

CRITICAL THINKING AND PROBLEM SOLVING RUBRICS

GRADES K-2



CATALINA FOOTHILLS SCHOOL DISTRICT
TUCSON, ARIZONA

General Description and Suggestions for Use

The district’s strategic plan, Envision21: Deep Learning, forms the basis for a focus on cross-disciplinary skills/proficiencies necessary for preparing our students well for a 21st century life that is increasingly complex and global. These skills, which are CFSD’s “deep learning proficiencies” (DLPs) are represented as 5c + s = dlp. They are the 5Cs: (1) Citizenship, (2) Critical Thinking and Problem Solving, (3) Creativity and Innovation, (4) Communication, (5) Collaboration + S: Systems Thinking. CFSD developed a set of rubrics (K-2, 3-5, 6-8, and 9-12) for each DLP.

These rubrics were developed using a backward design process to define and prioritize the desired outcomes for each DLP. They provide a common vocabulary and illustrate a continuum of performance. By design, the rubrics were not written to align to any specific subject area; they are intended to be contextualized within the academic content areas based on the performance area(s) being taught and assessed. In practice, this will mean that not every performance area in each of the rubrics will be necessary in every lesson, unit, or assessment.

Critical thinking and problem-solving processes overlap in many ways, but they are separated in this iteration of the DLP rubrics to clarify the definitions and characteristics of each and to make them more broadly applicable to a variety of tasks, contexts, and subject areas. The CFSD rubrics for **Critical Thinking and Problem Solving** were designed as a cross-disciplinary tool to support educators in teaching and assessing the performance areas associated with these proficiencies:

Critical Thinking:

- **Inquiry: Information and Discovery**
- **Interpretation, Analysis, and Reasoning**
- **Self-Regulation and Reflection**

Problem Solving:

- **Framing the Problem**
- **Solution Finding**
- **Self-Regulation and Reflection**

These tools are to be used primarily for formative instructional and assessment purposes; they are not intended to generate psychometrically valid, high stakes assessment data typically associated with state and national testing. CFSD provides a variety of tools and templates to support the integration of both **Critical Thinking and Problem Solving** into units, lessons, and assessments. When designing units, teachers are encouraged to create authentic assessment opportunities in which students can demonstrate mastery of content and the deep learning proficiencies at the same time.

The approach to teaching the performance areas in each rubric may vary by subject area because the way in which they are applied may differ based on the field of study. Scientists, mathematicians, social scientists, engineers, artists, and musicians (for example), all collaborate, solve problems, and share their findings or work within their professional communities. However, the way in which they approach their work, the tools used for collaboration, and the

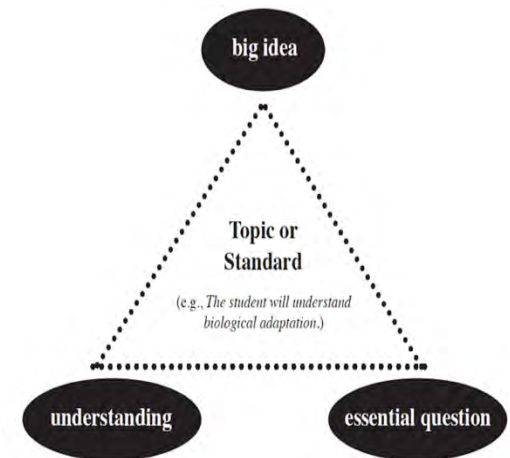
format for communicating their findings may vary based on the profession. These discipline-specific expressions of the 5Cs + S may require some level of customization based on the subject area. Each rubric can also be used to provide students with an opportunity to self-assess the quality of their work in relation to the performance areas. Student-friendly language or “I can” statements can be used by students to monitor and self-assess their progress toward established goals for each performance area.

Transfer

CFSD educators prioritize understanding and transfer to ensure that learning extends beyond the school experience. This 2019 version of the DLP, **Critical Thinking and Problem Solving**, includes long-term **transfer goals** that describe autonomous applications of student learning in college, career, and civic life. “Drill and direct instruction can develop discrete skills and facts into automaticity...but they cannot make us truly able. Understanding is about *transfer*, in other words. To be truly able requires the ability to transfer what we have learned to new and sometimes confusing settings. The ability to transfer our knowledge and skill effectively involves the capacity to take what we know and use it creatively, flexibly, fluently, in different settings or problems, on our own” (Wiggins and McTighe, 2011, p. 40).

Big Ideas

This 2019 version of the DLP, **Critical Thinking and Problem Solving**, includes a set of Understandings and Essential Questions (UEQs) developed by an interdisciplinary team of K-12 teachers and administrators with guidance from Jay McTighe, author of *Understanding by Design*. These big ideas will guide teachers toward the thoughtful design of assessments, units, and lessons that will facilitate transfer of deep learning. “Because big ideas are the basis of unified and effective understanding, they provide a way to set curriculum and instructional priorities...they illuminate experience; they are the linchpin of transfer...” (Wiggins and McTighe, 2011, p.71). “Understandings are the specific insights, inferences, or conclusions about the big idea you want your students to leave with” (Wiggins and McTighe, 2011, p. 80). “Essential questions make our unit plans more likely to yield focused and thoughtful learning and learners” (McTighe, 2017; McTighe & Wiggins, 2013, p. 17). The figure on the right represents the interrelationship among big ideas, understandings, and essential questions.



The **DLP Understandings** are written for K-12 because they express lasting, transferable goals for student learning. Understandings are meant to be revisited over time and across contexts. The continuity of working toward the same goals will help students deepen their understanding from Kindergarten to 12th grade. Understandings are primarily planning tools for teachers, although teachers may choose to share them with their students, if appropriate. Communicating an Understanding does not give away “the answer,” since simply stating an Understanding is not the same as truly grasping its meaning.

The **Essential Questions** are teaching and learning tools that help students unpack the Understandings. They support inquiry and engagement with deep learning and therefore may vary in complexity across grade levels.

Critical Thinking Transfer Goals and UEQs

Transfer Goals	
<p>Students will be able to independently use their learning to . . .</p> <ul style="list-style-type: none"> Critically analyze and evaluate a variety of information and claims in order to determine what to think, believe, or do. 	
Understandings	Essential Questions
<p>Students will understand that . . .</p>	<p>Students will keep considering . . .</p>
<ul style="list-style-type: none"> Critical thinkers remain open-minded and skeptical, ask questions, and deliberately seek alternative points of view before reaching decisions or taking actions. 	<ul style="list-style-type: none"> How do I know what is true? How should I decide what to believe and do? How will different points of view affect my decision making?
<ul style="list-style-type: none"> Critical thinkers organize and analyze information in order to make meaning and decide what to believe or what actions to take. 	<ul style="list-style-type: none"> How do I make meaning?
<ul style="list-style-type: none"> Critical thinkers are willing to “shift gears” when presented with sound reasoning and solid evidence. 	<ul style="list-style-type: none"> When should I shift my thinking?
<ul style="list-style-type: none"> Critical thinkers actively identify and challenge personal biases that influence thinking. 	<ul style="list-style-type: none"> How do my beliefs and opinions affect my thinking?

Problem Solving Transfer Goals and UEQs

Transfer Goals	
<p>Students will be able to independently use their learning to . . .</p> <ul style="list-style-type: none"> • Make sense of messy, never-before-seen problems, and persevere in solving them. 	
Understandings	Essential Questions
Students will understand that. . .	Students will keep considering. . .
<p>1. Effective problem solvers are flexible thinkers who consider multiple ways of defining a problem and who evaluate options before reaching a solution.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • What is the “real” problem? • Where do I begin when solving a problem?
<p>2. Effective problem solvers intentionally select strategies, tools, and approaches that are appropriate for a given context, audience, and perspective.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • Where do I begin when solving a problem? • What are the best strategies to solve the problem?
<p>3. Effective problem solvers expect to get stuck, and they take action to persevere through challenges.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • What do I do when I get stuck?
<p>4. Effective problem solvers don’t stop once a solution has been reached; they evaluate their work in pursuit of deeper understanding.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • How do I know I’ve solved the problem? • How do I know which solution is best? • What do I do once I’ve reached a solution?

Self-Regulation and Reflection Transfer Goals and UEQs

Transfer Goals	
Students will be able to independently use their learning to . . . <ul style="list-style-type: none"> Improve performance and persevere through challenges by applying deliberate effort, appropriate strategies, and flexible thinking. 	
Understandings	Essential Questions
Students will understand that. . .	Students will keep considering. . .
1. Effective learners set goals, regularly monitor their thinking, seek feedback, self-assess, and make needed adjustments.	<ul style="list-style-type: none"> How am I doing? How do I know? What are my next steps? What is the most effective way to monitor my progress? How do I know which feedback will help me improve my work? How can I get useful feedback? How do I prioritize my work?
2. We can always improve our performance through deliberate effort and use of strategies.	<ul style="list-style-type: none"> How can I keep getting better at [critical thinking] [problem solving]?

The deep learning proficiencies (5c+ s) are highly interconnected. For example, productive collaboration is contingent upon effective communication. Efficient and effective problem solving often requires collaboration skills. Divergent and convergent thinking, which are traits of Creativity and Innovation, are directly related to critical thinking. Our students will need to use a combination of proficiencies to solve problems in new contexts beyond the classroom. Therefore, it is important to be clear about which proficiency and/or performance area(s) are the focus for student learning, and then to assist students in understanding the connections between them and how they are mutually supportive.

What does Score 1.0 – Score 4.0 mean in the rubrics?

The rubrics are intended to support student progress toward mastering the deep learning proficiencies (DLPs). Four levels of performance are articulated in each rubric: Score 1.0 (Novice), Score 2.0 (Basic), Score 3.0 (Proficient), and Score 4.0 (Advanced). The descriptions follow a growth model to support students in developing their skills in each performance area. Scores 1.0 (Novice) and 2.0 (Basic) describe positive steps that students might take toward achieving Score 3.0 (Proficient) or Score 4.0 (Advanced) performance.

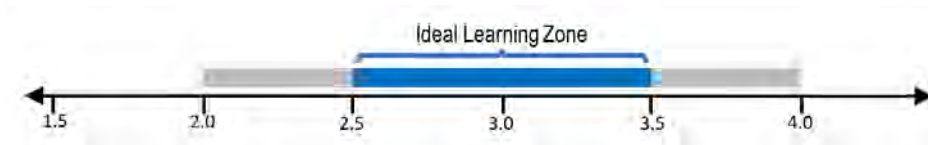
When using the rubrics to plan for instruction and assessment, teachers need to consider the knowledge and skills described in the Score 2.0 column (Basic) to be embedded in the Score 3.0 (Proficient) and 4.0 (Advanced) performance. The Novice level (Score 1.0) indicates that the student does not yet demonstrate the basic skills within the performance area, but that he/she exhibits related readiness skills that are a stepping-stone to a higher level of proficiency. Descriptions at the Novice level also include likely misconceptions that the student might exhibit.

The descriptive rubrics are designed to illustrate students' depth of knowledge/skill at various levels in order to facilitate the instructional and assessment process for all learners. At some performance levels, the indicators may remain the same, but the material under study is more or less complex depending on the grade level band (for example: the complexity of the material at grades 6-8 differs from that of grades 3-5 or 9-12).

The following descriptions explain the four levels on the rubric:

- Score 1.0 (Novice): Describes student performance that demonstrates readiness skills and/or misconceptions and requires significant support.
- Score 2.0 (Basic): Describes student performance that is below proficient, but that demonstrates mastery of basic skills/knowledge, such as terms and details, definitions, basic inferences, and processes.
- Score 3.0 (Proficient): Describes student performance that is proficient – the targeted expectations for each performance area of the DLP.
- Score 4.0 (Advanced): Describes an exemplary performance that exceeds proficiency.

The image below represents the ideal learning zone for students as 2.5 – 3.5.



Glossary

With adult support/guidance: In this rubric, working with adult support or guidance refers to a teacher walking an individual student through the process step-by-step. “With adult support” does not include whole class scaffolding strategies such as graphic organizers, turn and talk, etc.

Sources

The following sources directly influenced the revision of CFSD’s rubrics:

- Catalina Foothills School District. (2011, 2014, 2015). Rubrics for 21st century skills and rubrics for deep learning proficiencies. Tucson, Arizona.
- EdLeader21 (2013). 4Cs rubrics. Tucson, Arizona. [Adaptations from 4Cs Rubrics]
- McTighe, J., & Wiggins, G. P. (2013). Essential questions: Opening doors to student understanding. Alexandria, Virginia: ASCD.
- Partnership for 21st Century Skills. (2009). P21 framework definitions. Washington, DC.
- Rhodes, T. L. (Ed.) (2010). Assessing outcomes and improving achievement: Tips and tools for using rubrics. Association of American Colleges and Universities: Washington D.C. [Adaptations from VALUE rubrics, VALUE Project]
- Wiggins, G.P. & McTighe, J. (2011). The understanding by design guide to creating high-quality units. Alexandria, Virginia: ASCD.

CRITICAL THINKING

DLP PERFORMANCE AREA	1.0 (Novice) The student may exhibit the following readiness skills for Score 2.0:	2.0 (Basic) When presented with a grade-appropriate task, the student:	3.0 (Proficient) In addition to Score 2.0, the student:	4.0 (Advanced) In addition to Score 3.0, the student may:
<p>INQUIRY: INFORMATION AND DISCOVERY</p>	<p>Framing the Investigation: With guidance, identifies a topic for investigation.</p> <p>Questioning: Distinguishes between a question and a statement.</p> <p>Information Gathering: With guidance, gathers general information related to the broad topic under investigation.</p> <p>Source Evaluation: With guidance, identifies information within sources that is related to the broad topic under investigation.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Framing the Investigation: Identifies a topic for investigation.</p> <p>States an opinion.</p> <p>Questioning: With guidance (<i>for example: stem statements</i>), asks general questions to learn information about the broad topic under investigation (<i>for example: "What are habitats?"</i>).</p> <p>Information Gathering: Gathers general information related to the broad topic under investigation.</p> <p>Source Evaluation: Identifies information within sources that is related to the broad topic under investigation.</p>	<p>Framing the Investigation: Identifies a topic and purpose for investigation.</p> <p>Identifies own pre-existing opinions about the topic.</p> <p>Questioning: Asks general questions to learn information about the broad topic under investigation (<i>for example: "What animals live in this habitat?"</i>).</p> <p>Information Gathering: Gathers background information about the topic under investigation to answer questions.</p> <p>Source Evaluation: Identifies information within sources that is relevant to questions asked in the investigation.</p>	<p>Framing the Investigation: Describe aspects of the topic under investigation (<i>for example: background information, characteristics, stakeholders, requirements, etc.</i>).</p> <p>Explain how own pre-existing opinions about the topic might influence the investigation.</p> <p>Questioning: Formulate questions related to the specific topic under investigation (<i>for example: "How do animals survive in their habitat?"</i>).</p> <p>Information Gathering: Gather specific information about the topic under investigation in order to develop and answer questions.</p> <p>Source Evaluation: Evaluate information based on given criteria (<i>for example: relevance, accuracy, authority, etc.</i>) in order to decide which information to use.</p>

				Identify language that indicates an author’s opinion about a topic.
<p>INTERPRETATION, ANALYSIS, AND REASONING (Making meaning of information to form conclusions)</p>	<p>Organization: With adult support, highlights information relevant to the topic.</p> <p>Meaning-Making: Makes observations about images and/or text (<i>for example: “There are frogs in the picture. It says they are green.”</i>).</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Organization: Lists information relevant to the topic.</p> <p>Meaning-Making: Forms generalizations from images and/or text (<i>for example: “There are frogs in this pond, so frogs live in ponds.”</i>).</p>	<p>Organization: Uses provided categories to organize information (<i>for example: in researching habitats, students might be instructed to organize information by location, diet, adaptations, enemies, etc.</i>).</p> <p>Meaning-Making: Interprets images and/or text accurately to form inferences (<i>for example: “The eggs are in the water. That must be because the next phase in the frog’s lifecycle is a tadpole and tadpoles have to swim in water.”</i>).</p> <p>Formulates conclusions from information and inferences.</p>	<p>Organization: Organize information into logical groups or generate additional categories that demonstrate a deeper understanding of the topic.</p> <p>Meaning-Making: Identify connections between information and conclusions.</p>
<p>SELF-REGULATION AND REFLECTION</p>	<p>Reflection: Identifies own strengths and weaknesses as a critical thinker with adult support.</p> <p>Planning: Sets personal goals for critical thinking with adult support.</p> <p>Mindset: Explains the relationship between effort and success (<i>for example: “The harder I work at this, the better I’ll be at it.”; “I will work harder in this class from now on.”</i>).</p>	<p>Reflection: Identifies own strengths and weaknesses as a critical thinker.</p> <p>Planning: Sets personal goals for critical thinking.</p> <p>Mindset: Demonstrates a desire to improve (<i>for example: employs more practice, sets goals for improvement, asks for help from others instead of giving up</i>).</p>	<p>Reflection: Assesses thinking, reasoning, and critical thinking dispositions in response to feedback and/or established criteria.</p> <p>Planning: Sets goals for critical thinking based on feedback and/or established criteria.</p> <p>Mindset: Demonstrates a growth mindset (the belief that one can “get smarter” at critical thinking through effective effort) in response to setbacks and challenges. (<i>for example: persists</i>)</p>	<p>Reflection: Accurately reflect on thinking, reasoning, and critical thinking dispositions; use reflection and/or feedback to revise ideas or products.</p> <p>Question and critique own thinking process, including how strengths and weaknesses in own thinking, reasoning, and critical thinking dispositions may have affected the process or outcome.</p> <p>Planning: Seek out, identify, and use resources and strategies to</p>

	<p>See possible student misconceptions following the rubrics.</p>		<p><i>on difficult tasks, takes risks in the learning process, accepts and uses feedback/criticism, is comfortable making mistakes, explains failure from a growth mindset perspective).</i></p>	<p>achieve goals for improving the thinking process.</p> <p>Mindset: Proactively improve own areas of weakness by employing effective strategies to increase growth mindset (<i>for example: perseverance, taking risks, effective decision-making, actively seeking others' feedback, deliberate practice, finding and using external resources [skilled peers, other adult experts] to enrich and extend learning).</i></p>
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PROBLEM SOLVING

DLP PERFORMANCE AREA	1.0 (Novice) The student may exhibit the following readiness skills for Score 2.0:	2.0 (Basic) When presented with a grade-appropriate task, the student:	3.0 (Proficient) In addition to Score 2.0, the student:	4.0 (Advanced) In addition to Score 3.0, the student may:
FRAMING THE PROBLEM	<p>Understanding the Problem: States the problem and/or stated goal(s) or objective(s).</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Understanding the Problem: Describes the problem and/or stated goal(s) or objective(s) in own words.</p> <p>Asks clarifying questions related to the problem.</p>	<p>Understanding the Problem: Identifies information necessary to solve the problem (<i>for example: what is known, what is unknown, etc.</i>).</p> <p>Clarifies facts or processes with regard to the problem (<i>for example: clarifying the operation required in a mathematical word problem; clarifying the steps in a scientific investigation, etc.</i>).</p>	<p>Understanding the Problem: Determine what prior knowledge will be useful in solving the problem.</p> <p>Identify irrelevant information.</p>
SOLUTION FINDING	<p>Strategizing: Identifies problem-solving strategies.</p> <p>Solving the Problem: Applies a given strategy or approach to solve a problem or develop a solution.</p> <p>Evaluation: Explains the reasonableness of a given solution or approach to the problem, given specific criteria.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Strategizing: Selects an appropriate strategy or approach to solving the problem.</p> <p>Solving the Problem: Applies an appropriate strategy or approach to solve a problem or develop a solution.</p> <p>Evaluation: Explains the potential effects of a given approach or provided solution to a problem.</p>	<p>Strategizing: Selects multiple effective strategies or approaches to solve the problem efficiently.</p> <p>Solving the Problem: Applies an efficient strategy or effective approach to accurately solve a problem or develop a valid solution.</p> <p>Evaluation: Determines the reasonableness of the solution or approach to the problem, given specific criteria.</p> <p>Uses the evaluation to determine the need for further work on the problem.</p>	<p>Strategizing: Identify innovative, plausible strategies or approaches to solve the problem.</p> <p>Solving the Problem: Apply an elegant or innovative strategy or approach to solve the problem or develop a valid solution.</p> <p>Evaluation: Compare multiple approaches to identify and justify the most effective approach within the context of the problem.</p>

<p>SELF-REGULATION AND REFLECTION</p>	<p>Reflection: Identifies own strengths and weaknesses as a problem solver with adult support.</p> <p>Planning: Sets personal goals for problem solving with adult support.</p> <p>Mindset: Explains the relationship between effort and success (<i>for example: “The harder I work at this, the better I’ll be at it”; “I will work harder in this class from now on.”</i>).</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Reflection: Identifies own strengths and weaknesses as a problem solver.</p> <p>Planning: Sets personal goals for problem solving.</p> <p>Mindset: Demonstrates a desire to improve (<i>for example: employs more practice, sets goals for improvement, asks for help from others instead of giving up</i>).</p>	<p>Reflection: Assesses problem-solving skills and processes in response to feedback and/or the rubric.</p> <p>Planning: Sets goals for problem solving based on feedback and/or established criteria.</p> <p>Mindset: Demonstrates a growth mindset (the belief that one can “get smarter” at problem solving through effective effort) in response to setbacks and challenges (<i>for example: persists on difficult tasks, takes risks in the learning process, accepts and uses feedback/criticism, is comfortable making mistakes, explains failure from a growth mindset perspective</i>).</p>	<p>Reflection: Accurately reflect on problem-solving skills and processes; use reflection and/or feedback to revise ideas or products.</p> <p>Question and critique own problem-solving skills and processes.</p> <p>Planning: Seek out, select, and use resources and strategies to achieve goals for improving the problem-solving process.</p> <p>Mindset: Proactively improve own areas of weakness by employing effective strategies to increase growth mindset (<i>for example: perseverance, taking risks, effective decision-making, actively seeking others’ feedback, deliberate practice, finding and using external resources [skilled peers, other adult experts] to enrich and extend learning</i>).</p>
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Possible Misconceptions: K-2 Critical Thinking

The following chart lists possible misconceptions about **Critical Thinking**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

<i>Students might exhibit the following misconception, belief, or perception that...</i>		
Inquiry: Information and Discovery	Framing the Investigation	<ul style="list-style-type: none"> • The purpose of the investigation is to complete the task (for example: write an essay, conduct a research project). • Bias is inherently negative. • There is such a thing as an unbiased source. • I don't have any biases, or, I don't have any biases about _____.
	Questioning	<ul style="list-style-type: none"> • The topic is one-dimensional, rather than multifaceted (for example: struggles to narrow a topic into multiple, relevant questions; asks only one type of question or asks the same question repeatedly, using different words). • One question is sufficient for inquiry. • Answers are more important than questions.
	Information Gathering	<ul style="list-style-type: none"> • Research is framed around topics and answers rather than questions. • The most important part of research is finding "the" answers rather than developing inquiry questions to open up exploration of the topic. • I can find all the information I need through Google. • If an idea conflicts with my perspective, values, or beliefs, I should disregard it.
	Source Evaluation	<ul style="list-style-type: none"> • Ease of investigation is more important than depth of understanding (for example: rejects or accepts information based on arbitrary criteria, such as selecting the first piece of information that aligns with preconceived beliefs). • If a source is published, it is a credible source. • All news stories are true and unbiased.
Interpretation, Analysis, and Reasoning	Organization	<ul style="list-style-type: none"> • There is no connection between the task of categorizing and the purpose of organizing information (for example: creates arbitrary categories, such as where or when the information was found; lists repetitive information). • There is only one way to categorize information.

	Meaning-making	<ul style="list-style-type: none"> • All information is equally important (for example: forms inferences from irrelevant information or observations, creates inaccurate generalizations out of limited information or misconceptions). • A conclusion can be formed from a cursory examination of information. • I should form my opinion first and then seek evidence to support it. • The goal of analysis is to prove that my thinking is “right.”
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Possible Misconceptions: K-2 Problem Solving

The following chart lists possible misconceptions about **Problem Solving**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

<i>Students might exhibit the following misconception, belief, or perception that...</i>		
Framing the Problem	Understanding the Problem	<ul style="list-style-type: none"> • All information is equally important (for example: mistakes irrelevant or interesting information for essential information; applies irrelevant background knowledge; asks questions about details not important to the problem).
Solution Finding	Strategizing	<ul style="list-style-type: none"> • One content-appropriate strategy will be effective in all contexts. • Once I identify a strategy or approach that works, it is a waste of time to consider additional options.
	Solving the Problem	<ul style="list-style-type: none"> • Applying the strategy eliminates the need to think through the problem. • “Efficient” and “effective” mean the same thing. • As long as I reach a solution, it doesn’t matter how I got there.
	Evaluation	<ul style="list-style-type: none"> • The point of the problem is to solve it and that the strategy or approach used is irrelevant. • There is a “right” way to solve the problem or only one way to solve the problem.

Possible Misconceptions: K-2 Self-Regulation and Reflection

The following chart lists possible misconceptions about **Self-Regulation and Reflection**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

Self-Regulation and Reflection	Reflection	<ul style="list-style-type: none"> • Reflection is all about what I think; other people’s perspectives don’t matter. • Only the teacher’s perspective matters when it comes to identifying strengths and weaknesses. • I don’t have any weaknesses. • I don’t have any strengths. • All weaknesses affect my performance in the same way. • Reflection is a waste of time; I don’t need to reflect to improve.
	Planning	<ul style="list-style-type: none"> • A goal is the same thing as a plan. • Any goal is a worthy goal. • Short-term goals aren’t important. • I don’t need a plan; if I set a goal, I will achieve it. • I should set goals in areas where I am already successful. • I should set the same goal over and over. • Someone else will give me resources and ideas about how to improve.
	Mindset	<ul style="list-style-type: none"> • [Critical Thinking] [Problem Solving] is a talent and not a skill; I am as good at it as I’ll ever be. • If I’m really good at something, I won’t encounter any challenges. • If I experience a setback, I’ve failed. • Others’ feedback can’t help me. • Mistakes are bad; smart people don’t make mistakes. • The safe route leads to guaranteed success.

CRITICAL THINKING AND PROBLEM SOLVING RUBRICS

GRADES 3-5



CATALINA FOOTHILLS SCHOOL DISTRICT
TUCSON, ARIZONA

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These tools are to be used primarily for formative instructional and assessment purposes; they are not intended to generate psychometrically valid, high stakes assessment data typically associated with state and national testing. CFSD provides a variety of tools and templates to support the integration of both **Critical Thinking and Problem Solving** into units, lessons, and assessments. When designing units, teachers are encouraged to create authentic assessment opportunities in which students can demonstrate mastery of content and the deep learning proficiencies at the same time.

The approach to teaching the performance areas in each rubric may vary by subject area because the way in which they are applied may differ based on the field of study. Scientists, mathematicians, social scientists, engineers, artists, and musicians (for example), all collaborate, solve problems, and share their findings or work within their professional communities. However, the way in which they approach their work, the tools used for collaboration, and the

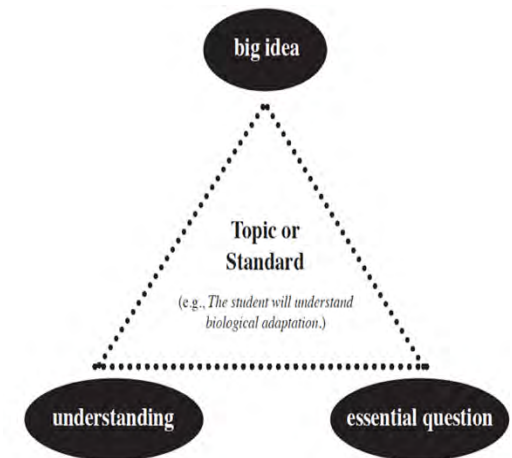
format for communicating their findings may vary based on the profession. These discipline-specific expressions of the 5Cs + S may require some level of customization based on the subject area. Each rubric can also be used to provide students with an opportunity to self-assess the quality of their work in relation to the performance areas. Student-friendly language or “I can” statements can be used by students to monitor and self-assess their progress toward established goals for each performance area.

Transfer

CFSD educators prioritize understanding and transfer to ensure that learning extends beyond the school experience. This 2019 version of the DLP, **Critical Thinking and Problem Solving**, includes long-term **transfer goals** that describe autonomous applications of student learning in college, career, and civic life. “Drill and direct instruction can develop discrete skills and facts into automaticity...but they cannot make us truly able. Understanding is about *transfer*, in other words. To be truly able requires the ability to transfer what we have learned to new and sometimes confusing settings. The ability to transfer our knowledge and skill effectively involves the capacity to take what we know and use it creatively, flexibly, fluently, in different settings or problems, on our own” (Wiggins and McTighe, 2011, p. 40).

Big Ideas

This 2019 version of the DLP, **Critical Thinking and Problem Solving**, includes a set of Understandings and Essential Questions (UEQs) developed by an interdisciplinary team of K-12 teachers and administrators with guidance from Jay McTighe, author of *Understanding by Design*. These big ideas will guide teachers toward the thoughtful design of assessments, units, and lessons that will facilitate transfer of deep learning. “Because big ideas are the basis of unified and effective understanding, they provide a way to set curriculum and instructional priorities...they illuminate experience; they are the linchpin of transfer...” (Wiggins and McTighe, 2011, p.71). “Understandings are the specific insights, inferences, or conclusions about the big idea you want your students to leave with” (Wiggins and McTighe, 2011, p. 80). “Essential questions make our unit plans more likely to yield focused and thoughtful learning and learners” (McTighe, 2017; McTighe & Wiggins, 2013, p. 17). The figure on the right represents the interrelationship among big ideas, understandings, and essential questions.



The **DLP Understandings** are written for K-12 because they express lasting, transferable goals for student learning. Understandings are meant to be revisited over time and across contexts. The continuity of working toward the same goals will help students deepen their understanding from Kindergarten to 12th grade. Understandings are primarily planning tools for teachers, although teachers may choose to share them with their students, if appropriate. Communicating an Understanding does not give away “the answer,” since simply stating an Understanding is not the same as truly grasping its meaning.

The **Essential Questions** are teaching and learning tools that help students unpack the Understandings. They support inquiry and engagement with deep learning and therefore may vary in complexity across grade levels.

Critical Thinking Transfer Goals and UEQs

Transfer Goals	
<p>Students will be able to independently use their learning to . . .</p> <ul style="list-style-type: none"> Critically analyze and evaluate a variety of information and claims in order to determine what to think, believe, or do. 	
Understandings	Essential Questions
Students will understand that . . .	Students will keep considering . . .
<ol style="list-style-type: none"> Critical thinkers remain open-minded and skeptical, ask questions, and deliberately seek alternative points of view before reaching decisions or taking actions. 	<ul style="list-style-type: none"> How do I know what is true? How should I decide what to believe and do? How will different points of view affect my decision making?
<ol style="list-style-type: none"> Critical thinkers organize and analyze information in order to make meaning and decide what to believe or what actions to take. 	<ul style="list-style-type: none"> How do I make meaning?
<ol style="list-style-type: none"> Critical thinkers are willing to “shift gears” when presented with sound reasoning and solid evidence. 	<ul style="list-style-type: none"> When should I shift my thinking?
<ol style="list-style-type: none"> Critical thinkers actively identify and challenge personal biases that influence thinking. 	<ul style="list-style-type: none"> How does what I believe or value influence my thinking?

Problem Solving Transfer Goals and UEQs

Transfer Goals	
<p>Students will be able to independently use their learning to . . .</p> <ul style="list-style-type: none"> • Make sense of messy, never-before-seen problems, and persevere in solving them. 	
Understandings	Essential Questions
Students will understand that. . .	Students will keep considering. . .
<p>1. Effective problem solvers are flexible thinkers who consider multiple ways of defining a problem and who evaluate options before reaching a solution.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • What is the “real” problem? • Where do I begin when solving a problem?
<p>2. Effective problem solvers intentionally select strategies, tools, and approaches that are appropriate for a given context, audience, and perspective.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • Where do I begin when solving a problem? • What are the best strategies to solve the problem?
<p>3. Effective problem solvers expect to get stuck, and they take action to persevere through challenges.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • What do I do when I get stuck?
<p>4. Effective problem solvers don’t stop once a solution has been reached; they evaluate their work in pursuit of deeper understanding.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • How do I know I’ve solved the problem? • How do I know which solution is best? • What do I do once I’ve reached a solution?

Self-Regulation and Reflection Transfer Goals and UEQs

Transfer Goals	
Students will be able to independently use their learning to . . . <ul style="list-style-type: none"> Improve performance and persevere through challenges by applying deliberate effort, appropriate strategies, and flexible thinking. 	
Understandings	Essential Questions
Students will understand that. . .	Students will keep considering. . .
1. Effective learners set goals, regularly monitor their thinking, seek feedback, self-assess, and make needed adjustments.	<ul style="list-style-type: none"> How am I doing? How do I know? What are my next steps? What is the most effective way to monitor my progress? How do I know which feedback will help me improve my work? How can I get useful feedback? How do I prioritize my work?
2. We can always improve our performance through deliberate effort and use of strategies.	<ul style="list-style-type: none"> How can I keep getting better at [critical thinking] [problem solving]?

The deep learning proficiencies (5c+ s) are highly interconnected. For example, productive collaboration is contingent upon effective communication. Efficient and effective problem solving often requires collaboration skills. Divergent and convergent thinking, which are traits of Creativity and Innovation, are directly related to critical thinking. Our students will need to use a combination of proficiencies to solve problems in new contexts beyond the classroom. Therefore, it is important to be clear about which proficiency and/or performance area(s) are the focus for student learning, and then to assist students in understanding the connections between them and how they are mutually supportive.

What does Score 1.0 – Score 4.0 mean in the rubrics?

The rubrics are intended to support student progress toward mastering the deep learning proficiencies (DLPs). Four levels of performance are articulated in each rubric: Score 1.0 (Novice), Score 2.0 (Basic), Score 3.0 (Proficient), and Score 4.0 (Advanced). The descriptions follow a growth model to support students in developing their skills in each performance area. Scores 1.0 (Novice) and 2.0 (Basic) describe positive steps that students might take toward achieving Score 3.0 (Proficient) or Score 4.0 (Advanced) performance.

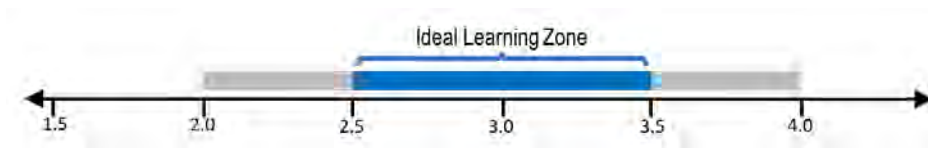
When using the rubrics to plan for instruction and assessment, teachers need to consider the knowledge and skills described in the Score 2.0 column (Basic) to be embedded in the Score 3.0 (Proficient) and 4.0 (Advanced) performance. The Novice level (Score 1.0) indicates that the student does not yet demonstrate the basic skills within the performance area, but that he/she exhibits related readiness skills that are a stepping-stone to a higher level of proficiency. Descriptions at the Novice level also include likely misconceptions that the student might exhibit.

The descriptive rubrics are designed to illustrate students' depth of knowledge/skill at various levels in order to facilitate the instructional and assessment process for all learners. At some performance levels, the indicators may remain the same, but the material under study is more or less complex depending on the grade level band (for example: the complexity of the material at grades 6-8 differs from that of grades 3-5 or 9-12).

The following descriptions explain the four levels on the rubric:

- Score 1.0 (Novice): Describes student performance that demonstrates readiness skills and/or misconceptions and requires significant support.
- Score 2.0 (Basic): Describes student performance that is below proficient, but that demonstrates mastery of basic skills/knowledge, such as terms and details, definitions, basic inferences, and processes.
- Score 3.0 (Proficient): Describes student performance that is proficient – the targeted expectations for each performance area of the DLP.
- Score 4.0 (Advanced): Describes an exemplary performance that exceeds proficiency.

The image below represents the ideal learning zone for students as 2.5 – 3.5.



Sources

The following sources directly influenced the revision of CFSD's rubrics:

- Catalina Foothills School District. (2011, 2014, 2015). Rubrics for 21st century skills and rubrics for deep learning proficiencies. Tucson, Arizona.
- EdLeader21 (2013). 4Cs rubrics. Tucson, Arizona. [Adaptations from 4Cs Rubrics]
- McTighe, J., & Wiggins, G. P. (2013). Essential questions: Opening doors to student understanding. Alexandria, Virginia: ASCD.
- Partnership for 21st Century Skills. (2009). P21 framework definitions. Washington, DC.
- Rhodes, T. L. (Ed.) (2010). Assessing outcomes and improving achievement: Tips and tools for using rubrics. Association of American Colleges and Universities: Washington D.C. [Adaptations from VALUE rubrics, VALUE Project]
- Wiggins, G.P. & McTighe, J. (2011). The understanding by design guide to creating high-quality units. Alexandria, Virginia: ASCD.

CRITICAL THINKING

DLP PERFORMANCE AREA	1.0 (Novice) The student may exhibit the following readiness skills for Score 2.0:	2.0 (Basic) When presented with a grade-appropriate task, the student:	3.0 (Proficient) In addition to Score 2.0, the student:	4.0 (Advanced) In addition to Score 3.0, the student may:
<p>INQUIRY: INFORMATION AND DISCOVERY</p>	<p>Framing the Investigation: With guidance, identifies a topic and purpose for investigation.</p> <p>Questioning: With guidance (<i>for example: stem statements</i>), asks general questions to learn information about the broad topic under investigation.</p> <p>Information Gathering: With guidance, gathers general information related to the broad topic under investigation.</p> <p>Source Evaluation: Identifies information within sources that is related to the topic under investigation.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Framing the Investigation: Identifies a topic and purpose for investigation.</p> <p>Defines “bias.”</p> <p>Questioning: Asks general questions to learn information about the broad topic under investigation (<i>for example: “What is force?”</i>).</p> <p>Information Gathering: Gathers background information about the topic under investigation in order to develop and answer questions (<i>for example: Wikipedia or encyclopedia excerpts</i>).</p> <p>Source Evaluation: Identifies information within sources that is relevant and/or irrelevant to questions asked in the investigation.</p>	<p>Framing the Investigation: Describes aspects of the topic under investigation (<i>for example: context, characteristics, stakeholders, genre, parameters, etc.</i>).</p> <p>Acknowledges own general biases.</p> <p>Questioning: Formulates questions related to the specific topic under investigation (<i>for example: “How can force be measured?”</i>).</p> <p>Information Gathering: Gathers information about the topic under investigation from credible sources in order to develop and answer questions.</p> <p>Source Evaluation: Evaluates information based on given criteria (<i>for example: relevance, accuracy, authority, etc.</i>) in order to decide which information to use.</p> <p>Identifies language that indicates an author’s opinion about a topic.</p>	<p>Framing the Investigation: Identify relationships among aspects of the topic under investigation, describing them as interrelated elements rather than isolated pieces.</p> <p>Acknowledge own biases with regard to the task or topic under investigation.</p> <p>Questioning: Generate additional questions and/or refine questions in response to new information.</p> <p>Prioritize questions to provide a solid foundation for inquiry.</p> <p>Information Gathering: Gather information from multiple relevant, timely, and credible sources, using a variety of collection methods (<i>for example: internet searches, surveys, databases, interviews, library catalog, etc.</i>).</p> <p>Deliberately seek diverse perspectives or information that conflicts with own beliefs, values, and perspectives.</p>

				Source Evaluation: Select appropriate criteria to evaluate sources and information; justify which sources will provide the most useful information with regard to the question(s).
INTERPRETATION, ANALYSIS, AND REASONING (Making meaning of information to form conclusions)	<p>Organization: Lists information related to the topic.</p> <p>Meaning-Making: Defines different types of information (for example: fact vs opinion, numerical vs. textual data, etc.).</p> <p>Makes observations about information.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Organization: Uses provided categories to organize information (for example: in researching a historical event in social studies, students might be instructed to organize information by important individuals, causes, impact, etc.).</p> <p>Meaning-Making: Interprets images and text accurately to form inferences.</p> <p>Formulates conclusions from information and inferences.</p>	<p>Organization: Organizes information into logical groups or generates additional categories that demonstrate a deeper understanding of the topic.</p> <p>Meaning-Making: Interprets information accurately to form valid inferences.</p> <p>Formulates logical conclusions from information, observations, and inferences.</p> <p>Identifies connections between information and conclusions.</p>	<p>Organization: Organize and prioritize information to reveal important differences, similarities, and/or patterns related to the topic under investigation.</p> <p>Meaning-Making: Analyze patterns to make meaning from the whole body of information.</p> <p>Consider multiple accounts or explanations before formulating conclusions; shift own thinking in response to new information or different perspectives.</p>
SELF-REGULATION AND REFLECTION	<p>Reflection: Identifies own strengths and weaknesses as a critical thinker.</p> <p>Planning: Sets personal goals for critical thinking.</p> <p>Mindset: Explains the relationship between effort and success (for example: “The harder I work at this, the better I’ll be at it.”; “I will work harder in this class from now on.”).</p>	<p>Reflection: Assesses thinking, reasoning, and critical thinking dispositions in response to feedback and/or established criteria.</p> <p>Planning: Sets goals for critical thinking based on feedback and/or established criteria.</p> <p>Mindset: Demonstrates a desire to improve (for example: employs more practice, sets goals for improvement, asks for help from others instead of giving up).</p>	<p>Reflection: Accurately reflects on thinking, reasoning, and critical thinking dispositions; uses reflection and/or feedback to revise ideas or products.</p> <p>Questions and critiques own thinking process, including how strengths and weaknesses in own thinking, reasoning, and critical thinking dispositions may have affected the process or outcome.</p>	<p>Reflection: Analyze patterns and trends in own thinking process.</p> <p>Evaluate own thinking, reasoning, and critical thinking dispositions throughout the process.</p> <p>Seek out and act on feedback from peers, teacher, and experts to improve.</p> <p>Planning: Analyze patterns and prior performance to set new goals for critical thinking; revise</p>

	<p>See possible student misconceptions following the rubrics.</p>		<p>Planning: Seeks out, selects, and uses resources and strategies to achieve goals for improving the thinking process.</p> <p>Mindset: Demonstrates a growth mindset (the belief that one can “get smarter” at critical thinking through effective effort) in response to setbacks and challenges <i>(for example: persists on difficult tasks, takes risks in the learning process, accepts and uses feedback/criticism, is comfortable making mistakes, explains failure from a growth mindset perspective).</i></p>	<p>goals in response to ongoing reflection.</p> <p>Mindset: Proactively improve own areas of weakness by employing effective strategies to increase growth mindset <i>(for example: perseverance, taking risks, effective decision-making, actively seeking others’ feedback, deliberate practice, finding and using external resources [skilled peers, other adult experts] to enrich and extend learning).</i></p>
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PROBLEM SOLVING

DLP PERFORMANCE AREA	1.0 (Novice) The student may exhibit the following readiness skills for Score 2.0:	2.0 (Basic) When presented with a grade-appropriate task, the student:	3.0 (Proficient) In addition to Score 2.0, the student:	4.0 (Advanced) In addition to Score 3.0, the student may:
FRAMING THE PROBLEM	<p>Understanding the Problem: States the problem and/or stated goal(s) or objective(s).</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Understanding the Problem: Describes the problem and/or stated goal(s) or objective(s) in own words.</p> <p>Asks clarifying questions related to the problem.</p>	<p>Understanding the Problem: Identifies information necessary to solve the problem (<i>for example: what is known, what is unknown, specifications, stakeholders, etc.</i>).</p> <p>Clarifies facts or processes with regard to the problem.</p>	<p>Understanding the Problem: Determine what prior knowledge will be useful in solving the problem.</p> <p>Identify the scope of the problem, including structures, patterns, constraints, and limitations.</p> <p>Clarify concepts and relationships with regard to the problem.</p>
SOLUTION FINDING	<p>Strategizing: Identifies problem-solving strategies.</p> <p>Solving the Problem: Applies a given strategy or approach to solve a problem or develop a solution.</p> <p>Evaluation: Explains the reasonableness of a given solution or approach to the problem, given specific criteria.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Strategizing: Selects an appropriate strategy or approach to solving the problem.</p> <p>Solving the Problem: Applies an appropriate strategy or approach to solve a problem or develop a solution.</p> <p>Evaluation: Evaluates the general effectiveness of the strategy or approach and the reasonableness of the solution (<i>for example: "This strategy worked because it helped me get the right answer."</i>)</p>	<p>Strategizing: Selects multiple effective strategies or approaches to solve the problem efficiently.</p> <p>Solving the Problem: Applies an efficient strategy or effective approach to accurately solve a problem or develop a valid solution.</p> <p>Evaluation: Evaluates the effectiveness of the strategy or approach and the validity of the solution by applying relevant criteria (<i>for example: effectiveness, efficiency, validity, etc.</i>).</p>	<p>Strategizing: Identify innovative, plausible strategies or approaches to solve the problem.</p> <p>Solving the Problem: Apply an elegant or innovative strategy or approach to solve the problem or develop a valid solution.</p> <p>Evaluation: Compare multiple approaches to identify and justify the most effective approach within the context of the problem.</p>

			Uses the evaluation to determine the need for further work on the problem.	
SELF-REGULATION AND REFLECTION	<p>Reflection: Identifies own strengths and weaknesses as a problem solver</p> <p>Planning: Sets personal goals for problem solving.</p> <p>Mindset: Explains the relationship between effort and success <i>(for example: “The harder I work at this, the better I’ll be at it”; “I will work harder in this class from now on.”)</i>.</p> <p>See possible student misconceptions following the rubrics</p>	<p>Reflection: Assesses problem-solving skills and processes in response to feedback and/or established criteria.</p> <p>Planning: Sets goals for problem solving based on feedback and/or established criteria.</p> <p>Mindset: Demonstrates a desire to improve <i>(for example: employs more practice, sets goals for improvement, asks for help from others instead of giving up)</i>.</p>	<p>Reflection: Accurately reflects on problem-solving skills and processes; uses reflection and/or feedback to revise ideas or products.</p> <p>Questions and critiques own problem-solving skills and processes.</p> <p>Planning: Seeks out, selects, and uses resources and strategies to achieve goals for improving the problem-solving process.</p> <p>Mindset: Demonstrates a growth mindset (the belief that one can “get smarter” at problem solving through effective effort) in response to setbacks and challenges <i>(for example: persists on difficult tasks, takes risks in the learning process, accepts and uses feedback/criticism, is comfortable making mistakes, explains failure from a growth mindset perspective)</i>.</p>	<p>Reflection: Analyze patterns and trends in own problem-solving skills and processes.</p> <p>Evaluate own problem-solving skills, strategies, and approaches throughout the process.</p> <p>Seek out and act on feedback from peers, teacher, and experts to improve.</p> <p>Planning: Analyze patterns and prior performance to set new goals for problem solving; revise goals in response to ongoing reflection.</p> <p>Mindset: Proactively improve own areas of weakness by employing effective strategies to increase growth mindset <i>(for example: perseverance, taking risks, effective decision-making, actively seeking others’ feedback, deliberate practice, finding and using external resources [skilled peers, other adult experts] to enrich and extend learning)</i>.</p>

Possible Misconceptions: 3-5 Critical Thinking

The following chart lists possible misconceptions about **Critical Thinking**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

<i>Students might exhibit the following misconception, belief, or perception that...</i>		
Inquiry: Information and Discovery	Framing the Investigation	<ul style="list-style-type: none"> • The purpose of the investigation is to complete the task (for example: write an essay, conduct a research project). • Bias is inherently negative. • There is such a thing as an unbiased source. • I don't have any biases, or, I don't have any biases about _____.
	Questioning	<ul style="list-style-type: none"> • The topic is one-dimensional, rather than multifaceted (for example: struggles to narrow a topic into multiple, relevant questions; asks only one type of question or asks the same question repeatedly, using different words). • One question is sufficient for inquiry. • Answers are more important than questions.
	Information Gathering	<ul style="list-style-type: none"> • Research is framed around topics and answers rather than questions. • The most important part of research is finding “the” answers rather than developing inquiry questions to open up exploration of the topic. • I can find all the information I need through Google. • If an idea conflicts with my perspective, values, or beliefs, I should disregard it.
	Source Evaluation	<ul style="list-style-type: none"> • Ease of investigation is more important than depth of understanding (for example: rejects or accepts information based on arbitrary criteria, such as selecting the first piece of information that aligns with preconceived beliefs). • If a source is published, it is a credible source. • All news stories are true and unbiased.
Interpretation, Analysis, and Reasoning	Organization	<ul style="list-style-type: none"> • There is no connection between the task of categorizing and the purpose of organizing information (for example: creates arbitrary categories, such as where or when the information was found; lists repetitive information).

		<ul style="list-style-type: none"> • There is only one way to categorize information.
	Meaning-making	<ul style="list-style-type: none"> • All information is equally important (for example: forms inferences from irrelevant information or observations, creates inaccurate generalizations out of limited information or misconceptions). • A conclusion can be formed from a cursory examination of information. • I should form my opinion first and then seek evidence to support it. • The goal of analysis is to prove that my thinking is “right.”

Possible Misconceptions: 3-5 Problem Solving

The following chart lists possible misconceptions about **Problem Solving**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

<i>Students might exhibit the following misconception, belief, or perception that...</i>		
Framing the Problem	Understanding the Problem	<ul style="list-style-type: none"> • All information is equally important (for example: mistakes irrelevant or interesting information for essential information; applies irrelevant background knowledge; asks questions about details not important to the problem).
Solution Finding	Strategizing	<ul style="list-style-type: none"> • One content-appropriate strategy will be effective in all contexts. • Once I identify a strategy or approach that works, it is a waste of time to consider additional options.
	Solving the Problem	<ul style="list-style-type: none"> • Applying the strategy eliminates the need to think through the problem. • “Efficient” and “effective” mean the same thing. • As long as I reach a solution, it doesn’t matter how I got there.
	Evaluation	<ul style="list-style-type: none"> • The point of the problem is to solve it and that the strategy or approach used is irrelevant. • There is a “right” way to solve the problem or only one way to solve the problem.

Possible Misconceptions: 3-5 Self-Regulation and Reflection

The following chart lists possible misconceptions about **Self-Regulation and Reflection**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

Self-Regulation and Reflection	Reflection	<ul style="list-style-type: none"> • Reflection is all about what I think; other people’s perspectives don’t matter. • Only the teacher’s perspective matters when it comes to identifying strengths and weaknesses. • I don’t have any weaknesses. • I don’t have any strengths. • All weaknesses affect my performance in the same way. • Reflection is a waste of time; I don’t need to reflect to improve.
	Planning	<ul style="list-style-type: none"> • A goal is the same thing as a plan. • Any goal is a worthy goal. • Short-term goals aren’t important. • I don’t need a plan; if I set a goal, I will achieve it. • I should set goals in areas where I am already successful. • I should set the same goal over and over. • Someone else will give me resources and ideas about how to improve.
	Mindset	<ul style="list-style-type: none"> • [Critical Thinking] [Problem Solving] is a talent and not a skill; I am as good at it as I’ll ever be. • If I’m really good at something, I won’t encounter any challenges. • If I experience a setback, I’ve failed. • Others’ feedback can’t help me. • Mistakes are bad; smart people don’t make mistakes. • The safe route leads to guaranteed success.

CRITICAL THINKING AND PROBLEM SOLVING RUBRICS

GRADES 6-8



CATALINA FOOTHILLS SCHOOL DISTRICT
TUCSON, ARIZONA

General Description and Suggestions for Use

The district’s strategic plan, Envision21: Deep Learning, forms the basis for a focus on cross-disciplinary skills/proficiencies necessary for preparing our students well for a 21st century life that is increasingly complex and global. These skills, which are CFSD’s “deep learning proficiencies” (DLPs) are represented as 5c + s = dlp. They are the 5Cs: (1) Citizenship, (2) Critical Thinking and Problem Solving, (3) Creativity and Innovation, (4) Communication, (5) Collaboration + S: Systems Thinking. CFSD developed a set of rubrics (K-2, 3-5, 6-8, and 9-12) for each DLP.

These rubrics were developed using a backward design process to define and prioritize the desired outcomes for each DLP. They provide a common vocabulary and illustrate a continuum of performance. By design, the rubrics were not written to align to any specific subject area; they are intended to be contextualized within the academic content areas based on the performance area(s) being taught and assessed. In practice, this will mean that not every performance area in each of the rubrics will be necessary in every lesson, unit, or assessment.

Critical thinking and problem-solving processes overlap in many ways, but they are separated in this iteration of the DLP rubrics to clarify the definitions and characteristics of each and to make them more broadly applicable to a variety of tasks, contexts, and subject areas. The CFSD rubrics for **Critical Thinking and Problem Solving** were designed as a cross-disciplinary tool to support educators in teaching and assessing the performance areas associated with these proficiencies:

Critical Thinking:

- **Inquiry: Information and Discovery**
- **Interpretation, Analysis, and Reasoning**
- **Self-Regulation and Reflection**

Problem Solving:

- **Framing the Problem**
- **Solution Finding**
- **Self-Regulation and Reflection**

These tools are to be used primarily for formative instructional and assessment purposes; they are not intended to generate psychometrically valid, high stakes assessment data typically associated with state and national testing. CFSD provides a variety of tools and templates to support the integration of both **Critical Thinking and Problem Solving** into units, lessons, and assessments. When designing units, teachers are encouraged to create authentic assessment opportunities in which students can demonstrate mastery of content and the deep learning proficiencies at the same time.

The approach to teaching the performance areas in each rubric may vary by subject area because the way in which they are applied may differ based on the field of study. Scientists, mathematicians, social scientists, engineers, artists, and musicians (for example), all collaborate, solve problems, and share

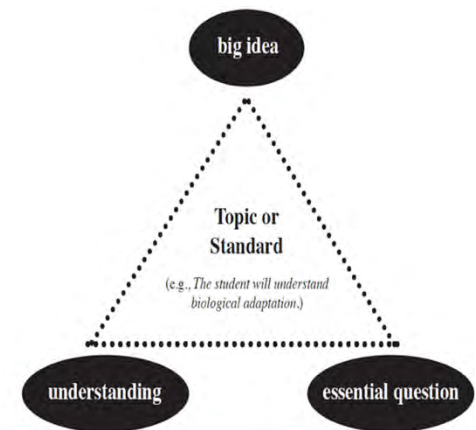
their findings or work within their professional communities. However, the way in which they approach their work, the tools used for collaboration, and the format for communicating their findings may vary based on the profession. These discipline-specific expressions of the 5Cs + S may require some level of customization based on the subject area. Each rubric can also be used to provide students with an opportunity to self-assess the quality of their work in relation to the performance areas. Student-friendly language or “I can” statements can be used by students to monitor and self-assess their progress toward established goals for each performance area.

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CFSD educators prioritize understanding and transfer to ensure that learning extends beyond the school experience. This 2019 version of the DLP, **Critical Thinking and Problem Solving**, includes long-term **transfer goals** that describe autonomous applications of student learning in college, career, and civic life. “Drill and direct instruction can develop discrete skills and facts into automaticity...but they cannot make us truly able. Understanding is about *transfer*, in other words. To be truly able requires the ability to transfer what we have learned to new and sometimes confusing settings. The ability to transfer our knowledge and skill effectively involves the capacity to take what we know and use it creatively, flexibly, fluently, in different settings or problems, on our own” (Wiggins and McTighe, 2011, p. 40).

Big Ideas

This 2019 version of the DLP, **Critical Thinking and Problem Solving**, includes a set of Understandings and Essential Questions (UEQs) developed by an interdisciplinary team of K-12 teachers and administrators with guidance from Jay McTighe, author of *Understanding by Design*. These big ideas will guide teachers toward the thoughtful design of assessments, units, and lessons that will facilitate transfer of deep learning. “Because big ideas are the basis of unified and effective understanding, they provide a way to set curriculum and instructional priorities...they illuminate experience; they are the linchpin of transfer...” (Wiggins and McTighe, 2011, p.71). “Understandings are the specific insights, inferences, or conclusions about the big idea you want your students to leave with” (Wiggins and McTighe, 2011, p. 80). “Essential questions make our unit plans more likely to yield focused and thoughtful learning and learners” (McTighe, 2017; McTighe & Wiggins, 2013, p. 17). The figure on the right represents the interrelationship among big ideas, understandings, and essential questions.



The **DLP Understandings** are written for K-12 because they express lasting, transferable goals for student learning. Understandings are meant to be revisited over time and across contexts. The continuity of working toward the same goals will help students deepen their understanding from Kindergarten to 12th grade. Understandings are primarily planning tools for teachers, although teachers may choose to share them with their students, if appropriate. Communicating an Understanding does not give away “the answer,” since simply stating an Understanding is not the same as truly grasping its meaning.

The **Essential Questions** are teaching and learning tools that help students unpack the Understandings. They support inquiry and engagement with deep learning and therefore may vary in complexity across grade levels.

Critical Thinking Transfer Goals and UEQs

Transfer Goals	
<p>Students will be able to independently use their learning to . . .</p> <ul style="list-style-type: none"> Critically analyze and evaluate a variety of information and claims in order to determine what to think, believe, or do. 	
Understandings	Essential Questions
Students will understand that . . .	Students will keep considering . . .
<ol style="list-style-type: none"> Critical thinkers remain open-minded and skeptical, ask questions, and deliberately seek alternative points of view before reaching decisions or taking actions. 	<ul style="list-style-type: none"> How do I know what is true? How should I decide what to believe and do? How will different points of view affect my decision making?
<ol style="list-style-type: none"> Critical thinkers organize and analyze information in order to make meaning and decide what to believe or what actions to take. 	<ul style="list-style-type: none"> How do I make meaning?
<ol style="list-style-type: none"> Critical thinkers are willing to “shift gears” when presented with sound reasoning and solid evidence. 	<ul style="list-style-type: none"> When should I shift my thinking?
<ol style="list-style-type: none"> Critical thinkers actively identify and challenge personal biases that influence thinking. 	<ul style="list-style-type: none"> How does what I believe or value influence my thinking?

Problem Solving Transfer Goals and UEQs

Transfer Goals	
<p>Students will be able to independently use their learning to . . .</p> <ul style="list-style-type: none"> • Make sense of messy, never-before-seen problems, and persevere in solving them. 	
Understandings	Essential Questions
Students will understand that. . .	Students will keep considering. . .
<p>1. Effective problem solvers are flexible thinkers who consider multiple ways of defining a problem and who evaluate options before reaching a solution.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • What is the “real” problem? • Where do I begin when solving a problem?
<p>2. Effective problem solvers intentionally select strategies, tools, and approaches that are appropriate for a given context, audience, and perspective.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • Where do I begin when solving a problem? • What are the best strategies to solve the problem?
<p>3. Effective problem solvers expect to get stuck, and they take action to persevere through challenges.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • What do I do when I get stuck?
<p>4. Effective problem solvers don’t stop once a solution has been reached; they evaluate their work in pursuit of deeper understanding.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • How do I know I’ve solved the problem? • How do I know which solution is best? • What do I do once I’ve reached a solution?

Self-Regulation and Reflection Transfer Goals and UEQs

Transfer Goals	
Students will be able to independently use their learning to . . . <ul style="list-style-type: none"> Improve performance and persevere through challenges by applying deliberate effort, appropriate strategies, and flexible thinking. 	
Understandings	Essential Questions
Students will understand that. . .	Students will keep considering. . .
1. Effective learners set goals, regularly monitor their thinking, seek feedback, self-assess, and make needed adjustments.	<ul style="list-style-type: none"> How am I doing? How do I know? What are my next steps? What is the most effective way to monitor my progress? How do I know which feedback will help me improve my work? How can I get useful feedback? How do I prioritize my work? How can I maintain focus on areas of influence rather than on factors I cannot influence?
2. We can always improve our performance through deliberate effort and use of strategies.	<ul style="list-style-type: none"> How can I keep getting better at [critical thinking] [problem solving]?

The deep learning proficiencies (5c+ s) are highly interconnected. For example, productive collaboration is contingent upon effective communication. Efficient and effective problem solving often requires collaboration skills. Divergent and convergent thinking, which are traits of Creativity and Innovation, are directly related to critical thinking. Our students will need to use a combination of proficiencies to solve problems in new contexts beyond the classroom. Therefore, it is important to be clear about which proficiency and/or performance area(s) are the focus for student learning, and then to assist students in understanding the connections between them and how they are mutually supportive.

What does Score 1.0 – Score 4.0 mean in the rubrics?

The rubrics are intended to support student progress toward mastering the deep learning proficiencies (DLPs). Four levels of performance are articulated in each rubric: Score 1.0 (Novice), Score 2.0 (Basic), Score 3.0 (Proficient), and Score 4.0 (Advanced). The descriptions follow a growth model to support students in developing their skills in each performance area. Scores 1.0 (Novice) and 2.0 (Basic) describe positive steps that students might take toward achieving Score 3.0 (Proficient) or Score 4.0 (Advanced) performance.

When using the rubrics to plan for instruction and assessment, teachers need to consider the knowledge and skills described in the Score 2.0 column (Basic) to be embedded in the Score 3.0 (Proficient) and 4.0 (Advanced) performance. The Novice level (Score 1.0) indicates that the student does not yet

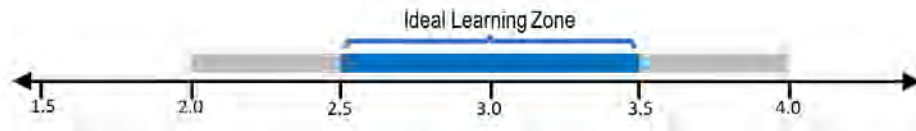
demonstrate the basic skills within the performance area, but that he/she exhibits related readiness skills that are a stepping-stone to a higher level of proficiency. Descriptions at the Novice level also include likely misconceptions that the student might exhibit.

The descriptive rubrics are designed to illustrate students' depth of knowledge/skill at various levels in order to facilitate the instructional and assessment process for all learners. At some performance levels, the indicators may remain the same, but the material under study is more or less complex depending on the grade level band (for example: the complexity of the material at grades 6-8 differs from that of grades 3-5 or 9-12).

The following descriptions explain the four levels on the rubric:

- Score 1.0 (Novice): Describes student performance that demonstrates readiness skills and/or misconceptions and requires significant support.
- Score 2.0 (Basic): Describes student performance that is below proficient, but that demonstrates mastery of basic skills/knowledge, such as terms and details, definitions, basic inferences, and processes.
- Score 3.0 (Proficient): Describes student performance that is proficient – the targeted expectations for each performance area of the DLP.
- Score 4.0 (Advanced): Describes an exemplary performance that exceeds proficiency.

The image below represents the ideal learning zone for students as 2.5 – 3.5.



Sources

The following sources directly influenced the revision of CFSD's rubrics:

- Catalina Foothills School District. (2011, 2014, 2015). Rubrics for 21st century skills and rubrics for deep learning proficiencies. Tucson, Arizona.
- EdLeader21 (2013). 4Cs rubrics. Tucson, Arizona. [Adaptations from 4Cs Rubrics]
- McTighe, J., & Wiggins, G. P. (2013). Essential questions: Opening doors to student understanding. Alexandria, Virginia: ASCD.
- Partnership for 21st Century Skills. (2009). P21 framework definitions. Washington, DC.
- Rhodes, T. L. (Ed.) (2010). Assessing outcomes and improving achievement: Tips and tools for using rubrics. Association of American Colleges and Universities: Washington D.C. [Adaptations from VALUE rubrics, VALUE Project]
- Wiggins, G.P. & McTighe, J. (2011). The understanding by design guide to creating high-quality units. Alexandria, Virginia: ASCD.

CRITICAL THINKING

DLP PERFORMANCE AREA	1.0 (Novice) The student may exhibit the following readiness skills for Score 2.0:	2.0 (Basic) When presented with a grade-appropriate task, the student:	3.0 (Proficient) In addition to Score 2.0, the student:	4.0 (Advanced) In addition to Score 3.0, the student may:
INQUIRY: INFORMATION AND DISCOVERY	<p>Framing the Investigation: Identifies a topic and purpose for investigation.</p> <p>Defines “cognitive bias.”</p> <p>Questioning: Asks general questions to learn information about the broad topic under investigation.</p> <p>Information Gathering: Gathers general information related to the broad topic under investigation.</p> <p>Source Evaluation: Identifies information within sources that is relevant to the topic under investigation.</p> <p>Identifies language that indicates bias.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Framing the Investigation: Describes aspects of the topic under investigation (<i>for example: context, characteristics, stakeholders, genre, parameters, etc.</i>).</p> <p>Acknowledges own general biases.</p> <p>Questioning: Formulates questions related to the specific topic under investigation.</p> <p>Generates additional questions and/or refines questions in response to new information.</p> <p>Information Gathering: Gathers background information about the topic under investigation in order to develop and answer questions (<i>for example: Wikipedia or encyclopedia excerpts</i>).</p> <p>Source Evaluation: Establishes criteria to evaluate information for the specific topic under investigation (<i>for example: accuracy, credibility, timeliness, authority, etc.</i>).</p>	<p>Framing the Investigation: Identifies relationships among aspects of the topic under investigation, describing them as interrelated elements rather than isolated pieces.</p> <p>Acknowledges own biases with regard to the task or topic under investigation.</p> <p>Questioning: Formulates clear and precise questions that challenge own beliefs or biases about the topic.</p> <p>Reformulates questions in response to information gathered.</p> <p>Prioritizes questions to provide a solid foundation for inquiry.</p> <p>Information Gathering: Gathers information from multiple relevant, timely, and credible sources, using a variety of collection methods (<i>for example: internet searches, surveys, databases, interviews, library catalog, etc.</i>).</p>	<p>Framing the Investigation: Defines the topic under investigation by examining it through various lenses or perspectives.</p> <p>Explain how own biases might influence the investigation.</p> <p>Questioning: Formulate and refine inquiry questions that explore multiple angles of the topic under investigation.</p> <p>Information Gathering: Gather information from diverse contexts, disciplines, and/or cultures.</p> <p>Source Evaluation: Compare information across sources to determine credibility and accuracy.</p>

		Generally applies criteria to source selection and determines which sources to use and which to disregard.	Deliberately seeks diverse perspectives or information that conflicts with own beliefs, values, and perspectives. Source Evaluation: Selects appropriate criteria to evaluate sources and information; justifies which sources will provide the most useful information with regard to the question(s).	
INTERPRETATION, ANALYSIS, AND REASONING (Making meaning of information to form conclusions)	Organization: Creates categories to organize information; lists the information. Meaning-Making: Defines different types of information (<i>for example: anecdotal, circumstantial, testimonial, statistical, visual, etc.</i>). Makes observations about information. See possible student misconceptions following the rubrics.	Organization: Classifies and compares information to organize it into logical groups. Meaning-Making: Interprets information accurately to form inferences. Formulates conclusions from information, observations, and inferences. Identifies connections between information and conclusions.	Organization: Organizes and prioritizes information to reveal important differences, similarities, and/or patterns related to the topic under investigation. Meaning-Making: Formulates logical, valid inferences from information. Analyzes patterns to make meaning from the whole body of information. Considers multiple accounts or explanations before formulating conclusions; shifts own thinking in response to new information or different perspectives.	Organization: Reorganize information in multiple ways to reveal insights into the topic, to challenge own assumptions, or to expose flaws in own thinking. Meaning-Making: Analyze outliers, contradictions, and inconsistencies in order to develop a complex conclusion.
SELF-REGULATION AND REFLECTION	Reflection: Identifies own strengths and weaknesses as a critical thinker.	Reflection: Assesses thinking, reasoning, and critical thinking dispositions in response to feedback and/or established criteria.	Reflection: Accurately reflects on thinking, reasoning, and critical thinking dispositions; uses reflection and/or feedback to revise ideas or products.	Reflection: Analyze patterns and trends in own thinking process. Evaluate own thinking, reasoning, and critical thinking

	<p>Planning: Sets personal goals for critical thinking.</p> <p>Mindset: Identifies the relationship between effort and success (<i>for example: “The harder I work at this, the better I’ll be at it.”; “I will work harder in this class from now on.”</i>).</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Planning: Sets goals for critical thinking based on feedback and/or established criteria.</p> <p>Mindset: Demonstrates a desire to improve (<i>for example: employs more practice, sets goals for improvement, asks for help from others instead of giving up</i>).</p>	<p>Questions and critiques own thinking process, including how strengths and weaknesses in own thinking, reasoning, and critical thinking dispositions may have affected the process or outcome.</p> <p>Planning: Seeks out, selects, and uses resources and strategies to achieve goals for improving the thinking process.</p> <p>Mindset: Demonstrates a growth mindset (the belief that one can “get smarter” at critical thinking through effective effort) in response to setbacks and challenges (<i>for example: persists on difficult tasks, takes risks in the learning process, accepts and uses feedback/criticism, is comfortable making mistakes, explains failure from a growth mindset perspective</i>).</p>	<p>dispositions throughout the process.</p> <p>Seek out and act on feedback from peers, teacher, and experts to improve.</p> <p>Planning: Analyze patterns and prior performance to set new goals for critical thinking; revise goals in response to ongoing reflection.</p> <p>Mindset: Proactively improve own areas of weakness by employing effective strategies to increase growth mindset (<i>for example: perseverance, taking risks, effective decision-making, actively seeking others’ feedback, deliberate practice, finding and using external resources [skilled peers, other adult experts] to enrich and extend learning</i>).</p>
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PROBLEM SOLVING

DLP PERFORMANCE AREA	1.0 (Novice) The student may exhibit the following readiness skills for Score 2.0:	2.0 (Basic) When presented with a grade-appropriate task, the student:	3.0 (Proficient) In addition to Score 2.0, the student:	4.0 (Advanced) In addition to Score 3.0, the student may:
FRAMING THE PROBLEM	<p>Understanding the Problem: Describes the problem and/or stated goal(s) or objective(s) in own words.</p> <p>Asks clarifying questions related to the problem.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Understanding the Problem: Identifies information necessary to solve the problem (<i>for example: what is known, what is unknown, specifications, stakeholders, etc.</i>).</p> <p>Clarifies facts or processes with regard to the problem.</p>	<p>Understanding the Problem: Determines what prior knowledge will be useful in solving the problem.</p> <p>Identifies the scope of the problem, including structures, patterns, constraints, and limitations.</p> <p>Clarifies concepts and relationships with regard to the problem.</p>	<p>Understanding the Problem: Uncover relevant information that is not readily apparent.</p> <p>Apply additional relevant content and/or consider alternate contexts to deepen understanding of the problem (<i>for example: examine the problem from different perspectives, examine potential outliers, extend relevant concepts and processes beyond the scope of the problem, etc.</i>).</p>
SOLUTION FINDING	<p>Strategizing: Identifies problem-solving strategies.</p> <p>Solving the Problem: Applies a given strategy or approach to solve a problem or develop a solution.</p> <p>Evaluation: Determines the reasonableness of the solution or approach to the problem, given specific criteria.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Strategizing: Selects an appropriate strategy or approach to solving the problem.</p> <p>Solving the Problem: Applies an appropriate strategy or approach to solve a problem or to develop a solution.</p> <p>Evaluation: Establishes and applies criteria to evaluate the general effectiveness of the strategy or approach and the reasonableness of the solution.</p>	<p>Strategizing: Selects multiple effective strategies or approaches to solve the problem efficiently.</p> <p>Solving the Problem: Applies an efficient strategy or effective approach to accurately solve a problem or develop a valid solution.</p> <p>Evaluation: Evaluates the effectiveness of the strategy or approach and the validity of the solution by applying relevant criteria.</p>	<p>Strategizing: Identify innovative, plausible strategies or approaches to solve the problem.</p> <p>Solving the Problem: Apply an elegant or innovative strategy or approach to solve the problem or develop a valid solution.</p> <p>Evaluation: Compare multiple approaches to identify and justify the most effective approach within the context of the problem.</p>

			<p>Uses the evaluation to determine the need for further work on the problem.</p>	
<p>SELF-REGULATION AND REFLECTION</p>	<p>Reflection: Identifies own strengths and weaknesses as a problem solver.</p> <p>Planning: Sets personal goals for problem solving.</p> <p>Mindset: Explains the relationship between effort and success (<i>for example: “The harder I work at this, the better I’ll be at it”; “I will work harder in this class from now on.”</i>).</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Reflection: Assesses problem solving-skills and processes in response to feedback and/or established criteria.</p> <p>Planning: Sets goals for problem solving based on feedback and/or established criteria.</p> <p>Mindset: Demonstrates a desire to improve (<i>for example: employs more practice, sets goals for improvement, asks for help from others instead of giving up</i>).</p>	<p>Reflection: Accurately reflects on problem-solving skills and processes; uses reflection and/or feedback to revise ideas or products.</p> <p>Questions and critiques own problem-solving skills and processes.</p> <p>Planning: Seeks out, selects, and uses resources and strategies to achieve goals for improving the thinking process.</p> <p>Mindset: Demonstrates a growth mindset (the belief that one can “get smarter” at problem solving through effective effort) in response to setbacks and challenges (<i>for example: persists on difficult tasks, takes risks in the learning process, accepts and uses feedback/criticism, is comfortable making mistakes, explains failure from a growth mindset perspective</i>).</p>	<p>Reflection: Analyze patterns and trends in own problem-solving skills and processes.</p> <p>Evaluate own problem-solving skills, strategies, and approaches throughout the process.</p> <p>Seek out and act on feedback from peers, teacher, and experts to improve.</p> <p>Planning: Analyze patterns and prior performance to set new goals for problem solving; revise goals in response to ongoing reflection.</p> <p>Revise own thinking when the evidence points to other possibilities.</p> <p>Mindset: Proactively improve own areas of weakness by employing effective strategies to increase growth mindset (<i>for example: perseverance, taking risks, effective decision-making, actively seeking others’ feedback, deliberate practice, finding and using external resources [skilled peers, other adult experts] to enrich and extend learning</i>).</p>

Possible Misconceptions: 6-8 Critical Thinking

The following chart lists possible misconceptions about **Critical Thinking**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

<i>Students might exhibit the following misconception, belief, or perception that...</i>		
Inquiry: Information and Discovery	Framing the Investigation	<ul style="list-style-type: none"> • The purpose of the investigation is to complete the task (for example: write an essay, conduct a research project). • Bias is inherently negative. • There is such a thing as an unbiased source. • I don't have any biases, or, I don't have any biases about _____.
	Questioning	<ul style="list-style-type: none"> • The topic is one-dimensional, rather than multifaceted (for example: struggles to narrow a topic into multiple, relevant questions; asks only one type of question or asks the same question repeatedly, using different words). • One question is sufficient for inquiry. • Answers are more important than questions.
	Information Gathering	<ul style="list-style-type: none"> • Research is framed around topics and answers rather than questions. • The most important part of research is finding "the" answers rather than developing inquiry questions to open up exploration of the topic. • I can find all the information I need through Google. • If an idea conflicts with my perspective, values, or beliefs, I should disregard it.
	Source Evaluation	<ul style="list-style-type: none"> • Ease of investigation is more important than depth of understanding (for example: rejects or accepts information based on arbitrary criteria, such as selecting the first piece of information that aligns with preconceived beliefs). • If a source is published, it is a credible source. • All news stories are true and unbiased.
Interpretation, Analysis, and Reasoning	Organization	<ul style="list-style-type: none"> • There is no connection between the task of categorizing and the purpose of organizing information (for example: creates arbitrary categories, such as where or when the information was found; lists repetitive information). • There is only one way to categorize information.

	Meaning-making	<ul style="list-style-type: none"> • All information is equally important (for example: forms inferences from irrelevant information or observations, creates inaccurate generalizations out of limited information or misconceptions). • A conclusion can be formed from a cursory examination of information. • I should form my opinion first and then seek evidence to support it. • The goal of analysis is to prove that my thinking is “right.”
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Possible Misconceptions: 6-8 Problem Solving

The following chart lists possible misconceptions about **Problem Solving**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

<i>Students might exhibit the following misconception, belief, or perception that...</i>		
Framing the Problem	Understanding the Problem	<ul style="list-style-type: none"> • All information is equally important (for example: mistakes irrelevant or interesting information for essential information; applies irrelevant background knowledge; asks questions about details not important to the problem).
Solution Finding	Strategizing	<ul style="list-style-type: none"> • One content-appropriate strategy will be effective in all contexts. • Once I identify a strategy or approach that works, it is a waste of time to consider additional options.
	Solving the Problem	<ul style="list-style-type: none"> • Applying the strategy eliminates the need to think through the problem. • “Efficient” and “effective” mean the same thing. • As long as I reach a solution, it doesn’t matter how I got there.
	Evaluation	<ul style="list-style-type: none"> • The point of the problem is to solve it and that the strategy or approach used is irrelevant. • There is a “right” way to solve the problem or only one way to solve the problem.

Possible Misconceptions: 6-8 Self-Regulation and Reflection

The following chart lists possible misconceptions about **Self-Regulation and Reflection**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

Self-Regulation and Reflection	Reflection	<ul style="list-style-type: none"> • Reflection is all about what I think; other people’s perspectives don’t matter. • Only the teacher’s perspective matters when it comes to identifying strengths and weaknesses. • I don’t have any weaknesses. • I don’t have any strengths. • All weaknesses affect my performance in the same way. • Reflection is a waste of time; I don’t need to reflect to improve.
	Planning	<ul style="list-style-type: none"> • A goal is the same thing as a plan. • Any goal is a worthy goal. • Short-term goals aren’t important. • I don’t need a plan; if I set a goal, I will achieve it. • I should set goals in areas where I am already successful. • I should set the same goal over and over. • Someone else will give me resources and ideas about how to improve.
	Mindset	<ul style="list-style-type: none"> • [Critical Thinking] [Problem Solving] is a talent and not a skill; I am as good at it as I’ll ever be. • If I’m really good at something, I won’t encounter any challenges. • If I experience a setback, I’ve failed. • Others’ feedback can’t help me. • Mistakes are bad; smart people don’t make mistakes. • The safe route leads to guaranteed success.

CRITICAL THINKING AND PROBLEM SOLVING RUBRICS

GRADES 9-12



CATALINA FOOTHILLS SCHOOL DISTRICT
TUCSON, ARIZONA

General Description and Suggestions for Use

The district’s strategic plan, Envision21: Deep Learning, forms the basis for a focus on cross-disciplinary skills/proficiencies necessary for preparing our students well for a 21st century life that is increasingly complex and global. These skills, which are CFSD’s “deep learning proficiencies” (DLPs) are represented as 5c + s = dlp. They are the 5Cs: (1) Citizenship, (2) Critical Thinking and Problem Solving, (3) Creativity and Innovation, (4) Communication, (5) Collaboration + S: Systems Thinking. CFSD developed a set of rubrics (K-2, 3-5, 6-8, and 9-12) for each DLP.

These rubrics were developed using a backward design process to define and prioritize the desired outcomes for each DLP. They provide a common vocabulary and illustrate a continuum of performance. By design, the rubrics were not written to align to any specific subject area; they are intended to be contextualized within the academic content areas based on the performance area(s) being taught and assessed. In practice, this will mean that not every performance area in each of the rubrics will be necessary in every lesson, unit, or assessment.

Critical thinking and problem-solving processes overlap in many ways, but they are separated in this iteration of the DLP rubrics to clarify the definitions and characteristics of each and to make them more broadly applicable to a variety of tasks, contexts, and subject areas. The CFSD rubrics for **Critical Thinking and Problem Solving** were designed as a cross-disciplinary tool to support educators in teaching and assessing the performance areas associated with these proficiencies:

Critical Thinking:

- **Inquiry: Information and Discovery**
- **Interpretation, Analysis, and Reasoning**
- **Self-Regulation and Reflection**

Problem Solving:

- **Framing the Problem**
- **Solution Finding**
- **Self-Regulation and Reflection**

These tools are to be used primarily for formative instructional and assessment purposes; they are not intended to generate psychometrically valid, high stakes assessment data typically associated with state and national testing. CFSD provides a variety of tools and templates to support the integration of both **Critical Thinking and Problem Solving** into units, lessons, and assessments. When designing units, teachers are encouraged to create authentic assessment opportunities in which students can demonstrate mastery of content and the deep learning proficiencies at the same time.

The approach to teaching the performance areas in each rubric may vary by subject area because the way in which they are applied may differ based on the field of study. Scientists, mathematicians, social scientists, engineers, artists, and musicians (for example), all collaborate, solve problems, and share their findings or work within their professional communities. However, the way in which they approach their work, the tools used for collaboration, and the

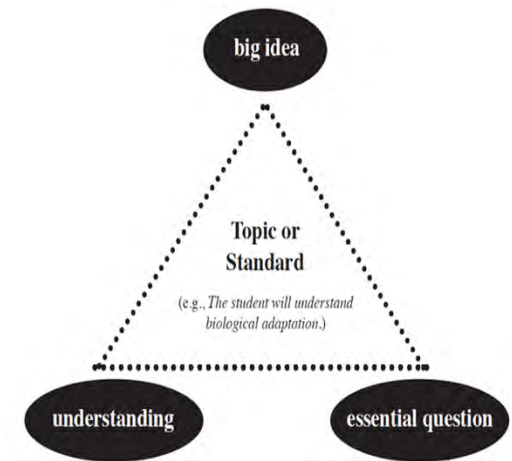
format for communicating their findings may vary based on the profession. These discipline-specific expressions of the 5Cs + S may require some level of customization based on the subject area. Each rubric can also be used to provide students with an opportunity to self-assess the quality of their work in relation to the performance areas. Student-friendly language or “I can” statements can be used by students to monitor and self-assess their progress toward established goals for each performance area.

Transfer

CFSD educators prioritize understanding and transfer to ensure that learning extends beyond the school experience. This 2019 version of the DLP, **Critical Thinking and Problem Solving**, includes long-term **transfer goals** that describe autonomous applications of student learning in college, career, and civic life. “Drill and direct instruction can develop discrete skills and facts into automaticity...but they cannot make us truly able. Understanding is about *transfer*, in other words. To be truly able requires the ability to transfer what we have learned to new and sometimes confusing settings. The ability to transfer our knowledge and skill effectively involves the capacity to take what we know and use it creatively, flexibly, fluently, in different settings or problems, on our own” (Wiggins and McTighe, 2011, p. 40).

Big Ideas

This 2019 version of the DLP, **Critical Thinking and Problem Solving**, includes a set of Understandings and Essential Questions (UEQs) developed by an interdisciplinary team of K-12 teachers and administrators with guidance from Jay McTighe, author of *Understanding by Design*. These big ideas will guide teachers toward the thoughtful design of assessments, units, and lessons that will facilitate transfer of deep learning. “Because big ideas are the basis of unified and effective understanding, they provide a way to set curriculum and instructional priorities...they illuminate experience; they are the linchpin of transfer...” (Wiggins and McTighe, 2011, p.71). “Understandings are the specific insights, inferences, or conclusions about the big idea you want your students to leave with” (Wiggins and McTighe, 2011, p. 80). “Essential questions make our unit plans more likely to yield focused and thoughtful learning and learners” (McTighe, 2017; McTighe & Wiggins, 2013, p. 17). The figure on the right represents the interrelationship among big ideas, understandings, and essential questions.



The **DLP Understandings** are written for K-12 because they express lasting, transferable goals for student learning. Understandings are meant to be revisited over time and across contexts. The continuity of working toward the same goals will help students deepen their understanding from Kindergarten to 12th grade. Understandings are primarily planning tools for teachers, although teachers may choose to share them with their students, if appropriate. Communicating an Understanding does not give away “the answer,” since simply stating an Understanding is not the same as truly grasping its meaning.

The **Essential Questions** are teaching and learning tools that help students unpack the Understandings. They support inquiry and engagement with deep learning and therefore may vary in complexity across grade levels.

Critical Thinking Transfer Goals and UEQs

Transfer Goals	
<p>Students will be able to independently use their learning to . . .</p> <ul style="list-style-type: none"> Critically analyze and evaluate a variety of information and claims in order to determine what to think, believe, or do. 	
Understandings	Essential Questions
Students will understand that . . .	Students will keep considering . . .
<ol style="list-style-type: none"> Critical thinkers remain open-minded and skeptical, ask questions, and deliberately seek alternative points of view before reaching decisions or taking actions. 	<ul style="list-style-type: none"> How do I know what is true? How should I decide what to believe and do? How will different points of view affect my decision making?
<ol style="list-style-type: none"> Critical thinkers organize and analyze information in order to make meaning and decide what to believe or what actions to take. 	<ul style="list-style-type: none"> How do I make meaning?
<ol style="list-style-type: none"> Critical thinkers are willing to “shift gears” when presented with sound reasoning and solid evidence. 	<ul style="list-style-type: none"> When should I shift my thinking?
<ol style="list-style-type: none"> Critical thinkers actively identify and challenge personal biases that influence thinking. 	<ul style="list-style-type: none"> How does what I believe or value influence my thinking?

Problem Solving Transfer Goals and UEQs

Transfer Goals	
<p>Students will be able to independently use their learning to . . .</p> <ul style="list-style-type: none"> • Make sense of messy, never-before-seen problems, and persevere in solving them. 	
Understandings	Essential Questions
Students will understand that. . .	Students will keep considering. . .
<p>1. Effective problem solvers are flexible thinkers who consider multiple ways of defining a problem and who evaluate options before reaching a solution.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • What is the “real” problem? • Where do I begin when solving a problem?
<p>2. Effective problem solvers intentionally select strategies, tools, and approaches that are appropriate for a given context, audience, and perspective.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • Where do I begin when solving a problem? • What are the best strategies to solve the problem?
<p>3. Effective problem solvers expect to get stuck, and they take action to persevere through challenges.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • What do I do when I get stuck?
<p>4. Effective problem solvers don’t stop once a solution has been reached; they evaluate their work in pursuit of deeper understanding.</p>	<ul style="list-style-type: none"> • What makes an effective problem solver? • How do I know I’ve solved the problem? • How do I know which solution is best? • What do I do once I’ve reached a solution?

Self-Regulation and Reflection Transfer Goals and UEQs

Transfer Goals	
<p>Students will be able to independently use their learning to . . .</p> <ul style="list-style-type: none"> Improve performance and persevere through challenges by applying deliberate effort, appropriate strategies, and flexible thinking. 	
Understandings	Essential Questions
<p>Students will understand that. . .</p>	<p>Students will keep considering. . .</p>
<p>1. Effective learners set goals, regularly monitor their thinking, seek feedback, self-assess, and make needed adjustments.</p>	<ul style="list-style-type: none"> How am I doing? How do I know? What are my next steps? What is the most effective way to monitor my progress? How do I know which feedback will help me improve my work? How can I get useful feedback? How do I prioritize my work? How can I maintain focus on areas of influence rather than on factors I cannot influence?
<p>2. We can always improve our performance through deliberate effort and use of strategies.</p>	<ul style="list-style-type: none"> How can I keep getting better at [critical thinking] [problem solving]?

The deep learning proficiencies (5c+ s) are highly interconnected. For example, productive collaboration is contingent upon effective communication. Efficient and effective problem solving often requires collaboration skills. Divergent and convergent thinking, which are traits of Creativity and Innovation, are directly related to critical thinking. Our students will need to use a combination of proficiencies to solve problems in new contexts beyond the classroom. Therefore, it is important to be clear about which proficiency and/or performance area(s) are the focus for student learning, and then to assist students in understanding the connections between them and how they are mutually supportive.

What does Score 1.0 – Score 4.0 mean in the rubrics?

The rubrics are intended to support student progress toward mastering the deep learning proficiencies (DLPs). Four levels of performance are articulated in each rubric: Score 1.0 (Novice), Score 2.0 (Basic), Score 3.0 (Proficient), and Score 4.0 (Advanced). The descriptions follow a growth model to support students in developing their skills in each performance area. Scores 1.0 (Novice) and 2.0 (Basic) describe positive steps that students might take toward achieving Score 3.0 (Proficient) or Score 4.0 (Advanced) performance.

When using the rubrics to plan for instruction and assessment, teachers need to consider the knowledge and skills described in the Score 2.0 column (Basic) to be embedded in the Score 3.0 (Proficient) and 4.0 (Advanced) performance. The Novice level (Score 1.0) indicates that the student does not yet

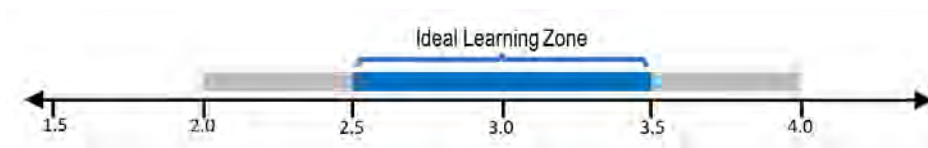
demonstrate the basic skills within the performance area, but that he/she exhibits related readiness skills that are a stepping-stone to a higher level of proficiency. Descriptions at the Novice level also include likely misconceptions that the student might exhibit.

The descriptive rubrics are designed to illustrate students' depth of knowledge/skill at various levels in order to facilitate the instructional and assessment process for all learners. At some performance levels, the indicators may remain the same, but the material under study is more or less complex depending on the grade level band (for example: the complexity of the material at grades 6-8 differs from that of grades 3-5 or 9-12).

The following descriptions explain the four levels on the rubric:

- Score 1.0 (Novice): Describes student performance that demonstrates readiness skills and/or misconceptions and requires significant support.
- Score 2.0 (Basic): Describes student performance that is below proficient, but that demonstrates mastery of basic skills/knowledge, such as terms and details, definitions, basic inferences, and processes.
- Score 3.0 (Proficient): Describes student performance that is proficient – the targeted expectations for each performance area of the DLP.
- Score 4.0 (Advanced): Describes an exemplary performance that exceeds proficiency.

The image below represents the ideal learning zone for students as 2.5 – 3.5.



Sources

The following sources directly influenced the revision of CFSD's rubrics:

- Catalina Foothills School District. (2011, 2014, 2015). Rubrics for 21st century skills and rubrics for deep learning proficiencies. Tucson, Arizona.
- EdLeader21 (2013). 4Cs rubrics. Tucson, Arizona. [Adaptations from 4Cs Rubrics]
- McTighe, J., & Wiggins, G. P. (2013). Essential questions: Opening doors to student understanding. Alexandria, Virginia: ASCD.
- Partnership for 21st Century Skills. (2009). P21 framework definitions. Washington, DC.
- Rhodes, T. L. (Ed.) (2010). Assessing outcomes and improving achievement: Tips and tools for using rubrics. Association of American Colleges and Universities: Washington D.C. [Adaptations from VALUE rubrics, VALUE Project]
- Wiggins, G.P. & McTighe, J. (2011). The understanding by design guide to creating high-quality units. Alexandria, Virginia: ASCD.

CRITICAL THINKING

DLP PERFORMANCE AREA	1.0 (Novice) The student may exhibit the following readiness skills for Score 2.0:	2.0 (Basic) When presented with a grade-appropriate task, the student:	3.0 (Proficient) In addition to Score 2.0, the student:	4.0 (Advanced) In addition to Score 3.0, the student may:
INQUIRY: INFORMATION AND DISCOVERY	<p>Framing the Investigation: Identifies a topic and purpose for investigation.</p> <p>Defines “cognitive bias” and acknowledges own general biases.</p> <p>Questioning: Asks general questions to learn information about the broad topic under investigation (<i>for example: “What is nuclear energy?”</i>).</p> <p>Information Gathering: Gathers general information related to the broad topic under investigation.</p> <p>Source Evaluation: Identifies information within sources that is relevant to the topic under investigation.</p> <p>Identifies language that indicates bias.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Framing the Investigation: Describes aspects of the topic under investigation (<i>for example: context, characteristics, stakeholders, genre, parameters, etc.</i>).</p> <p>Acknowledges own biases with regard to the task or topic under investigation.</p> <p>Questioning: Formulates questions related to the specific topic under investigation (<i>for example: “What are the most contentious issues surrounding nuclear energy?”</i>).</p> <p>Generates additional questions and/or refines questions in response to new information.</p> <p>Information Gathering: Gathers background information about the topic under investigation in order to develop and answer questions (<i>for example: Wikipedia or encyclopedia excerpts</i>).</p> <p>Source Evaluation: Establishes criteria to evaluate information for the specific topic under investigation (<i>for example:</i></p>	<p>Framing the Investigation: Defines the topic under investigation by examining it through various lenses or perspectives.</p> <p>Explains how own biases might influence the investigation.</p> <p>Questioning: Formulates clear and precise questions that challenge own beliefs and explore multiple angles of the topic under investigation (<i>for example: “How does the use of nuclear energy influence our economy?” “What are the health-related effects of nuclear energy use?”</i>).</p> <p>Reformulates questions in response to information gathered.</p> <p>Prioritizes questions to provide a solid foundation for inquiry.</p> <p>Information Gathering: Gathers information from multiple relevant, timely, and credible sources, using a variety of collection methods (<i>for example: internet searches, surveys,</i></p>	<p>Framing the Investigation: Describe how limitations to the investigation might influence the outcome.</p> <p>Formulate a plan to subvert own biases with regard to the topic under investigation.</p> <p>Questioning: Formulate and refine thought-provoking inquiry questions, carefully phrasing them to influence the depth, quality, and value of the information obtained through the investigation (<i>for example: “Why do certain interest groups support or oppose nuclear energy?” “Can nuclear energy solve the energy gap?” “To what degree should we consider prior nuclear accidents when making decisions about our energy use?”</i>).</p> <p>Information Gathering: Gather information from diverse contexts, disciplines, and/or cultures.</p> <p>Source Evaluation: Synthesize various aspects of a source(s) (<i>for example: author, publisher,</i></p>

		<p><i>accuracy, credibility, timeliness, authority, etc.</i>)</p> <p>Generally applies criteria to source selection and determines which sources to use and which to disregard.</p>	<p><i>databases, interviews, library catalog, etc.</i>)</p> <p>Deliberately seeks diverse perspectives or information that conflicts with own beliefs, values, and perspectives.</p> <p>Source Evaluation: Selects appropriate criteria to evaluate sources and information; justifies which sources will provide the most useful information with regard to the question(s).</p> <p>Compares information across sources to determine credibility and accuracy.</p>	<p><i>publication date, region, content, etc.</i>) to evaluate nuances of bias, credibility, and accuracy (<i>for example: does not reject or accept a source in its entirety</i>).</p>
<p>INTERPRETATION, ANALYSIS, AND REASONING (Making meaning of information to form conclusions)</p>	<p>Organization: Creates categories to organize information; lists the information.</p> <p>Meaning-making: Defines different types of information (<i>for example: anecdotal, circumstantial, testimonial, statistical, visual, etc.</i>).</p> <p>Makes observations about information.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Organization: Classifies and compares information to organize it into logical groups.</p> <p>Meaning-making: Interprets information accurately to form inferences.</p> <p>Formulates conclusions from information, observations, and inferences.</p> <p>Identifies connections between information and conclusions.</p>	<p>Organization: Organizes and prioritizes information to reveal important differences, similarities, and/or patterns related to the topic under investigation.</p> <p>Meaning-making: Formulates logical, valid inferences from information.</p> <p>Analyzes patterns to make meaning from the whole body of information.</p> <p>Considers multiple accounts or explanations before formulating conclusions; shifts own thinking in response to new information or different perspectives.</p>	<p>Organization: Reorganize information in multiple ways to reveal insights into the topic, to challenge own assumptions, or to expose flaws in own thinking.</p> <p>Meaning-making: Analyze outliers, contradictions, and inconsistencies in order to develop a complex conclusion.</p>

<p>SELF-REGULATION AND REFLECTION</p>	<p>Reflection: Identifies own strengths and weaknesses as a critical thinker.</p> <p>Planning: Sets personal goals for critical thinking.</p> <p>Mindset: Identifies the relationship between effort and success <i>(for example: “The harder I work at this, the better I’ll be at it.”; “I will work harder in this class from now on.”)</i>.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Reflection: Assesses thinking, reasoning, and critical thinking dispositions in response to feedback and/or established criteria.</p> <p>Planning: Sets goals for critical thinking based on feedback and/or established criteria.</p> <p>Mindset: Demonstrates a desire to improve <i>(for example: employs more practice, sets goals for improvement, asks for help from others instead of giving up)</i>.</p>	<p>Reflection: Accurately reflects on thinking, reasoning, and critical thinking dispositions; uses reflection and/or feedback to revise ideas or products.</p> <p>Questions and critiques own thinking process, including how strengths and weaknesses in own thinking, reasoning, and critical thinking dispositions may have affected the process or outcome.</p> <p>Planning: Seeks out, selects, and uses resources and strategies to achieve goals for improving the thinking process.</p> <p>Mindset: Demonstrates a growth mindset (the belief that one can “get smarter” at critical thinking through effective effort) in response to setbacks and challenges <i>(for example: persists on difficult tasks, takes risks in the learning process, accepts and uses feedback/criticism, is comfortable making mistakes, explains failure from a growth mindset perspective)</i>.</p>	<p>Reflection: Analyze patterns and trends in own thinking process.</p> <p>Evaluate own thinking, reasoning, and critical thinking dispositions throughout the process.</p> <p>Seek out and act on feedback from peers, teacher, and experts to improve.</p> <p>Planning: Analyze patterns and prior performance to set new goals for critical thinking; revise goals in response to ongoing reflection. points to other possibilities.</p> <p>Mindset: Proactively improve own areas of weakness by employing effective strategies to increase growth mindset <i>(for example: perseverance, taking risks, effective decision-making, actively seeking others’ feedback, deliberate practice, finding and using external resources [skilled peers, other adult experts] to enrich and extend learning)</i>.</p>
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PROBLEM SOLVING

DLP PERFORMANCE AREA	1.0 (Novice) The student may exhibit the following readiness skills for Score 2.0:	2.0 (Basic) When presented with a grade-appropriate task, the student:	3.0 (Proficient) In addition to Score 2.0, the student:	4.0 (Advanced) In addition to Score 3.0, the student may:
FRAMING THE PROBLEM	<p>Understanding the Problem: Describes the problem and/or stated goal(s) or objective(s) in their own words.</p> <p>Asks clarifying questions related to the problem.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Understanding the Problem: Identifies information necessary to solve the problem (<i>for example: what is known, what is unknown, specifications, stakeholders, etc.</i>).</p> <p>Clarifies facts or processes with regard to the problem.</p>	<p>Understanding the Problem: Determines what prior knowledge will be useful in solving the problem.</p> <p>Identifies the scope of the problem, including structures, patterns, constraints, and limitations.</p> <p>Clarifies concepts and relationships with regard to the problem.</p>	<p>Understanding the Problem: Uncover relevant information that is not readily apparent.</p> <p>Apply additional relevant content and/or consider alternate contexts to deepen understanding of the problem (<i>for example: examine the problem from different perspectives, examine potential outliers, extend relevant concepts and processes beyond the scope of the problem, etc.</i>).</p>
SOLUTION FINDING	<p>Strategizing: Identifies problem-solving strategies.</p> <p>Solving the Problem: Applies a given strategy or approach to solve a problem or develop a solution.</p> <p>Evaluation: Determines the reasonableness of the solution or approach to the problem, given specific criteria.</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Strategizing: Selects an appropriate strategy or approach to solving the problem.</p> <p>Solving the Problem: Applies an appropriate strategy or approach to solve a problem or to develop a solution.</p> <p>Evaluation: Establishes and applies criteria to evaluate the general effectiveness of the strategy or approach and the reasonableness of the solution.</p>	<p>Strategizing: Selects multiple effective strategies or approaches to solve the problem efficiently.</p> <p>Solving the Problem: Applies an efficient strategy or effective approach to accurately solve a problem or develop a valid solution.</p> <p>Evaluation: Evaluates the effectiveness of the strategy or approach and the validity of the solution by applying relevant criteria.</p>	<p>Strategizing: Identify innovative, plausible strategies or approaches to solve the problem.</p> <p>Solving the Problem: Apply an elegant or innovative strategy or approach to solve the problem or develop a valid solution.</p> <p>Evaluation: Compare multiple approaches to identify and justify the most effective approach within the context of the problem.</p>

			Uses the evaluation to determine the need for further work on the problem.	
SELF-REGULATION AND REFLECTION	<p>Reflection: Identifies own strengths and weaknesses as a problem solver.</p> <p>Planning: Sets personal goals for problem solving.</p> <p>Mindset: Explains the relationship between effort and success (<i>for example: "The harder I work at this, the better I'll be at it"; "I will work harder in this class from now on."</i>).</p> <p>See possible student misconceptions following the rubrics.</p>	<p>Reflection: Assesses problem-solving skills and processes in response to feedback and/or established criteria.</p> <p>Planning: Sets goals for problem solving based on feedback and/or established criteria.</p> <p>Mindset: Demonstrates a desire to improve (<i>for example: employs more practice, sets goals for improvement, asks for help from others instead of giving up</i>).</p>	<p>Reflection: Accurately reflects on problem-solving skills and processes; uses reflection and/or feedback to revise ideas or products.</p> <p>Questions and critiques own problem-solving skills and processes.</p> <p>Planning: Seeks out, selects, and uses resources and strategies to achieve goals for improving the problem-solving process.</p> <p>Mindset: Demonstrates a growth mindset (the belief that one can "get smarter" at problem solving through effective effort) in response to setbacks and challenges (<i>for example: persists on difficult tasks, takes risks in the learning process, accepts and uses feedback/criticism, is comfortable making mistakes, explains failure from a growth mindset perspective</i>).</p>	<p>Reflection: Analyze patterns and trends in own problem-solving skills and processes.</p> <p>Evaluate own problem-solving skills, strategies, and approaches throughout the process.</p> <p>Seek out and act on feedback from peers, teacher, and experts to improve.</p> <p>Planning: Analyze patterns and prior performance to set new goals for problem solving; revise goals in response to ongoing reflection.</p> <p>Mindset: Proactively improve own areas of weakness by employing effective strategies to increase growth mindset (<i>for example: perseverance, taking risks, effective decision-making, actively seeking others' feedback, deliberate practice, finding and using external resources [skilled peers, other adult experts] to enrich and extend learning</i>).</p>

Possible Misconceptions: 9-12 Critical Thinking

The following chart lists possible misconceptions about **Critical Thinking**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

<i>Students might exhibit the following misconception, belief, or perception that...</i>		
Inquiry: Information and Discovery	Framing the Investigation	<ul style="list-style-type: none"> • The purpose of the investigation is to complete the task (for example: write an essay, conduct a research project). • Bias is inherently negative. • There is such a thing as an unbiased source. • I don't have any biases, or, I don't have any biases about _____.
	Questioning	<ul style="list-style-type: none"> • The topic is one-dimensional, rather than multifaceted (for example: struggles to narrow a topic into multiple, relevant questions; asks only one type of question or asks the same question repeatedly, using different words). • One question is sufficient for inquiry. • Answers are more important than questions.
	Information Gathering	<ul style="list-style-type: none"> • Research is framed around topics and answers rather than questions. • The most important part of research is finding “the” answers rather than developing inquiry questions to open up exploration of the topic. • I can find all the information I need through Google. • If an idea conflicts with my perspective, values, or beliefs, I should disregard it.
	Source Evaluation	<ul style="list-style-type: none"> • Ease of investigation is more important than depth of understanding (for example: rejects or accepts information based on arbitrary criteria, such as selecting the first piece of information that aligns with preconceived beliefs). • If a source is published, it is a credible source. • All news stories are true and unbiased.
Interpretation, Analysis, and Reasoning	Organization	<ul style="list-style-type: none"> • There is no connection between the task of categorizing and the purpose of organizing information (for example: creates arbitrary categories, such as where or when the information was found; lists repetitive information).

		<ul style="list-style-type: none"> • There is only one way to categorize information.
	Meaning-making	<ul style="list-style-type: none"> • All information is equally important (for example: forms inferences from irrelevant information or observations, creates inaccurate generalizations out of limited information or misconceptions). • A conclusion can be formed from a cursory examination of information. • I should form my opinion first and then seek evidence to support it. • The goal of analysis is to prove that my thinking is “right.”

Possible Misconceptions: 9-12 Problem Solving

The following chart lists possible misconceptions about **Problem Solving**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

<i>Students might exhibit the following misconception, belief, or perception that...</i>		
Framing the Problem	Understanding the Problem	<ul style="list-style-type: none"> • All information is equally important (for example: mistakes irrelevant or interesting information for essential information; applies irrelevant background knowledge; asks questions about details not important to the problem).
Solution Finding	Strategizing	<ul style="list-style-type: none"> • One content-appropriate strategy will be effective in all contexts. • Once I identify a strategy or approach that works, it is a waste of time to consider additional options.
	Solving the Problem	<ul style="list-style-type: none"> • Applying the strategy eliminates the need to think through the problem. • “Efficient” and “effective” mean the same thing. • As long as I reach a solution, it doesn’t matter how I got there.
	Evaluation	<ul style="list-style-type: none"> • The point of the problem is to solve it and that the strategy or approach used is irrelevant. • There is a “right” way to solve the problem or only one way to solve the problem.

Possible Misconceptions: 9-12 Self-Regulation and Reflection

The following chart lists possible misconceptions about **Self-Regulation and Reflection**. Understanding student misconceptions can help teachers develop lessons that proactively address these barriers to deep learning and transfer.

Self-Regulation and Reflection	Reflection	<ul style="list-style-type: none"> • Reflection is all about what I think; other people’s perspectives don’t matter. • Only the teacher’s perspective matters when it comes to identifying strengths and weaknesses. • I don’t have any weaknesses. • I don’t have any strengths. • All weaknesses affect my performance in the same way. • Reflection is a waste of time; I don’t need to reflect to improve.
	Planning	<ul style="list-style-type: none"> • A goal is the same thing as a plan. • Any goal is a worthy goal. • Short-term goals aren’t important. • I don’t need a plan; if I set a goal, I will achieve it. • I should set goals in areas where I am already successful. • I should set the same goal over and over. • Someone else will give me resources and ideas about how to improve.
	Mindset	<ul style="list-style-type: none"> • [Critical Thinking] [Problem Solving] is a talent and not a skill; I am as good at it as I’ll ever be. • If I’m really good at something, I won’t encounter any challenges. • If I experience a setback, I’ve failed. • Others’ feedback can’t help me. • Mistakes are bad; smart people don’t make mistakes. • The safe route leads to guaranteed success.