Edit]

AK1. ==========
The following Additional KSAs are prerequisite knowledge that can be required for tasks that address the Focal KSAs. Whether they are to be supported or not (e.g., glossary, background facts, equation list) is a decision to be made -- either by the assessment design team, either at the level of the testing program or at the level of the individual task if that is appropriate in the testing program.
==========

AK2. Knowledge of kinematic definitions and concepts details

AK3. Knowledge of the concept of mass details

AK4. Knowledge that a force is a push or pull on an object details

AK5. Knowledge of the relationship among mass, force, and the acceleration of an object details

AK6. Knowledge and understanding of gravity as an outside force details

AK7. Knowledge that when forces are balanced, objects stay at rest or move at a constant speed details

AK8. ==========
The following group of additional KSAs are generally construct-irrelevant knowledge, skills, or other attributes that may be involved in tasks generated under this design pattern. The task author can consider offering supports,

presenting material, or getting work products that reduce or avoid requirements for these Additional KSAs, either through accommodated forms of a task or UDL principles. Many of these Additional KSAs are linked to Variable Task Features or Potential Work Products for suggestions on how to do this.
==========

AK9. Perceptual
. vision
. hearing
. touch details

AK10. Language and symbols
. vocabulary and symbols
. syntax and underlying structure
. English-language proficiency
. decoding text or math notation
. decoding charts, graphs, or images details

AK11. Cognitive
. background knowledge
. concepts and categories
. information processing strategies
. memory and transfer details

AK12. Skill and fluency
. dexterity, strength, and mobility
. navigation and object manipulation
. automaticity (e.g., calculations, writing)
. familiarity with media
. facility with tools details

AK13. Executive (problem solving)
. goal and expectation setting
. goal maintenance and adjustment
. planning and sequencing steps in a process
. managing information and resources
. working memory
. monitoring progress details

AK14. Affective
. intrinsic, task-specific motivation (challenge and/or threat, interest)
. sustaining effort and persistance
. coping skills and frustration management details

Potential observations [Edit]

Po1. Accuracy and completeness of drawings representing the forces acting on an object

Po2. Accuracy and completeness of a prediction of an effect based on a specific cause

Po3. Accuracy of classifying situations that depict objects in various states of motion in terms of the cause of that motion

Po4. Accuracy and completeness of the explanation of how forces have impacted the motion of the objects

Po5. Accuracy and completeness of the prediction of the motion of an object using the laws of motion, given a scenario describing a scientific investigation

Po6. Appropriate use of evidence to support an explanation about the relationship of forces and motion

Po7. Accuracy of selecting the cause of an observed motion

Potential work products [Edit]

Pw1. Selection of an explanation to describe a situation where unbalanced forces are present (selected response)

Pw2. Written or oral explanation of the motion of an object that includes the cause/effect relationship (constructed response)

Pw3. Selection or production of a diagram that depicts the forces of motion acting on an obejct

Pw4. Selection or production of a graph to depict a specific motion or its cause

Pw5. Selection or production of a data table based on an observation or prediction of an object's motion

Pw6. Selection or production of a model based on an observation or prediction of an object's motion

Potential rubrics [Edit]

Pr1. Key for selected response items

Pr2. Partial-credit scoring of constructed responses

Characteristic features [Edit]

Cf1. A situation in which unbalanced forces are acting on an object

Variable features [Edit]

Vf1. Number of forces present

Vf2. Kinds of forces present (e.g., gravity, balanced, unbalanced)

Vf3. Direction of forces present

Vf4. Types of objects (e.g., balls, snowmobiles, cars)

Vf5. Number of objects present

Vf6. Perceptual Features (1): Representational Format
- Flexible size of text and images
- Flexible amplitude of speech or sound
- Adjustable contrast
- Flexible colors
- Flexible layout details

Vf7. Perceptual Features (2): Auditory Information
- Text equivalents (e.g. captions, automated speech to text)
- Visual graphics or outlines
- Virtual manipulatives, video animation
- Verbal descriptions
- Tactile graphics, objects details

Vf8. Perceptual Features (3): Visual Information
- Spoken equivalents for text and images
- Automatic text to speech
- Tactile graphics
- Braille details

Vf9. Language and Symbols (1): Supports for Vocabulary and Symbols
- Pre-taught vocabulary and symbols
- Embedded support for key terms (e.g. technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
- Embedded support for non-technical terms (e.g. non-technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
- Embedded alternatives for unfamiliar references (e.g. domain specific notation, jargon, figurative language, etc.) details

Vf10. Language and Symbols (2): Supports for Syntactic Skills and Underlying Structure
- Alternate syntactic levels (simplified text)
- Grammar aids
- Highlighted syntactical elements (e.g. subjects, predicates, noun-verb agreement, adjectives, phrase structure, etc.)
- Highlight structural relations or make them more explicit

Vf11. Language and Symbols (3): Supports for English Language
- All key information in the dominant language (e.g. English) is also available in prevalent first languages (e.g. Spanish) for second language learners and in ASL for students who are deaf
- Key vocabulary words have links to both dominant and non-dominant definitions and pronunciations
- Domain-specific vocabulary (e.g. "matter" in science) is translated for both special and common meanings
- Electronic translation tools, multi-lingual glossaries details

Vf12. Language and Symbols (4): Supports for Decoding and Fluency
- Digital text with automatic text to speech
- Digital Braille with automatic Braille to speech

Vf13. Cognitive Features (1): Supports for Background knowledge
- Advanced organizers, pre-teaching, relevant analogies and examples
- Links to prior knowledge (e.g. hyperlinks to multimedia, concrete objects in

students' environments)
- Provision of an example

Vf14. Cognitive Features (2): Supports for Critical features, Big Ideas, and Relationships
- Concept maps, graphic organizers, outlines
- Highlight features in text, diagrams, graphics, and illustrations
- Reducing the field of competing information or distractions, masking
- Using multiple examples and non-examples to emphasize critical concepts

Vf15. Cognitive Features (3): Options that Guide Information Processing
- Explicit prompts for each step in a sequential process
- Interactive models that guide exploration and inspection
- Graduated scaffolds that support information processing strategies
- Multiple entry points and optional pathways through content
- Chunking information into smaller elements, progressive release of information, sequential highlighting
- Discrete question(s) or scenario-based text presentation
- Complexity of the scientific investigation presented in the scenario
- Cognitive complexity (Webb's Depth of Knowledge Levels)
- If selected response, distractors based on misconceptions/typical errors vs. non-misconceptions details

Vf16. Cognitive Features (4): Supports for Memory and Transfer
- Checklists, organizers, sticky notes, electronic reminders
- Prompts for using mnemonic strategies and devices
- Templates, graphic organizers, concept maps to support note-taking
- Scaffolding that connects new information to prior knowledge
- Embedding new ideas in familiar ideas and contexts, use of analogy, metaphor, example

Vf17. Skill and Fluency (1): Supports for Manipulations
- Virtual manipulatives, Snap-to constraints
- Nonstick mats, Larger objects

Vf18. Skill and Fluency (2): Supports for Navigation
- Alternatives for physically interacting with materials: by hand, by voice, by single switch, by keyboard, by joystick, by adapted keyboard

Vf19. Skill and Fluency (3): Alternatives to Writing
- Voice recognition, Audio taping, Dictation, Video, Illustration

Vf20. Skill and Fluency (4): Supports for Composition
- Keyboarding and alternative keyboards, Onscreen keyboard,
- Wider lines, Larger paper, Pencil grips
- Drawing tools - with shapes, lines, etc.
- Blank tables, charts, graph paper
- Spellcheckers, calculators, sentence starters, word prediction, dictation (voice recognition or scribe), symbol-to-text, sentence strips

Vf21. Executive Features (1): Support for Goal and Expectation Setting
- Prompts and scaffolds to estimate effort, resources, and difficulty
- Animated agents that model the process and product of goal-setting
- Guides and checklists for scaffolding goal-setting

Vf22. Executive Features (2): Supports for Goal Maintenance and Adjustment
- Maintain salience of objectives and goals (e.g. reminders, progress charts)
- Adjust levels of challenge and support (e.g. adjustable leveling and embedded support, alternative levels of difficulty, alternative points of entry)

Vf23. Executive Features (3): Supports for Planning and Sequencing
- Embedded prompts to "stop and think" before acting
- Checklists and project planning templates for setting up prioritization, schedules, and steps
- Guides for breaking long-term objectives into reachable short-term objectives

Vf24. Executive Features (4): Supports for Managing Information
- Graphic organizers and templates for organizing information
- Embedded prompts for categorizing and systematizing
- Checklists and guides for note-taking

Vf25. Executive Features (5): Supports for Working Memory
- Note-taking, Mnemonic aids
- Locate items near relevant text

Vf26. Executive Features (6): Supports for Monitoring Progress
- Guided questions for self-monitoring
- Representations of progress (e.g. before and after photos, graphs and charts)
- Templates that guide self-reflection on quality and completeness
- Differentiated models of self-assessment strategies

Vf27. Affect Features (1): Supports for Intrinsic Motivation (Challenge and/or Threat)
- Offer individual choice
- Enhance relevance, value, authenticity (e.g. contextualize to students' lives, provision of an example)
- Options to vary level of novelty and risk (e.g. options in peer and adult support, alternatives to competition, alternatives to public display or performance, alternative consequences)
- Options to vary sensory stimulation (e.g. shortened work periods, frequent breaks, noise buffers, optional headphones, alternative settings, presentation of fewer items at a time)

Vf28. Affect Features (2): Supports for Sustaining Effort and Persistence
- Maintain salience of goals (e.g. explicit display of goals, periodic reminders, replacement of long-term goals with short-term objectives, prompts for visualization)
- Adjustable levels of challenge and support
- Encourage collaboration and support
- Communicate on-going, mastery-oriented feedback

Vf29. Affect Features (3): Support for Self-regulation
- Guide motivational goal-setting
- Scaffold self-regulatory skills and strategies
- Develop emotional self-assessment and reflection

I am a kind of [Edit]

These are kinds of me [Edit]

These are parts of me [Edit]

Educational standards [Edit]

KY (1) Related Core Content for Assessment SC-07-1.2.1. Students will explain the cause and effect relationship between simple observable motion and unbalan…

KY (2) Program of Studies: Understandings SC-7-MF-U-1. Students will understand that an object remains at rest or maintains a constant speed and direction …

KY (3) Program of Studies: Understandings SC-7-MF-U-2. Students will understand that forces acting against each other can be balanced, canceling each other…

KY (4) Program of Studies: Skills and Concepts SC-7-MF-S-2. Students will test the cause and effect relationship between straight-line motion and unbalanced for…

KY (5) Program of Studeis: Skills and Concepts SC-7-MF-S-4. Students will make inferences and draw conclusions about the motion of objects, and predict changes …

KY (6) Academic Expectations 2.1. Students understand scientific ways of thinking and working and use those methods to solve real-life…

KY (7) Big Idea: Motion and Forces (Physical Science) Grade 7. Whether observing airplanes, baseballs, planets, or people, the motion of all bodies is governed by …

Templates [Edit]

Exemplar tasks [Edit]

Online resources [Edit]

References [Edit]

Tags [Add Tag]

(No tags defined.)

List of Examples:

Activity Continuous Zone Design Pattern Educational Standard Evaluation Phase Evaluation Procedure (rubric) Materials and Presentation Measurement Model Observable Variable Student Model Student Model Variable Task Exemplar Task Model Variable Task Specification Template Work Product

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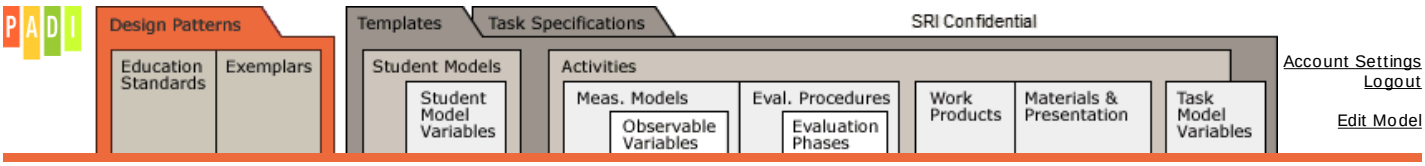

[NV] Using Model-Based Reasoning in Conservation of Matter - UDL | Design Pattern 2090

[View Tree | View Horiz | Duplicate | Permit | Export | Delete]

Title [Edit] [NV] Using Model-Based Reasoning in Conservation of Matter - UDL

Overview [Edit] Students are given models of physical and chemical changes to make explanations, predictions, and inferences about the conservation of matter. Can students use a model to show that matter is conserved (neither created or destroyed) during physical and/or chemical changes?

Focal Knowledge, Skills, and Abilities [Edit]

FK1. Knowledge that when matter goes through a physical or chemical change, the total matter remains the same

FK2. Knowledge that conservation of matter holds for every chemical and physical reaction

FK3. Knowledge that physical changes rearrange, but do not alter, particles

FK4. Knowledge that chemical changes are able to alter the structure of the particles or elements but do not impact or change the mass

FK5. Knowledge that mass does not disappear during a physical or chemical change

FK6. Ability to reason through the concepts and relationships of a given model and apply it to conservation of matter problems (given model for a physical or chemical change - e.g., water, adding acid to a base)

Rationale [Edit]

R1. A common misconception that students hold is that matter is created or destroyed during a process of physical or chemical change. To understand the topic area through a scientific perspective, students need to understand that matter is conserved during physical and chemical changes. This understanding can be best represented using correct models of physical and chemical change. Students can use these models to make explanations, predictions, and inferences such as filling in missing information.

Additional Knowledge, Skills, and Abilities [Edit]

AK1. ==========
The following Additional KSAs are prerequisite knowledge that can be required for tasks that address the Focal KSAs. Whether they are to be supported or not (e.g., glossary, background facts, equation list) is a decision to be made -- either by the assessment design team, either at the level of the testing program or at the level of the individual task if that is appropriate in the testing program.
==========

AK2. Ability to construct simple chemical equations details

AK3. Ability to identify balanced basic chemical equations details

AK4. Ability to understand mass (definition) details

AK5. Ability to understand states of matter details

AK6. Familiarity with representations of models details

AK7. Ability to understand vocabulary related to conservation of matter details

AK8. Ability to understand concepts related to conservation of matter details

AK9. Ability to distinguish between physical and chemical changes details

AK10. Familiarity with simulations for conducting demonstrations of physical and chemical changes

AK11. Familiarity with hands-on kit for conducting demonstrations of physical and chemical changes

AK12. ==========
The following group of additional KSAs are generally construct-irrelevant knowledge, skills, or other attributes that may be involved in tasks generated

under this design pattern. The task author can consider offering supports, presenting material, or getting work products that reduce or avoid requirements for these Additional KSAs, either through accommodated forms of a task or UDL principles. Many of these Additional KSAs are linked to Variable Task Features or Potential Work Products for suggestions on how to do this.
==========

AK13. Perceptual
. vision
. hearing
. touch

AK14. Language and symbols
. vocabulary and symbols
. syntax and underlying structure
. English-language proficiency
. decoding text or math notation
. decoding charts, graphs, or images

AK15. Cognitive
. background knowledge
. concepts and categories
. information processing strategies
. memory and transfer

AK16. Skill and fluency
. dexterity, strength, and mobility
. navigation and object manipulation
. automaticity (e.g., calculations, writing)
. familiarity with media
. facility with tools

AK17. Executive
. goal and expectation setting
. goal maintenance and adjustment
. planning and sequencing steps in a process
. managing information and resources
. working memory
. monitoring progress

AK18. Affective
. intrinsic, task-specific motivation (challenge and/or threat, interest)
. sustaining effort and persistence
. coping skills and frustration management

Potential observations [Edit]

Po1. Correctness of illustrating that when matter goes through a physical or chemical change the total matter remains the same

Po2. Accuracy of explanations, predictions, and retrodictions reasoned through the models (with respect to the conservation of matter)

Po3. Accuracy of identification of a correct result from a chemical or physical change

Po4. Accuracy of identification of a misconception about conservation of matter details

Potential work products [Edit]

Pw1. A drawing of the result of an experiment that produces a chemical or physical change

Pw2. A drawing of the molecular or atomic representation of a chemical change

Pw3. Written or oral explanation of the concept of conservation of matter details

Pw4. Written or oral explanation and/or prediction of the result of an experiment that produces a chemical or physical change details

Pw5. Written or oral explanation that describes the molecular or atomic representation of a chemical change details

Pw6. Written or oral description of a model of physical or chemical change and accompanying drawing that represents the change details

Pw7. Selection of the correct model that would result in a given chemical or physical change

Pw8. Selection of the correct chemical or physical change produced by a given model

Potential rubrics [Edit]

Pr1. Separate rubrics for quality of content and quality of inquiry

Pr2. Multiple-choice dichotomous scoring of correct chemical or physical change or model that would result in change

Pr3. Error analysis (distractors based on misconceptions or typical errors in procedures)

Pr4. Partial credit scoring of written responses:
o Written specification of the model (5 points total)
. Full (3 points)- Complete written description of model that includes: (a) all relevant variables; (b) accurated description of relationships among variables; and (c) correct outcome of chemical and physical change.
. Partial (2 points)- Any one of the components is missing or incorrect.
. Partial (1 point) - Any two of the components are missing or incorrect.
. Incorrect (0 points) - All three components are missing or incorrect.
o Drawing of the model (2 points total)
. Full (2 points) - Drawing of model that includes all relevant variables; depicts relationship among variables appropriately.
. Partial (1 point) - Any one of the components is missing or incorrect.
. Incorrect (0 points) - Both components are missing or incorrect.

Characteristic features [Edit]

Cf1. Presentation of a situation involving physical or chemical change

Cf2. Reasoning in the situation that revolves around the conservation of matter

Variable features [Edit]

Vf1. Number of variables

Vf2. Complexity of variable relationships

Vf3. Perceptual Features (1): Representational Format
- Flexible size of text and images
- Flexible amplitude of speech or sound
- Adjustable contrast
- Flexible colors
- Flexible layout

Vf4. Perceptual Features (2): Auditory Information
- Text equivalents (e.g. captions, automated speech to text)
- Visual graphics or outlines
- Virtual manipulatives, video animation
- Verbal descriptions
- Tactile graphics, objects

Vf5. Perceptual Features (3): Visual Information
- Spoken equivalents for text and images
- Automatic text to speech
- Tactile graphics
- Braille

Vf6. Language and Symbols (1): Supports for Vocabulary and Symbols
- Pre-taught vocabulary and symbols
- Embedded support for key terms (e.g. technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
- Embedded support for non-technical terms (e.g. non-technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
- Embedded alternatives for unfamiliar references (e.g. domain specific notation, jargon, figurative language, etc.)

Vf7. Language and Symbols (2): Supports for Syntactic Skills and Underlying Structure
- Alternate syntactic levels (simplified text)
- Grammar aids
- Highlighted syntactical elements (e.g. subjects, predicates, noun-verb agreement, adjectives, phrase structure, etc.)
- Highlight structural relations or make them more explicit

Vf8. Language and Symbols (3): Supports for English Language
- All key information in the dominant language (e.g. English) is also available in prevalent first languages (e.g. Spanish) for second language learners and in ASL for students who are deaf
- Key vocabulary words have links to both dominant and non-dominant definitions and pronunciations
- Domain-specific vocabulary (e.g. "matter" in science) is translated for both

special and common meanings
- Electronic translation tools, multi-lingual glossaries

Vf9. Language and Symbols (4): Supports for Decoding and Fluency
- Digital text with automatic text to speech
- Digital Braille with automatic Braille to speech

Vf10. Cognitive Features (1): Supports for Background knowledge
- Advanced organizers, pre-teaching, relevant analogies and examples
- Links to prior knowledge (e.g. hyperlinks to multimedia, concrete objects in students' environments)
- Provision of an example

Vf11. Cognitive Features (2): Supports for Critical features, Big Ideas, and Relationships
- Concept maps, graphic organizers, outlines
- Highlight features in text, diagrams, graphics, and illustrations
- Reducing the field of competing information or distractions, masking
- Using multiple examples and non-examples to emphasize critical concepts

Vf12. Cognitive Features (3): Options that Guide Information Processing
- Explicit prompts for each step in a sequential process
- Interactive models that guide exploration and inspection
- Graduated scaffolds that support information processing strategies
- Multiple entry points and optional pathways through content
- Chunking information into smaller elements, progressive release of information, sequential highlighting
- Discrete question (s) or scenario-based text presentation
- Complexity of the scientific investigation presented in the scenario
- Cognitive complexity (Webb's Depth of Knowledge Levels)
- If selected response, distractors based on misconceptions/typical errors vs. non-misconceptions

Vf13. Cognitive Features (4): Supports for Memory and Transfer
- Checklists, organizers, sticky notes, electronic reminders
- Prompts for using mnemonic strategies and devices
- Templates, graphic organizers, concept maps to support note-taking
- Scaffolding that connects new information to prior knowledge
- Embedding new ideas in familiar ideas and contexts, use of analogy, metaphor, example

Vf14. Skill and Fluency (1): Supports for Manipulations
- Virtual manipulatives, Snap-to constraints
- Nonstick mats, Larger objects

Vf15. Skill and Fluency (2): Supports for Navigation
- Alternatives for physically interacting with materials: by hand, by voice, by single switch, by keyboard, by joystick, by adapted keyboard

Vf16. Skill and Fluency (3): Alternatives to Writing
- Voice recognition, Audio taping, Dictation, Video, Illustration

Vf17. Skill and Fluency (4): Supports for Composition
- Keyboarding and alternative keyboards, Onscreen keyboard,
- Wider lines, Larger paper, Pencil grips
- Drawing tools - with shapes, lines, etc.
- Blank tables, charts, graph paper
- Spellcheckers, calculators, sentence starters, word prediction, dictation (voice recognition or scribe), symbol-to-text, sentence strips

Vf18. Executive Features (1): Support for Goal and Expectation Setting
- Prompts and scaffolds to estimate effort, resources, and difficulty
- Animated agents that model the process and product of goal-setting
- Guides and checklists for scaffolding goal-setting

Vf19. Executive Features (2): Supports for Goal Maintenance and Adjustment
- Maintain salience of objectives and goals (e.g. reminders, progress charts)
- Adjust levels of challenge and support (e.g. adjustable leveling and embedded support, alternative levels of difficulty, alternative points of entry)

Vf20. Executive Features (3): Supports for Planning and Sequencing
- Embedded prompts to "stop and think" before acting
- Checklists and project planning templates for setting up prioritization, schedules, and steps
- Guides for breaking long-term objectives into reachable short-term objectives

Vf21. Executive Features (4): Supports for Managing Information
- Graphic organizers and templates for organizing information
- Embedded prompts for categorizing and systematizing
- Checklists and guides for note-taking

Vf22. Executive Features (5): Supports for Working Memory
- Note-taking, Mnemonic aids
- Locate items near relevant text

Vf23. Executive Features (6): Supports for Monitoring Progress
- Guided questions for self-monitoring
- Representations of progress (e.g. before and after photos, graphs and charts)
- Templates that guide self-reflection on quality and completeness
- Differentiated models of self-assessment strategies

Vf24. Affect Features (1): Supports for Intrinsic Motivation (Challenge and/or Threat)
- Offer individual choice
- Enhance relevance, value, authenticity (e.g. contextualize to students' lives, provision of an example)
- Options to vary level of novelty and risk (e.g. options in peer and adult support, alternatives to competition, alternatives to public display or performance, alternative consequences)
- Options to vary sensory stimulation (e.g. shortened work periods, frequent breaks, noise buffers, optional headphones, alternative settings, presentation of fewer items at a time)

Vf25. Affect Features (2): Supports for Sustaining Effort and Persistence
- Maintain salience of goals (e.g. explicit display of goals, periodic reminders, replacement of long-term goals with short-term objectives, prompts for visualization)
- Adjustable levels of challenge and support
- Encourage collaboration and support
- Communicate on-going, mastery-oriented feedback

Vf26. Affect Features (3): Support for Self-regulation
- Guide motivational goal-setting
- Scaffold self-regulatory skills and strategies
- Develop emotional self-assessment and reflection

I am a kind of [Edit]

These are kinds of me [Edit]

These are parts of me [Edit]

Educational standards [Edit]

NV (1) Standard P.8.A.5. Students know mass is conserved in physical and chemical changes.

NV (2) Unifying Concept A. Scientific inquiry is the process by which humans systematically examine the natural world. Scienti…

Templates [Edit]

Exemplar tasks [Edit]

Online resources [Edit]

References [Edit]

Tags [Add Tag]

(No tags defined.)

List of Examples:

Activity Continuous Zone Design Pattern Educational Standard Evaluation Phase Evaluation Procedure (rubric) Materials and Presentation Measurement Model Observable Variable Student Model Student Model Variable Task Exemplar Task Model Variable Task Specification Template Work Product

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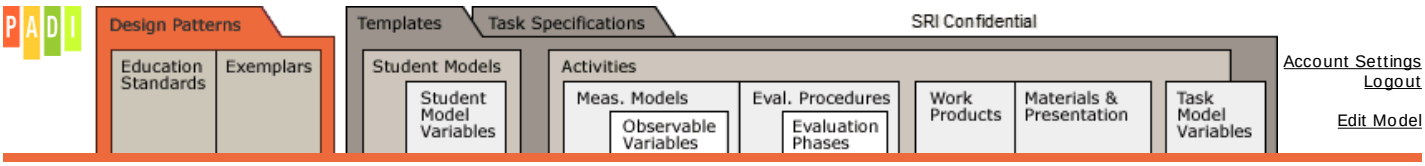

[SC] Using the Periodic Table to Reason about Properties of Elements - UDL | Design Pattern 2089

[View Tree | View Horiz | Duplicate | Permit | Export | Delete]

Title [Edit] [SC] Using the Periodic Table to Reason about Properties of Elements - UDL

Overview [Edit] Students use the periodic table to compare and contrast different elements and their properties in order to make evidence-based predictions of new or existing elements. Does the student understand the patterns represented in the periodic table and how they can predict the properties of other elements with similar characteristics?

Focal Knowledge, Skills, and Abilities [Edit]

FK1. Understanding that in each box of the periodic table, the given element is designated with a symbol and its atomic number appears above the symbol

FK2. Knowledge that the periodic table contains each element's name, symbol, atomic number, and atomic mass

FK3. Knowledge that the atomic number increases as you go across the rows of elements

FK4. Understanding the interrelationships among groups, elements, periods, names, and numbers as they are organized in the periodic table

FK5. Reasoning through the representational form of the periodic table about the key factors associated with periods, groups, metals, and nonmetals

FK6. Understanding that the periodic table is a commonly used representation of all chemical elements

FK7. Understanding that in the periodic table, columns are called groups and are families, and periods are rows

FK8. Knowledge that elements in the same family have similar properties

FK9. Knowledge of some of the familiar element categories in the periodic table (e.g., metals and nonmetals)

Rationale [Edit]

R1. All known chemical elements can be classified in a table form known as the periodic table. The elements are arranged in order of increasing atomic number. In the table, the elements are arranged in groups (columns) and periods (rows) which reflect common patterns of atomic, physical, or chemical properties. For example, copper is a metal and carbon is a non metal. Elements in the same family have similar properties. Common patterns emerge when comparing and contrasting the properties of elements. Understanding of these patterns allows for evidence-based predictions of new elements.

Additional Knowledge, Skills, and Abilities [Edit]

AK1. ==========
The following Additional KSAs are prerequisite knowledge that can be required for tasks that address the Focal KSAs. Whether they are to be supported or not (e.g., glossary, background facts, equation list) is a decision to be made -- either by the assessment design team, either at the level of the testing program or at the level of the individual task if that is appropriate in the testing program.
========== details

AK2. Ability to understand that there is a distinction between metals and nonmetals details

AK3. Ability to understand what properties are of substances details

AK4. ==========
The following group of additional KSAs are generally construct-irrelevant knowledge, skills, or other attributes that may be involved in tasks generated under this design pattern. The task author can consider offering supports, presenting material, or getting work products that reduce or avoid requirements for these Additional KSAs, either through accommodated forms of a task or UDL principles. Many of these Additional KSAs are linked to Variable Task Features or Potential Work Products for suggestions on how to do this.

==========

AK5. Perceptual
. vision
. hearing
. touch

AK6. Language and symbols
. vocabulary and symbols
. syntax and underlying structure
. English-language proficiency
. decoding text or math notation
. decoding charts, graphs, or images

AK7. Cognitive
. background knowledge
. concepts and categories
. information processing strategies
. memory and transfer

AK8. Skill and fluency
. dexterity, strength, and mobility
. navigation and object manipulation
. automaticity (e.g., calculations, writing)
. familiarity with media
. facility with tools

AK9. Executive (problem solving)
. goal and expectation setting
. goal maintenance and adjustment
. planning and sequencing steps in a process
. managing information and resources
. working memory
. monitoring progress

AK10. Affective
. intrinsic, task-specific motivation (challenge and/or threat, interest)
. sustaining effort and persistence
. coping skills and frustration management

Potential observations [Edit]

Po1. Accurate identification of elements that are in the same families, periods, or are metals vs. nonmetals

Po2. Accurate explanations and predictions about the properties of elements reasoned through the use of the periodic table details

Po3. Accurate identification of a misclassification of an element in the periodic table based on its atomic number

Potential work products [Edit]

Pw1. Identification of which element in a set is not in the period or group in which the other elements are found

Pw2. Based on the location of a target element in the periodic table, identification of other elements with similar properties

Pw3. A description of how the periodic table can be used to reason about the relationships among elements

Pw4. Completion of a table of metal and nonmetal elements

Potential rubrics [Edit]

Pr1. Multiple choice-dichotomous scoring of correct classification of elements based on their properties

Pr2. Error analysis (distractors based on misconceptions or typical errors in procedures)

Pr3. Partial credit scoring of written responses:
o Written explanation of how the organization of the periodic table can be used to identify elements that are metals and nonmetals (5 points total)
. Full (3 points) complete written description that includes: (a) identification of all elements with the desired properties; (b) an explanation of the organization of the periodic table that includes the use of "groups or families of elements" and "periods of elements"; (c) identification of the common patterns that emerge when comparing and contrasting the properties of the elements;

. Partial (2 points): Any one of the components is missing or incorrect.
. Partial (1 point): Any two of the components are missing or incorrect.
. Incorrect (0 points): All three components are missing or incorrect.
o Written description of the real life applications for one of the elements with the desired properties (2 points total)
. Full (2 points): Written description accurately identifies: (a) real life applications for the element based on its properties; and (b) presents a brief justification of why that application is appropriate for the particular element.
. Partial (1 point): The justification for the application is missing or incorrect.
. Incorrect (0 points): Both components are missing or incorrect.

Characteristic features [Edit]

Cf1. Presentation of information from the periodic table

Cf2. Information about one or more elements in relation to the periodic table

Variable features [Edit]

Vf1. Number and variety of elements presented

Vf2. Type of information about elements represented in the periodic table

Vf3. Type of underlying model at issue details

Vf4. Perceptual Features (1): Representational Format
- Flexible size of text and images
- Flexible amplitude of speech or sound
- Adjustable contrast
- Flexible colors
- Flexible layout

Vf5. Perceptual Features (2): Auditory Information
- Text equivalents (e.g. captions, automated speech to text)
- Visual graphics or outlines
- Virtual manipulatives, video animation
- Verbal descriptions
- Tactile graphics, objects

Vf6. Perceptual Features (3): Visual Information
- Spoken equivalents for text and images
- Automatic text to speech
- Tactile graphics
- Braille

Vf7. Language and Symbols (1): Supports for Vocabulary and Symbols
- Pre-taught vocabulary and symbols
- Embedded support for key terms (e.g. technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
- Embedded support for non-technical terms (e.g. non-technical glossary, hyperlinks/ footnotes to definitions, illustrations, background knowledge)
- Embedded alternatives for unfamiliar references (e.g. domain specific notation, jargon, figurative language, etc.)

Vf8. Language and Symbols (2): Supports for Syntactic Skills and Underlying Structure
- Alternate syntactic levels (simplified text)
- Grammar aids
- Highlighted syntactical elements (e.g. subjects, predicates, noun-verb agreement, adjectives, phrase structure, etc.)
- Highlight structural relations or make them more explicit

Vf9. Language and Symbols (3): Supports for English Language
- All key information in the dominant language (e.g. English) is also available in prevalent first languages (e.g. Spanish) for second language learners and in ASL for students who are deaf
- Key vocabulary words have links to both dominant and non-dominant definitions and pronunciations
- Domain-specific vocabulary (e.g. "matter" in science) is translated for both special and common meanings
- Electronic translation tools, multi-lingual glossaries

Vf10. Language and Symbols (4): Supports for Decoding and Fluency
- Digital text with automatic text to speech
- Digital Braille with automatic Braille to speech

Vf11. Cognitive Features (1): Supports for Background knowledge
- Advanced organizers, pre-teaching, relevant analogies and examples
- Links to prior knowledge (e.g. hyperlinks to multimedia, concrete objects in students' environments)
- Provision of an example

Vf12. Cognitive Features (2): Supports for Critical features, Big Ideas, and Relationships
- Concept maps, graphic organizers, outlines
- Highlight features in text, diagrams, graphics, and illustrations
- Reducing the field of competing information or distractions, masking
- Using multiple examples and non-examples to emphasize critical concepts

Vf13. Cognitive Features (3): Options that Guide Information Processing
- Explicit prompts for each step in a sequential process
- Interactive models that guide exploration and inspection
- Graduated scaffolds that support information processing strategies
- Multiple entry points and optional pathways through content
- Chunking information into smaller elements, progressive release of information, sequential highlighting
- Discrete question(s) or scenario-based text presentation
- Complexity of the scientific investigation presented in the scenario
- Cognitive complexity (Webb's Depth of Knowledge Levels)
- If selected response, distractors based on misconceptions/typical errors vs. non-misconceptions

Vf14. Cognitive Features (4): Supports for Memory and Transfer
- Checklists, organizers, sticky notes, electronic reminders
- Prompts for using mnemonic strategies and devices
- Templates, graphic organizers, concept maps to support note-taking
- Scaffolding that connects new information to prior knowledge
- Embedding new ideas in familiar ideas and contexts, use of analogy, metaphor, example

Vf15. Skill and Fluency (1): Supports for Manipulations
- Virtual manipulatives, Snap-to constraints
- Nonstick mats, Larger objects

Vf16. Skill and Fluency (2): Supports for Navigation
- Alternatives for physically interacting with materials: by hand, by voice, by single switch, by keyboard, by joystick, by adapted keyboard

Vf17. Skill and Fluency (3): Alternatives to Writing
- Voice recognition, Audio taping, Dictation, Video, Illustration

Vf18. Skill and Fluency (4): Supports for Composition
- Keyboarding and alternative keyboards, Onscreen keyboard,
- Wider lines, Larger paper, Pencil grips
- Drawing tools - with shapes, lines, etc.
- Blank tables, charts, graph paper
- Spellcheckers, calculators, sentence starters, word prediction, dictation (voice recognition or scribe), symbol-to-text, sentence strips

Vf19. Executive Features (1): Support for Goal and Expectation Setting
- Prompts and scaffolds to estimate effort, resources, and difficulty
- Animated agents that model the process and product of goal-setting
- Guides and checklists for scaffolding goal-setting

Vf20. Executive Features (2): Supports for Goal Maintenance and Adjustment
- Maintain salience of objectives and goals (e.g. reminders, progress charts)
- Adjust levels of challenge and support (e.g. adjustable leveling and embedded support, alternative levels of difficulty, alternative points of entry)

Vf21. Executive Features (3): Supports for Planning and Sequencing
- Embedded prompts to "stop and think" before acting
- Checklists and project planning templates for setting up prioritization, schedules, and steps
- Guides for breaking long-term objectives into reachable short-term objectives

Vf22. Executive Features (4): Supports for Managing Information
- Graphic organizers and templates for organizing information
- Embedded prompts for categorizing and systematizing
- Checklists and guides for note-taking

Vf23. Executive Features (5): Supports for Working Memory
- Note-taking, Mnemonic aids
- Locate items near relevant text

Vf24. Executive Features (6): Supports for Monitoring Progress
- Guided questions for self-monitoring
- Representations of progress (e.g. before and after photos, graphs and charts)
- Templates that guide self-reflection on quality and completeness
- Differentiated models of self-assessment strategies

Vf25. Affect Features (1): Supports for Intrinsic Motivation (Challenge and/or Threat)
- Offer individual choice
- Enhance relevance, value, authenticity (e.g. contextualize to students' lives, provision of an example)
- Options to vary level of novelty and risk (e.g. options in peer and adult support, alternatives to competition, alternatives to public display or performance, alternative consequences)
- Options to vary sensory stimulation (e.g. shortened work periods, frequent breaks, noise buffers, optional headphones, alternative settings, presentation of fewer items at a time)

Vf26. Affect Features (2): Supports for Sustaining Effort and Persistence
- Maintain salience of goals (e.g. explicit display of goals, periodic reminders, replacement of long-term goals with short-term objectives, prompts for visualization)
- Adjustable levels of challenge and support
- Encourage collaboration and support
- Communicate on-going, mastery-oriented feedback

Vf27. Affect Features (3): Support for Self-regulation
- Guide motivational goal-setting
- Scaffold self-regulatory skills and strategies
- Develop emotional self-assessment and reflection

I am a kind of [Edit]

These are kinds of me [Edit]

These are parts of me [Edit]

Educational standards [Edit]

SC (1) Indicator 7-5.4. Use the periodic table to identify the basic organization of elements and groups of elements (includ…

SC (2) Content Standard 7-5. The student will demonstrate an understanding of the classifications and properties of matter and th…

Templates [Edit]

Exemplar tasks [Edit]

Online resources [Edit]

References [Edit]

Tags [Add Tag]

(No tags defined.)

List of Examples:

Activity Continuous Zone Design Pattern Educational Standard Evaluation Phase Evaluation Procedure (rubric) Materials and Presentation Measurement Model Observable Variable Student Model Student Model Variable Task Exemplar Task Model Variable

Task Specification Template Work Product

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