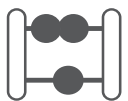


Caulfield Racecourse



# Thinking & Learning Conference

2014



23-26 May

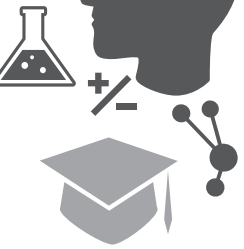
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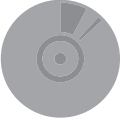
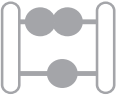
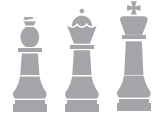


## Jay McTighe

Sat 24 & Sun 25 May

### Understanding by Design 2-Day Institute

*Sessions 1, 2 and 3*





## JAY MCTIGHE



Dr Jay McTighe has a wealth of experience developed during a rich and varied career in education. He served as director of the Maryland Assessment Consortium, a state collaboration of school districts working together to develop and share formative performance assessments. Prior to this position, McTighe was involved with school improvement projects at Maryland State Department of Education. He is well known for work with “thinking skills,” having coordinated state wide efforts to develop instructional strategies, curriculum models, and assessment procedures for improving the quality of student thinking. McTighe also directed the development of the Instructional Framework, a multimedia database on teaching.

In addition to his work at the state level, McTighe has experience at the district level in Prince George’s County, Maryland, as a classroom teacher, resource specialist, and program coordinator. He also served as director of the Maryland Summer Centre for Gifted and Talented Students, a state wide residential enrichment program held at St. Mary’s College.

McTighe has published articles in a number of leading journals and books, including *Educational Leadership*, *Developing Minds*, *Thinking Skills: Concepts and Techniques*, and *The Developer*. He has co-authored three books on assessment: *Assessing Learning in the Classroom*, *Assessing Outcomes: Performance Assessment Using the Dimensions of Learning Model*, and *Evaluation Tools to Improve as Well as Evaluate Student Performance*. He is co-author, with Grant Wiggins, of the best-selling *Understanding by Design* series and the newly released *Connecting Content and Kids: Integrating Differentiation and Understanding by Design*, co-authored with Carol Ann Tomlinson.

McTighe has an extensive background in staff development and is a regular speaker at national, state, and district conferences and workshops. He is also a featured presenter in four videotape programs, *Performance Assessment in the Classroom*, *Developing Performance Assessments*, *Understanding*, and *Using Backward Design*.

McTighe earned an undergraduate degree from the College of William and Mary and a master’s degree from the University of Maryland, and has completed post-graduate studies at Johns Hopkins University. He was selected to participate in the Educational Policy Fellowship Program through the Institute for Educational Leadership in Washington, D.C. McTighe served as a member of the National Assessment Forum, a coalition of education and civil rights organisations advocating reforms in national, state, and local assessment policies and practices. He served a three-year term on the ASCD Publications Committee, serving as committee chair from 1994 to 1995.

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## *Understanding by Design 2.0* **Updates and Upgrades**



*presented by*

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## Key Understandings about...

### -- *Understanding* --

- A primary goal of education is the development and deepening of student understanding of important ideas and processes within, and across, disciplines so that they can transfer their learning to new situations.
- Content needs to be “unpacked” to identify the big ideas worth understanding and the essential questions worth uncovering.
- Evidence of student understanding is revealed when students apply (transfer) their learning within authentic contexts.
- Six facets of understanding – the capacity to explain, interpret, apply, shift perspective, empathize, and self-assess – serve as indicators that students understand.
- Understanding must be “earned” by the learner. Teaching for understanding facilitates “meaning making” by the students and equips them to successfully transfer their learning.

### -- *Design* --

- Effective curriculum development reflects a three-stage design process called “backward design.” This process helps to insure that curriculum plans are well aligned and focused on desired learnings. Backward curriculum design also helps avoid the twin problems of “textbook coverage” and “activity-oriented” teaching.
- The backward design process can be productively applied to planning a single unit, a year-long course, and an entire K-12 curriculum.
- Regular reviews of curriculum and assessment designs, based on design standards, are needed for quality control to avoid the most common design mistakes and disappointing results.
- Educators can “work smarter” in curriculum design by working collaboratively and sharing ideas via electronic networks (e.g., the [ubdexchange.org](http://ubdexchange.org) web site).



# UbD in a Nutshell

## Guiding Principles of Understanding by Design

1. UbD is a way of thinking purposefully about curricular planning and school reform. It offers a 3-stage design process, a set of helpful design tools, and design standards - not a rigid program or prescriptive recipe.
2. The primary goal of UbD is student understanding: the ability to make meaning of “big ideas” and transfer learning.
3. UbD “unpacks” and transforms Content Standards into the relevant Stage 1 elements and appropriate assessments in Stage 2.
4. Understanding is revealed when students autonomously transfer their learning through authentic performance. Six facets of understanding - the capacity to *explain, interpret, apply, shift perspective, empathize, and self assess* - serve as indicators of understanding.
5. Teachers are coaches of understanding, not mere purveyors of content or activity. They design for and support “meaning making” and “transfer” by the learner; and adjust to achieve intended results.
6. Planning is best done “backward” from the desired results and the transfer tasks that embody the goals. The 3 Stages (Desired Results, Evidence, Learning Plan) must align for the unit to be most effective.
7. Regular reviews of curriculum against design standards enhance curricular quality and effectiveness.
8. UbD reflects a “continuous improvement” approach. The results of curriculum designs - student performance - informs needed adjustments.

## Understanding-based Curriculum

### Key Questions of Backward Design

#### Stage 1: Desired Results

- What long-term transfer goals are sought?
- What meanings should students make in order to arrive at important understandings?
- What essential questions will students explore?
- What knowledge & skill will students acquire?
- What established goals/Standards are targeted?

#### Stage 2: Evidence

- What performances and products will reveal evidence of meaning-making and transfer?
- By what criteria will performance be assessed, in light of Stage 1 desired results?
- What additional evidence will be collected for all Stage 1 Desired Results?

#### Stage 3: Learning Plan

- What activities, experiences, and lessons will lead to achievement of the desired results and success at the assessments?
- How will the learning plan help students of Acquisition, Meaning Making, and Transfer?
- How will the unit be sequenced and differentiated to optimize achievement for all learners?
- Are all three stages properly aligned?



## A Summary of Key Research Findings Supporting Understanding by Design

- Views of how effective learning proceeds have shifted from the benefits of diligent drill and practice to focus on students' understanding and application of knowledge.

- Experts' knowledge is organized... Their knowledge is not simply a list of facts and formulas that are relevant to the domain; instead, their knowledge is organized around core concepts or 'big ideas' that guide their thinking about the domain (e.g., Newton's second law of motion); it is "conditionalized" to specify the contexts in which it is applicable; it supports understanding and transfer (to other contexts) rather than only the ability to remember. Novices' knowledge is much less likely to be organized around big ideas; they are more likely to approach problems by searching for correct formulas and pat answers that fit their everyday intuitions.

- Learning must be guided by generalized principles in order to be widely applicable. Knowledge learned at the level of rote memory rarely transfers; transfer most likely occurs when the learner knows and understands underlying principles that can be applied to problems in new contexts. Learning with understanding is more likely to promote transfer than simply memorizing information from a text or a lecture.

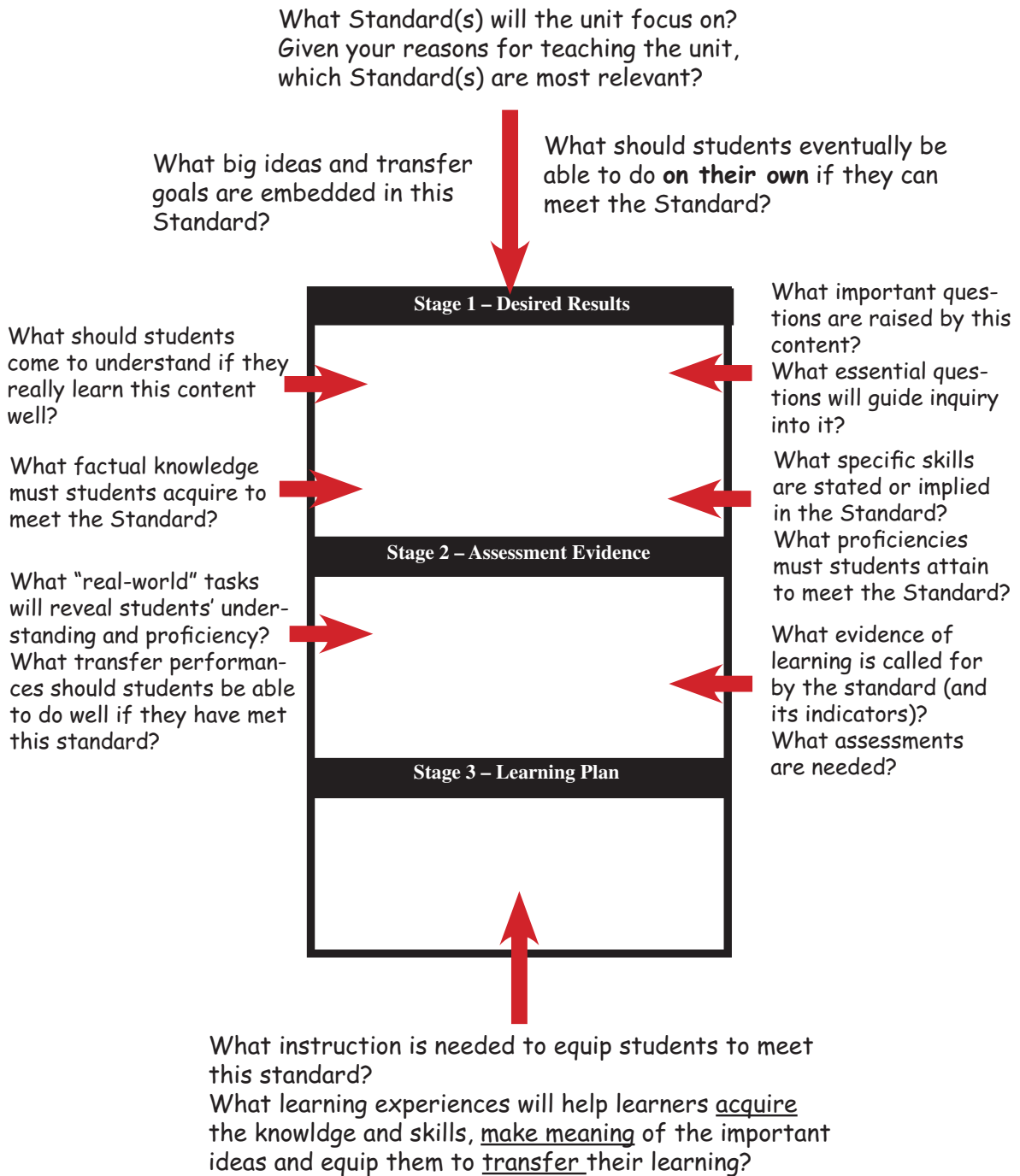
- Skills and knowledge must be extended beyond the narrow contexts in which they are initially learned. For example, knowing how to solve a math problem in school may not transfer to solving math problems in other contexts. It is essential for a learner to develop a sense of *when* what has been learned can be used -- the conditions of application. Failure to transfer is often due to learners' lack of this type of conditional knowledge.

- Curricula that are a "mile wide and an inch deep" run the risk of developing disconnected rather than connected knowledge. Research on expertise suggest that a superficial coverage of many topics in the domain may be a poor way to help students develop the competencies that will prepare them for future learning and work."

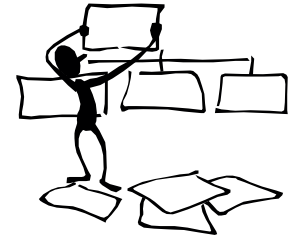
- Feedback is fundamental to learning, but feedback opportunities are often scarce in classrooms. Students may receive grades on tests and essays, but these are summative assessments that occur at the end of projects. What are needed are formative assessments, which provide students with opportunities to revise and improve the quality of their thinking and understanding.

- Assessments must reflect the learning goals that define various environments. If the goal is to enhance understanding and applicability of knowledge, it is not sufficient to provide assessments that focus primarily on memory for facts and formulas. Many assessments measure only propositional (factual) knowledge and never ask whether students know *when*, *where*, and *why* to use that knowledge. Given the goal of learning with understanding, assessments and feedback must focus on understanding, and not only on memory for procedures or facts.

## Working with Standards using UbD



## The Understanding by Design Template 2.0



### Frequently Asked Questions

#### *1. Why did you change the UbD Template?*

Just as computer software programs are regularly updated to incorporate new ideas and adjustments based on user feedback, the new Template reflects the most current thinking on UbD, based on our own observations and the constant feedback we get from users throughout the world. In particular, we have seen the need to highlight transfer goals and the coding of Stages 2 and 3 because too often well-intentioned designers were not focusing on long-term transfer in their units, and the unit assessments often did not closely align with the stated goals of Stage 1.

#### *2. Do you have to follow the UbD Template order (top to bottom) when you design?*

No. Backward design does not demand a rigid sequence. The process of thinking through a design is inherently non-linear, with various entry points, leading eventually to a logically-organized product. Regardless of approach, designers should routinely check the emerging design against the UbD Design Standards to ensure that the process yields a desired high-quality unit design.

#### *3. Should you use the 3-stage UbD Template for planning lessons as well as units?*

We do not recommend isolated lesson planning separate from unit planning. We have chosen the unit as a focus for design because the key elements of UbD – understandings, essential questions, and transfer performances – are too complex and multi-faceted to be satisfactorily addressed within a single lesson. For instance, essential questions should be revisited over time, not answered by the end of a single class period.

Nonetheless, the larger unit goals provide the context in which individual lessons are planned. Teachers often report that careful attention to Stages 1 and 2 sharpens their lesson planning, resulting in more purposeful teaching and improved learning.

Wiggins, G. and McTighe, J. (2011) *The Understanding by Design Guide to Creating High Quality Units*. Association for Supervision and Curriculum Development (ASCD).

<http://www.ascd.org/publications/books/109107.aspx>





UbD Template 2.0

## Stage 1 – Desired Results

Established Goals	Transfer
<p><b>National Driver Development Standards</b></p> <p>G1 Demonstrate a working knowledge of rules, regulations and procedures of operating an automobile</p> <p>G2 Use visual search skills to obtain correct information and make reduced-risk decisions for effective speed and position adjustments</p> <p>G3 Interact with other users within the Highway Transportation System by adjusting speed, space, and communications to avoid conflicts and reduce risk</p> <p>G4 Demonstrate balanced vehicle movement through steering, braking, and accelerating in a precise and timely manner throughout a variety of adverse conditions</p> <p><i>Source: American Driver &amp; Traffic Safety Association</i></p>	<p><i>Students will be able to independently use their learning to...</i></p> <p>T1 drive courteously and defensively without accidents or needless risk.</p> <p>T2 anticipate and adapt their knowledge of safe and defensive driving to various traffic, road and weather conditions.</p>
<p><b>Meaning</b></p> <p><b>UNDERSTANDINGS</b> <i>Students will understand that...</i></p> <p>U1 Defensive driving assumes that other drivers are not attentive and that they might make sudden or ill-advised moves.</p> <p>U2 The time needed to stop or react is deceptively small, thus requiring constant anticipation &amp; attention.</p> <p>U3 Effective drivers constantly adapt to the various traffic, road, &amp; weather conditions.</p>	<p><b>ESSENTIAL QUESTIONS</b> <i>Students will keep considering...</i></p> <p>Q1 What must I anticipate and do to minimize risk and accidents when I drive?</p> <p>Q2 What makes a courteous and defensive driver?</p>
<p><b>Acquisition of Knowledge &amp; Skill</b></p> <p><i>Students will know...</i></p> <p>K1 the driving laws of their state, province or country</p> <p>K2 rules of the road for legal, courteous and defensive driving</p> <p>K3 basic car features and functions</p>	<p><i>Students will be skilled at...</i></p> <p>S1 procedures of safe driving under varied traffic, road &amp; weather conditions</p> <p>S2 signalling/communicating intentions</p> <p>S3 quick response to surprises</p> <p>S4 parallel parking</p>



UbD Template 2.0

Stage 2 – Evidence		Assessment Evidence
Coding	Evaluative Criteria	
		<b>PERFORMANCE TASK(S)</b>
Transfer goals	<ul style="list-style-type: none"> <li>skillful</li> <li>courteous/defensive</li> <li>anticipates well</li> <li>responsive</li> </ul>	<ol style="list-style-type: none"> <li>1. <i>Task:</i> drive from home to school and back, with parental and teacher supervision. The goal is to demonstrate skillful, responsive, and defensive driving under real-world conditions.</li> <li>2. <i>Task:</i> Same task as #1 but with rainy conditions.</li> <li>3. <i>Task:</i> Same task as #1 but with rush hour traffic.</li> <li>4. Booklet: Write a booklet for other young drivers on the big ideas of safe and effective driving</li> </ol>
Meaning Goals		<p>.....</p> <p><b>OTHER EVIDENCE</b></p> <p>.....</p>
Meaning Goals	<ul style="list-style-type: none"> <li>accurate</li> <li>perceptive</li> </ul>	<ol style="list-style-type: none"> <li>5. Self-assess your driving and parking in Tasks 1 - 3 in terms of <i>courteous &amp; defensive</i>. Discuss adjustments made.</li> <li>6. Observation of student driver in a driving simulator or car off road.</li> <li>7. Written test required for getting a license.</li> <li>8. Road test required for getting a license.</li> </ol>
Skill & Transfer Goals	<ul style="list-style-type: none"> <li>skilled</li> </ul>	
Knowledge & Skill Goals; simple transfer	<ul style="list-style-type: none"> <li>knows the law</li> <li>drives well enough to meet driving test criteria</li> </ul>	



Stage 3 – Learning Plan

Code Key: T = transfer, M = Meaning-making, A = Acquisition

Coding

		<i>Pre-assessment</i>																								
	Pre-assessment of driving knowledge, skill, understandings, and attitudes using surveys and simulators.	<i>Progress Monitoring</i>																								
	<b>LEARNING EVENTS</b>																									
	<i>Note: this is a merely suggestive overview of a unit plan. A typical unit summarizes all learning events in more detail.</i>																									
T	<p>All instruction is carried out and formatively assessed under a 5-level system of increased autonomy:</p> <ul style="list-style-type: none"> <li>the skill is introduced</li> <li>it can be carried out under full instruction</li> <li>it can be carried out correctly when prompted</li> <li>it seldom needs to be prompted</li> <li>you can carry it out consistently without any prompting</li> </ul> <p>Expert driving is modeled via video and the driving instructor; the driving exam is introduced and studied.</p>	<p>Formative assessment and informal feedback by instructor as student tries to apply skills learned while driving off-road</p> <ul style="list-style-type: none"> <li>Look for such common misconceptions and skill deficits as -</li> <li>* failure to check mirrors and peripheral vision</li> <li>* not accurately responding during changes in road conditions</li> <li>* not perceiving speed of oncoming cars during merges and turns</li> </ul>																								
A	<p>Reflection and generalizations promoted via discussion of the essential questions after each virtual and real road experience. Written self-assessment required after each driving experience.</p>																									
M	<p>Experience and equipping via direct instruction and videoe simulators is provided in terms of how to handle: Wet Roads, Dry Roads, Darkness Daylight, Highway, City, Country.</p>																									
A, T	<p>Separate skill development and real-world practice in –</p> <table border="0"> <tr> <td>Car Check</td> <td>Circles</td> <td>Anticipation &amp; Planning Ahead</td> </tr> <tr> <td>Safety Checks</td> <td>Pedestrian Crossings</td> <td>Use of Speed</td> </tr> <tr> <td>Controls &amp; Instruments</td> <td>Highways</td> <td>Other Traffic</td> </tr> <tr> <td>Starting up, Moving and Stopping</td> <td>Turns</td> <td>Intersections</td> </tr> <tr> <td>Safe Positioning</td> <td>Reversing</td> <td>Darkness</td> </tr> <tr> <td>Mirrors</td> <td>Parking</td> <td>Weather Conditions</td> </tr> <tr> <td>Signals</td> <td>Emergency Stopping</td> <td>Rules &amp; Laws</td> </tr> <tr> <td></td> <td>Security</td> <td></td> </tr> </table>	Car Check	Circles	Anticipation & Planning Ahead	Safety Checks	Pedestrian Crossings	Use of Speed	Controls & Instruments	Highways	Other Traffic	Starting up, Moving and Stopping	Turns	Intersections	Safe Positioning	Reversing	Darkness	Mirrors	Parking	Weather Conditions	Signals	Emergency Stopping	Rules & Laws		Security		
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A, T																										



UbD Template 2.0

**Stage 1 – Desired Results**

<p><b>Established Goals</b></p> <p>What Content Standards, Program and/or Mission related goal(s) will this unit address?</p>	<p><b>Transfer</b></p> <p><i>Students will be able to independently use their learning to...</i></p> <p>What kinds of long-term, independent accomplishments are desired?</p> <hr/> <p><b>Meaning</b></p> <p><b>UNDERSTANDINGS</b> <i>Students will understand that...</i></p> <p>What specifically do you want students to understand?</p> <p>What inferences should they make?</p> <p><b>ESSENTIAL QUESTIONS</b> <i>Students will keep considering...</i></p> <p>What thought-provoking questions will foster inquiry, meaning making, and transfer?</p> <hr/> <p><b>Acquisition of Knowledge &amp; Skill</b></p> <p><i>Students will know...</i></p> <p>What facts and basic concepts should students know and be able to recall?</p> <p><i>Students will be skilled at...</i></p> <p>What discrete skills and processes should students be able to use?</p>
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UbD Template 2.0

Stage 2 – Evidence		Assessment Evidence
<p><b>Coding</b></p> <p>Are all of the Desired Results being appropriately assessed?</p>	<p><b>Evaluative Criteria</b></p> <p>What criteria will be used in each assessment to evaluate attainment of the Desired Results?</p> <p>Regardless of the format of the assessment, what qualities are most important?</p>	<p><b>PERFORMANCE TASK(S)</b></p> <p>How will students demonstrate their understanding (meaning-making and transfer) through complex performance?</p> <div style="border: 1px solid gray; padding: 5px; margin: 10px 0;"> <p><i>Consider the six facets when developing assessments of understanding. Optional: Use the G.R.A.S.P.S. elements to frame an authentic context for the task(s).</i></p> </div> <p>..... OTHER EVIDENCE</p> <p>What other evidence will you collect to determine whether Stage 1 goals were achieved?</p>

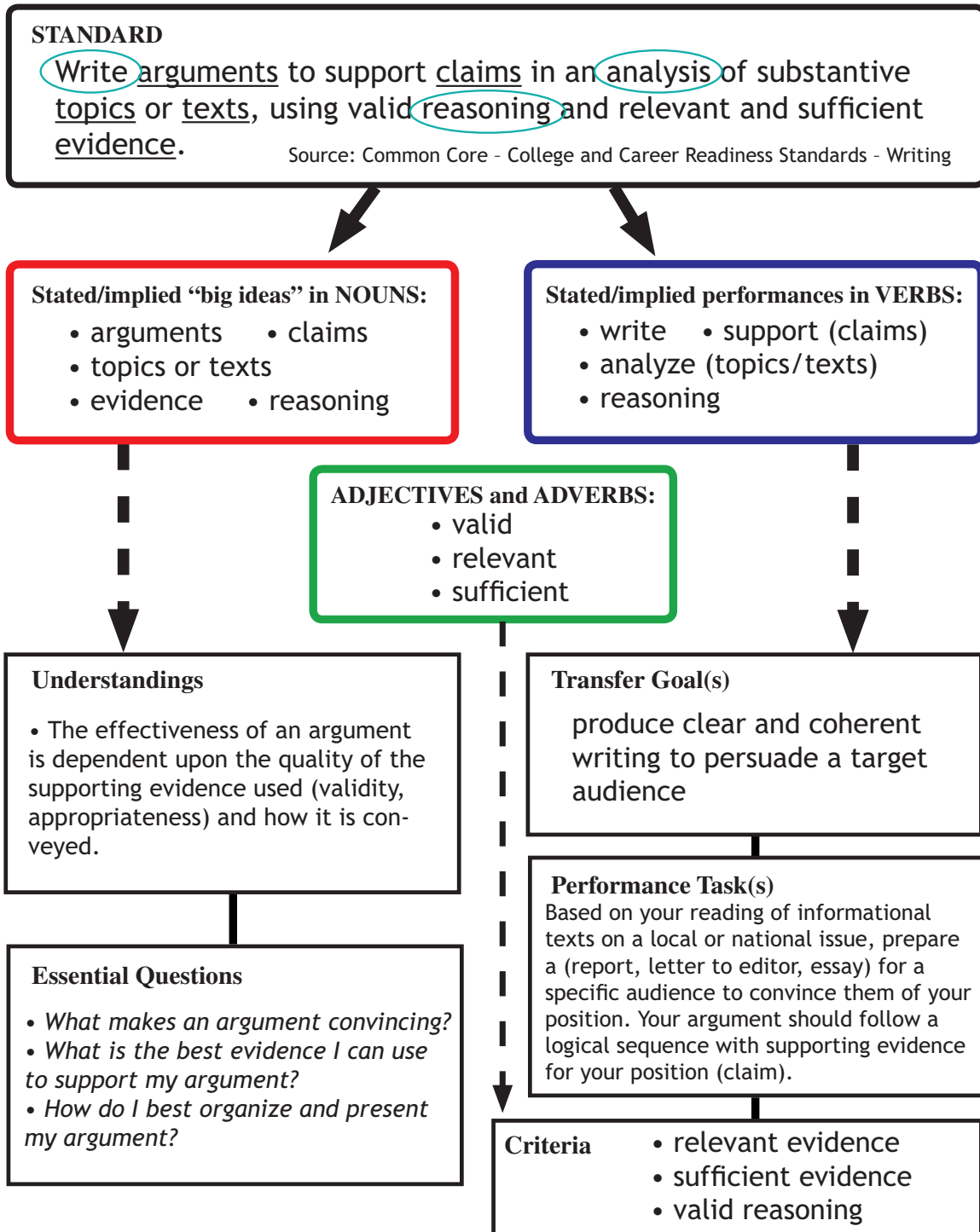


UbD Template 2.0

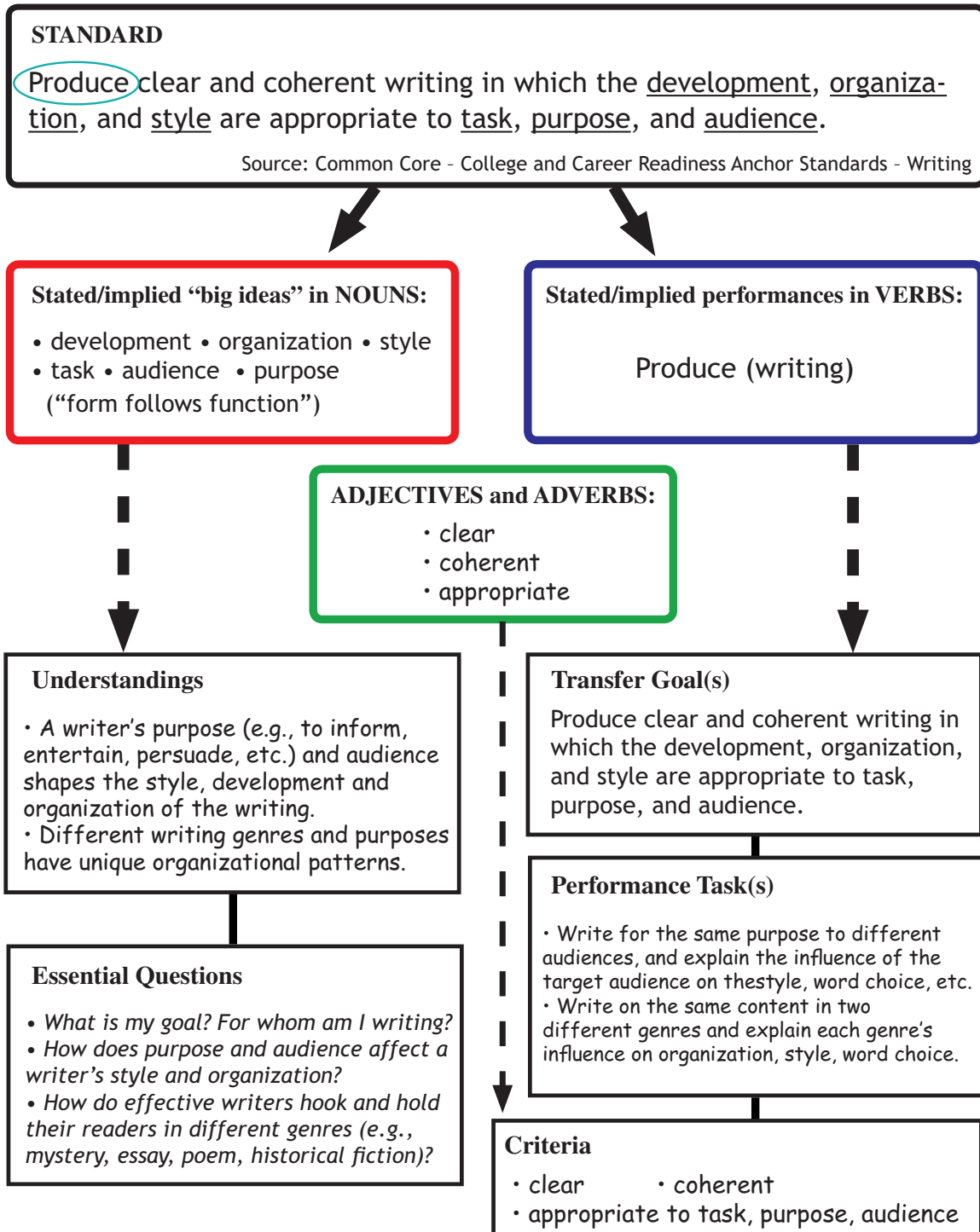
Stage 3 – Learning Plan

Coding	<p><i>Pre-assessment</i></p> <p><b>What pre-assessments will you use to check students' prior knowledge, skill levels and potential misconceptions?</b></p> <p>.....</p> <p><b>LEARNING EVENTS</b></p> <p>.....</p> <p><b>Are all three types of goals (acquisition, meaning, and transfer) addressed in the learning plan?</b></p> <p><b>Does the learning plan reflect principles of learning and best practices?</b></p> <p><b>Is there tight alignment across all three stages?</b></p> <div style="border: 1px solid gray; padding: 10px; margin: 10px 0;"> <p><i>While detailed lesson plans are not expected here, you should include sufficient information so that another teacher who is familiar with the unit's content could understand and follow the basic learning plan. That means not just stating WHAT learners will do but WHY the event is proposed - its purpose</i></p> <p><i>Optional: Use the column on the left to code your learning activities; e.g., their alignment with Stage 1 elements, T-M-A, or W.H.E.R.E.T.O.</i></p> </div> <p><i>Progress Monitoring</i></p> <p><b>How will you monitor students' progress towards acquisition, meaning-making, and transfer, during lesson events?</b></p> <p><b>What are potential rough spots and student misunderstandings?</b></p> <p><b>How will students get the feedback they need and opportunities to make use of it?</b></p>
	<p><b>What's the goal for (or type of) each event?</b></p>

## Unpacking Standards - “Inside Out” Method

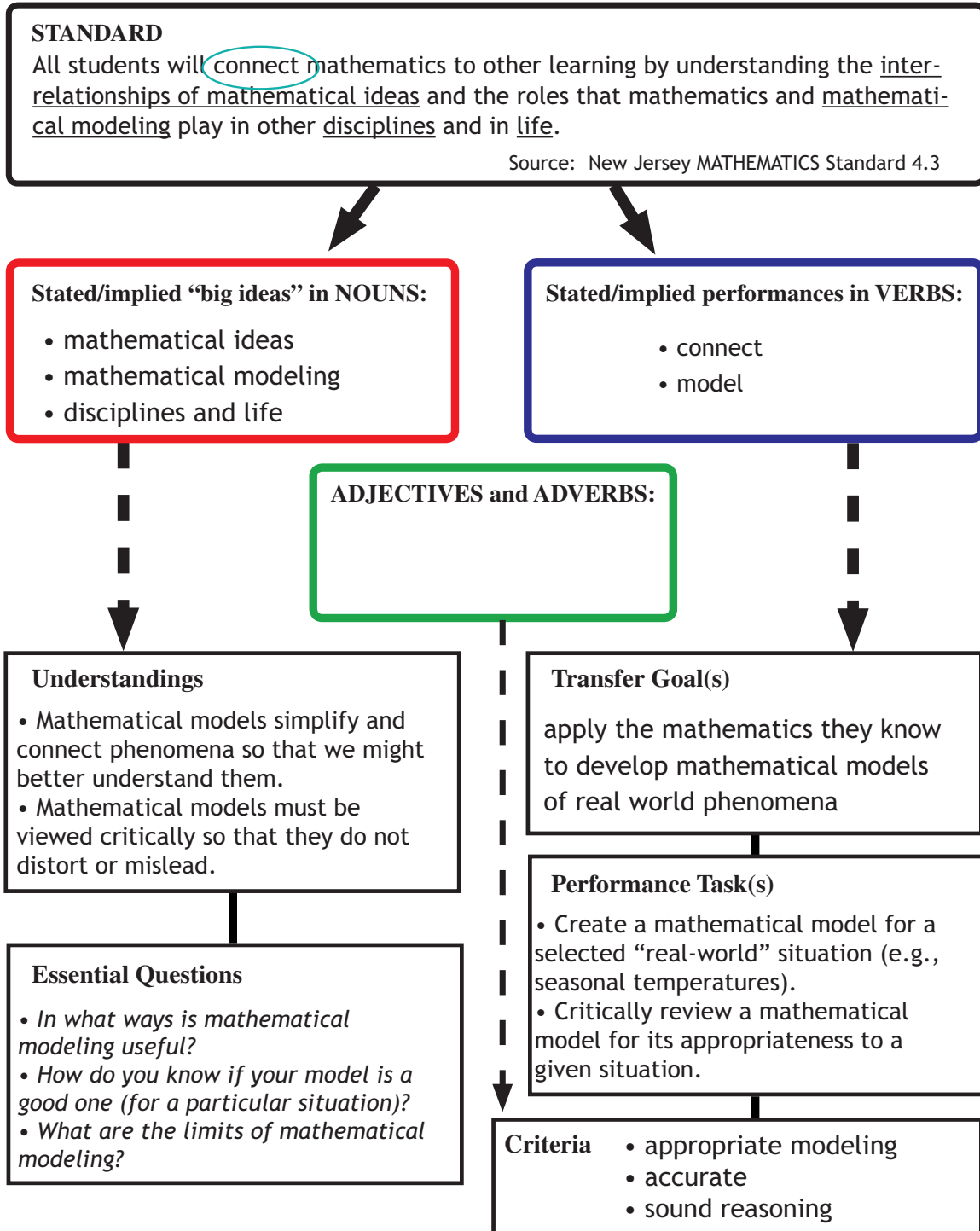


## Unpacking Standards - “Inside Out” Method

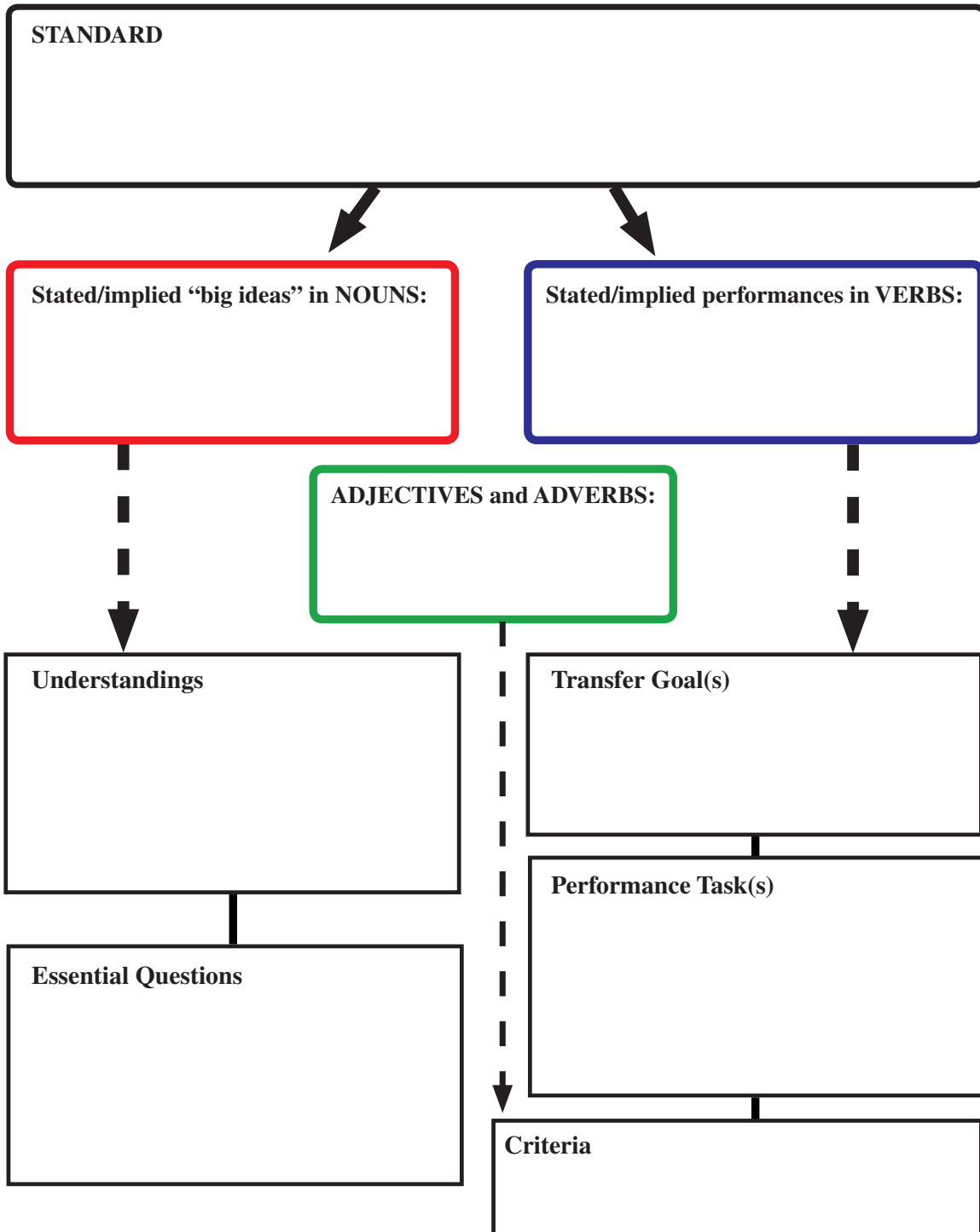




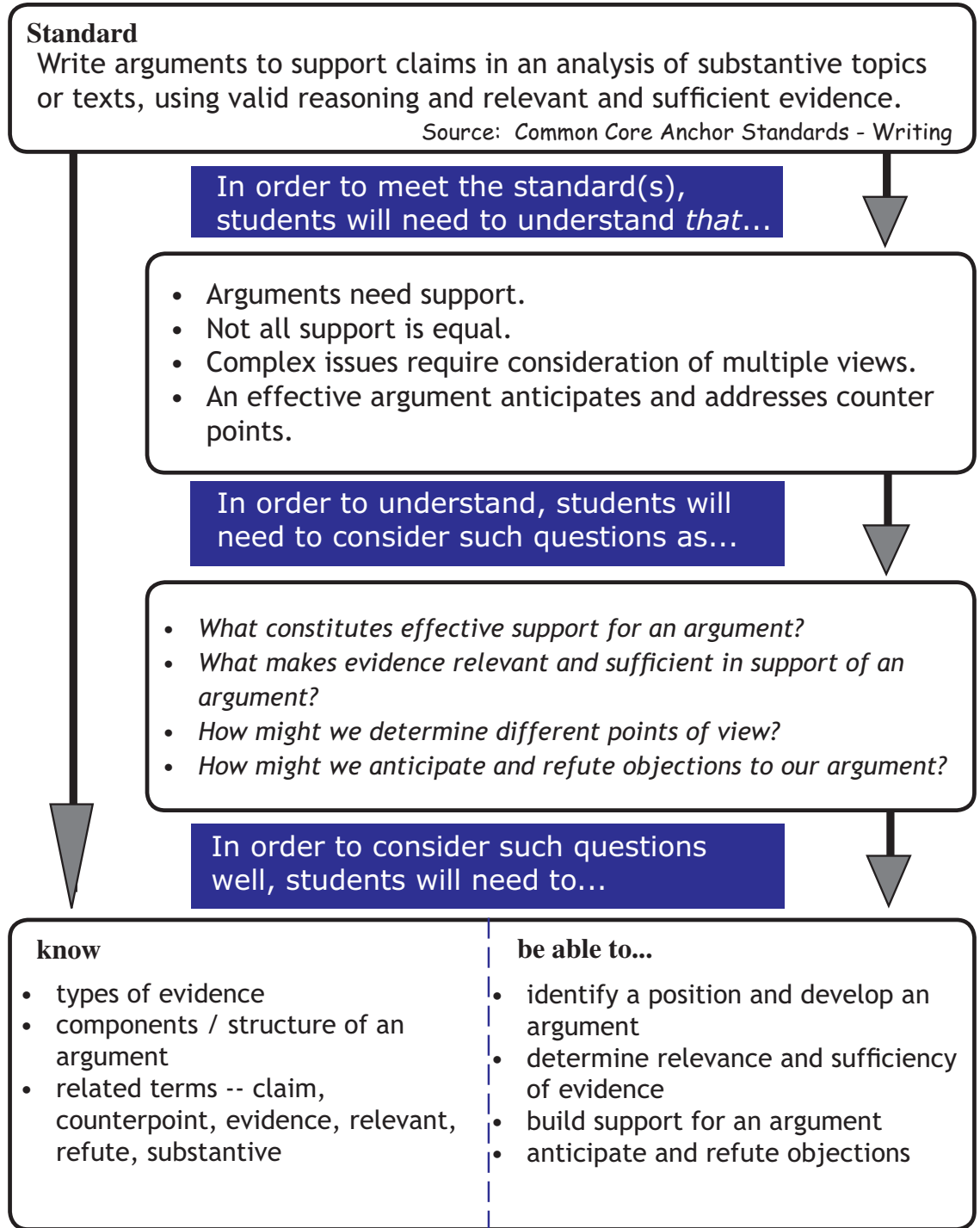
## Unpacking Standards - “Inside Out” Method



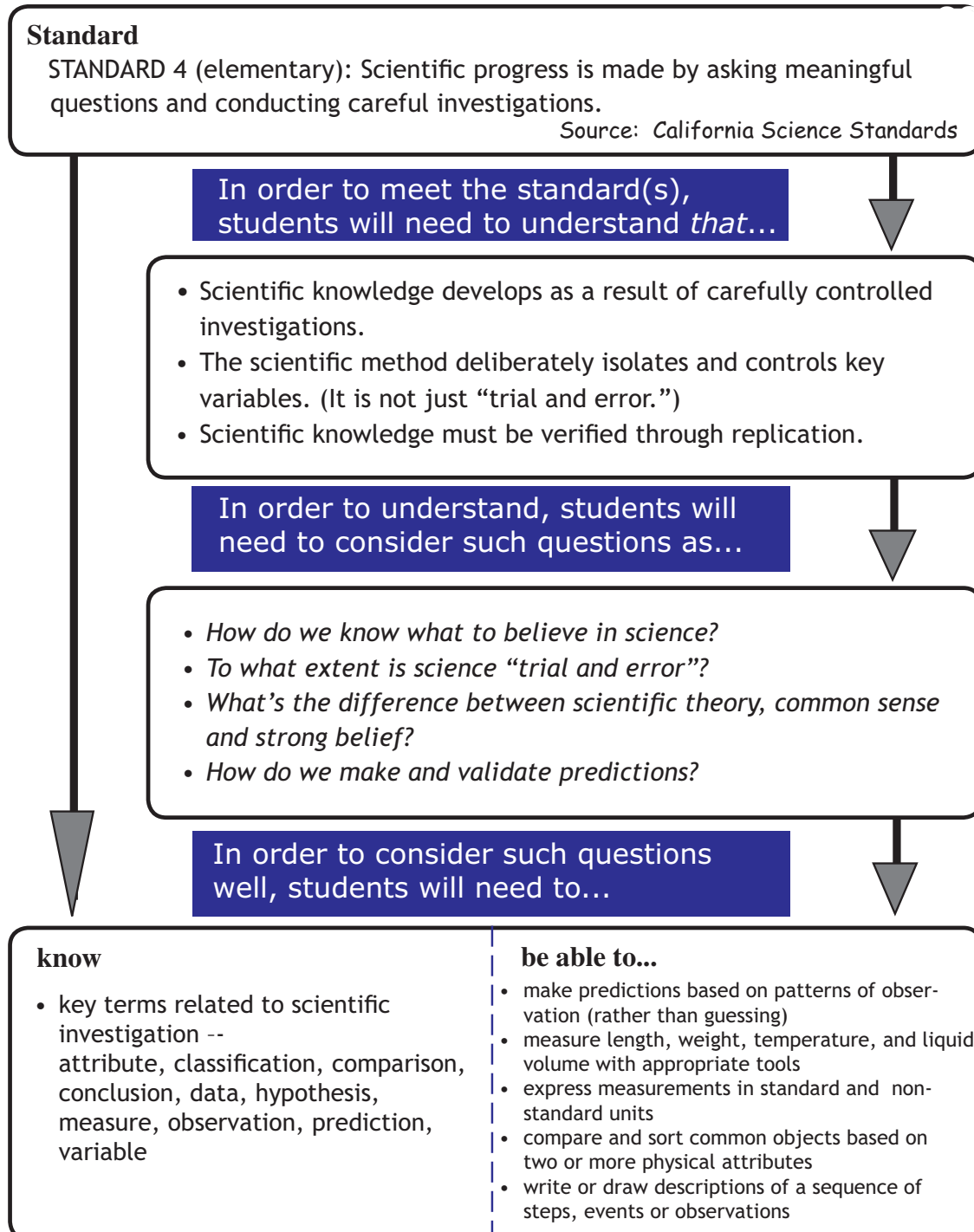
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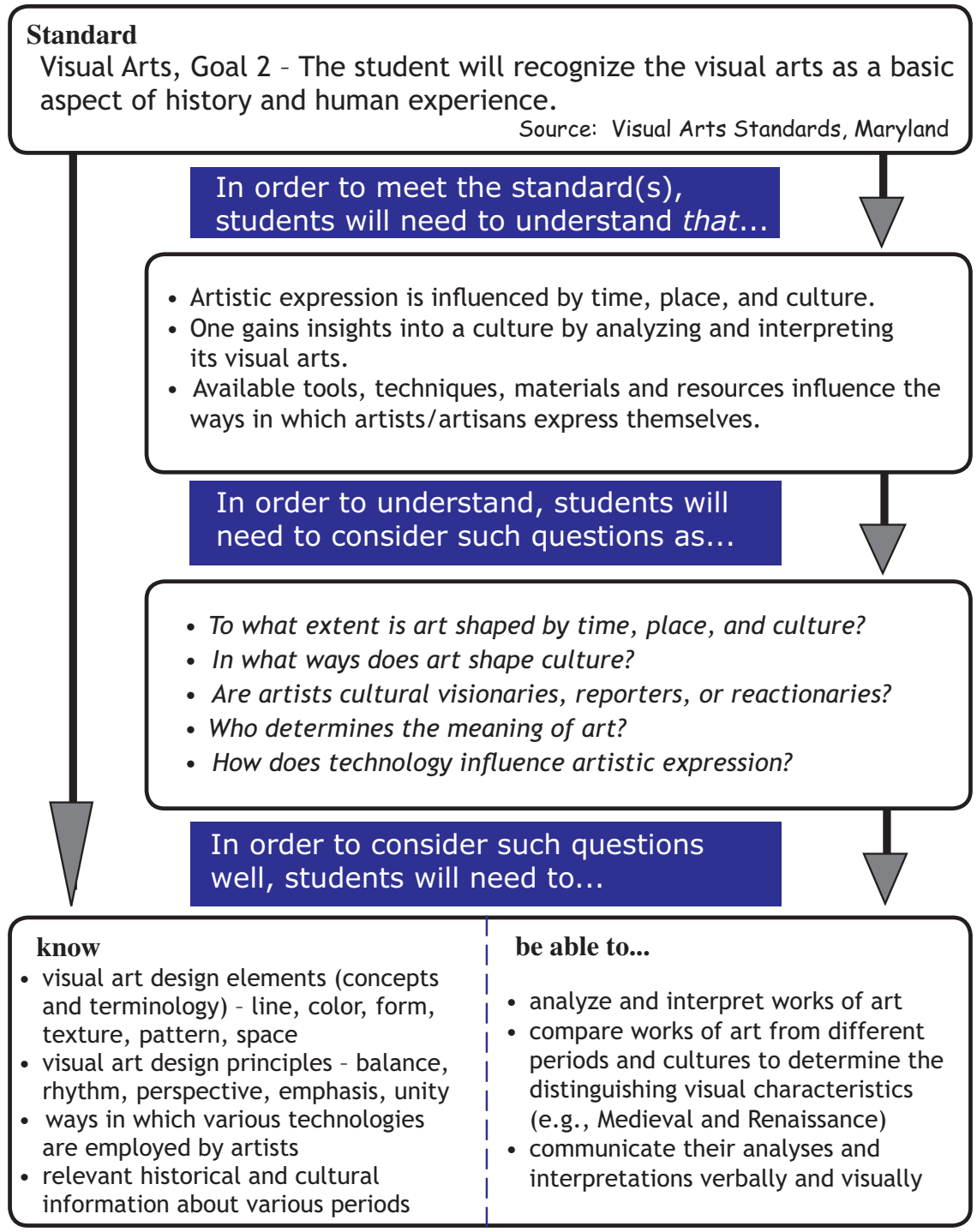
## Unpacking Standards: Top Down Method



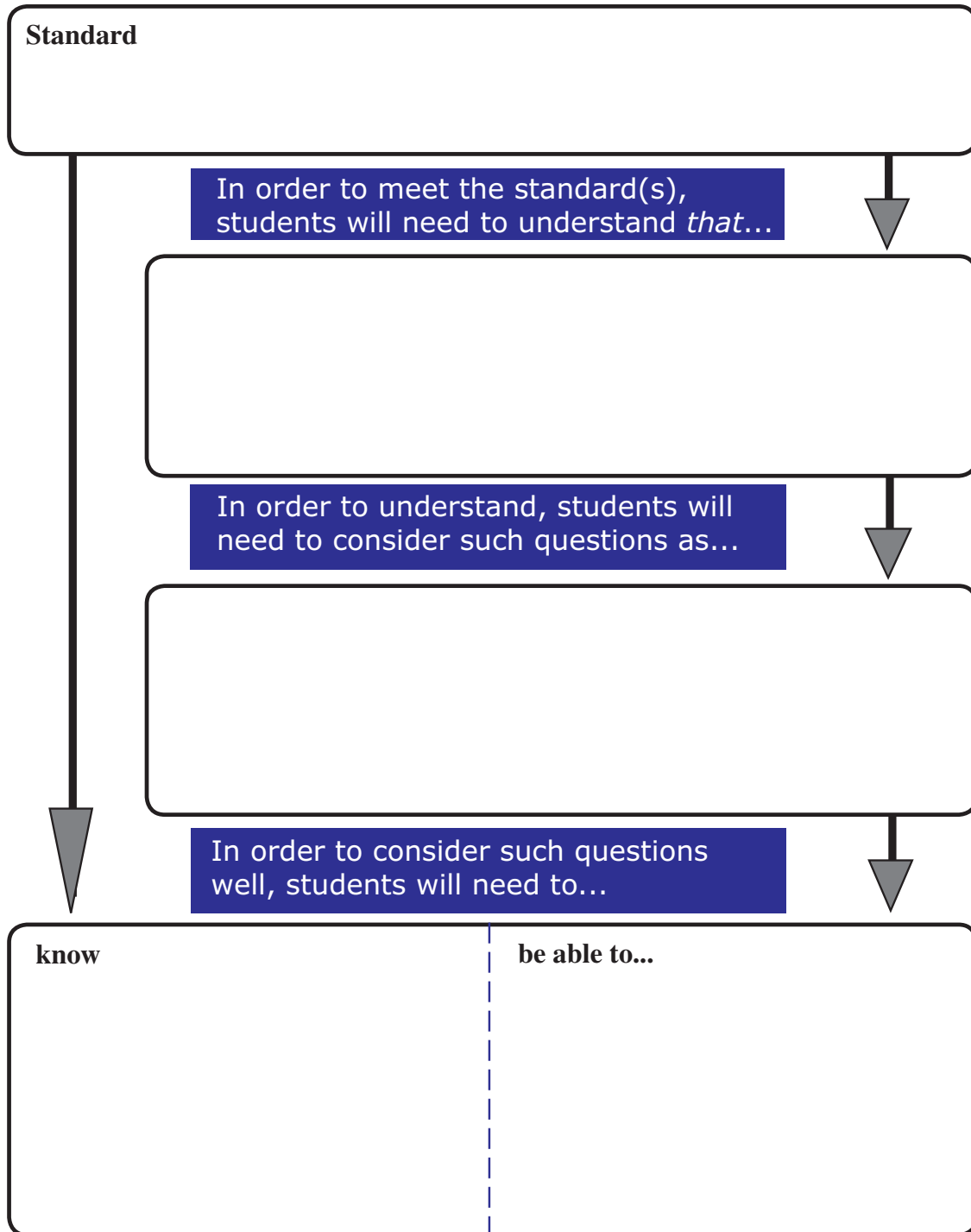
## Unpacking Standards: Top Down Method



## Unpacking Standards: Top Down Method



## Unpacking Standards: Top Down Method





## Key Conceptual Understandings and Processes in the Science Standards

### Crosscutting Scientific and Engineering Concepts

- 1. Patterns** – Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.
- 2. Cause and Effect** – Mechanism and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.
- 3. Scale, Proportion, and Quantity** – In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.
- 4. Systems and System Models** – Defining the system under study – specifying its boundaries and making explicit a model of that system – provides tools for understanding and testing ideas that are applicable throughout science and engineering.
- 5. Energy and Matter** – Flows, cycles, and conservation. Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.
- 6. Structure and Function** – The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.
- 7. Stability and Change** – For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of the system are critical elements of study.

### Practices for K-12 Science Classrooms

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics, information and computer technology, & computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information



# Unpacking Standards – “Matrix” Method

Unpacking Standards Worksheets

<p><b>A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas Science</b></p> <p><b>High School Biology</b></p> <p><b>Content Standards</b></p> <p>Core Concepts of Science and Engineering</p> <ul style="list-style-type: none"> <li>✓ 1. <b>Patterns.</b> Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.</li> <li>✓ 2. <b>Cause and effect.</b> Mechanism and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.</li> <li>3. <b>Scale, proportion, and quantity.</b> In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system’s structure or performance.</li> <li>4. <b>Systems and system models.</b> Defining the system under study – specifying its boundaries and making explicit a model of that system – provides tools for understanding and testing ideas that are applicable throughout science and engineering.</li> <li>5. <b>Energy and matter.</b> Flows, cycles, and conservation. Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems’ possibilities and limitations.</li> <li>6. <b>Structure and function.</b> The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.</li> <li>✓ 7. <b>Stability and change.</b> For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of the system are critical elements of study.</li> </ul>	<p><b>Process Standards</b></p> <p><b>Scientific and Engineering Practices:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 1. Asking questions (for science) and defining problems (for engineering)</li> <li><input type="checkbox"/> 2. Developing and using models</li> <li>✓ <input checked="" type="checkbox"/> 3. Planning and carrying out investigations</li> <li><input type="checkbox"/> 4. Analyzing and interpreting data</li> <li><input type="checkbox"/> 5. Using mathematics, information and computer technology, and computational thinking</li> <li><input type="checkbox"/> 6. Constructing explanations (for science) and designing solutions (for engineering)</li> <li><input type="checkbox"/> 7. Engaging in argument from evidence</li> <li>✓ <input checked="" type="checkbox"/> 8. Obtaining, evaluating, and communicating information</li> </ul>
	<p><b>TRANSFER GOAL(S)</b> <i>Students will be able to independently use their learning to...</i></p> <p>Design and conduct a scientific investigation and communicate results for a self-generated hypothesis.</p>
	<p><b>PERFORMANCE TASK IDEAS</b></p> <p><b>Task 1 – How does exercise affect the pulse rate?</b> Design and conduct an investigation that compares normal pulse rate to changes caused by two selected physical activities (e.g., jogging, swimming, push-ups, squats) for designated intervals. Prepare a report including:</p> <ul style="list-style-type: none"> <li>• an explanation of homeostasis, oxygen/carbon dioxide feedback loop, effect of pulse rate</li> <li>• an interpretation of the results</li> </ul> <p>Answer these questions in your report - <i>How did the pulse rates during exercise compare to the normal (resting) pulse rate? How do CO2 and O2 levels affect the heart rate? How does the heart rate effect pulse rate? How does this affect homeostasis? Is the respiratory rate also affected? • How can your design be improved?</i></p> <p><b>Task 2 – Design and construct a scientific experiment to test which of four antacids would be the most effective for neutralizing acid. Prepare a (news article, podcast, Power Point slide show, Animoto animation) to communicate your findings to the general public.</b></p> <p style="text-align: right;">*Source: pals.sri.com</p>





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Unpacking Standards Worksheets

Process Standards	
<p><b>Common Core State Standards</b> <b>Mathematics</b></p> <p><b>Content Standards</b></p> <p><b>Grade 6:</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Understand ratio concepts and use ratio reasoning to solve problems.</li> <li><input checked="" type="checkbox"/> Apply and extend previous understandings of multiplication and division to divide fractions by fractions.</li> <li><input type="checkbox"/> Compute fluently with multi-digit numbers and find common factors and multiples.</li> <li><input type="checkbox"/> Apply and extend previous understandings of numbers to the system of rational numbers.</li> <li><input type="checkbox"/> Apply and extend previous understandings of arithmetic to algebraic expressions.</li> <li><input type="checkbox"/> Reason about and solve one-variable equations and inequalities.</li> <li><input type="checkbox"/> Represent and analyze quantitative relationships between dependent and independent variables.</li> <li><input checked="" type="checkbox"/> Solve real-world and mathematical problems involving area, surface area, and volume.</li> <li><input type="checkbox"/> Develop understanding of statistical variability.</li> <li><input type="checkbox"/> Summarize and describe distributions.</li> </ul>	<p><b>Standards for Mathematical Practice:</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> 1. Make sense of problems and persevere in solving them.</li> <li><input type="checkbox"/> 2. Reason abstractly and quantitatively.</li> <li><input type="checkbox"/> 3. Construct viable arguments and critique the reasoning of others.</li> <li><input checked="" type="checkbox"/> 4. Model with mathematics.</li> <li><input type="checkbox"/> 5. Use appropriate tools strategically.</li> <li><input checked="" type="checkbox"/> 6. Attend to precision.</li> <li><input type="checkbox"/> 7. Look for and make use of structure.</li> <li><input type="checkbox"/> 8. Look for and express regularity in repeated reasoning.</li> </ul> <p><b>TRANSFER GOAL(S)</b> <i>Students will be able to independently use their learning to...</i></p> <p>apply mathematical reasoning to solve problems involving ratio.</p> <p><b>PERFORMANCE TASK Ideas</b></p> <p>A former NBA legend, Hoops McGinty, has pledged money to the local science museum for an exhibit on our solar system. He pledges the money under one condition: that a regulation NBA basketball be used to represent some aspect of the scale display and that other NBA-related shapes and sizes be used (e.g., a basketball be used to represent a planet or moon). The building floor space is 300 by 800 feet. As designer, how do you propose that the main exhibit hall with a model of the solar system be built to scale? Prepare a diagram with accurate measurements drawn to scale. Show your work so that Hoops will approve and select your design.</p>



# Unpacking Standards – “Matrix” Method

Unpacking Standards Worksheets

<p>The College Board Advanced Placement Program <b>WORLD HISTORY</b></p> <p><b>Content Standards</b></p> <p><b>Theme 1:</b> Interaction between humans and the environment</p> <ul style="list-style-type: none"> <li>o Demography and disease</li> <li>✓ Migration</li> <li>✓ Patterns of settlement</li> <li>o Technology</li> </ul> <p><b>Theme 2:</b> Development and interaction of cultures</p> <ul style="list-style-type: none"> <li>o Religions</li> <li>✓ Belief systems, philosophies, and ideologies</li> <li>o Science and technology</li> <li>o The arts and architecture</li> </ul> <p><b>Theme 3:</b> State building, expansion and conflict</p> <ul style="list-style-type: none"> <li>o Political structures and forms of governance</li> <li>o Empires</li> <li>o Nations and nationalism</li> <li>o Revolts and revolutions</li> <li>o Regional, transregional, and global structures and organizations</li> </ul> <p><b>Theme 4:</b> Creation, expansion and interaction of</p> <ul style="list-style-type: none"> <li>o Agricultural and pastoral production</li> <li>o Trade and commerce</li> <li>o Labor systems</li> <li>o Industrialization</li> <li>o Capitalism and socialism</li> </ul> <p><b>Theme 5:</b> Development and transformation of social structures</p> <ul style="list-style-type: none"> <li>o Gender roles and relations</li> <li>o Family and kinship</li> <li>o Racial and ethnic constructions</li> <li>o Social and economic classes</li> </ul>	<p><b>Process Standards</b></p> <p><b>Historical Thinking Skills:</b></p> <ul style="list-style-type: none"> <li>✓ Crafting historical arguments from historical evidence             <ul style="list-style-type: none"> <li>★ Historical argumentation</li> <li>★ Appropriate use of relevant historical evidence</li> </ul> </li> <li>★ Chronological reasoning             <ul style="list-style-type: none"> <li>★ Historical causation</li> <li>★ Patterns of continuity and change over time</li> <li>○ Periodization</li> </ul> </li> <li>★ Comparison and contextualization             <ul style="list-style-type: none"> <li>★ Comparison</li> <li>★ Contextualization</li> </ul> </li> <li>✓ Historical interpretation and synthesis             <ul style="list-style-type: none"> <li>★ Interpretation</li> <li>★ Synthesis</li> </ul> </li> </ul> <p><b>TRANSFER GOAL(S)</b> <i>Students will be able to independently use their learning to...</i></p> <p>Use primary and secondary sources to produce an informed explanation of what happened, why it happened, and how it impacted the future.</p>	<p><b>PERFORMANCE TASK IDEAS</b></p> <p>Consider this questions - <i>How did the coercive labor systems in the Americas impact the economic growth and cultural patterns of both Africa and the Americas?</i></p> <p>In 1998, UNESCO decreed that August 23rd is the “International Day for the Remembrance of the Slave Trade and its Abolition.” The focus of this year’s remembrance is how economy shapes public behavior. Prepare a keynote address that describes how coercive labor systems impacted Africa and the Americas both economically and culturally. Be sure to consider alternate points of view in your address as there are some areas of disagreement amongst historians.</p>
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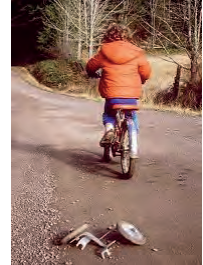
Unpacking Standards Worksheets

# Unpacking Standards – “Matrix” Method

<b>Process Standards</b>	<b>Content Standards</b>	<b>TRANSFER GOAL(S)</b> <i>Students will be able to independently use their learning to...</i>	<b>PERFORMANCE TASK Ideas</b>
	<b>Content Standards</b>		



# TRANSFER GOALS



## Definition

Transfer Goals highlight the effective uses of understanding, knowledge, and skill that we seek in the long run; i.e., what we want students to be able to do when they confront new challenges – both in and outside of school. There are a small number of overarching, long-term transfer goals in each subject area. For example, a long-term aim in mathematics is for students to be able to solve “real world” problems on their own. A long-term transfer goal in history is for students to apply the lessons of history when considering contemporary issues.

In every case, the ability to transfer learning manifests itself in not just one setting but varied real-world situations. Transfer is about independent performance in context. You can only be said to have fully understood if you can apply your learning without someone telling you what to do and when to do it. In the real world, no teacher is there to direct and remind you about which lesson to plug in here or there. Transfer is about intelligently and effectively drawing from your repertoire, independently, to handle new contexts on your own. In the real world, no teacher is there to direct and remind you about which lesson to plug in here or there: transfer is about intelligently and effectively drawing from your repertoire, independently, to handle particular contexts on your own. The goal of transfer thus requires that an instructional plan (in Stage 3) help the student to become increasingly autonomous, and the assessments (in Stage 2) need to determine the degree of student autonomy.

Transfer goals have several distinguishing characteristics:

- They require application (not simply recognition or recall).
- The application occurs in new situations (not ones previously taught or encountered; i.e., the task cannot be accomplished as a result of rote learning).
- The transfer requires a thoughtful assessment of which prior learning applies here – i.e. some strategic thinking is required (not simply “plugging in” skill and facts).
- The learners must apply their learning autonomously (on their own, without coaching or teacher support).
- Transfer calls for the use of habits of mind (i.e., good judgment, self regulation, persistence) along with academic understanding, knowledge and skill.



## Long Term Transfer Goals

### *examples*

*Students will be able to independently use their learning to:*

#### **Reading**

- Read and respond to text in various genres (literature, non-fiction, technical) for various purposes (entertainment, to be informed, to perform a task).
- Comprehend text by getting the main idea (the “gist”), interpreting (“between the lines”), critically appraising, and making personal connections.

#### **Writing**

Effectively write in various genre for various audiences in order to Explain (narrative, expository), Entertain (creative), Persuade (persuasive), Help perform a task (technical), and Challenge or Change Things (satirical).

#### **Mathematics**

- Recognize and solve never-seen-before, “messy” mathematical problems in which the appropriate solution approach is not obvious.

#### **Science**

- Evaluate scientific claims (e.g., XX brand of paper towels absorbs the most liquid of all the leading brand), and analyze current issues involving science or technology. (e.g., Ethanol is the most cost-effective alternative fuel source.)
- Conduct an investigation to answer a question

#### **History**

- Apply lessons of the past (patterns of history) to current and future events and issues, and to other historical events.
- Critically appraise historical and contemporary claims/decisions.

#### **Performing Arts**

- Interpret the meaning of works of art.
- Create and perform an original work in a selected medium to express ideas and/or to evoke mood and emotion.

#### **Health and Physical Education**

- Make healthful choices and decisions regarding diet, exercise, stress management, alcohol/drug use.

#### **World Language**

- Communicate effectively in the target language in “real world” situations.
- Demonstrate a sensitivity to culture and context.

*Understanding-based Curriculum*

## Revising Understandings

<b>Original Draft</b> <i>Students will understand that...</i>	<b>Commentary</b>	<b>Revision</b>	<b>Commentary</b>
the three branches of government.	Not an understanding – just states the topic, not the understanding sought about that topic.	Our founders believed in limited and divided government, in order to ensure that absolute power could never occur in government again.	The revised understanding is both a transferable generalization and a not so obvious result of their analysis of the history of monarchies.
they should eat right and live healthy lives.	This understanding is a truism – obvious on its face, and not requiring thought beyond basic knowledge to grasp it.	We are what we eat.	A more thought-provoking and focused understanding that should encourage discussion and further inquiry in order to uncover the insights in the statement.
different countries have different cultures.	While this is an understanding that may not be obvious to younger students, the claim is so vague that it isn't clear where this leads in terms of specific inquiry and insight.	Cultures develop unique traditions and norms around universal human needs such as food and housing.	The revised understanding provides greater focus about the inquiry and learning in the unit, and hints at an important paradoxical insight: cultures develop differently around universal human needs.
force makes things move.	Too superficial and imprecise a statement of the desired understanding.	$F = ma$	Newton's Law is a profound, concise and more focusing understanding.
many linear relationships can be found in the world.	Extremely vague – we aren't told where to find them or how. As stated, it is more of a fact than a useful insight drawn from inference.	If you find a relationship in which 2 variables are related to each other in a constant ratio, the relationship can be represented graphically by a straight line.	The revised understanding, describes the general class of relationships called 'linear' and how to find them. (Note that this is not true by definition: it must be inferred from the experience with such relationships)



Understanding-based Curriculum

## Revising Essential Questions

Original Draft	Commentary	Revision	Commentary
<i>Are there any benefits from the deforestation of the rain forests?</i>	The question calls for some information gathering and analysis, but ends in a list.	<i>Do the benefits outweigh the costs of deforestation?</i>	The revised question broadens the inquiry and calls for a more sophisticated analysis; far more likely to spark debate and deeper inquiry into any list of pros and cons.
<i>How does this diet match up with the USDA Guidelines?</i>	The question requires some analysis and evaluation, but there is a “correct” answer.	<i>What should we eat?</i>	A much more open version with lots of inquiry and debate potential.
<i>What is non-fiction?</i>	A definitional question with an unambiguous answer.	<i>How much license does a writer of non-fiction have to make a point?</i>	This version of the question explores an interesting “grey” area having both historical and contemporary relevance.
<i>Who speaks Spanish in our community?</i>	A straightforward question asking for a list.	<i>How well can you thrive speaking only English?</i>	A more provocative version calling for greater analysis and a shift of perspective.
<i>What is an axiom?</i>	A straight-forward question calling for a “definitional” answer.	<i>Why should we assume that?</i>	A much more open question that gets at why some things are “given” even if they do not seem obvious or necessary.
<i>What distinguishes Impressionist art?</i>	A “leading” question with an expected set of characteristics.	<i>Why and how do artists break with tradition?</i>	These questions require an examination of artistic trends and call for a generalization by learners.
<i>What types of exercises will improve fitness?</i>	This question involves research but is leading-toward expected answers.	<i>“No pain, no gain” – agree?</i>	A more provocative question, likely to spark discussion, debate – and further inquiry.



## English/Language Arts – Overarching Understandings & Questions for READING

Standard: Students read, comprehend, and respond to a range of materials using a variety of strategies for different purposes.

Focus: Reading as a Process • Responding to Text • Word Meaning • Word Identification • Understanding • Textual Features • Connecting Reading to Prior Knowledge and Experiences

### Understandings:

- Great literature provides rich and timeless insights into the key themes, dilemmas, and challenges that we face. They present complex stories in which the inner and outer lives of human beings are revealed.
- Different types of texts (e.g., essay, mystery, editorial, poem, technical) have unique structures. Understanding a text's structure will help you better grasp its meaning.
- Sometimes the author makes his/her meaning plain; often, however, a reader must dig beneath the "surface" of the text to find that meaning.
- Reading for meaning often requires imagining conversation with and questioning of the author. You must consider and respond – very different from passively accepting or instantly liking or disliking.
- Just because you read the text doesn't mean you understood it. Just because you had a strong response to the text doesn't mean you understood it either.
- Different readers may respond to the same text in different ways. The better responses are those that provide greater insight into the text and/or the issues raised.
- Good readers use many strategies that work, and they quickly try another one when the one they are using doesn't work. They not only know many different strategies, but they never get stuck in persisting with one that isn't working.
- Good readers are never afraid or embarrassed to admit when they don't understand. Asking questions – of a text, of a teacher, of another reader – is what good readers do.

### Essential Questions:

- What makes a great book *great*?
- How does *what* you read influence *how* you read it?
- What is the author saying? How do you know?
- What does the text mean to you?
- What should you do if you aren't getting it?
- Is this text relevant? To what? How?
- Why don't writers just say what they mean and mean what they say?





## English/Language Arts – Overarching Understandings & Questions for WRITING

### **Understandings:**

1. Audience and purpose (e.g., to inform, persuade, entertain) influence the use of literary techniques (e.g., style, tone, word choice).
2. Writers do not always say what they mean. Indirect forms of expression (e.g., satire, irony) require readers to read between the lines to find the intended meaning.
3. Punctuation marks and grammar rules are like highway signs and traffic signals. They guide readers through the text to help avoid confusion.
4. A writer selects a form based on his purpose.
5. A writer's point of view is influenced by his experience.
6. Conventions of language help readers understand what is being communicated.
7. The purposeful use and non-use of language conventions help readers understand.
8. A writer's word choice and syntax are characteristics of voice which help to personalize text.

### **Essential Questions:**

1. *Why write? What if writing didn't exist? Why share personal experiences in writing?*
2. *How is written language different from spoken language? What makes writing worth reading?*
3. *How do writers express their thoughts and feelings? Where do ideas for writing come from? What makes writing flow?*
4. *How do effective writers hook and hold their readers? What makes writing easy to follow? What is the best beginning? What is the best ending? What is the best order (sequence)? What is a complete thought?*
5. *Why am I writing? For whom? What am I trying to achieve through my writing? Who will read my writing? What will work best for my audience?*
6. *Why does a writer choose the form of writing he/she does?*
7. *What is the relationship between reader and writer?*
8. *How do writers communicate clearly?*
9. *To what extent do conventions of language impact communication?*
10. *What makes writing worth reading?*
11. *Why do we need grammar?*
12. *To what extent is the pen mightier than the sword?*

Source: Delaware Department of Education – ELA Design Team



## Overarching Essential Questions for MATHEMATICS

- I. How is mathematics used to quantify and compare situations, events and phenomena?*
- II. What are the mathematical attributes of objects or processes and how are they measured or calculated?*
- III. How are spatial relationships, including shape and dimension, used to draw, construct, model and represent real situations or solve problems?*
- IV. How is mathematics used to measure, model and calculate change?*
- V. What are the patterns in the information we collect and how are they useful?*
- VI. How can mathematics be used to provide models that help us interpret data and make predictions?*
- VII. What are the limits of mathematical modeling/representation?*
- VIII. In what ways can data be expressed so that its accurate meaning is concisely presented to a specific audience?*
- IX. How do the graphs of mathematical models and data help us better understand the world in which we live?*
- X. What does it mean to reason mathematically?*
- XI. How can mathematics support effective communication?*
- XII. What do effective problem solvers do? What do they do when they get stuck?*

– adapted from Pomperaug Region #15 Schools, CT



## Deriving Essential Understandings and Questions from VISUAL ARTS Standards

### **Standard 1. Understands that visual art communicates different ideas, experiences and stories to the viewer**

- *What is the purpose of art?*
- *How do we understand what is communicated visually?*
- *What is important about art?*
- *How does art tell us about a place or time?*
- *Why do we need special vocabulary to discuss art?*

### **Standard 2. Understands that history, culture and the visual arts influence each other**

- *Who is an artist?*
- *Why make art?*
- *How have artists in other times and places communicated?*
- *What is the connection between media and time period?*
- *Who is an artist responsible to? (themselves, the community, the world, etc.)*

### **Standard 3. Understands that the visual arts can be evaluated based on various criteria**

- *What is art?*
- *What makes art “good”? What makes art “bad”?*
- *What is the difference between how a subject appears and how we think of it?*

### **Standard 4. Understands that artists vary media, techniques and processes according to their purpose**

- *What effect does working in different styles of Art have?*
- *How is art like other pieces that authors and musicians create?*
- *Is there a particular way a media should or should not be used?*
- *What is the connection between media and time period?*
- *How does the media influence the message?*

### **Standard 5. Identifies, uses, and adjusts principles of design effectively and according to purpose.**

- *How can we make a work of art appear to be unified? Why does it matter?*

### **Standard 6. Identifies, uses, and adjusts elements of art effectively and according to purpose.**

- *What is the connection between color and emotion?*
- *How can we arrange the elements of art to express our ideas and knowledge?*



Understanding-based Curriculum

## Framing a Course Using Essential Questions

Biology Essential Questions	Key Topics									
	The Cell	Heredity	Evolution	Taxonomy	Viruses, Protists, Fungi & Bacteria	Plants	Invertebrates & Vertebrates	Ecology and Interaction	Human Body Systems	Ethics of Biology
What are we made of? What is everything made of? What makes any living thing what it is? What is "alive"?	✓	✓							✓	
How are structure and function related in living things? Why does this creature do this and look like that?	✓					✓		✓	✓	
How are characteristics of living things passed on through generations? What is inherited and how does it happen? What is 'nature' and what is 'nurture'? What's determined and what's an accident? How and in what ways are accidents beneficial?		✓	✓							
What is that creature? How do we know? What's in a name? How should we classify the things around us?						✓			✓	
How do living things obtain and use energy? Coordinate the actions of cells and organs? Move nutrients? Breathe? Manage water, salts, and wastes?	✓									
How much interaction, stress, growth, and change (to individuals and species) is possible, even desirable, biologically?	—	—	—		—	—	—	—	—	
What is the evidence for evolution? How much of the controversy is science-based and how much is cultural?			✓							
How do diseases and medicines work? What can biology teach us about human health?	✓	✓								
What analogies have been most helpful in understanding life? How and when do the analogies permit and how and when do they inhibit further understanding?	—	—	—		—	—	—	—	—	
Is there a moral limit to how far we should go in tinkering with human bodies and life more generally?	—	—	—		—	—	—	—	—	



Understanding-based Curriculum

## Framing a Course Using Essential Questions

<h1 style="margin: 0;">French I</h1> <p style="margin: 0;"><b>Key Topics</b></p> <p style="margin: 0;"><b>Essential Questions</b></p> <p style="margin: 0;">What are the similarities and differences between French and English? How can English help me learn French? How can it hold me back?</p> <p style="margin: 0;">What strategies can help me to retain as much as possible in long-term memory?</p> <p style="margin: 0;">How can I use context to understand words I do not know? What cues do I listen and watch for before I respond?</p> <p style="margin: 0;">What are key rules for making sense of the gender of nouns, pronunciation, syntax?</p> <p style="margin: 0;">What do I do when I am stuck? How can I keep the conversation going?</p> <p style="margin: 0;">How can body language help or hinder my ability to communicate or understand?</p> <p style="margin: 0;">How can I sound more like a native? What do I want to avoid as much as possible?</p> <p style="margin: 0;">What is it like to be a "foreigner"? What are its benefits, given the discomforts?</p> <p style="margin: 0;">How can I describe the people and culture without stereotyping them?</p>	1.1 Use oral and written language to provide information, exchange ideas, and explain concepts in formal and informal communications.											
	1.2 Comprehend the main ideas and significant details in oral and written presentation in the target language.											
	1.3 Use accurate pronunciation and culturally appropriate gestures to clarify meaning and intent in formal and informal situations.											
	1.4 Determine when the comprehension of language surpasses the ability to produce it, and use circumlocution to successfully communicate messages.											
	3.1 Analyze how linguistic elements are used to convey meaning in the home and target languages.											
	3.2 Analyze how grammatical structures of the target language correlate to the home language.											

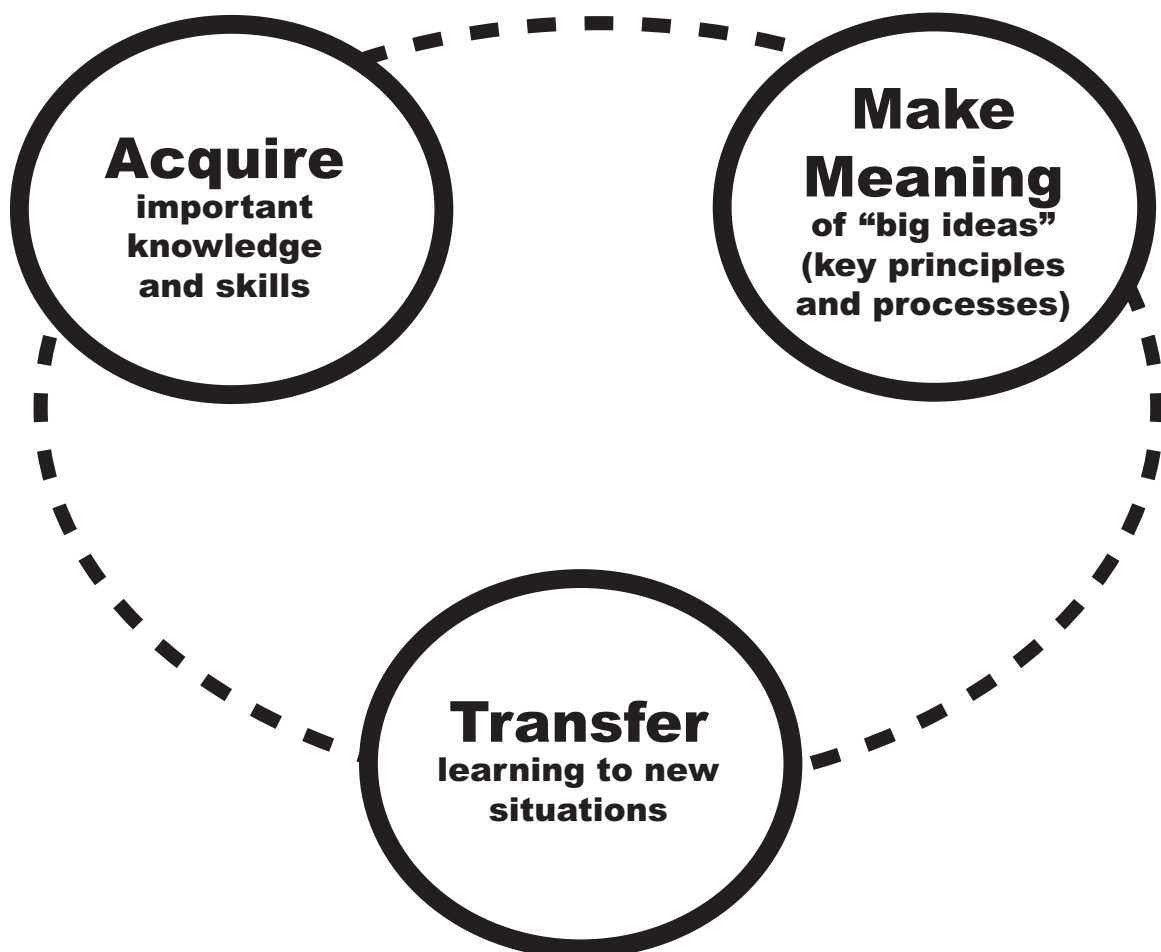


## Teaching and Learning for Understanding

*What does it mean to teach and learn for understanding?*

We have found it useful to consider this question by examining three distinct, yet interrelated, learning goals: 1) acquisition of new information and skill, 2) making meaning of that content (i.e., coming to understand), and 3) transfer of one's knowledge (i.e., applying one's learning to new situations).

These three categories link directly to elements identified in *Understanding by Design*. In Stage 1 teachers specify the knowledge and skill that they intend students to **acquire**. They also decide upon the “big ideas” they want students to come to understand and develop essential questions to help students **make meaning** of those ideas. In Stage 2, teachers develop performance tasks requiring **transfer** as evidence that students understand and can apply their knowledge in authentic contexts.



*Understanding-based Curriculum*

## What is Fair?

*Who won this year's 7th grade race around the campus?*

Every year at Birdsong Middle School, there is an all-class race. Below are the results for the 7th grade (which is made up of four different classes). But there is a problem: no one agrees on who won! One person thinks Class C should win the trophy because they had the 1st runner overall in the race. Another person thinks Class D should win because they had 3 runners come in under 10th place. A third person says: just find the average. But a 4th person said: wait a minute – Class C had more students in their class than Class D. Averages won't be fair! A 5th person says: use the scoring system in Cross Country – just add up the place of finish of the top 5 finishers in each class and the lowest total wins. A 6th person says – unfair! Some classes did well in the first few runners but poorly in the middle! Why should *they* win? Now, everyone is confused and arguing.

**What is the fairest way to determine the winner? Which class should win the trophy?**

Your group, well-known in the school as a group of expert mathematicians (and respected for your sense of fairness) is being consulted as to who should win the trophy. What will you recommend and why?

<u>Class rank</u>	<u>Class A</u>	<u>Class B</u>	<u>Class C</u>	<u>Class D</u>
1	4	6	1	2
2	9	7	3	5
3	11	10	14	8
4	12	13	18	15
5	20	16	19	17
6	21	22	23	31
7	25	24	28	33
8	26	27	30	36
9	29	34	32	37
10	35	39	41	38
11	43	40	44	46
12	45	42	47	51
13	49	48	50	55
14	54	52	56	57
15	61	53	60	58
16	65	62	63	59
17	69	66	64	67
18	70	72	68	
19	71		73	
20			74	

*Notes on the chart:*

- The numbers in the chart, from 1 to 74 represent the place of finish of that runner. So, the overall race winner was from Class C, the number two runner overall was in Class D, etc.
- Class rank refers to the rank of finish place in that class, not the overall race. So, the first runner in class A was 4th overall in the race, the 2nd best runner in class A came in 9th overall, etc.
- The blanks reflect the fact that each of the 4 classes has a different number of students.




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## Coding a Learning Plan Using A - M - T

**A** = acquiring basic knowledge and skills    **M** = making meaning    **T** = transfer

### Mathematics Unit on Measures of Central Tendency

Essential Question: *What is fair - and how can mathematics help us answer the question?*

1. Introduce and discuss the essential question, first part - What is “fair”? What is “unfair”? **M**
2. Introduce the 7th grade race problem. Which of the 7th-grade classes won the race? What is a fair way to decide? Small-group inquiry, followed by class discussion of answers. **M**
3. Teacher informs students about the mathematical connections derived from the problem analysis, and lays out the unit and its culminating transfer task. **A**
4. In small-group jigsaw, students share their answers to the INQUIRY sheet, then return to their team to generalize from all the small-group work. Discuss other examples related to the concept of “fairness” such as the following. **M**
  - *What is a fair way to rank many teams when they do not all play each other?*
  - *What is a fair way to split up limited food among hungry people of very different sizes?*
  - *When is it ‘fair’ to use majority vote and when is it not fair? What might be fairer?*
  - *Is it fair to have apportioned Representatives based on a state’s population, yet have two Senators from each state irrespective of their size? What might be fairer?*
  - *What are fair and unfair ways of representing how much money the “average” worker earns, for purposes of making government policy?*
5. Teacher connects the discussion to the next section in the textbook - measures of central tendency (mean, median, mode, range, standard deviation). **A**
6. Students practice calculating each type of measure. **A**
7. Teacher gives quiz on mean, median, mode from textbook. **A**
8. Teacher leads a review and discussion of the quiz results. **A M**
9. Group task worked on in class: What is the fairest possible grading system for schools to use? **M T**
10. Individuals and small teams present their grading policy recommendations and reasons. **M T**
11. Culminating transfer task: Each student determines which measure (mean, median or mode) should be used to calculate their grade for the marking period and writes a note to the teacher showing their calculations and explaining their choice. **T**
12. Students write a reflection on the essential question and their learnings as a result of the unit. **M**





Understanding-based Curriculum

# Learning Goals and Teaching Roles

	ACQUIRE	MAKE MEANING	TRANSFER
<p>Three Interrelated Learning Goals →</p> <p><i>Note: These three goals are of course interrelated. However, there is merit in distinguishing them to sharpen and focus teaching and assessment.</i></p>	<p>This goal seeks to help learners <i>acquire</i> factual information and basic skills.</p> <p><u>Direct Instruction</u> In this role, the teacher's primary role is to <i>inform</i> the learners through explicit instruction in targeted knowledge and skills; differentiating as needed.</p> <p><i>Strategies include:</i></p> <ul style="list-style-type: none"> <li><input type="radio"/> diagnostic assessment</li> <li><input type="radio"/> lecture</li> <li><input type="radio"/> advanced organizers</li> <li><input type="radio"/> graphic organizers</li> <li><input type="radio"/> questioning (convergent)</li> <li><input type="radio"/> demonstration/modeling</li> <li><input type="radio"/> process guides</li> <li><input type="radio"/> guided practice</li> <li><input type="radio"/> feedback, corrections,</li> <li><input type="radio"/> differentiation</li> </ul>	<p>This goal seeks to help students <i>construct meaning</i> (i.e., <i>come to an understanding</i>) of important ideas and processes.</p> <p><u>Facilitative Teaching</u> Teachers in this role engage the learners in actively processing information and guide their inquiry into complex problems, texts, projects, cases, or simulations; differentiating as needed.</p> <p><i>Strategies include:</i></p> <ul style="list-style-type: none"> <li><input type="radio"/> diagnostic assessment</li> <li><input type="radio"/> using analogies</li> <li><input type="radio"/> graphic organizers</li> <li><input type="radio"/> questioning (divergent) &amp; probing</li> <li><input type="radio"/> concept attainment</li> <li><input type="radio"/> inquiry-oriented approaches</li> <li><input type="radio"/> Problem-Based Learning</li> <li><input type="radio"/> Socratic Seminar</li> <li><input type="radio"/> Reciprocal Teaching</li> <li><input type="radio"/> formative (on-going) assessments</li> <li><input type="radio"/> understanding notebook</li> <li><input type="radio"/> feedback/ corrections</li> <li><input type="radio"/> rethinking and reflection prompts</li> <li><input type="radio"/> differentiated instruction</li> </ul>	<p>This goal seeks to support the learner's ability to <i>transfer</i> their learning autonomously and effectively in new situations.</p> <p><u>Coaching</u> In a coaching role, teachers establish clear performance goals, supervise on-going opportunities to perform (independent practice) in increasingly complex situations, provide models and give on-going feedback (as personalized as possible). They also provide "just in time teaching" (direct instruction) when needed.</p> <p><i>Strategies include:</i></p> <ul style="list-style-type: none"> <li><input type="radio"/> on-going assessment,</li> <li><input type="radio"/> providing specific feedback in the context of authentic application</li> <li><input type="radio"/> conferencing</li> <li><input type="radio"/> prompting self assessment and reflection</li> </ul>
<p>Teacher Role/ Instructional Strategies</p> <p><i>Note: Like the above learning goals, these three teaching roles (and their associated methods) work together in pursuit of identified learning results.</i></p>			



*Understanding-based Curriculum*

## Teaching and Assessing for Understanding – Observable Classroom Indicators

*To what extent are...*

1. Instruction and assessment focused on “big ideas” and essential questions based on established standards/outcomes?	4	3	2	1
2. Essential questions posted and revisited throughout a unit?	4	3	2	1
3. Pre-assessments used to check students’ prior knowledge and potential misconceptions regarding new topics of study?	4	3	2	1
4. Opening ”hooks” used to engage students in exploring the big ideas and essential questions?	4	3	2	1
5. Students’ understanding of the “big ideas” and core processes assessed through authentic tasks involving one or more of the six facets?	4	3	2	1
6. Evaluations of student products/performances based upon known criteria/rubrics, performance standards, and models (exemplars)?	4	3	2	1
7. Appropriate instructional strategies used to help learners’ <b>acquire</b> knowledge and skills, <b>make meaning</b> of the big ideas, and <b>transfer</b> their learning?	4	3	2	1
8. Students given regular opportunities to rethink, revise and reflect on their work based on feedback from on-going (formative) assessments?	4	3	2	1
9. The students expected to self-asses/ reflect on their work/learning and set goals for improvement?	4	3	2	1
10. Other: _____	4	3	2	1



UbD Template 2.0

**Stage 1 – Desired Results**

**Established Goals**

**Transfer**

*Students will be able to independently use their learning to...*

**Meaning**

**UNDERSTANDINGS**

*Students will understand that...*

**ESSENTIAL QUESTIONS**

*Students will keep considering...*

**Acquisition of Knowledge & Skill**

*Students will know...*

*Students will be skilled at...*

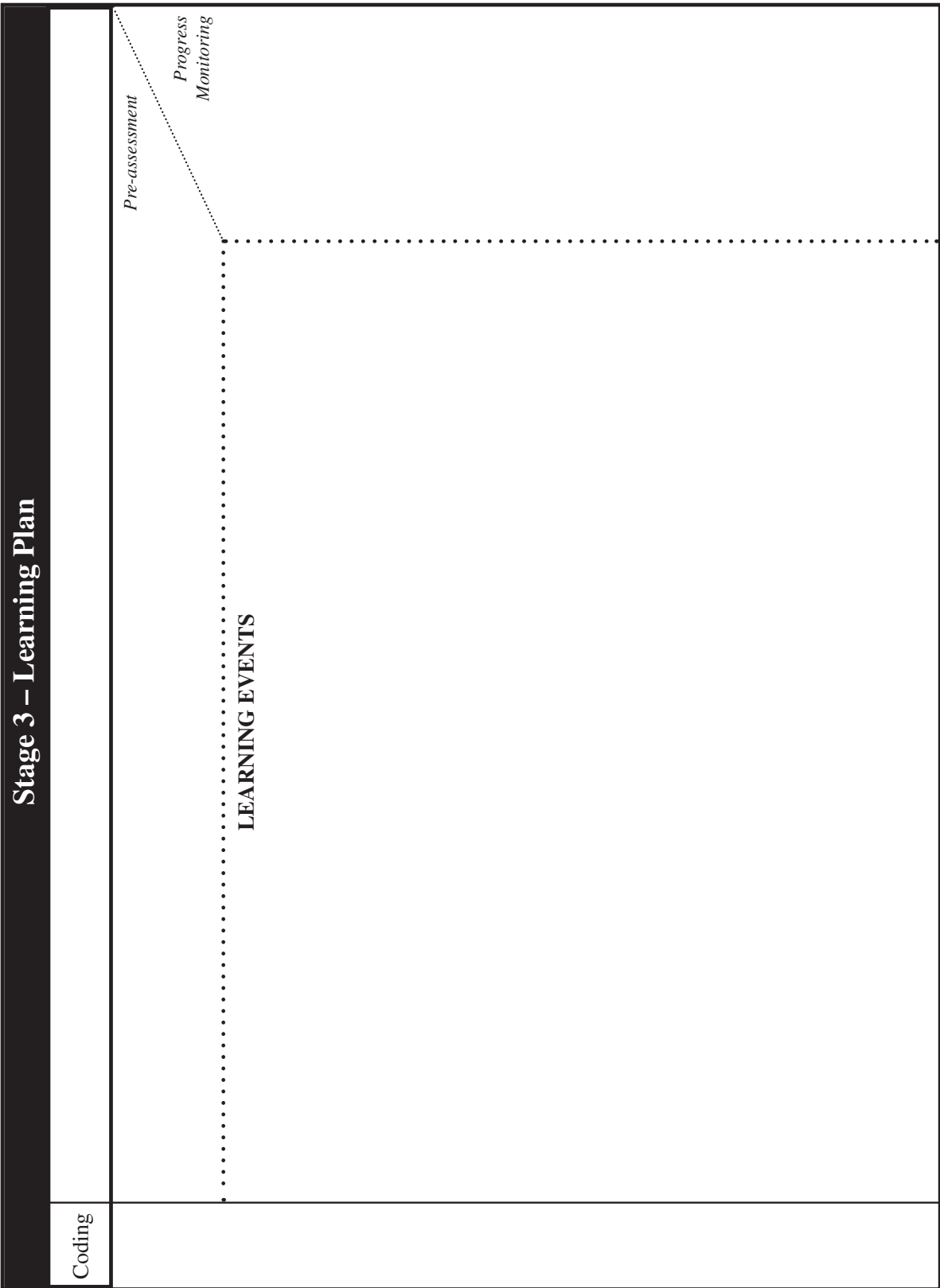
*UbD Template 2.0*

Stage 2 – Evidence	
Coding	Assessment Evidence
<p style="text-align: center;">Evaluative Criteria</p>	<p style="text-align: center;">PERFORMANCE TASK(S)</p> <hr style="border-top: 1px dotted black;"/> <p style="text-align: center;">OTHER EVIDENCE</p>



UbD Template 2.0

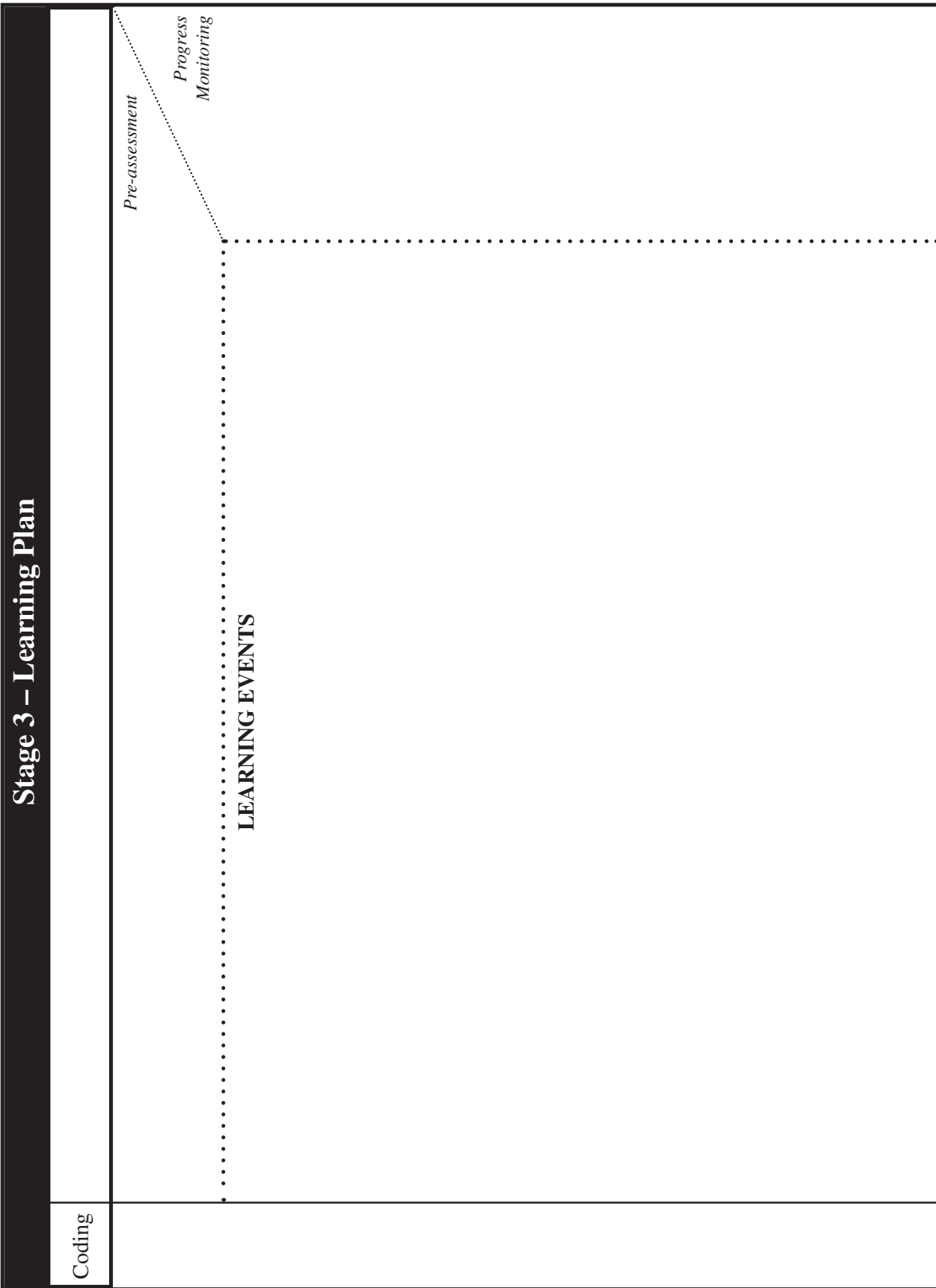
Stage 3 – Learning Plan





UbD Template 2.0

Stage 3 – Learning Plan





# RELATED RESOURCES



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Qty	Code	Title	Price
	SOT2004	Backward Design DVD	\$150.00
	609012	Connecting DI, UbD & What Works in Schools DVD	\$119.00
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	CO4433	Scoring Rubrics in the Classroom: Using Performance Criteria	\$45.95
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STAGE 1: DESIRED RESULTS – KEY UNDERSTANDINGS		TRANSFER
<b>ESTABLISHED GOALS</b>	<p><i>Students will be able to independently use their learning to ...</i></p> <p>Better understand current events and issues based what has happened in the past</p>	
<b>Curriculum</b>		
<p><b>Content Descriptors: AC History : 6</b></p> <ul style="list-style-type: none"> <li>ACHHS125 Explanation and communication: Use a range of communication forms (oral, graphic, written) and digital technologies</li> <li>ACHHS117 Chronology, terms and concepts: Sequence historical people and events</li> <li>ACHHS119 Historical questions and research: Identify questions to inform an historical inquiry</li> <li>ACHHS118 Chronology, terms and concepts: Use historical terms and concepts</li> <li>ACHHS122 Analysis and use of sources: Compare information from a range of sources</li> <li>ACHHS121 Analysis and use of sources: Locate information related to inquiry questions in a range of sources</li> </ul> <p>Historical Knowledge and Understanding</p> <ul style="list-style-type: none"> <li>ACHHK116 Australia as a Nation: The contribution of individuals and groups, including Aboriginal people and/or Torres Strait Islanders and migrants, to the development of Australian society, for example in areas such as the economy, education, science, the arts, sport</li> <li>ACHHK115 Australia as a Nation: Stories of groups of people who migrated to Australia (including from ONE Asian country) and the reasons they migrated, such as World War II and Australian migration programs since the war</li> <li>ACHHS120 Historical questions and research: Identify and locate a range of relevant sources</li> </ul> <p><b>ACARA AC Achievement Standards</b></p> <ul style="list-style-type: none"> <li>ACSA-H16-9 In developing these texts and organising and presenting their information, they use historical terms and concepts and incorporate relevant sources.</li> <li>ACSA-H16-5 When researching, students develop questions to frame an historical inquiry.</li> <li>ACSA-H16-4 Students sequence events and people (their lifetime) in chronological order, and represent time by creating timelines.</li> <li>ACSA-H16-3 Students explain the significance of an individual and group.</li> <li>ACSA-H16-2 Students compare the different experiences of people in the past.</li> <li>ACSA-H16-1 Students identify change and continuity and describe the causes and effects of change on society.</li> <li>ACSA-H16-8 Students develop texts, particularly narratives and descriptions.</li> <li>ACSA-H16-6 Students identify a range of sources and locate and compare information to answer inquiry questions.</li> <li>ACSA-H16-7 Students examine sources to identify and describe points of view.</li> </ul>	<p><b>UNDERSTANDINGS</b></p> <p><i>Students will understand that ...</i></p> <p>U1 People migrate to other countries for economic, political or personal reasons. (These can be classified as push / pull factors) - M2</p> <p>U2 Australian population, throughout history, has become increasingly multicultural, which has had a range of positive and negative effects. - M1</p> <p>U3 Moving from one place to another has positives, but can also be a difficult process. There is an adjustment process involved when adapting to a new culture and personal experiences can be influenced by a range of factors. - M3</p>	<p><b>ESSENTIAL QUESTIONS</b></p> <p><i>Students will keep considering ...</i></p> <p>EQ1 Why do people move? - M2</p> <p>EQ2 What are effects of migration – personal, social, economic, political?</p> <p>EQ3 Is the grass always greener somewhere else? M3</p> <p>GQ1 Guiding Curriculum Question: Who were the people who came to Australia? Why did they come? - M2</p> <p>GQ2 Guiding Curriculum Question: What contribution have significant individuals and groups made to the development of Australian society? - M1</p>
	<b>ACQUISITION OF KNOWLEDGE AND SKILL</b>	
	<b>KNOWLEDGE</b>	<b>SKILLS</b>
<p><i>Students will know ...</i></p> <p>K1 Reasons for migration - push and pull. - A2</p> <p>K2 Who migrated to Australia and when. - A2</p> <p>K3 Key historical events which influenced migration to Australia. - A2</p> <p>K4 Experiences of migrant to Australia. - A2</p> <p>K5 Contributions made by migrants to Australian society. - A1</p> <p>K6 Influence of different cultural groups upon Australian society. - A1</p> <p>K7 Stories of people who have had problems adjusting to a new culture (Karate Kid) A3</p> <p>K8 Key Vocabulary - Push and Pull, Migration, immigration an emigration, culture, multicultural, refugee, 10 pound pom, Populate or Perish, Gold Rush</p>	<p><i>Students will be skilled at ...</i></p> <p>S1 Research process. - A1</p> <p>S2 Data analysis - table and graph form. - A2</p> <p>S3 Identifying historical trends in data. - A2</p> <p>S4 Presentation Information. - A1</p> <p>S5 Timelines - sequencing and interpreting. - A2</p> <p>S6 Classifying and grouping migration reasons. - A1</p> <p>S7 Empathise with the stories of a variety of migrants. - A3</p>	