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21st Century Learning Design

21CLD Student Work Rubrics

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21st Century Student Work Rubrics

Introduction

Educators globally are working to design new models of learning that better prepare learners The purpose of this guide is to help educators identify and understand the 21st century skills that are demonstrated in students' work products.

Student work is what students produce when they complete a learning activity. It can be something they completed in one class period or the results of an extended project that took place both in and outside of school.

This guide describes **six dimensions of students' 21st century learning**, each of which represents an important skill for students for develop:

- collaboration
- knowledge construction
- self-regulation
- real-world problem-solving and innovation
- use of ICT for learning
- skilled communication

For each dimension, this guide will help you to determine how strongly the student work demonstrates the related skill. Each dimension has the same structure:

- The **overview** introduces key concepts for that dimension.
- The "**big ideas**" define important attributes of the student work for each dimension.
- The **rubric** uses the big ideas to help you assign a number from 1 to 4, according to how strongly the student work demonstrates the given skill.
- The **flowchart** shows how to choose the best number in each case.

In 21CLD, analysing student work is different from the grading that teachers usually do. When grading, teachers assign a grade based on the overall quality of the work. When assigning a number to student work for a given dimension, teachers should consider *only* the degree to which the student work demonstrates that dimension, *not* the overall quality of the work. Our purpose is to focus on specific elements of 21st century learning.

Collaboration

Did students work together? Did they share responsibility fairly, make substantive decisions together, and create interdependent work products?

Overview

Increasingly, collaboration is an essential skill for students in school as well as in their future careers in the workplace. The learning activity rubric for collaboration looked at the opportunities and encouragement that the learning activity provides for students to work together and to collaborate more deeply. This student work rubric looks at the collaborative work that is actually taking place in the classroom: are students working together, negotiating their ideas, and sharing the work fairly?

Because the big ideas in this rubric look at the process of collaborative work in the classroom, they cannot be judged solely from student work products. Use of this rubric will require a different view of the classroom. For example, it can be used with any of the following:

- Direct observation of classroom activities by another educator or other in-person observer
- A videotape of students' interactions during the class
- Questionnaires completed by students, asking about how they worked with each other

Big Ideas

Students are **working together** when they work in **pairs or groups** to:

- discuss an issue
- solve a problem
- create a product

Students' work in pairs or groups might also include people from outside the classroom, such as students in other classes or schools, or community members or experts. Students can work together face to face or by using technology to share ideas or resources.

IS THIS WORKING TOGETHER?	
YES:	**NO:**
Pairs of students gave each other feedback.	Students did their work alone.
A small group discussed an issue together.	The whole class discussed an issue.
A student used Skype to interview a student in another town.	
Students used OneNote to share their story drafts and give each other feedback.	Each student created his/her own story and sent it to the teacher for feedback.

Students are **sharing responsibility** when they are working in pairs or groups to develop a common product, design, or response. Shared responsibility is more than simply helping each other: students must collectively own the work and be mutually responsible for its outcome.

If the group work involves students or adults from outside the classroom, this qualifies as shared responsibility ONLY if the students and the outside participants are mutually responsible for the outcome of the work.

IS THIS SHARED RESPONSIBILITY?	
YES:	**NO:**
Students conducted a lab experiment together. Students had joint responsibility for carrying out the lab experiment.	**Students gave each other feedback**. One student "owned" the work, and the other was only helping.
A student worked with a peer in another country via Skype and Microsoft Office 365 to develop a joint website. The students shared responsibility for the development of the website.	**A student interviewed a peer in another country via Skype about the local weather**. This is a task that students conducted together, but they did not have mutual responsibility for any particular outcome.

Students are **sharing responsibility fairly** when all students on a team are engaged in the work, and all are contributing toward the final outcome. If the task gives students shared responsibility but in practice one student is doing all or most of the work, they are **not** sharing the responsibility fairly.

ARE STUDENTS SHARING RESPONSIBILITY FAIRLY?	
YES:	**NO:**
A team of 4 students designed a website about an author. Each of the students contributed the text and visuals related to a different book the author had written.	A team of 4 students designed a website about an author. Two students divided the topics and did most of the website creation, while the other two students were talking about something else.
Small groups of students used tablet PCs to complete an activity about diffusion and osmosis. Each group submitted one answer sheet for the entire group, but all students contributed to the work.	Small groups of students used tablet PCs to complete an activity about diffusion.and osmosis. On student did the work of completing the answer sheet for the entire group.

Students are **making substantive decisions** when they are actively resolving important issues that will guide their work. Substantive decisions are decisions that shape the content, process, OR product of students' work:

- **Content:** Students are using their knowledge of an issue to make a decision that affects the academic content of their work together, such as taking a stance on a topic they will then write about, or deciding on the hypothesis they will test.
- **Process:** Students are planning what they will do, when to do it, what tools they will use, or the roles and responsibilities of people on the team.
- **Product:** Students are making fundamental design decisions that affect the nature and usability of their product.

DID THESE STUDENTS MAKE SUBSTANTIVE DECISIONS?	
YES:	**NO:**
Students discussed which capital city to choose for their project, based on what they knew of the political systems of each country. The students negotiated their ideas. This is a content decision that will shape their work together.	**Students worked together to identify capital cities of particular countries in Europe**. This decision does not affect the rest of their work.
Students devised a plan for creating their music video for international children's day. Students discussed who would direct, shoot, and edit the video; what	**Students filmed a video according to the list of steps the teacher provided.** The teacher planned the process of their work, not the students.

technologies they would use; and the timeline for completing different stages of the work. These decisions are fundamental to the work process for the entire project.	
Students in science class made substantive edits to the app they created about Mendelian genetics: for example, they changed the parameters that users can set to explore offspring characteristics. These revisions impact fundamental features of the product.	**Students in science class made aesthetic edits to the app they created about Mendelian genetics: for example, they changed the background colour and font.** These revisions do not impact the fundamental features of the product.

Students are making **substantive decisions together** when they interact with one another to jointly arrive at their decision. During this process, students can usually be observed to be sharing ideas, listening to each other, and negotiating and debating if they do not initially agree. They might also decide on a strategy for coming to agreement: they have to convince each other, or they will take a vote and go with the majority opinion, for example.

If students have different opinions and one of the students makes the decision for the entire group without taking the opinions of other students into account, this is NOT considered making substantive decisions together.

DID STUDENTS MAKE SUBSTANTIVE DECISIONS TOGETHER?	
YES:	**NO:**
A team of students decided what side of an issue they will argue for in a debate. The students negotiated their ideas. This is a content decision that will shape their work together, and students all contributed to the decision.	**A team of students decided what side of an issue they would argue for in a debate. The students disagreed, and one student submitted her own choice as the decision of the group.** Students did not make the decision together, and did not have a strategy to resolve their disagreement.
A group of students planned how they would conduct the interviews for their oral history project: some students wanted to create a specific protocol to follow, while others wanted to conduct more open-ended interviews. Eventually they decided to create a list of topics to use as a guide, while letting the	**A group of students planned how they will conduct the interviews for their oral history project: some students wanted to create a specific protocol to follow; others wanted to conduct more open-ended interviews; and others were disengaged from the conversation.**

interviews mostly follow their own course. This is a substantive decision about their work process, and students arrived at a middle-ground solution to their initial question.	**Eventually one person made a decision for the whole group.** Students did not make the decision together.
Students decide whether to create an online journal or a physical journal for their next journalism class project. Some students preferred one option, while others preferred the other. They decided to take a vote and go with the majority opinion. This was an important decision about the format of the final product; students developed a plan for arriving at a group decision.	**Students decided whether to create an online journal or a physical journal for their next journalism class project. Some students preferred one option, while others preferred the other. One student told the teacher they couldn't decide and asked the teacher to decide for them.** Students did not make the decision together and did not have a strategy to resolve their disagreement themselves.

Students' work products are **interdependent** when there is evidence that all students contributed and the work was integrated into a coherent product. If a work product is interdependent, ALL of the following conditions are true:

1. *The product contains evidence of contributions from all students in the group.* For example, each student created a particular section of content or contributed to a particular aspect of the product (such as text vs. graphics). There may also be evidence from observing the students' work together than important ideas contributed by each student are incorporated into the final product.

2. *Each contribution is essential to the final product.* If one student's contribution is removed, the product would no longer be complete or fully functional.

3. *Students have integrated their work into a coherent whole.* There is evidence that students have planned together and taken the work of others into account as they developed their own. For example, if each student created a page of a presentation, and the students simply assembled the pages together for the final presentation, this is NOT considered interdependent. The final presentation IS considered interdependent if the students' contributions work together to tell a story or communicate an overarching idea; in this case, there is evidence that students' individual pages were designed as parts of a coherent whole.

Collaboration: Student Work Rubric

1 =

- Students are NOT working together in pairs or groups.

2 =

- Students ARE **working together**
- BUT they are NOT sharing responsibility fairly.

3 =

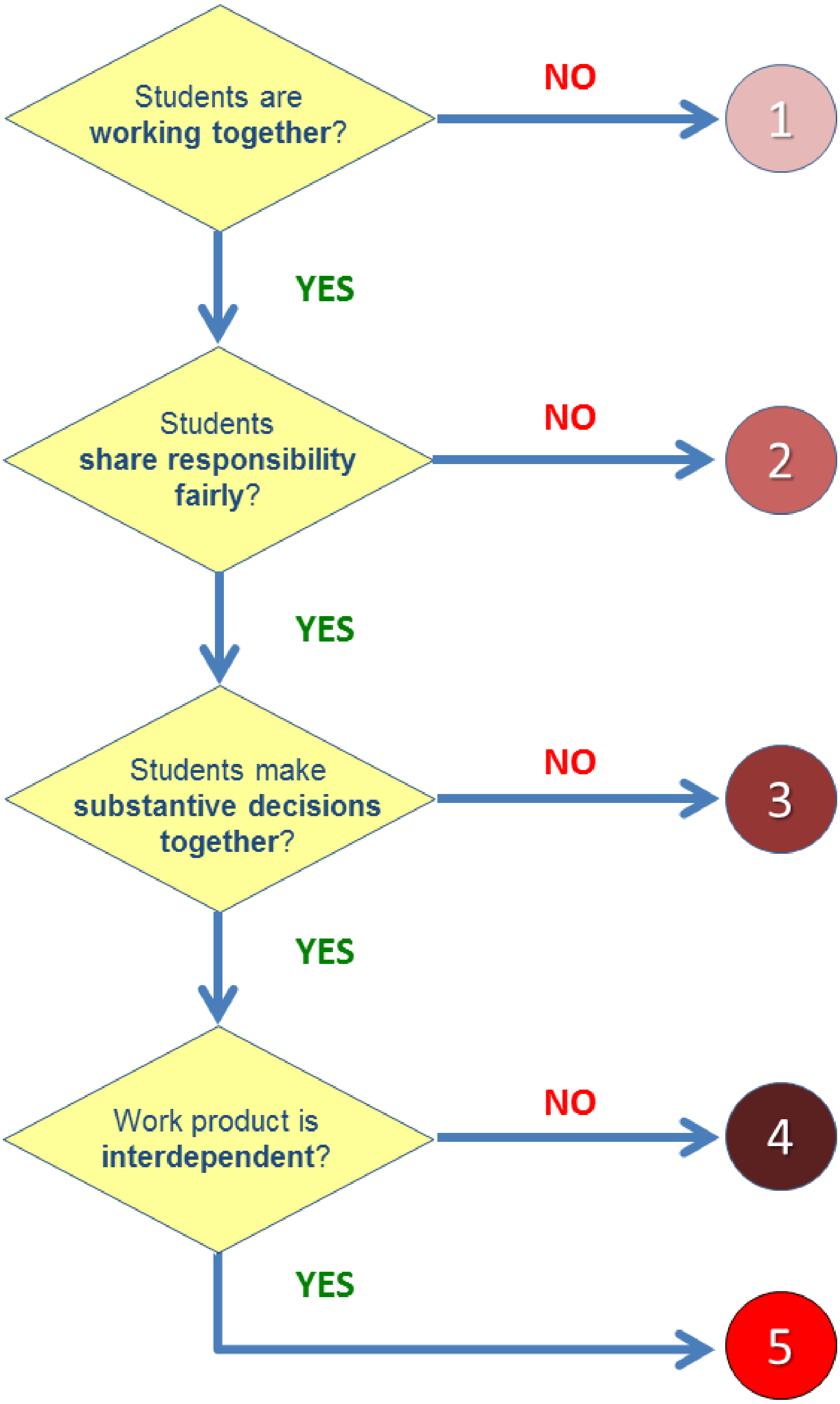
- Students ARE **sharing responsibility fairly**
- BUT they ARE NOT making substantive decisions together.

4 =

- Students ARE **sharing responsibility fairly**
- AND they ARE **making substantive decisions together**
- BUT their work product is NOT interdependent.

- Students ARE **sharing responsibility fairly**
- AND they ARE **making substantive decisions together**
- AND their work product IS **interdependent**.

Collaboration: Decision Steps



Knowledge Construction

Did the student construct knowledge? Was that knowledge conceptually accurate? Was it applied or interdisciplinary?

Overview

Students are often given information to learn and reproduce. By contrast, when students **construct knowledge**, they generate ideas and understandings that are *new to them*. Students can do this through **interpretation**, **analysis**, **synthesis**, or **evaluation**.

For this rubric, student work is stronger when the **main effort** involved knowledge construction, and when the work demonstrates **conceptual understanding** appropriate for the student's age.

The strongest student work demonstrates that students **applied** the knowledge they constructed to a different context, and connects information and ideas from **two or more academic disciplines** (for example, integrates ideas from both science and literature).

Big Ideas

Knowledge construction happens when students do more than reproduce what they have learned: they go beyond knowledge reproduction to generate ideas and understandings that are new to them. The skills of knowledge construction are often considered "critical thinking." Students build knowledge when they **interpret**, **analyse**, **synthesize**, or **evaluate** information or ideas.

- Interpretation means drawing inferences beyond the literal meaning. For example, students might read a description of a historical period and infer why people who lived then behaved the way they did.
- Analysis means identifying the parts of a whole and their relationships to each other. For example, students might investigate local environmental factors to determine which are most likely to affect migrating birds.
- Synthesis means identifying the relationships between two or more ideas. For example, students might be required to compare and contrast perspectives from multiple sources.
- Evaluation means judging the quality, credibility, or importance of data, ideas, or events. For example, students might read different accounts of an historical event and determine which ones they find most credible.

If students practiced a procedure they already knew, or followed a set of steps they were given, the students WERE NOT constructing knowledge. To determine whether students already knew a certain procedure, consider what is typically expected of students their age. If students devised a procedure themselves, they WERE constructing knowledge.

It is important to note that not all student work involving "research" results in knowledge construction. If students looked up information and then wrote a paper that simply described what they found, students were reproducing knowledge, NOT constructing knowledge—they did not interpret, analyse, synthesize, or evaluate anything.

IS THIS KNOWLEDGE CONSTRUCTION?	
YES:	**NO:**
A student used details in a story to infer the reasons why a character committed a crime.	A student's paper described the crime a character committed.
Students searched the Internet for information about local activities to help the environment and analysed the information to decide what else could be done.	Students searched the internet for information about local activities to help the environment and gave a presentation to describe what they found.
A student's paper compared and contrasted information from multiple sources.	A student's paper describes information they found online or in books.
Students compared different explanations for changes in atmospheric pressure to determine which explanations they found credible.	Students familiar with the barometer used one to measure atmospheric pressure.
Students who have not learned about parallel lines examined several different pairs of lines to develop a definition of "parallel."	Students used the definition of "parallel" to decide whether several sets of lines were parallel.

The **main effort** is what students spent the most time and effort on. You might have to estimate how much time and effort students spent on different parts of the work if you cannot ask the teacher or review the learning activity.

IS THE MAIN EFFORT KNOWLEDGE CONSTRUCTION?	
YES:	**NO:**
A student made a <u>short</u> list of important details from a story, then wrote <u>an essay</u> using these details as evidence for why a character committed a crime. The work implies that most of the student's time was spent on analysis.	**A student made a <u>long</u> list of details from a story, then wrote <u>two sentences</u> to describe why a character committed a crime.** The work implies that most of the student's time was spent listing details (a recall task).

Students demonstrate **conceptual understanding** when they apply a concept to new material *without* major conceptual errors. Consider a student's age when determining the level of understanding demonstrated. In general, older students are expected to demonstrate a more complex understanding of concepts.

IS THIS CONCEPTUAL UNDERSTANDING?	
YES:	**NO:**
A 10-year-old student's work demonstrates understanding that plants use sunlight to make their food in a process called photosynthesis.	**A 10-year-old student's work demonstrates understanding that sunlight helps plants grow but not of how that happens.**
In a lab report, a 14-year-old student predicted that when two liquids were mixed, the volume of the mixture would depend on the identity of the liquids. This requires an understanding of atomic structure.	**In a lab report, a 14-year-old student predicted that when two liquids were mixed, the volume would always be the sum of the volumes of the separate liquids**. This demonstrates a lack of understanding of atomic structure.

Students apply their knowledge when they use the knowledge they have constructed to support another knowledge construction task in a new context. For example, students in a physics class might construct knowledge about heat principles from a study of the Earth's inner core, and then apply what they learned to investigate the environment of Jupiter. Students in language class might write a persuasive essay for an academic audience and then apply the knowledge they constructed about audience-focused writing to reposition the same content for a public newspaper article. In each case, the second knowledge construction task deepens students' understanding of core principles because they must abstract what they learned and look at it from a different perspective in order to apply it in a different situation.

To be considered an application of knowledge in a new context, it is not enough for the two contexts to differ only in surface features. Students cannot have responded to the new situation simply by applying the same formula. The work must demonstrate that students used interpretation, analysis, synthesis, or evaluation to decide how to use what they have learned in this new context.

DID STUDENTS APPLY THEIR KNOWLEDGE?	
YES:	**NO:**
Students analyzed demographic statistics from their hometown and then used their understanding of population trends to develop a plan for an upcoming housing development project. Students applied their knowledge from analyzing demographic statistics in order to develop a housing plan; this step required further analysis.	**Students analyzed demographic statistics from their hometown and then analyzed demographic statistics from a second location of their choice.** Students did not apply their knowledge from analyzing demographic statistics to any new activity; they simply repeated the same activity with a different dataset.
Students examined photos enlarged at different sizes to develop an understanding of similarity and then applied that knowledge to abstract geometric shapes, thinking about size ratios and angles to determine which shapes are mathematically similar. Students applied their knowledge from evaluating shapes to deepen their own understanding of mathematical similarity.	Students examined photos enlarged at different sizes to develop an understanding of similarity and then described their understanding. Students did not apply their knowledge from evaluating shapes to any new domain; they simply articulated that knowledge.
Students in theatre class analyzed the characters in a play to learn about character development; then the students used Movie Maker to create their own one-act play demonstrating character development. Students applied their knowledge from their character analysis to create and develop their own characters; this step required further interpretation and analysis.	Students in theatre class analyzed the characters in a play to learn about character development and then wrote an essay about what they learned. Students did not apply their knowledge from their character analysis to any new task; they simply articulated that knowledge.

Students designed and executed a procedure for testing the qualities of the tap water at their school. Once they had accurate data, they used that information to determine which water filtration system would be most appropriate for the school. Students applied their knowledge from designing and conducting water quality tests to select an appropriate water filtration system, which required them to look at what they have learned in a new way and deepen their knowledge.	Students designed and executed a procedure for testing the qualities of the tap water at their school. They tested the water and redesigned the procedure iteratively until they had accurate data. Although students applied their knowledge from previous trials to refine the procedure, they only applied knowledge within a single (repeated) context. They deepened their knowledge, but did not extend it to a new type of application.

Interdisciplinary student work involves content, important ideas, or methods from different academic subjects (such as mathematics and music, or language arts and history). Subjects that are typically taught together in your country do not count as interdisciplinary.

For purposes of this rubric, ICT is NOT considered a separate academic subject. ICT is often used as a tool for learning in other subjects. For example, students might build ICT skills when they do online research for a history project. This activity is NOT considered interdisciplinary.

Knowledge Construction: Rubric

1

- The student work DOES NOT demonstrate knowledge construction**.** The work shows only that students reproduced information or used familiar procedures.

2

- The student work DOES demonstrate knowledge construction**.** It shows that the student **interpreted, analysed, synthesized,** or **evaluated** information or ideas.
- BUT the student's **main effort** WAS NOT knowledge construction.

3

- The student's **main effort** WAS knowledge construction
- BUT the work DOES NOT demonstrate **conceptual understanding.**

4

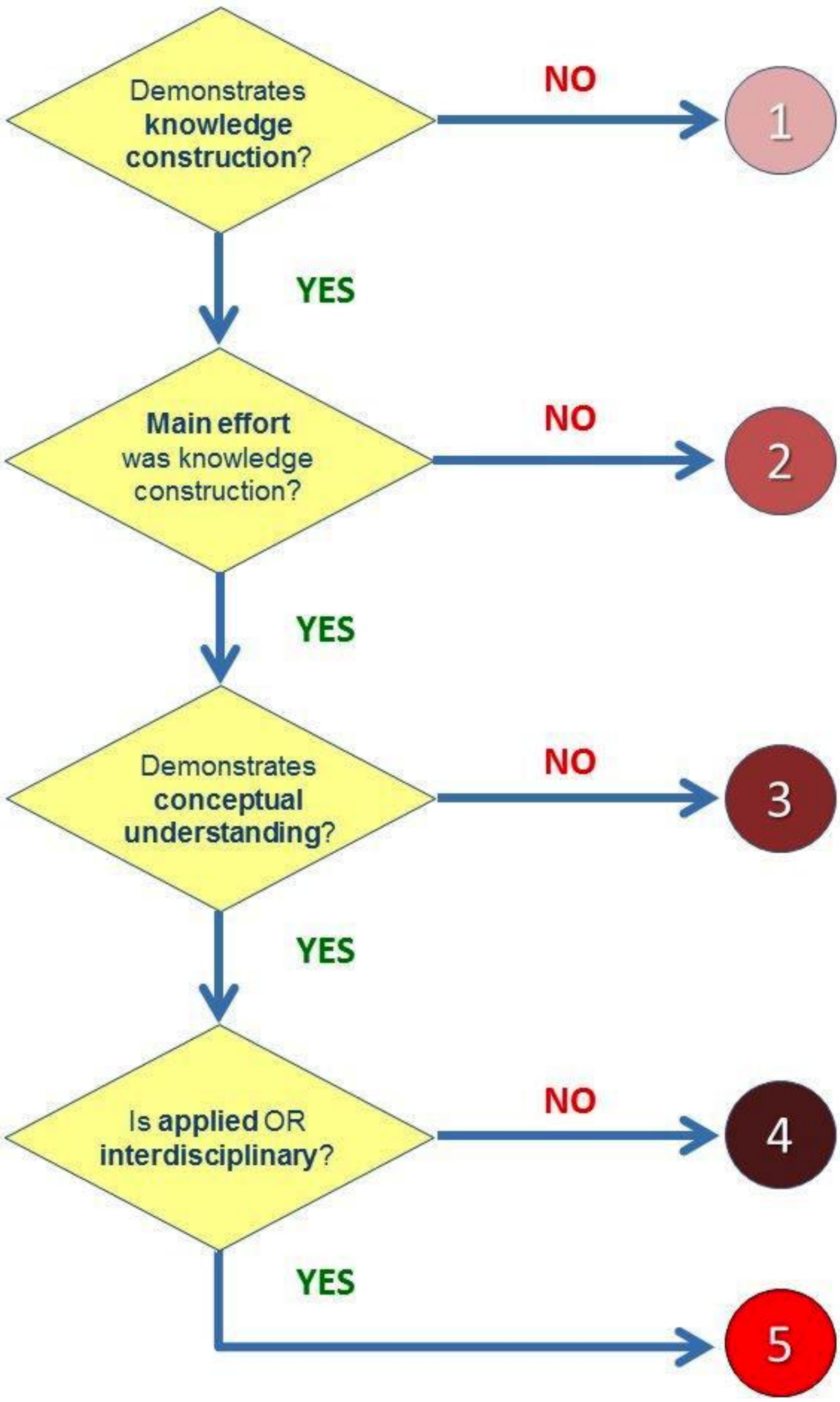
- The student's **main effort** WAS knowledge construction
- AND the work DOES demonstrate **conceptual understanding**

  BUT students did not **apply their knowledge** AND
  the work is NOT **interdisciplinary**.

5

- The student's **main effort** WAS knowledge construction
- AND the work DOES demonstrate **conceptual understanding**
- AND students DID **apply their knowledge**
  OR
  the work IS **interdisciplinary**.

Knowledge Construction: Decision Steps



Real-World Problem-Solving and Innovation

Did the student develop a successful solution to a real-world problem? Did the student implement the solution in the real world?

Overview

In traditional schooling, students produce work that is often unrelated to what they see and do in the world outside school. This rubric examines whether students' work demonstrates **problem-solving** and the use of data or situations from the **real world**. The strongest student work for this rubric demonstrates that the student:

- **did NOT already know** a response or solution to the task
- developed a **successful solution** to a **real-world problem**
- **innovated** by putting into practice his or her ideas, designs or solutions for others.

Big Ideas

Student work demonstrates **problem-solving** when it addresses a defined challenge. Work that involved problem-solving shows that students:

- developed a solution to a problem that was new to them OR
- completed a task that they had not been instructed how to do OR
- designed a complex product that met a set of requirements.

For this rubric, student work can demonstrate problem-solving even if the student's solution was already known to scientists or even to older students. For example, if students who had not already learned about buoyancy decided to place different kinds of objects in water to see which would sink and which would float, their work would demonstrate problem-solving.

To count for this rubric, problem-solving must have been the student's **main effort**—the part of the work he or she spent the most time and effort on.

IS THIS PROBLEM-SOLVING?	
YES:	**NO:**
Students rewrote a story from the perspective of a character other than the narrator. Students used the original story but were not instructed how to complete this task.	**Students read a story and then took a quiz about what they read.** Students did not have to develop any solutions. They were not addressing a defined challenge.
Students used a map of a bus route to propose where pedestrian crossings should be added in a fictional town. Students were not instructed where to put the crossings.	**Students learned about pedestrian safety by studying a map showing bus stops and pedestrian crossings.** Students were not addressing a defined challenge.

Solutions to **real-world** problems address authentic situations and needs that exist outside an academic context. Solutions to real-world problems:

- Address problems **experienced by real people**. For example, if students diagnosed an ecological imbalance in a rainforest in Costa Rica, they were working with a situation that affects the real people who live there.
- Are for a **specific, plausible audience** other than the teacher as grader. For example, students' designs for equipment to fit a small city playground could benefit the children of the community.
- Reflect a **specific, explicit context**. For example, a students' plan for an community garden in a public park in their town reflects a specific context; a exercise about which vegetables grow best in which parts of their country does not.
- Involve the **use of actual data** if the student used data—not data developed by a teacher or publisher just for a lesson. Real scientific records of earthquakes or first-person accounts of an historical event are actual data.

To count for this rubric, the real-world context must be **evident** in the student work—a real-world context that is only implied does NOT count. For example, if a student's writing *could* be of interest to a particular audience but there is no evidence in the work that the student had this audience in mind, the real-world context is not evident.

ARE THESE REAL-WORLD PROBLEMS?	
YES:	**NO:**
Students rewrote a Shakespeare play for a teenage audience. Teenagers were the real, specific audience.	**Students rewrote a Shakespeare play in a new rhyme scheme.** This had no specific audience.
Students used their town's bus map to propose where pedestrian crossings should be added in their town. This had a specific, explicit context. Students used actual data to do this.	**Students used a bus map in a textbook to propose where pedestrian crossings should be added in a fictional town.** This did not involve actual data.
Students investigated whether growing plants in their classroom could improve the air quality. Even though the setting was the classroom, air quality is a real issue.	**Students investigated the interaction between green plants and carbon dioxide in the air.** There is no explicit context for the students' investigation.

Real-world problem solutions must also be **successful**: they must meet the requirements of the student's task and have no unrealistic assumptions or obvious mis-statements of fact. Consider the age of the student when determining the success of a solution. For example, 14-year-old students would not be expected to develop a successful solution to fight a drug-resistant disease, but their solutions count as successful if they are consistent with scientific principles that they would be expected to know.

Student work demonstrates **innovation** when students' ideas or solutions were **put into practice in the real world**. For example, it counts as innovation if students designed *and built* a community garden on the grounds of their school; it does not count if they just designed the garden.

If students did not have the authority to implement their own ideas, it counts as innovation ONLY if the work shows that students conveyed their ideas to people outside the classroom context who *could* implement them. For example, it counts as innovation if students presented their ideas for building a community garden in a public park in their town to a local environmental group or to local officials, but NOT if students designed a community garden for that public park and shared their plans only with their teacher.

Innovation also **benefited people other than the student**; it had value beyond meeting the requirements of a classroom exercise. The townspeople who tended the new garden in the public park and the teenagers who attended the rewritten Shakespeare play benefited from students' efforts, for example.

It also counts as innovation if students created a project for a science fair or submitted an original poem to a regional poetry contest, for example, because the fair and contest were not teacher-controlled and had real audiences who were interested in and could benefit from the students' work.

IS THIS INNOVATION?	
YES:	**NO:**
Students rewrote a Shakespeare play for a teenage audience and performed it at a local youth centre. The teenage audience at the youth centre benefited from the students' effort.	**Students rewrote a Shakespeare play for a teenage audience but did not perform it.** No one outside the classroom benefited from the students' effort.
Students wrote letters to the town council about their ideas for adding pedestrian crossings in their town AND mailed the letters to council members. Students could not make new pedestrian crossings themselves but the town council could implement their ideas.	**Students wrote letters addressed to the town council about improving pedestrian safety BUT only gave the letters to their teacher to grade.** The letters did not reach an audience beyond the teacher as grader.

Real-World Problem-Solving and Innovation: Rubric

1

- The student's main effort WAS NOT **problem-solving**.

2

- The student's main effort WAS **problem-solving**
- BUT the solution DID NOT address a **real-world problem**
  OR
  the solution WAS NOT **successful**.

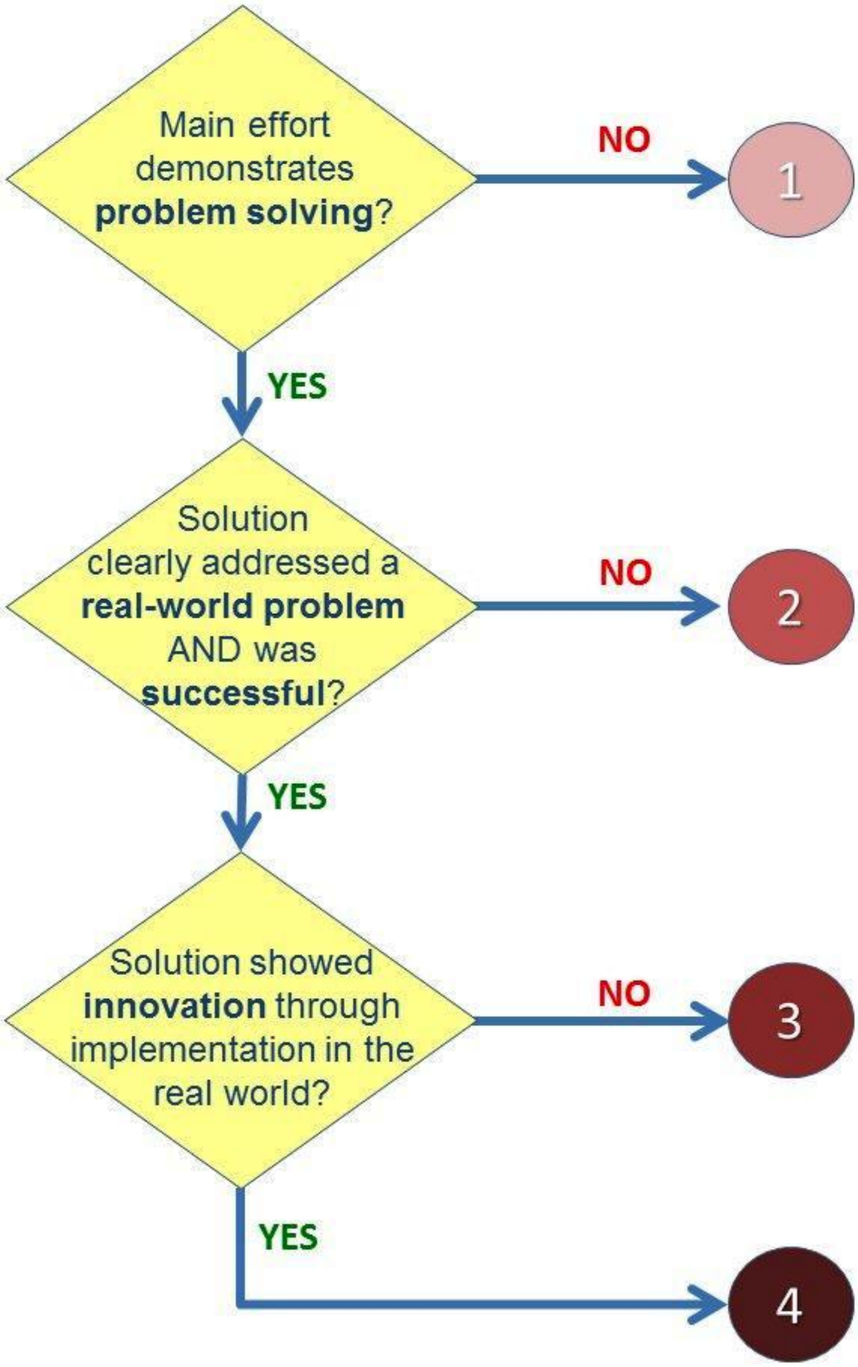
3

- The student's main effort WAS **problem-solving**
- AND the solution DID address a **real-world problem**
  AND
  the solution WAS **successful**
- BUT the student DID NOT **innovate**. He or she DID NOT implement a solution in the real world.

4

- The student's main effort WAS **problem-solving**
- AND the solution DID address a **real-world problem**
  AND
  the solution WAS **successful**
- AND the student DID **innovate**. He or she DID implement a solution in the real world.

Real-World Problem-Solving and Innovation: Decision Steps



Use of ICT for Learning

Were students passive consumers of ICT, active users, or designers of an ICT product for an authentic audience?

Overview

We live in a connected world with unprecedented access to a vast array of digital information and experiences. The use of technology continues to transform how we live and work. On-going adoption of new advances in ICT has become more essential to both life-long learning and life-long earning. In today's globalized, knowledge-based economies, individuals increasingly need skills not only to intelligently consume information and ideas, but also to design and create *new* information and ideas using ICT.

While ICT is becoming increasingly common in classrooms and learning environments, it is often used to present or consume information rather than to fundamentally transform learning experiences. This rubric examines *how* students use ICT— and whether it is used in more powerful ways to construct knowledge or to design knowledge-based products.

In this rubric, the term "ICT" encompasses the full range of available digital tools, both hardware (computers and related electronic devices such as tablets and notebooks, e-readers, smart phones, personal digital assistants, camcorders, graphing calculators, and electronic whiteboards) and software (including everything from an Internet browser and multimedia development tools to engineering applications, social media, and collaborative editing platforms).

ICT is a powerful tool to promote and support a wide range of 21st century skills, including all other 21CLD rubrics. For example, ICT can help students to collaborate in ways that were not possible before, or to communicate through new mediums of expression. In this rubric we focus on the interaction of ICT use with two rubrics in particular: knowledge construction and real-world problem-solving and innovation. These are not the only important ways that ICT can support innovative teaching and learning, but they represent particularly powerful uses.

Big Ideas

Student use of ICT happens when students use ICT directly to complete all or part of the learning activity. The teacher's use of ICT to present materials to students does not count as student use: it is important that students have control over the ICT use themselves. Some teachers' use of ICT can enhance their teaching significantly: for example, teachers can show simulations that make difficult content easier for students to visualize. However, this rubric focuses only on whether the *students* used ICT actively in their learning. There must be evidence of that student ICT use either in the work product itself or in the process that led to the work product.

IS THIS STUDENT USE?	
YES:	**NO:**
A student used Excel spreadsheet software to complete a math learning activity.	A student used a worksheet printed by the teacher to complete a math learning activity.
Students learned about cell replication by using a software simulation to explore the process.	Students learned about cell replication by watching the teacher demonstrate a software simulation of the process.
A student wrote a report using a word processing program, with edits tracked by the student.	A student wrote a report by hand, and the teacher emailed suggested edits.

Knowledge construction occurs when students generate ideas and understandings that are *new to them*, through **interpretation, analysis, synthesis,** or **evaluation**. This rubric examines whether the student work demonstrates that students used ICT in ways that **supported knowledge construction,** either directly or indirectly.

ICT **supports knowledge construction** when:

- Students use ICT directly for the knowledge-construction part of a learning activity. For example, students use a computer to analyze scientific information.
- Students use ICT to indirectly support knowledge construction, by using ICT to complete one step of an activity, and then using information from that step in the knowledge-construction part of the activity. For example, students wrote a paper that summarized their analysis of current events on Twitter. Even if students conducted their analysis and wrote their paper offline, the information they found on Twitter supported their analysis, so we say that ICT use supported knowledge construction.

The knowledge construction supported by ICT must be about the learning goals of the activity: learning to use the ICT does not qualify. For example, students might learn about PowerPoint as they create a presentation for history class. But to be considered knowledge construction using ICT, it is essential that the use of PowerPoint helped them to deepen their interpretation, analysis, synthesis, or evaluation of historical ideas, not just to deepen their knowledge on how to use the tool.

Evaluation of Internet resources related to the learning goals is also considered knowledge construction. Students may be learning to become intelligent, ethical users of Internet resources rather than passive consumers of the information. For example, students might have found several sources on a topic and evaluated their credibility before they selected which information to rely on.

DID STUDENTS CONSTRUCT KNOWLEDGE SUPPORTED BY ICT?	
YES:	**NO:**
Students used StickySorter to create interconnected plot and character diagrams for the novel they read in literature class.	Students used StickySorter to create a list of the characters in the novel they read in literature class
A student used AutoCollage to create a composite image that reflects the style and influences of an artist of his choice.	A student used AutoCollage to create a composite image of art works by an artist of his choice.
A student used Songsmith to create a song that uses “if…then” construction in her foreign language class.	A student used Songsmith to create a song reciting the months of the year in her foreign language class.
A student wrote a lab report explaining her findings from using probe ware to measure heat, weight, and time during a chemical reaction, describing how the weight changed over time as heat increased and hypothesizing about the relationships between the three variables.	A student wrote a lab report listing her heat, weight, and time data points gathered from probe ware during a chemical reaction.
A student used Triangle Solver to explore the relationship between angles in a triangle and write a hypothesis about angle measurements and triangles.	A student used Triangle Solver to fill in the measurement of the third angle in a series of triangles.

ICT is required for this knowledge construction when students construct knowledge that would be impossible or impractical without the use of the ICT. For example, students might use email to communicate with students in another country over a period of two weeks to research the impact of a recent drought on their community. In this case, email enabled students to construct knowledge that they could not have constructed without ICT because mailing physical letters would be impractical in this short a time. The use of email was required for constructing this knowledge.

Many knowledge construction activities can also be done without ICT. For example, students may be asked to find information about the beaks of a variety of bird species with different diets and develop categories of different types of beaks. If students used the Internet for this activity, they used ICT to construct knowledge, but ICT was not required: they would have been able to achieve the same learning goals without ICT if they had chosen to go to the library and consult printed books.

IS ICT REQUIRED FOR THIS KNOWLEDGE CONSTRUCTION?	
YES:	**NO:**
A student wrote a report analysing the different perspectives in three current event articles from international newspapers found on the Internet. In this school, current newspapers from other countries are not available in hardcopy.	**A student wrote a report analysing the different perspectives in three current event articles from the online version of their local newspaper.** The local newspaper is probably available to students in hardcopy.
A team of students created a process diagram showing how stars form, based on what they learned from a computer-based simulation about star formation. The simulation helped to deepen the students' knowledge about events that cannot be directly observed.	**A team of students created a process diagram showing what happens when you mix vinegar and baking soda, based on what they learned from a computer-based simulation about household science.** The simulation showed something that the students could have done with physical materials instead.
A student wrote a narrative explanation of slope, based on what he learned from exploring a simulation showing graphs of time, distance, and speed. The simulation enabled students to explore the concept of slope dynamically, which they could not have done without the simulation.	**A student wrote a narrative explanation of slope, based on what he learned from filling in time, distance, and speed in an equation in Excel.** The Excel calculations could also have been done by hand.

A student created a short video based on interviews conducted with older family members about their childhoods. The product included video and audio that contributed depth and meaning to the story and helped students to conduct deeper analysis about what they had learned through selecting the appropriate clips.	**A student wrote a report in Word based on interviews conducted with older family members about their childhoods.** The student could also write the reports by hand and the knowledge construction would remain the same.

Students are **designers** of ICT products when their work is an **ICT product that others can use.** For example, if students record a podcast and make it available on the Internet, they are creating an ICT product others could use. The product lasts beyond the learning activity and can be used or enjoyed by an outside audience.

When students act as designers, ICT is supporting their real-world problem-solving and innovation. Students must have an authentic audience in mind, such as a community that needs the information their podcast will provide, or younger students who will learn about disease prevention from the simulation students are building. In their design, students must attend to the needs and preferences of that audience. Ideally, but not necessarily, the product might actually be used by the intended audience. Students who create a product with no particular audience in mind do not qualify as designers under this definition. To qualify for this idea, **students' attention to the audience must be evident in their product**.

IS ATTENTION TO AUDIENCE EVIDENT IN STUDENTS' ICT PRODUCT?		
ACTIVITY	**YES:**	**NO:**
In computer programming class, students used TouchDevelop to design and program a mobile smartphone app that could help senior citizens in their daily lives.	**The product is optimized for large print so that seniors can see it easily, among other features.** The app includes features that these students chose specifically for accessibility to a senior audience.	**The product has a user interface that would be difficult for seniors to use.** These students did not take the needs of the target end users into account in their design.
Students used SongSmith to create a song to educate visitors at the children's natural history museum about dinosaurs.	**The song has a clear melody and a refrain that teaches an important fact about dinosaurs.** The song includes features that this team of students chose specifically for relevance and appropriateness for the museum audience.	**The song has a heavy, dissonant sound and lyrics that are hard to understand.** This team of students did not take the needs of the target end users into account in their design.
Students created a game to help younger students learn and practice addition.	**The game uses bright colors and pictures, has clear rules and objectives, and incorporates a reasonable level of challenge.** The game includes features that students chose specifically to engage young children.	**The game is not visually appealing, has complicated rules, and includes overly complex mathematics.** The students did not consider the preferences and abilities of the target audience.
Students used the Internet to research and communicate with local food producers.	**A student created an app designed to help families in their community make more local choices when buying food.** This student designed an ICT product that would be accessible and usable to local families.	**A student wrote a report of their findings and submitted it to the teacher.** This student did not create an ICT product nor consider the needs of any particular audience.

Use of ICT for Learning: Rubric

1

- Student work does NOT demonstrate ICT use.

2

- Students **used ICT**
- BUT the work does NOT demonstrate knowledge construction supported by ICT.

3

- Student work demonstrates **knowledge construction supported by ICT**
- BUT students could have constructed the same knowledge without using ICT.

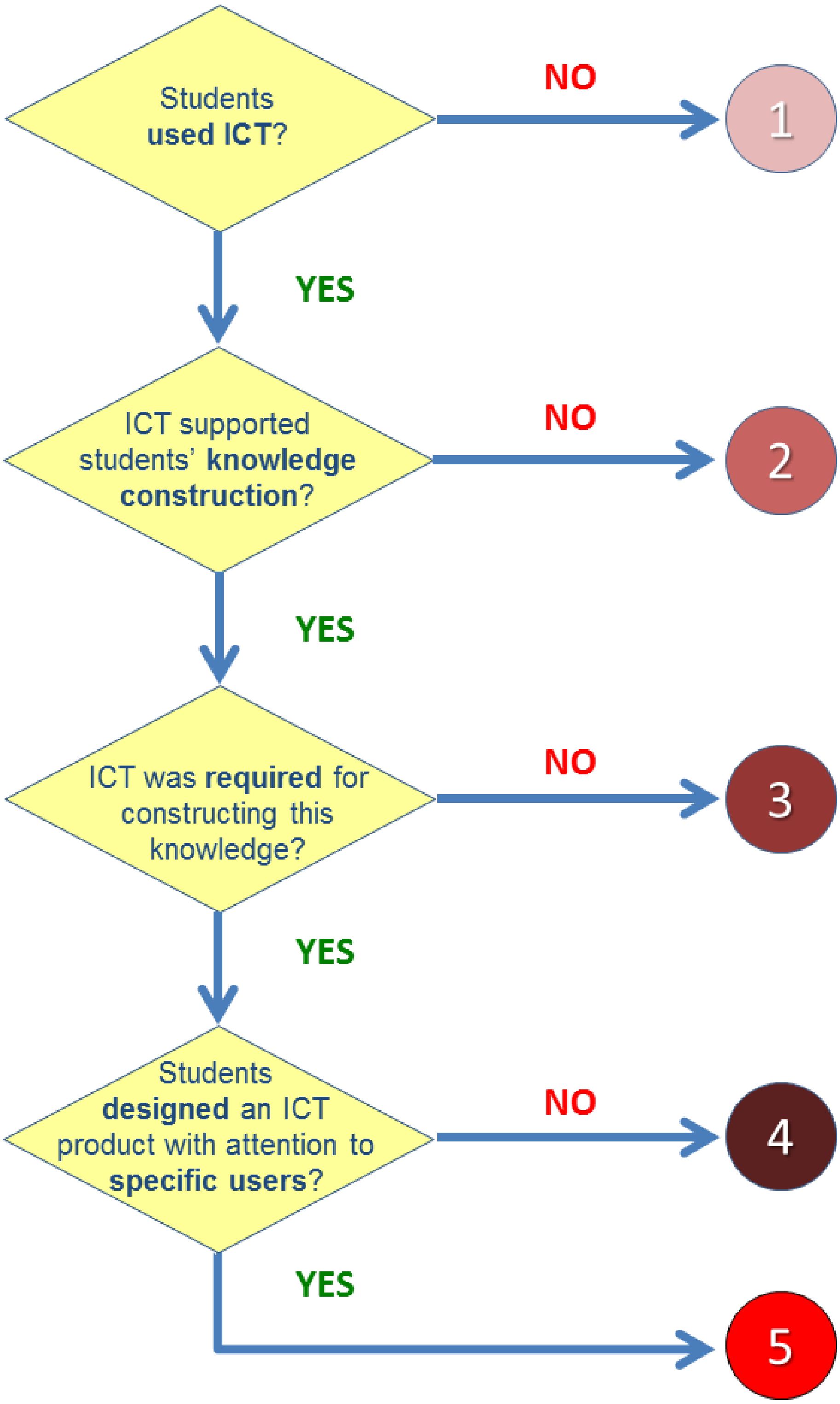
4

- Student work demonstrates **knowledge construction supported by ICT**
- AND the ICT WAS **required for constructing this knowledge**
- BUT students did NOT design an ICT product for authentic users.

5

- Student work demonstrates **use knowledge construction supported by ICT**
- AND the ICT WAS **required for constructing this knowledge**
- AND students designed a **product** that **demonstrates attention to authentic users** in its design.

Use of ICT for Learning: Decision Steps



Self-Regulation

Are students aware of learning goals and success criteria in advance? Did they successfully plan and monitor their own work, and improve their product by incorporating feedback?

Overview

Today's complex world demands self-regulated thinkers and learners who can take responsibility for their lives, their work, and their ongoing learning. It requires individuals to monitor their own work and to incorporate feedback to develop and improve their work products.

These skills often take time for students to develop, particularly if their earlier schooling mainly asked them to follow the teacher's instructions. This rubric looks at the development of increasingly sophisticated self-regulation skills. The first step is awareness of the "big picture" of the learning process they are about to engage in, including learning goals for the activity and how they will be assessed. At higher levels of this rubric, students take responsibility for planning their own work, and improve the quality of their work by incorporating feedback or self-reflection.

It may not be possible to evaluate these skills on the basis of students' work products alone. Useful data sources include:

- **Direct observation** of classroom activities by another educator or other in-person observer
- **A videotape** of students' planning and monitoring activities during the class
- **Questionnaires completed by students**, asking about the process and direction of their work.

Big Ideas

Learning goals define what is to be learned in this activity and how these goals fit with prior and future learning.

Success criteria are the factors that will be considered to determine whether the learning goals have been met: the evidence of student progress and success in this learning activity.

When students are aware of these important learning parameters before they complete the work, they can begin to consider how to manage and monitor their own learning. This rubric looks at whether students are **aware of learning goals and associated success criteria** in advance of completing their work. Ideally, students have been involved in the determination of learning goals and development of success criteria, co-constructing them with the teacher. Student awareness is a first step.

Evidence that a student was aware of the learning goals and success criteria might include, for example, that the student:

- participated in a class discussion about the learning goals and success criteria;
- was seen to read them after they were provided by the teacher;
- was able to describe them in an interview;
- was observed to consult them as he or she completed the work.

When students **plan their own work**, they make decisions about the schedule and steps they will follow to accomplish the task. Planning their own work may involve:

- *Deciding how:* Students break down a complex task into simpler sub-tasks, or choose the tools they will use.
- *Deciding when:* Students create a schedule for their work and set interim deadlines.
- *Deciding who:* A group of students determines how to divide work among themselves.
- *Deciding where:* Students decide what pieces of the work would be done inside or outside of the school building or the school day.

If students follow detailed instructions and timelines from the teacher, they are NOT planning their own work. Students making decisions about small aspects of tasks does NOT qualify as planning their own work.

When students **monitor their own work**, they use the plan they developed as a guide to complete their activities. Students at advanced stages of self-regulation will carry out tasks according to the plan, consult the plan to see what to do next and how to do it, and make changes to the plan as needed when unforeseen circumstances arise. It is the students who are taking responsibility for the process of their work.

Students' planning and monitoring is **successful** when they achieve the target outcome of the process. Their work is completed on time, appropriate milestones are achieved, and members of the team each contribute as planned. This is in contrast to students who fail to complete the work, or who leave much of the work to the last minute.

DID THESE STUDENTS SUCCESSFULLY PLAN AND MONITOR THEIR OWN WORK?		
Learning Activity:	**YES:**	**NO:**
Over two weeks, students worked in groups to research and debate climate change with their classmates.	This group of students decided who would research which aspects of the topic and who would speak at different points in the debate, and carried out these roles as they prepared for the debate.	The teacher assigned specific roles to each student in the group.
	This group of students made and followed their own deadlines for completing their research, writing their speech, and practicing it.	This group of students did not plan any particular timeline, and ended up writing their speech the night before the debate with no time to practice.

When students **improve the quality of their product by incorporating feedback**, they are taking responsibility for the quality of their work and for continuing to improve it. Usually, this includes the following conditions:

- Students have received feedback from the teacher or from peers, or have conducted an explicit process of self-assessment against the learning goals and success criteria.
- Students consider the feedback, and use it to improve the next draft of their work before they have completed the final product. Evidence that students incorporated the feedback should be present in the students' final work.
- The revisions actually improved the quality of the product, according to the learning goals of the activity and the success criteria for the students' work. If students incorporate a correction by rote or do not deeply consider the implications for their work deeply, they are not taking responsibility for managing the quality of their work.

DID THESE STUDENTS IMPROVE THE QUALITY OF THEIR WORK BASED ON FEEDBACK?		
Learning Activity:	**YES:**	**NO:**
Students learned about environmental conservation and created games in Kodu where players make decisions to preserve the environment.	After developing a beta version of their game, a student traded games with a partner and incorporated the partner's feedback to improve the game before turning it in.	A student posted the first version of her game for classmates to play.
Pairs of students created PowerPoint presentations about a topic in world history.	A pair did a practice presentation to the class. Their final presentation included substantive changes based on the feedback they received from their teacher and peers; for example, it now includes multiple perspectives on the war they were describing.	A pair did a practice presentation to the class. Their final presentation was not substantively different, even though they had received several good suggestions from the class.
Students were writing persuasive essays. At the beginning of the activity the students participated in the development of the rubric that would be used to judge the quality of their essays.	A student consulted the rubric as he was drafting his essay to guide the quality of his work.	A student wrote and submitted his essay without consulting the rubric.
Students were writing persuasive essays. After they had completed a first draft the teacher handed out the rubric that would be used to judge the quality of their essays, and asked students to use it to revise their essay before they submitted it.	A student used the rubric and it gave her ideas for ways to improve the evidence she had included in her essay; she implemented these changes before she submitted the final draft.	A student looked at the rubric as instructed. But the final draft of her essay contained only cosmetic changes, even though it would not receive a high score on the rubric.

Self Regulation: Coding Rubric

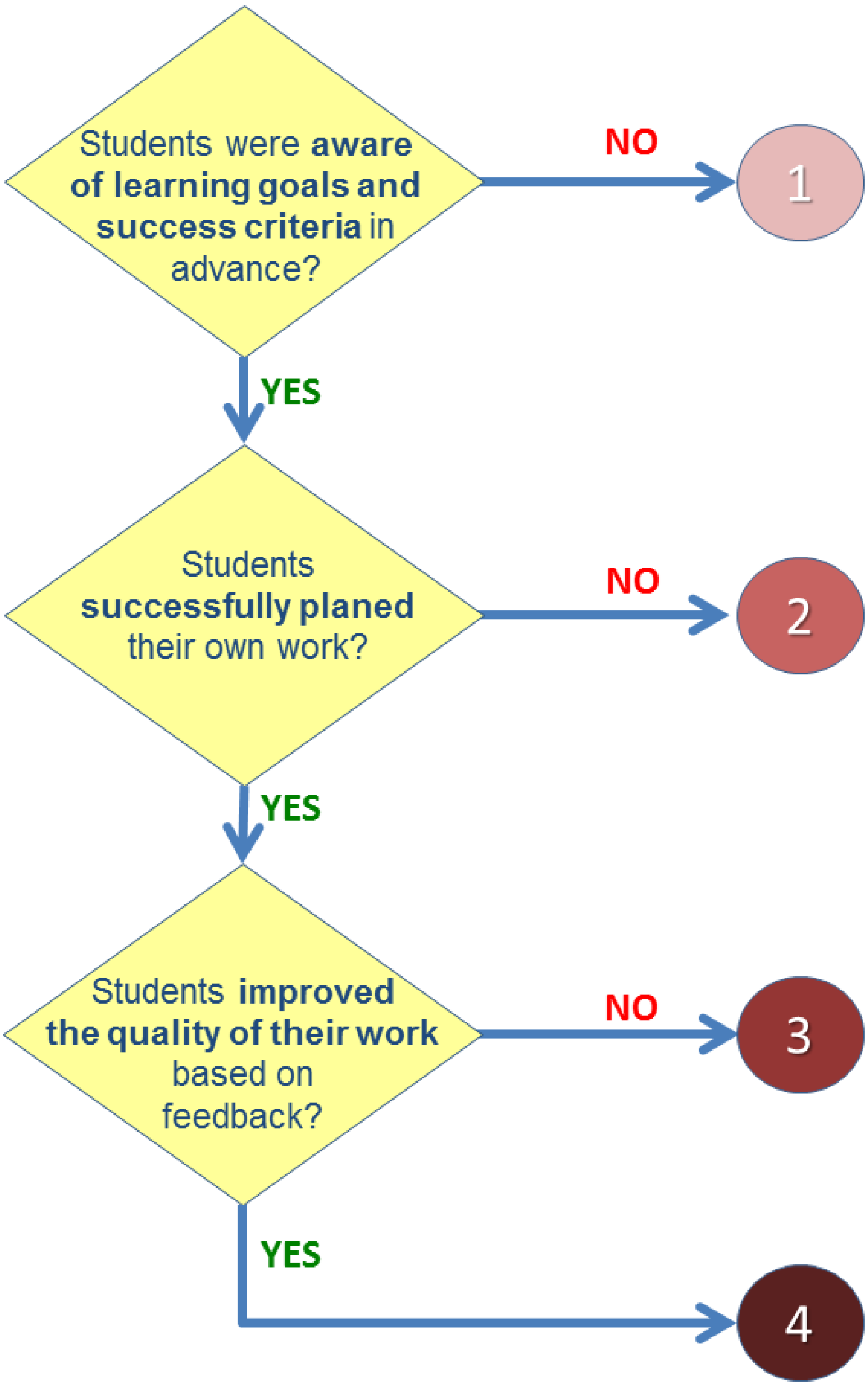
1 =
- Students did NOT show evidence that they were aware of both learning goals and associated success criteria in advance of completing their work.

2 =
- Students DID show evidence that they were **aware of learning goals and associated success criteria** in advance of completing their work
- BUT they DID NOT successfully plan and monitor their own work.

3 =
- Students DID show evidence that they were **aware of learning goals and associated success criteria** in advance of completing their work
- AND they DID **successfully plan and monitor their own work**
- BUT they did NOT improve the quality of their work based on feedback.

4 =
- Students DID show evidence that they were **aware of learning goals and associated success criteria** in advance of completing their work
- AND they DID **successfully plan and monitor their own work**
- AND they DID **improve the quality of their work based on feedback**.

Self-Regulation: Decision Steps



Skilled Communication

Did students produce extended or multi-modal communication? Was their communication supported with sufficient evidence and designed with a particular audience in mind?

Overview

This rubric examines whether students produced extended or multi-modal communication, and whether the communication includes a logical explanation or examples or evidence that supports a central thesis. At higher levels of the rubric, students designed their communication for a particular audience.

21st century communication can take many different forms. For example, as part their work students may have a discussion with a peer over Skype. In this rubric, we don't focus on informal classroom talk, whether face-to-face or electronic. Instead, we focus on students' articulation of their ideas in a permanent form: a presentation, a podcast, a written document, an email, etc. A performance (for example, a skit or oral debate) would also be considered in this rubric. We recognize that less formal conversational media are also very important aspects of communication. But effective uses of Skype will have an outcome related to the learning goals of the activity: did students produce a summary of what they learned through Skype, or build that learning into the final product they created? This rubric evaluates the skilled communication exhibited in the products or outcomes of the students' work.

Big Ideas

Extended communication is communication that represents a set of connected ideas, not a single simple thought. In written work, extended communication is the equivalent of one or more complete paragraphs rather than a sentence or phrase. In electronic or visual media, extended communication might take the form of a sequence of video, a podcast, or 1 or more pages of a presentation that connects or illustrates several ideas.

A single text message or tweet is NOT extended communication. If students engaged in electronic communication, this is ONLY considered extended communication if they produced an outcome that connects the ideas they discussed (for example, documentation of what they learned or next steps for resolving an issue that arose). The duration of an electronic chat is not considered in evaluating extended communication.

The communication must be the **student's own work**. If there is evidence that the work was simply copied from the Internet, this would not count as extended communication.

IS THIS EXTENDED COMMUNICATION?	
YES:	**NO:**
A student wrote a paragraph in response to an essay prompt.	**A student wrote one sentence for each of several short-answer responses on a test.** Together, the sentences contain the same amount of information as a paragraph, but they are not presented together.
Students hosted a webinar to present on different topics about their city to peers in their sister-city and then answered follow-up questions.	**Students participated in a webinar where they listened to presentations by peers from their sister-city and then asked follow-up questions.**
A student wrote an extended proof to demonstrate the solution to a geometry problem.	**A student solved a geometry problem, but did not write any proof.**
Students held a Skype conversation with peers from another school to create a plan for the performance they will put on together about the novel they read.	**Students held a Skype conversation with peers from another school to talk about the novel they read.**

Communication is **multi-modal** when it includes more than one type of communication mode or tool used to communicate a coherent message. For example, students might create a presentation that integrates video and text, or embed a photograph into a blog post. The communication is considered multi-modal only if the elements work together to produce a stronger message than any one element alone.

If students **chose the tool or tools** they would use to communicate, we consider it to be a multi-modal communication opportunity.

IS THIS COMMUNICATION MULTI-MODAL?	
YES:	**NO:**
A team of students created a radio advertisement for their new invention, choosing to use an audio rather than print medium because they thought it would be most compelling if they could use sound. The students chose what type of media would be best to use for the purpose.	**Students created a radio advertisement for their new invention as assigned by the teacher.** Students did not choose what type of media to use, and their product was not multi-modal.
A student wrote a lab report about her science lab on density of matter, including narrative text and screen shots of real-time data displays. In this student work product, narrative and visual displays of data work together for a more complete description of the experiment.	**A student wrote a lab report about her science lab on density of matter, including only narrative text.** The student used only one mode of media.
A team of students produced a blog post on a hurricane, including a written description of the conditions as well as sound and photos. Multiple modes of media add depth to the students' description.	**A team of students produced a podcast on a hurricane, and turned in a written script and the final audio podcast.** The story is the same whether written out (in the script) or spoken (in the podcast); multiple media were not used to enhance the content of the communication.

Communication includes **supporting evidence** when students explained their ideas, described their reasoning, or provided supporting facts or examples.

For this rubric, a “thesis” is a claim, hypothesis, or conclusion. Students must have a thesis when they are asked to state a point of view, make a prediction, or draw a conclusion from a set of facts or a chain of logic. The communication includes evidence if students described their reasoning or provided supporting facts or examples.

The evidence is **sufficient** if it successfully supports the claim that the student is making or explains the student’s reasoning. The reasoning must be coherent and logical, and include enough detail that it might be expected to succeed in explaining or persuading the audience.

Consider the age of the students when deciding whether supporting evidence is sufficient. Older students would typically be expected to provide more extensive and persuasive evidence than younger students.

Spelling and grammar are important communication skills but are not the focus here. If a communication provides sufficient coherent evidence to support a thesis, it would score well on this rubric despite poor spelling and grammar.

DID THIS STUDENT PROVIDE SUFFICIENT SUPPORTING EVIDENCE?		
ACTIVITY	**YES:**	**NO:**
15-year-old students wrote essays about why global warming is a problem.	**The essay states a claim about global warming and provides evidence from scientific articles about changing climate patterns and their impact on the global ecosystem.** The paper uses scientific evidence to support a claim.	**The essay states a claim about global warming, and notes that the weather had been hot that week.** Students at this age level would be expected to go beyond anecdotal evidence from one point in time to support a scientific claim about climate.
Students wrote blog posts about the main themes from Alice in Wonderland.	**The post includes written text, with examples from the story to illustrate each point.** The post provides evidence to support each proposed theme.	**The post includes a list of themes, without any additional information to explain the theme or show how that theme appears in the book.** The post does not provide evidence to support the list of themes.

Students wrote journal entries from the perspective of a slave.	**The journal entry states a perspective about the imagined life of a slave and describes historically accurate activities to substantiate that perspective.** The journal entry has a thesis and uses detail to help the reader understand how the author feels and why.	**The journal entry includes a list of activities that a slave might have performed, but does not incorporate those activities into a broader perspective.** The journal entry does not have a thesis and does not use detail to describe and support any claims.
Students used OneNote to create a video of themselves solving a mathematical problem.	**The video includes an explanation of the steps the student took and their reasoning.** The video provides an explanation of both the process and the rationale, enabling the viewer to follow the student's thought process.	**The video only includes the steps the student took to solve the problem, without any explanation of their reasoning.** The video does not provide sufficient evidence to explain the student's thinking.

Student communication demonstrates that is was **designed appropriately for a particular audience** if it provides evidence that students paid attention to the specific readers, listeners, viewers, or others with whom they were communicating. It is not sufficient that students were communicating to a general audience on the internet. They must have had in mind a specific group with specific needs, and shaped their communication appropriately.

Evidence that students designed their communication appropriately for a particular audience might include their choice of **tools, content,** or **style** that they used to reach the audience. They might have considered what tools the audience has access to or uses on a regular basis; the type of information they must present in order for the audience to understand their thesis; or the formality or informality of the language they chose in order to be appropriate to the audience.

It is ideal, but not essential, if the communication was actually seen by the audience for which it was designed. The requirement is that the students must have developed their communication with that audience in mind. For example, students might develop some type of presentation to teach younger students about how to divide fractions. Their design might demonstrate that they made a thoughtful selection of what medium to use to reach those students (for example, a podcast), and what type of language and content the students would understand and relate to. This satisfies the requirement even if the podcast is never used by younger students.

DID STUDENTS DESIGN THEIR COMMUNICATION APPROPRIATELY FOR A PARTICULAR AUDIENCE?		
ACTIVITY	**YES:**	**NO:**
Students created videos about their school to welcome incoming students.	**The video includes a friendly "host" who provides key information about the school and shows images from life at the school.** The video is designed both to make incoming students feel welcome and to provide them with important information about their new school.	**The video does not welcome or engage the viewer and shows images only of the playground.** The students did not consider the perspective or needs of the target audience.
Students wrote emails to a product manager of a company, suggesting improvements to a product.	**The email clearly explains the suggested improvements for the product, positioning them as having widespread appeal for consumers.** Students considered the arguments and perspectives that would be most compelling to the manager.	**The email makes a personal demand for an improvement that is not likely to apply to the broader public.** Students did not consider the arguments and perspectives that would be most compelling to the company.
Students designed a "rocks and minerals" exhibit for the town library.	**The exhibit provides clear take-home messages through high-interest content like rock and mineral samples and interactive displays.** Students designed their exhibit to capture the interest of the museum audience.	**The exhibit presents dense information through text-heavy printouts mounted on the walls.** Students did not design their exhibit to be appropriate for the museum audience.

Skilled Communication: Rubric

1
- The communication is NOT extended or multi-modal.

2
- The communication IS **extended** or **multi-modal**
- BUT it does NOT contain sufficient supporting evidence
  AND it is NOT designed appropriately for a particular audience.

3
- The communication IS **extended** or **multi-modal**
- AND it DOES contain **sufficient supporting evidence**
  OR
  it IS **designed appropriately for a particular audience**
- BUT not both.

4
- The communication IS **extended** or **multi-modal**
- AND it DOES contain **sufficient supporting evidence**
- AND it IS **designed appropriately for a particular audience.**

Skilled Communication: Decision Steps