Higher Order Thinking

With Karen Kruger
February 13, 2013
Karen Kruger, MS, is the Director of Education at Hidden Sparks. Previously, she served as Hidden Sparks’ Internal Coach Program school-based mentor, a regional facilitator, and the lead trainer for NCLB funded workshops. She mentored middle school teachers and administrators for the New York City Department of Education. Ms. Kruger also served as a field facilitator and course instructor for Schools Attuned, teaching courses offered by All Kinds of Minds, developed curricula for workshops, and mentored and supervised teachers in grades K-12. A former adjunct professor at Bank Street College of Education, where she received her master’s degree, Ms. Kruger has taught in elementary and middle schools.
Overview of the Session

We are going to learn about Higher Order Thinking (HOT) and consider how to infuse this type of thinking into our work with students.
Session Goals:

- Understand what is HOT and why it is important.
- Appreciate the importance of fostering HOT in our students.
- Heightened awareness of how the classroom environment can affect HOT.
What exactly is Higher Order Thinking?

True or False?

1. Higher Order Thinking (HOT) is a way of thinking that is determined at birth and cannot be increased or decreased.

2. HOT is usually not evident until later elementary grades.

3. It’s possible for HOT to be missing in an entire grade level at certain schools.
HOT – common myths

- People often think that HOT is one “thing” and you either have it or you don’t.
- Some teachers may believe that HOT is a “set amount” in a child’s brain and it cannot be increased or decreased.
- Some principals believe that HOT can “be missing” in an entire class or in an entire grade.
- Some people believe certain people are “concrete thinkers” and therefore cannot have HOT abilities.
- What do you think of when you hear the phrase “Higher Order Thinking”?

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A Brief History of Bloom’s Taxonomy

Old Version

New Version
Another way to consider Bloom’s Taxonomy...
Karin Hess looks at both...

- In 2004, Karin Hess applied Webb’s DOK levels to Bloom’s Taxonomy

And this is what she developed...
## Matrix of Webb and Bloom (Karen Hess)

<table>
<thead>
<tr>
<th>Revised Bloom’s Taxonomy</th>
<th>Webb’s DOK Level 1</th>
<th>Webb’s DOK Level 2</th>
<th>Webb’s DOK Level 3</th>
<th>Webb’s DOK Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recall</strong></td>
<td><strong>Webb’s DOK Level 1</strong></td>
<td><strong>Webb’s DOK Level 2</strong></td>
<td><strong>Webb’s DOK Level 3</strong></td>
<td><strong>Webb’s DOK Level 4</strong></td>
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<tr>
<td>Retrieve knowledge from long-term memory, recognize, recall, locate, identify</td>
<td>Recall, recognize, or locate basic facts, details, events, or ideas explicit in texts</td>
<td>Read words orally in connected text with fluency &amp; accuracy</td>
<td>Define terms</td>
<td>Explain, generalize, or connect ideas using supporting evidence (quote, example, text reference)</td>
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<tr>
<td><strong>Understand</strong></td>
<td><strong>Webb’s DOK Level 2</strong></td>
<td><strong>Webb’s DOK Level 3</strong></td>
<td><strong>Webb’s DOK Level 4</strong></td>
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<tr>
<td>Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion, predict, compare/contrast, match like ideas, explain, construct models</td>
<td>Identify or describe literary elements (characters, setting, sequence, etc.)</td>
<td>Give non-examples/examples</td>
<td>Make basic inferences or logical predictions from data or texts</td>
<td>Identify main ideas or accurate generalizations of texts</td>
</tr>
<tr>
<td><strong>Apply</strong></td>
<td><strong>Webb’s DOK Level 3</strong></td>
<td><strong>Webb’s DOK Level 4</strong></td>
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<tr>
<td>Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task</td>
<td>Use language structure (prefix/suffix) or word relationships (synonym/antonym) to determine meaning of words</td>
<td>Use context to identify the meaning of word(s) with/without context</td>
<td>Use language structure (prefix/suffix) or word relationships (synonym/antonym) to determine meaning of words</td>
<td>Obtain and interpret information using text features</td>
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<tr>
<td><strong>Analyze</strong></td>
<td><strong>Webb’s DOK Level 4</strong></td>
<td><strong>Webb’s DOK Level 5</strong></td>
<td><strong>Webb’s DOK Level 6</strong></td>
<td><strong>Webb’s DOK Level 7</strong></td>
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<tr>
<td>Break into constituent parts, determine how parts relate, differentiates between relevant-inrelevant; distinguish, focus, select, organize, outline, find coherence, deconstruct (e.g., for bias or point of view)</td>
<td>Identify whether specific information is contained in graphic representations (e.g., map, chart, table, graph, T-chart, diagram) or text features (e.g., headings, subheadings, captions)</td>
<td>Categorize, compare, or distinguish information elements, terms, facts, details, events</td>
<td>Analyze information within data sets or texts</td>
<td>Analyze multiple sources of evidence, or multiple works by the same author, or across genres, time periods, themes</td>
</tr>
<tr>
<td><strong>Evaluate</strong></td>
<td><strong>Webb’s DOK Level 5</strong></td>
<td><strong>Webb’s DOK Level 6</strong></td>
<td><strong>Webb’s DOK Level 7</strong></td>
<td><strong>Webb’s DOK Level 8</strong></td>
</tr>
<tr>
<td>Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique</td>
<td>Cite evidence and develop a logical argument for conjectures</td>
<td>Describe, compare, and contrast solution methods</td>
<td>Verify reasonableness of results</td>
<td>Critique conclusions drawn</td>
</tr>
<tr>
<td><strong>Create</strong></td>
<td><strong>Webb’s DOK Level 6</strong></td>
<td><strong>Webb’s DOK Level 7</strong></td>
<td><strong>Webb’s DOK Level 8</strong></td>
<td><strong>Webb’s DOK Level 9</strong></td>
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<tr>
<td>Revise, rearrange elements into new patterns/sequences, generate, hypothesize, design, plan, produce</td>
<td>Generate conjectures or hypotheses based on observations or prior knowledge and experience</td>
<td>Synthesize information within one source or text</td>
<td>Develop a complex model for a given situation</td>
<td>Develop an alternative solution</td>
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<thead>
<tr>
<th>Revised Bloom’s Taxonomy</th>
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<th>Webb’s DOK Level 4</th>
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</thead>
<tbody>
<tr>
<td><strong>Remember</strong></td>
<td>Recall &amp; Reproduction</td>
<td>Skills &amp; Concepts</td>
<td>Strategic Thinking/Reasoning</td>
<td>Extended Thinking</td>
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<tr>
<td>Retrieve knowledge from long-term memory, recognize, recall, locate, identify</td>
<td>Describe or define facts, details, terms</td>
<td>Specify, explain, show relationships; explain why, cause-effect</td>
<td>Explain, generalize, or connect ideas using supporting evidence (quote, example, text reference)</td>
<td>Explain how concepts or ideas specifically relate to other content domains or concepts</td>
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<td>Select appropriate words to use when intended meaning/definition is clearly evident</td>
<td>Give non-examples/examples</td>
<td>Write multi-paragraph composition for specific purpose, focus, voice, tone, &amp; audience</td>
<td>Develop generalizations of the results obtained or strategies used and apply them to new problem situations</td>
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<td>Write simple sentences</td>
<td>Take notes; organize ideas/data</td>
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<tr>
<td><strong>Understand</strong></td>
<td>Apply rules or use resources to edit specific spelling, grammar, punctuation, conventions, word use</td>
<td>Apply basic formats for documenting sources</td>
<td>Use context to identify the meaning of words/phrases</td>
<td>Apply internal consistency of text organization and structure to composing a full composition</td>
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<tr>
<td>Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion, predict, compare/contrast, match like ideas, explain, construct models</td>
<td>Apply formats, organization, &amp; internal text structure (signal words, transitions, semantic cues) of different texts</td>
<td>Develop a text that may be limited to one paragraph</td>
<td>Apply a concept in a new context</td>
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<td>Distinguish: relevant-relevant information; fact/opinion</td>
<td>Apply word choice, point of view, style to impact readers’ interpretation of a text</td>
<td>Develop generalizations of the results obtained or strategies used and apply them to new problem situations</td>
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<td><strong>Apply</strong></td>
<td>Decide which text structure is appropriate to audience and purpose</td>
<td>Compare literary elements, terms, facts, details, events</td>
<td>Analyze interrelationships among concepts, issues, problems</td>
<td>Analyze multiple sources of evidence, or multiple works by the same author, or across genres, or time periods</td>
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<td>Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task</td>
<td>Analyze format, organization, &amp; internal text structure (signal words, transitions, semantic cues) of different texts</td>
<td>Apply tools of author’s craft (literary devices, viewpoint, or potential dialogue) with intent</td>
<td>Analyze complex/abstract themes, perspectives, concepts</td>
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<td>Distinguish: relevant-relevant information; fact/opinion</td>
<td>Use reasoning, planning, and evidence to support inferences made</td>
<td>Gather, analyze, and organize multiple information sources</td>
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<td>Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique</td>
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<td><strong>Evaluate</strong></td>
<td>Create</td>
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<td>Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique</td>
<td>Brainstorm/deep concepts, problems, or perspectives related to a topic or concept</td>
<td>Generate conjectures or hypotheses based on observations or prior knowledge and experience</td>
<td>Develop a complex model for a given situation</td>
<td>Synthesize information across multiple sources or texts</td>
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<td><strong>Create</strong></td>
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<td>Recognize elements into new</td>
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<td>structures, generate, hypothesize, design, plan, produce</td>
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Higher Order Thinking involves:
- Concept formation
- Critical thinking
- Creativity/Brainstorming
- Problem solving
- Mental Representation
- Rule Use
- Reasoning and Logical thinking
Concept Formation

- Concept Formation is integrating a series of features that often go together to form a class of ideas or objects.

- 3 Categories of concept formation:
  - **Verbal conceptualization** – forming concepts using language. Ex: understanding terms, explaining ideas.
  - **Nonverbal conceptualization** – forming concepts without using language. Ex: understanding place value, geometric shapes, interprets maps, graphs, charts,
  - **Process conceptualization** – forming concepts that explain a mechanism or how something works. Ex: understanding processes like metamorphosis, digestion, resistance (in a wire), photosynthesis.
Critical thinking

- Critical thinking is the ability to evaluate things such as products, ideas, opinions of others.

- Examples: Able to evaluate different points of view, able to form opinions based on evidence, able to defend a point of view. Doesn’t accept things at face value and can compare and contrast positions.
Creativity and Brainstorming

- Creativity and Brainstorming –
  - involves the ability to think independently and produce self-generated thoughts or products
  - The capacity to start with nothing and create something.
  - It requires the ability to take risks – can be frightening for some people and liberating for others.

- Examples: Finds unique ways of solving problems, writes imaginative stories, draws original cartoons, enjoys expression through music, dance, art mediums.
Problem solving

• Problem solving – includes the ability to apply a systematic stepwise approach to complex questions or challenges.

• Examples: Plans and implements school projects in appropriate, well-thought-out steps; implements a stepwise approach when studying for tests; systematically resolves social or interpersonal conflict.
Mental Representation

- Mental Representation is the ability to portray new ideas in one’s mind so that they are meaningful and lasting.

- Examples: Present new ideas in varied ways (anecdotal, visual, verbal, metaphorical. May excel when solving word problems, may use multiple approaches to various demands of learning.
Rule Use

- Rule Use includes the ability to learn and apply existing rules and principles as well as being able to develop your own rules.

- Examples: showing an understanding of spelling and grammatical rules; recognizes patterns to which specific rules pertain and then applies them (e.g., “‘i’ before ‘e’ except after ‘c’…”); ability to generalize a rule or principle; can form own rules and generalizations; can use conditional thinking: If…then…

<table>
<thead>
<tr>
<th>RULES</th>
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<td>1. YOU CAN….</td>
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<tr>
<td>2. YOU CAN'T…</td>
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Reasoning and Logical Thinking

- Reasoning and logical thinking involves coming up with sensible, thoughtful answers to complex issues.

- Examples: Making inferences; understands proportional reasoning in mathematics (using equations and ratios); can discern recurring themes or ideas in educational experiences.
Why is HOT important?

• Teachers tend to emphasize lower order thinking in their lessons and spend the majority of the classroom time on enforcing skills like recall, define, recognize, calculate, answer “who, what, when, where, why” questions.

• HOT: The ability to problem solve, think critically or logically, to be able to reason, to create things, to form concepts are all brain functions that teachers hope to cultivate in their students.

• When students are engaged with HOT, learning becomes more meaningful and more enduring.
Where is HOT?

- Most of the types of thinking that are involved in the grouping of HOT occurs in the prefrontal cortex of the brain (PFC) which is located in the front of the brain, behind our eyes and forehead.

- It used to be thought that the PFC was fully developed by ages 22-24. Recent studies indicate that the PFC continues to develop well into the mid-30’s. This is good news for young adults who may continue to struggle with impulse control and other executive function issues.
Some important brain biology

Brain Structures Involved in Dealing with Fear and Stress
How does stress, anxiety and fear affect our PFC?

- According to Judy Willis, the more stress we feel, the harder it is to focus attention, be a creative problem solver, create long term accessible memories and use what we’ve learned to do well on tests.
- Instead of being reflective, we become reactive. When we are in a reactive state, our reactive brains go into a fightflightfreeze mode.
- RAS – Reticular Activating System – the filter or gate keeper to the PFC.
How can we encourage HOT in our students?

- Look for their strengths! Observe your students, focusing on who demonstrates strengths in the components of HOT (creativity, problem solving, critical thinking, logical thinking, mental representation, etc.). Be sure to tell your students what you are seeing/thinking.
- Understand how emotions can affect brain function and students who are upset or afraid or stressed, will have a more difficult time learning.
- Appreciate that in order to create more opportunities for “insight”, it’s important to allow the students’ minds to become ‘quiet’.
- Allow time for reflection because that helps with executive function and self-control.
- Learn how to ask questions that encourage HOT and WAIT to allow time for students to answer the question.
Which kinds of questions encourage HOT?
(from Claire Wurtzel’s webinar see references)

- **Comprehension Questions**: asks students to show their understanding. Locate, explain, describe. “Explain the meaning of collaboration in your own words”.

- **Application**: you have to use what you’ve learned. Demonstrate, construct, and calculate. “How is this situation an example of collaboration”?

- **Analysis**: Examine critically. Compare, contrast, categorize, seeing patterns.” Outline or diagram the key steps in creating a collaborative conversation”?

- **Synthesis**: Put together in a new way. Compose, invent and produce. “How would create a collaborative conversation with a person you had trouble with”?

- **Evaluation**: Determine the worth or value based on criteria: Judge, predict, verify. “Which method of problem solving do you think was more effective”? 

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How long do you wait for an answer?

- What is the average amount of time that teachers wait for a student to answer a question?
How can I make my classroom more conducive to HOT?

• Warm and inclusive classroom environment, minimizing stressful, anxiety producing demands of students.

• Sense of community – building relationships, supporting each other, joining together to be connected, relying and trusting each other.

• Share your understanding of basic brain function with your students, involve them with your learning about higher order thinking.

What can you do in your classroom or with your students tomorrow to include HOT?
References

- Depth of Knowledge:  http://schools.nyc.gov
- Karin K. Hess:  www.ncte.org
- HS WOW webinars:
  Claire Wurtzel’s “How to Ask Questions that Stimulate Students to Think and Learn”
  Kate Sussman’s “Ecology of the Classroom”
  Kelli Pollack’s “Helping Students Discover How They Learn”
- Judy Willis:  www.radteach.com
- David Rock:  www.davidrock.net
- “Using Think-Time and Wait-Time Skillfully in the Classroom”  www.eric.ed.gov
- www.allkindsofminds.org
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Presenter</th>
</tr>
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<tbody>
<tr>
<td>Wednesday, 3/13/13</td>
<td>Internet Treasures and Tools for Literacy and Writing</td>
<td>Jeannie Crowley</td>
</tr>
<tr>
<td>8:00-9:00pm</td>
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<tr>
<td>Wednesday, 4/17/13</td>
<td>Focus on the Shy and Anxious Child</td>
<td>Meryl Silver</td>
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<td>8:00-9:00pm</td>
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For more information visit: [www.hiddensparks.org](http://www.hiddensparks.org)
About Hidden Sparks

Hidden Sparks is a non-profit fund whose purpose is to help children with learning differences reach their full potential in school and life. Hidden Sparks develops and supports professional development programs for Jewish day schools to help increase understanding and support for teaching to diverse learners.

Guided by a philosophy that by helping schools meet the needs of children with learning and behavioral differences, ultimately all students will benefit. Hidden Sparks’ programs combine professional development in learning and positive behavioral support, guided classroom observation and one on one coaching. The Hidden Sparks model and program is currently in 21 Jewish Day Schools/Yeshivot in New York and 7 in Boston, through a partnership with Gateways: Access to Jewish Education.
Contacting Hidden Sparks

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