CRITICAL THINKING

COMPLEX THINKING

SESSION 4

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Complex Thinking: Creativity, Critical Thought, and Logic

A separate set of mental processes facilitates your ability to do complex, sophisticated thinking, such as understanding concepts, generating original ideas, and using logical approaches to address complicated problems. Complex thinking includes many key abilities that are important to success in today's world.

People with strengths in complex thinking may be good at deeply understanding ideas and concepts, seeing connections among information from different sources, demonstrating imagination, constructing and defending arguments based on facts or evidence, taking risks with new ideas, and/or drawing inferences from limited information.

Conversely, people with challenges in this area may struggle to understand new ideas and concepts without considerable support, have trouble "reading between the lines" or making inferences, approach problems in a haphazard way, or tend to rely on existing ideas rather than coming up with original ones.

As with other areas of learning, complex thinking is not something you're simply either good at or not good at.

Different people are good at thinking about different kinds of ideas. The subject matter—and your level of interest in it—can affect how well you understand and think about concepts. And everyone has a certain degree of imagination and creativity.

Strategies for managing challenges with complex thinking

Talk through an approach to solving a difficult problem with someone else before beginning.

Make an effort to ask good questions when learning about a new idea. This can help increase your comprehension.

Take an improvisation class. This can help you practice "thinking on your feet" and coming up with unscripted ideas in response to a line or scenario you're given.

Play games that develop reasoning and logic skills. Research suggests even simple, inexpensive games can have a big impact.

Turn off the television. To find out how this and other strategies can encourage creativity and innovation

Complex Thinking Skills & Reasoning

Introduction

This page is designed for busy practitioners trying to design performance assessment tasks that align standards and benchmarks with assessments that really measure what's valued and that incorporate higher order thinking skills.

Thinking skills and reasoning processes are considered a critical element to designing purposeful performance assessment tasks, as well as thought-provoking pencil-paper test items by experts such as Jay McTighe, Grant Wiggins, Richard Stiggins, Art Costa and Robert Marzano, to mention but a few.

For decades, teachers have been learning about the levels of thinking skills/processes (i.e. Bloom's Taxonomy) and attempting to provide work for their students in such a way that it provides the practice, rehearsal and scrimmage necessary for students to become competent thinkers.

What you find provided, are templates reflecting a combination of the work of many great educational leaders, local as well as national. Some, dating back as far as Benjamin Bloom's work of three to four decades ago, some as recent as Robert Marzano's work in Dimensions of Learning and in Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education.

Incorporating Thinking Skills into Performance Assessment Tasks

Attention to selecting which thinking skill or reasoning process that should be incorporated in a performance assessment task is the 2nd step in the nine step plan. The 1st step focuses attention on selecting the standard and benchmark that the task will assess. Step #2 asks the designer to choose a thinking skill or a reasoning process to provide structure for the task. The choice of a thinking skill or a reasoning process should answer the task design question: "What will students do to be able to show they understand the content chosen for them to learn?"

Once a task designer has selected the thinking skill or reasoning process to be incorporated in the performance assessment task from the At-A-Glance list, more detailed guidelines can be found by clicking on the name of the skill or process. Provided at those links will be detailed instructions for teaching a thinking skill; guiding questions, process steps and graphic organizers to be used to focus the learners; as well as checklists and rubrics to provide formative and summative feedback to students and their parents. Sample tracking matrixes and teacher observation forms are also featured to help educators document the balance and the frequency of the skills and processes being taught, supported and assessed.

At-A-Glance: Thinking Skills and Reasoning Processes

The following thinking skills and reasoning processes are linked to a web page that contains the downloadable resources on:

- strategies for teaching a thinking skill/reasoning process
- assessment checklist (K-2)
- assessment student rubric
- assessment teacher rubric

Extend & Refining Knowledge - Dimension 3

Thinking Skill	**Stimulus Questions**
Comparing	How might _____ and _____ be organized into groups? What are the rules or characteristics that have been used to form groups?
Classifying	How might _____ be organized into groups? What are the rules or characteristics that have been used to form groups?

Extend & Refining Knowledge - Dimension 3

Thinking Skill	Stimulus Questions
Induction	What conclusions could be drawn from the data?
Deduction	Are there specific rules operating? Are there things that must happen because of these rules?
Error Analysis	Are there errors in reasoning or in a process that can be described?
Constructing Support	Is there a position you want to defend on a particular issue?
Abstracting	What is the relationship that exists in _____ ? What is the abstract pattern or theme that lies at the heart of the relationship?
Analyzing Perspectives	What are the different perspectives or points of view on an issue?

Using Knowledge Meaningfully - Dimension 4

Reasoning Process	Stimulus Questions
Decision Making	Is there an important decision that should be studied or made?
Problem Solving	Is there some obstacle that needs to be overcome?
Experimental Inquiry	Is there a prediction about _____ that can be made and then tested?
Invention	Is there something you want to create or improve upon?
Investigation • Historical • Projective	• Is there something that happened in the past that could be studied? • Is there a possible or hypothetical event that could be examined?

Using Knowledge Meaningfully - Dimension 4

Reasoning Process Stimulus Questions

- Definitional
- Is there a new concept or theory that could be described in detail?

Complex Thinking

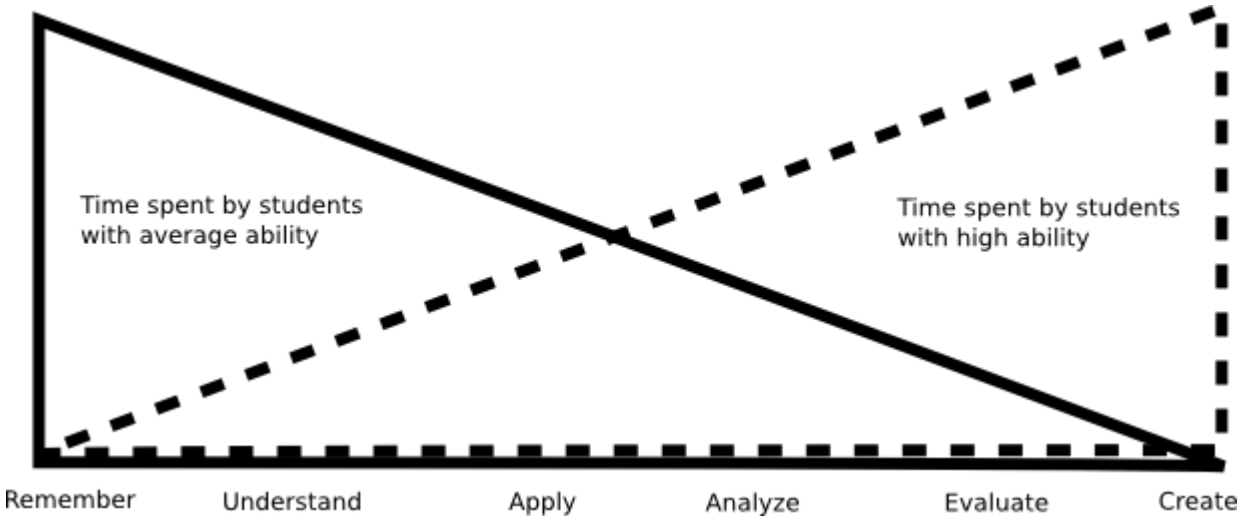
Description

Thinking skills are often characterized on a continuum of levels. Lower levels of thinking are simpler (memorizing, identifying, etc.). than higher levels (synthesizing, judging, analyzing, etc.) Differentiating curriculum to increase the complexity of the thinking involved means the learning process will emphasize the use and development of higher level thinking skills. This includes creative and critical thinking, problem solving, concept development, conflict resolution, moral and ethical reasoning and analysis. Complex thinking processes often involve content that is abstract or complex. Students should apply the new thinking to new situations, use their new skills to develop new knowledge, products, or ideas, and then evaluate the qualities of their thinking.

All students need to develop a repertoire of higher level thinking skills; however highly able learners who naturally think in more complex ways can and should spend a relatively greater proportion of their school time using and developing these skills. The overlapping triangles in Figure 4.6.1 represent this difference in emphasis. Remembering, understanding and applying are the lower levels; analyzing, evaluating and creating are considered higher levels of thinking .The height of each triangle indicates the relative amount of time students should spend developing skills at

each level of thinking; higher means more time and lower means less. The bases of both triangles cover *all* levels indicating all students need to learn and use all thinking skills. The height of the triangle for complex thinkers is greater over the higher levels of thinking to show that highly able learners who naturally think in more complex ways and are ready to develop even more sophisticated cognitive processes than others should spend more of their time doing this.

Figure 4.6.1



Examples

Programs for thinking skill development: Bloom's Taxonomy (revised by Anderson & Kratwohl in 2001) is one of many systems proposed to support the development of complex thinking skills. It is given more attention in Appendix B. Others include:

- Parnes' version of Creative Problem Solving (further developed by Treffinger
- Paul & Elder's Critical Thinking

Each of these approaches focuses on a different type of thinking, however there are overlaps among them as well. A teacher should choose the model that emphasizes the type of thinking best suited to the learning outcomes to be addressed. Committing to one model and using it consistently, within and across content areas, will have greater benefits for students than attempting to introduce more than one at the same time. Students should however, be introduced to a variety of models and heuristics during their years in school.

Graphic organizers are also an effective means of enabling students to understand and improve their thinking. More complex graphics can be offered to more complex thinkers. They take the form of webs, flow charts, matrices, hierarchies, Venn diagrams, cycles, etc. Many templates for using shapes to guide the development of different types of analyzing information and planning complex activities are available online.

A number of the "College of William and Mary Teaching Models" are graphic organizers to be used in the development of critical thinking skills. For example, the Hamburger Model for Persuasive Writing:

"The Hamburger Model uses the familiar metaphor of a sandwich to help students construct a paragraph or essay. Students begin by stating their point of view on the issue in question (the top bun). They then provide reasons, or evidence, to support their claim; they should try to incorporate at least three supportive reasons (the "patties"). Elaboration on the reasons provides additional detail (the "fixings"). A concluding sentence or paragraph wraps up the sandwich (the bottom bun)."

Teaching Complex Thinking

Challenge students toward cognitive complexity.

Students at risk of educational failure, particularly those of limited standard English proficiency, are often forgiven any academic challenges on the assumption that they are of limited ability, or they are forgiven any genuine assessment of progress because the assessment tools are inadequate. Thus, both standards and feedback are weakened, with the predictable result that achievement is impeded. While such policies may often be the result of benign motives, the effect is to deny many diverse students the basic requirements of progress -- high academic standards and meaningful assessment that allows feedback and responsive assistance.

There is a clear consensus among education researchers that students at risk of educational failure require instruction that is cognitively challenging; that is, instruction that requires thinking and analysis, not only rote, repetitive, detail-level drills. This does not mean ignoring phonics rules, or not memorizing the multiplication tables, but it does mean going beyond that level of curriculum into the exploration of the deepest possible reaches of interesting and meaningful materials. There are many ways in which cognitive complexity has been introduced into the teaching of students at risk of educational failure. There is good reason to believe, for instance, that a bilingual curriculum itself provides cognitive challenges that make it superior to a monolingual approach.

Working with a cognitively challenging curriculum requires careful leveling of tasks, so that students are motivated to stretch. It does not mean drill-and-kill exercises, nor it does not mean overwhelming challenges that discourage effort. Getting the correct balance and providing appropriate assistance is, for the teacher, a truly cognitively challenging task.

Indicators of Challenging Activities

The teacher:

1. assures that students - for each instructional topic - see the whole picture as a basis for understanding the parts.
2. presents challenging standards for student performance.
3. designs instructional tasks that advance student understanding to more complex levels.
4. assists students to accomplish more complex understanding by building from their previous success.
5. gives clear, direct feedback about how student performance compares with the challenging standards.