



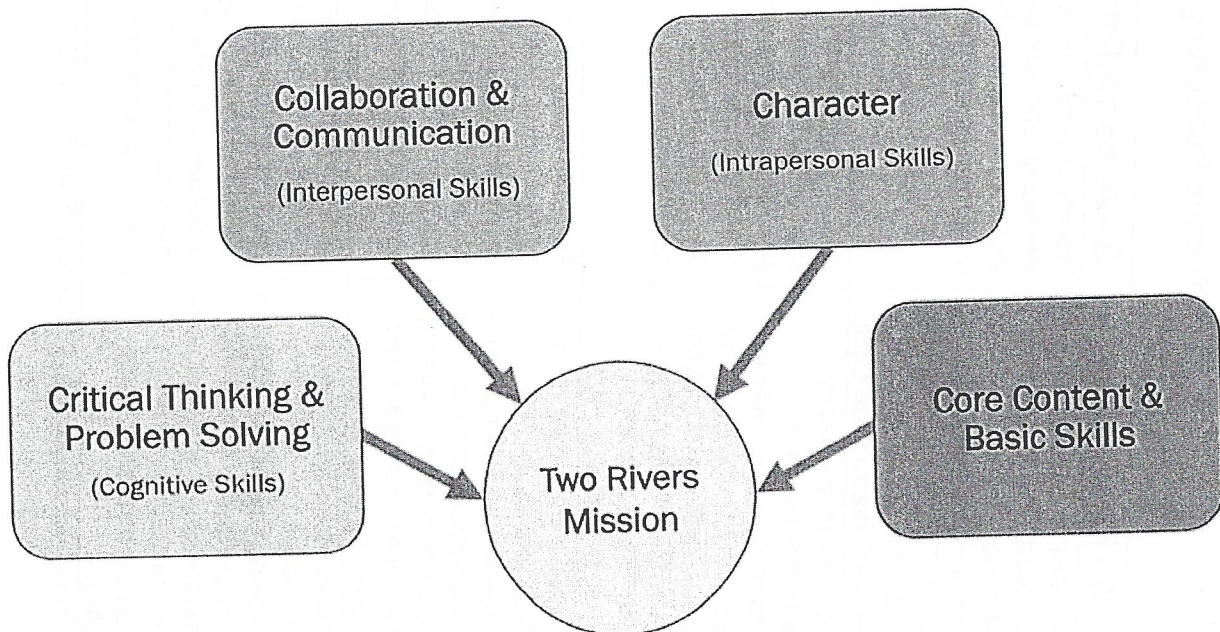
TWO RIVERS PUBLIC CHARTER SCHOOL

Are the Students Really Thinking? Defining, Teaching, and Assessing Critical Thinking Skills iNACOL Symposium 2019

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Learning Target:

- I can describe the process for creating assessments of critical thinking and problem solving used by Two Rivers Public Charter School.
- I can describe how performance assessments of critical thinking and problem-solving skills move teachers and students toward a robust vision of student achievement.



**Two Rivers Public Charter School
Effective Reasoning Rubric**

Component	4 - Exemplary	3 - Accomplished	2 - Developing	1 - Beginning
Validity of the Claim	Provides an accurate claim that illustrates insight into the supporting information from which the claim is made. The claim reflects a study of or a familiarity with the particulars of the topic.	Provides claims that, with few exceptions, are valid and demonstrates a basic understanding of the topic.	Provides some claim that is based on significant misunderstandings of the subject matter.	Significantly misinterprets the information. Makes a claim that has no bearing on the situation or are clearly illogical.
Relevant Support	Clearly and accurately identifies all relevant information from which to make the claim. The type of supporting information selected reflects creative insight and a careful analysis of the situation.	Specifies all relevant supporting information from which to make the claim. Selects information that is important to the general topic.	Includes some information that is not important to the claim or does not accurately identify the important information from which the claim could be made.	Selects unimportant or trivial information to support the claim.
Logic of the Claim and Support	Makes a claim that reflects clear and logical links between the information or observations and the claim made from them. Clearly describes each link in the chain of logical support.	Presents a claim that follows logically from the selected information or observations, but may be missing clear description of some links in the logic.	Presents a claim that reflects an erroneous interpretation made from the information or observations.	Draws an erroneous conclusion from the selected support or cannot satisfactorily describe the rationale behind the claim.
Challenge of Question	Raises questions that challenge the claim and provide insight into differing perspectives. Questions demonstrate an awareness of the complexity of the topic addressed by the claim.	Raises questions that adequately challenge the claim. If explored further, the questions may lead to a deeper understanding of the topic addressed by the claim, but is not obvious.	Raises questions that mildly challenge the claim, but are easily dismissed.	Does not raise any questions or questions raised are irrelevant to the claim.

Adapted from the Catalina Foothills School District's 21st Century Skills Rubric: Critical and Creative Thinking: Inductive Reasoning 6/06 - 6/11

Rubric for Problem Solving

Component	4 - Exemplary	3 - Accomplished	2 - Developing	1 - Beginning
<p>Identifies What is Known</p>	<p>Based on given information, accurately identifies everything that is known and relevant to solving the problem including ideas that may need to be inferred from the problem description. <i>Supplies information that may not be commonly known, but that has some bearing on the topic being studied.</i></p>	<p>Based on given information, accurately identifies everything that is known and relevant to solving the problem, <i>including relevant understanding about the content relative to the context of the problem.</i></p>	<p>Based on given information, accurately identifies some things that are known about the problem. Some of the information identified may be irrelevant to solving the problem.</p>	<p>Inaccurately identifies information related to the problem or unable to identify any information known about the problem. Includes ideas that are irrelevant to solving the problem.</p>
<p>Defines the Problem</p>	<p>Describes accurately both the core question that must be answered to solve the problem as well as supporting questions that provides insight into the nature of the problem.</p>	<p>Describes accurately the core question that must be answered to solve the problem. May identify some supporting questions, but not completely exploring the complexity of the problem.</p>	<p>Describes the core question in a way that simplifies the question or demonstrates a lack of understanding of the complexity of the problem.</p>	<p>Identifies a question that is not core to solving the problem or is unable to describe what the problem is asking.</p>
<p>Generates Possible Solution Strategies</p>	<p>Identifies at least two possible approaches to finding solutions and articulates clear steps to be undertaken to reach a solution.</p>	<p>Identifies a possible approach to a solution with steps to be undertaken to reach a solution.</p>	<p>Identifies a possible approach to a solution without a clear sense of the steps to solve the problem.</p>	<p>Unable to identify an approach to a possible solution.</p>
<p>Applies Problem-Solving Steps</p>	<p>Uses the full range of steps and strategies identified to solve the problem. Effectively evaluates the process and changes course when necessary.</p>	<p>Uses most of the problem steps and strategies identified to solve the problem. Sometimes effectively evaluates the process & changes course.</p>	<p>Uses a few of the problem solving steps identified to solve the problem. Does not evaluate the process.</p>	<p>Misses multiple steps in solving the problem. Becomes stuck on where to start.</p>
<p>Evaluates Solutions</p>	<p>Evaluates and analyzes the solution(s) and describes how the solution(s) accurately and effectively solve the problem.</p>	<p>Provides some rationale for how the solution(s) accurately solve the problem.</p>	<p>Provides some rationale for how the solution relates to the problem, but is missing key connections to the problem.</p>	<p>Provides no rationale for how or why a solution addresses the problem.</p>

Adapted from the *Assessing 21st Century Skills: A Guide to Evaluating Mastery and Authentic Learning* by Laura Greenstein 2012; and from the Catalina Foothills School District's 21st Century Skills Rubric: Critical and Creative Thinking: Investigation 6/06 – 6/11

Rubric for Decision Making

Component	Exemplary	Accomplished	Developing	Beginning
Identification of Possible Options	Presents a comprehensive list of the most relevant possible options and describes each in detail.	Identifies options that represent several of the most relevant possible alternatives.	Identifies some options that are relevant and others that are not. OR only names one option.	Selects options that are clearly not relevant to the decision.
Criteria for Evaluating Options	Clearly identifies the criteria by which the identified options will be assessed. The criteria reflect an unusually thorough understanding of the nature of the decision task.	Clearly identifies the criteria by which the identified options will be assessed. With no significant exceptions, the criteria are relevant to the decision task.	Identifies some relevant criteria by which the identified options will be assessed. However, some relevant criteria are omitted, or criteria are included that may not be relevant to the task.	Identifies few or no criteria that are relevant to the decision task.
Assessment of Options	Provides a thorough, fully developed assessment of each option based upon the criteria. Exceeds the demand of the decision task by comparing and contrasting the options to provide greater insights.	Presents an accurate assessment of the extent to which the options meet the identified criteria.	Does not completely address all the criteria; or applies all appropriate criteria to the options but is not completely accurate in assessing how well the criteria have been met.	Does not address the extent to which the options meet the criteria or is inaccurate in assessing how well the alternatives meet the criteria.
Rationale for Choice	Selects an option that meets or exceeds the criteria and represents a well-supported answer to the initial decision question. Provides a useful discussion of issues and insights that arose during the selection process.	Successfully answers the decision question by selecting an option that meets or exceeds established criteria and justifies their answer by referencing how the decision was made.	Selects an option that does not entirely conform to the student's assessment of the options.	Makes a selection that does not appear reasonable or cannot be justified by the student's evaluation of the options.

Adapted from the Catalina Foothills School District's 21st Century Skills Rubric: Critical and Creative Thinking: Decision Making 6/06 – 6/11. Created in Collaboration with the Stanford Center for Assessment, Learning and Equity (SCALE).

Name: _____

Date: _____

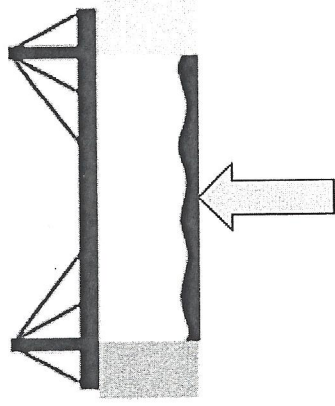
Two Rivers Problem Solving Task - 4/5

Spanning Length

This assessment will show how well you can solve a problem. Please make sure to show all of your thinking. This assessment is not just about finding an answer - it is about showing how you approach and work through a problem.

The problem: With the given materials, create the longest bridge span you possibly can between two cups.

Bridge spans look like this:



Span means the distance between the two ends.

You have the following materials:

- 4 rubber bands
- 2 sheets of 8.5 x 11 paper
- 12 inches of blue tape
- 2 red cups

Your task is to create a the longest possible bridge between two red cups. Keep the following rules in mind:

- The bridge must stand independently between the two cups.
- You do not have to use all of the materials.
- You may cut up or use only a piece of any of the materials.
- You may not use additional materials.

Planning: Before you begin building, please complete the KWI chart below.

What do you KNOW?	What do you WANT to know?	What are some IDEAS you have about how to solve the problem?

Planning continued:

In your own words, explain the problem you are trying to solve.

What will you try first? What will you do if that doesn't work? How will your bridge stand? You can explain using words and/or pictures. Label your drawings so that it is clear how your bridge will follow the directions.

After Work Session 1: Answer the following questions. Write on the lines and/or draw to the right of the lines. Label your drawings so that it is clear how your bridge follows the directions.

What did you create?

Picture with labels:

What worked or didn't work?

Picture with labels:

What will you try next?

Picture with labels:

After Work Session 2: Answer the following questions. Write on the lines and/or draw to the right of the lines. Label your drawings so that it is clear how your bridge follows the directions.

What did you create?

Picture with labels:

What worked or didn't work?

Picture with labels:

How did you change your bridge from the first round? Why did you make those changes?

Picture with labels:

Evaluate your work.

Did your bridge stand? _____ How many inches was your bridge span? _____

Answer the following questions using words and/or pictures with labels.

How did the design of your bridge allow it to span this many inches?

What could be improved in the design of your bridge?

If we were to complete this task again what would you do differently?

Two Rivers Public Charter School
 Problem Solving Assessment
 4th Grade - 5th Grade

Task Administration Directions

<p>Agenda</p> <ol style="list-style-type: none"> 1. Whole class: Introduce the problem (5 minutes) 2. Student planning (10 minutes) 3. Work session 1 (9 minutes) 4. Reflection on work session 1 (6 minutes) 5. Work session 2 (9 minutes) 6. Reflection on the task (12 minutes) 7. Wrap up (5 minutes) 	<p>Materials</p> <ul style="list-style-type: none"> ● One packet per student (pages above stapled into a packet) ● Pencils (1 per student) ● One set of materials per student (4 rubber bands, 2 sheets of 8.5 x 11 paper, 12 inches of blue tape, 2 red cups) ● Scissors (enough that students have easy access to them)
<p>Task administration notes:</p> <ul style="list-style-type: none"> ● This test is designed to be administered to a whole class. ● Each student will need their own space in which to work which allows enough room for building a bridge. Consider desk arrangement in advance to make sure this is possible. ● To make sure this is a problem solving task, and not a writing or fine motor task, consider what assistance students may need, and how you might provide that. Some students may need help with cutting, and a few may need someone to scribe their written work. Clarify written directions as needed. ● For very young students or students with language production challenges, consider posting a word bank that includes (and maybe shows with a picture) the following words: bridge, span ● Setting up materials (bins of water, bags with individual student material) before the task will save time. 	

Detailed Directions:

1. Whole class: Introduce the problem (5 minutes)
- Consider gathering the class together on the rug, if that structure exists.
- Explain the purpose of the task. You might say something like: *Today you are going to solve a problem. I'm really interested in how you think while you are solving a problem. This task is designed to show how well you can solve problems and how well you can explain your thinking about a problem. It is a design problem: you are going to try to build something. This problem is deliberately hard: if it were easy, you'd solve it right away and I wouldn't know much about how you approach a problem. So don't worry if you try some things that don't work. Your challenge today is to persevere with a challenging design problem, try different things, and explain your thinking.*
- Present the task: *With the given materials, create a bridge that spans the longest distance possible. Point out the visual model of a span, and remind students that the distance between supports cannot touch the ground or table the bridge is built on.*
 - Show the materials and review the following guidelines:

- *You do not have to use all of the materials.*
 - *You may cut up or use only a piece of the materials.*
 - *You may not use additional materials. (Consider explaining that this means they cannot replace their materials during the work sessions, even if something breaks, because you want to see how they can solve that problem.)*
 - Explain a few more things about the task and process.
 - *This is supposed to be a design problem, not a cutting problem. If you have something you want to try, and can't cut something, feel free to raise your hand and ask an adult to help you.*
 - *You will work on this problem individually. So while you will see students around you try different things, remember that there are lots of ways to build a bridge. Focus on exploring your own ideas, and don't worry too much about what other kids are doing.*
 - Explain how and why students will be sharing their thinking.
 - Consider saying something like: *Because I am really interested in knowing more about how you think about a problem, you will be spending some time writing or drawing about your thinking, and some time actually building. You will begin by writing or drawing. Then you will have some time to build. Then we will stop and write or draw. Then you will build some more. Finally, you will write or draw again at the end to explain your work. I will also be taking pictures of what you build, so that when I look at what you wrote and drew, I can better understand what you mean.*
 - Invite students to return to their desks. Remind them that they are not to touch the materials they will find there!
2. Student planning (10 minutes)
- Remind the students that they are not to touch the building materials yet.
 - Pass out the packet. Review the first 3 pages with students, reading aloud and explaining each part.
 - Page 1 just reminds them of the task. *This page has all of the information I just explained. You can look back at it as you're answering questions and building your bridge.*
 - Pages 2 and 3 are what they are going to complete right now, before they start building. Make sure they notice that there are questions on both pages.
 - For the KWI chart, ask: *Who has seen a chart like this before? (Make sure they connect it to other work they've done).*
 - For the questions after the KWI chart, point out that
 - *You may write something here that is already written in the KWI chart. That's fine!*
 - *You can explain what you are going to try and how your bridge will stand. Be sure to label your pictures so I can see your thinking. Remember that I want to see how you are going to solve this problem.*
 - Give students 9 minutes to complete pages 2 and 3 of the packet. During this time, no one may begin building. Prompt students to answer all of the questions on both pages. Students who have not finished the KWI (p. 2) and questions (p. 3) need to finish while the rest of the class begins work session 1.
3. Work session 1 (9 minutes)
- Invite students to put their packets to one side (far from the water bins so they stay dry) and begin building their bridges: *You will have 8 minutes for the first work session. At the end of that time, you will pause and explain your work in your packet. Then you will have more time to build.* Consider using a visible timer so that students can see how much time is remaining.
 - Circulate and help students with materials as needed, but do not help them create or improve their bridges.

- If they ask for help, consider using the following prompts: *What could you try next? How could you improve your bridge? What might help it stand? Is it off the ground?*
 - If they ask for more materials or replacements remind them that they can only use the materials they were given. Consider: *Remember that the point of this task is to see how well you solve problems, so think about what you can do with what you have. You will have a chance to explain your thinking when you answer questions, so you can write about what you would have done differently with more (or new) materials.*
 - Tell students when there is one minute remaining in this work session.
4. Reflection on work session 1 (6 minutes)
- Students must stop working on their bridges.
 - Direct students to take out their packets and turn to page 4. If they need to, they can move to a dry space to answer the questions. Read the questions about Work Session 1 aloud.
 - Remind students: *For the next five minutes, you are only explaining your thinking, not building. Remember that the purpose of this task is to share your thinking, and that the writing and drawing you are doing in the packet is very important for that. Don't forget to label your drawings (with the materials that you have used) so that it is clear that you are following the directions.*
 - Give students 5 minutes to write silently. During this time, circulate and take a photograph of what each student has built during work session #1.
 - In order to capture students' thinking, students must answer all three questions. After five minutes, the students who have not finished should finish writing while the rest of the class begins work session 2.
5. Work session 2 (9 minutes)
- Tell students they will have another 8 minutes to work on building their bridges. Repeat the directions if needed: *You will have 8 more minutes to work on your bridge. Remember that the span must stand without touching the ground. We will measure your length at the end of this session.*
 - Consider using a visible timer so that students can see how much time is remaining.
 - Circulate and help students with materials as needed, but do not help them create or improve their bridges.
 - If they ask for help, consider using the following prompts: *What could you try next? How could you improve your bridge? Remember that you don't have to use all of the materials and you can cut them if you need to.*
 - If they ask for more materials or replacements, remind them that they can only use the materials they were given. Consider: *Remember that the point of this task is to see how well you solve problems, so think about what you can do with what you have. You will have a chance to explain your thinking when you answer questions, so you can write about what you would have done differently with more (or new) materials.*
6. Reflection on the task (12 minutes)
- Prompt students to stop testing their bridges and take out their packets.
 - Read aloud the questions under After Work Session 2 and Evaluate your work (pages 5 and 6). *Remember that the purpose of this task is to share your thinking, and that the writing and drawing you are doing in the packet is very important for that. Don't forget to label your drawings (with the materials that you have used) so that it is clear that you are following the directions and so I can see your thinking.*
 - Give students 10 minutes to answer these questions individually. Prompt them to answer all of the questions on both pages.
 - During this time, circulate and take a photograph of what each student has built.

7. Wrap up (5 minutes)

- Collect all papers.
- Thank students for their hard work and perseverance.
- If you'd like, you can have students share their solutions to the problem with the class.

**Two Rivers Public Charter School
Rubric for Problem Solving
Scoring Guide**

Component	Exemplary	Accomplished	Developing	Beginning
Identifies What is Known Evidence: K of KWI, or clear articulation of what is known in "What will you try first" questions after KWI *Use only Planning section for this*	Based on given information, accurately identifies everything that is known and relevant to solving the problem, <i>including relevant understanding about the content or context of the problem.</i> Accomplished + Adding something relevant and helpful from their background knowledge (e.g. height makes it easier for the span to not touch the ground!))	Based on given information, accurately identifies everything that is known and relevant to solving the problem. Explains that they will build a bridge but of given materials (does not necessarily need to list all materials). Might add background knowledge that is not relevant or helpful (ex: bridges are big).	Based on given information, accurately identifies some things that are known about the problem. May also identify some information identified that is irrelevant to solving the problem. Does not reference materials or names only one material that they can use	Inaccurately identifies information related to the problem or unable to identify any information known about the problem. Includes ideas that are irrelevant to solving the problem. Includes inaccurate information or does not list anything
Defines the Problem Evidence: W, I of KWI, "Explain the problem" after KW *Use only Planning section for this*	Describes accurately the core question that must be answered to solve the problem as well as useful supporting questions.	Describes accurately the core question that must be answered to solve the problem.	Describes the core question in a way that simplifies the question or demonstrates a lack of understanding of the complexity of the problem.	Identifies a question that is not core to solving the problem or is unable to describe what the problem is asking.
Generates Possible Solution Strategies Evidence: I of KWI, "What will you try first?" questions after KWI	Accomplished + relevant supporting question that will help solve the problem (e.g. What materials should I use? How can I make the span of the bridge sturdy? Will the cups stay if I...?) Identifies at least one reasonable and problem specific possible approach to a solution. Outlines several steps in detail AND/OR identifies another reasonable and problem specific possible approach.	Lists 3 criteria: build a bridge between two cups, use only the materials given, the bridge doesn't touch the ground Identifies a reasonable and problem specific possible approach to a solution with some sense of steps to be undertaken to reach a solution.	Build a bridge (and maybe one other criteria) Identifies a possible but very general approach to a solution without a clear sense of the steps to solve the problem.	Incorrect or blank Unable to identify an approach to a possible solution.
Evidence: I of KWI, "What will you try first?" questions after KWI	Accomplished + clearly articulates how their design will allow the bridge to float and hold marbles (e.g. making it balanced, making it as big/light as possible) AND/OR	Gives a specific approach and/or steps (explains either in words or with a clear picture what they will build)	Gives a problem-specific but general approach without articulating details (e.g. use the materials to make a bridge, see how it floats)	Blank or gives a general approach that is not problem-specific (e.g. work hard, use my brain, try different things)

<p>Applies Problem-Solving Steps</p>	<p>describes in-depth an alternative strategy that they will try</p> <p>Uses the steps and strategies identified to solve the problem. Articulates an evaluation of how these steps and strategies are or are not helpful in solving the problem. Takes action (either changes course or continues with a strategy) that reflects this evaluation.</p>	<p>Uses the steps and strategies identified to solve the problem. Takes action (either changes course or continues with a strategy) that reflects an accurate evaluation of his her/process, but does not articulate this evaluation.</p>	<p>Uses some of the steps identified to work towards solving the problem. No evidence of evaluating the process.</p>	<p>Misses multiple steps in solving the problem. Becomes stuck on where to start.</p>
<p>Evidence: photographs of work and answers to questions in "After Work Session 1" and "After Work Session 2"</p>	<p>Builds a bridge, which may or may not float and hold marbles. Work clearly explains why their strategy worked or why they changed strategies. Clearly explains what they will try next (After Work Session 1) and/or how they changed their bridge (After Work Session 2) in a way that shows their evaluation of their steps and strategies.</p>	<p>Builds a bridge, which may or may not float and hold marbles. Work shows that students continued with a strategy that was working or changed course, but does not explain that choice.</p>	<p>Builds something that is not a bridge. Makes some effort to build a bridge, but when it does not work, does not show they have realized this and/or tried something else.</p>	<p>Builds something that is not a bridge or does not build anything. Has only a little, unfinished work.</p>
<p>Evaluates Solutions</p>	<p>Evaluates and analyzes the solution(s) and describes how the solution(s) accurately and effectively solve the problem.</p>	<p>Provides some reasonable rationale for how the solution(s) accurately solve the problem.</p>	<p>Provides some rationale for how the solution relates to the problem, but is missing key connections to the problem.</p>	<p>Provides no rationale for how or why a solution addresses the problem.</p>
<p>Evidence: answers to questions "After Work Session 2" and "Evaluate your work"</p>	<p>Accomplished + describes a specific reason why their bridge floated/hold marbles (or didn't), references an overall design principle they used (e.g. balance, size of the bridge, weight), and/or a relevant physics concept to evaluate and analyze their solution</p>	<p>Explains something about how their bridge floated/hold marbles (or didn't), making a direct connection between the design choice they made and the bridge floating/holding marbles (or not)</p>	<p>Vague or unclear evaluation of their solution with little or no explanation</p>	<p>No evaluation or explanation of the solution.</p>

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