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How to Increase Higher Order Thinking

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Parents and teachers can do a lot to encourage higher order thinking. Here are some strategies to help foster children's complex thinking.

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Higher order thinking (HOT) is thinking on a level that is higher than memorizing facts or telling something back to someone exactly the way it was told to you. HOT takes thinking to higher levels than restating the facts and requires students to do something with the facts — understand them, infer from them, connect them to other facts and concepts, categorize them, manipulate them, put them together in new or novel ways, and apply them as we seek new solutions to new problems.

Answer children's questions in a way that promotes HOT

Parents and teachers can do a lot to encourage higher order thinking, even when they are answering children's questions. According to Robert Sternberg, answers to children's questions can be categorized into seven levels, from low to high, in terms of encouraging higher levels of thinking. While we wouldn't want to answer every question on level seven, we wouldn't want to answer every question on levels one and two, either. Here are the different levels and examples of each.

Level 1: Reject the question

Example:

"Why do I have to eat my vegetables?"

"Don't ask me any more questions." "Because I said so."

Level 2: Restate or almost restate the question as a response

Example:

"Why do I have to eat my vegetables?"

"Because you have to eat your vegetables."

"Why is that man acting so crazy?"

"Because he's insane."

"Why is it so cold?"

"Because it's 15° outside."

Level 3: Admit ignorance or present information

Example:

"I don't know, but that's a good question."

Or, give a factual answer to the question.

Level 4: Voice encouragement to seek response through authority

Example:

"Let's look that up on the internet."

"Let's look that up in the encyclopedia."

"Who do we know that might know the answer to that?"

Level 5: Encourage brainstorming, or consideration of alternative explanations

Example:

"Why are all the people in Holland so tall?"

"Let's brainstorm some possible answers."

"Maybe it's genetics, or maybe it's diet, or maybe everybody in Holland wears elevator shoes, or..."
etc.

When brainstorming, it is important to remember all ideas are put out on the table. Which ones are "keepers" and which ones are tossed in the trashcan is decided later.

Level 6: Encourage consideration of alternative explanations and a means of evaluating them

Example:

"Now how are we going to evaluate the possible answer of genetics? Where would we find that information? Information on diet? The number of elevator shoes sold in Holland?"

Level 7: Encourage consideration of alternative explanations plus a means of evaluating them, and follow-through on evaluations

Example:

"Okay, let's go find the information for a few days — we'll search through the encyclopedia and the Internet, make telephone calls, conduct interviews, and other things. Then we will get back together next week and evaluate our findings."

This method can be equally effective with schoolwork and with everyday matters such as how late an adolescent can stay out on Saturday night or who is getting to go to a concert. For example, polling several families that are randomly or mutually chosen may produce more objective results than either parent or child "skewing" the results by picking persons whose answers will support their way of thinking.

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Strategies for enhancing higher order thinking

These following strategies are offered for enhancing higher order thinking skills. This listing should not be seen as exhaustive, but rather as a place to begin.

Take the mystery away

Teach students about higher order thinking and higher order thinking strategies. Help students understand their own higher order thinking strengths and challenges.

Teach the concept of concepts

Explicitly teach the concept of concepts. Concepts in particular content areas should be identified and taught. Teachers should make sure students understand the critical features that define a particular concept and distinguish it from other concepts.

Name key concepts

In any subject area, students should be alerted when a key concept is being introduced. Students may need help and practice in highlighting key concepts. Further, students should be guided to identify which type(s) of concept each one is — concrete, abstract, verbal, nonverbal or process.

Categorize concepts

Students should be guided to identify important concepts and decide which type of concept each one is (concrete, abstract, verbal, nonverbal, or process).

Tell and show

Often students who perform poorly in math have difficulty with nonverbal concepts. When these students have adequate ability to form verbal concepts, particular attention should be given to providing them with verbal explanations of the math problems and procedures. Simply working problems again and again with no verbal explanation of the problem will do little to help these students. Conversely, students who have difficulty with verbal concept formation need multiple examples with relatively less language, which may confuse them. Some students are "tell me" while others are "show me."

Move from concrete to abstract and back

It can be helpful to move from concrete to abstract and back to concrete. When teaching abstract concepts, the use of concrete materials can reinforce learning for both young and old alike. If a person is able to state an abstract concept in terms of everyday practical applications, then that person has gotten the concept.

Teach steps for learning concepts

A multi-step process for teaching and learning concepts may include (a) name the critical (main) features of the concept, (b) name some additional features of the concept, (c) name some false features of the concept, (d) give the best examples or prototypes of the concept (what it is), (e) give some non-examples or non-prototypes (what the concept isn't), and (f) identify other similar or connected concepts.

Go from basic to sophisticated

Teachers should be sure that students have mastered basic concepts before proceeding to more sophisticated concepts. If students have not mastered basic concepts, they may attempt to memorize rather than understand. This can lead to difficulty in content areas such as math and physics. A tenuous grasp of basic concepts can be the reason for misunderstanding and the inability to apply knowledge flexibly.

Expand discussions at home

Parents may include discussions based on concepts in everyday life at home. The subject matter need not relate directly to what she is studying at school. Ideas from reading or issues in local or national news can provide conceptual material (for example, "Do you think a dress code in school is a good idea?").

Connect concepts

Teachers should lead students through the process of connecting one concept to another, and also putting concepts into a hierarchy from small to large. For example, if the concept is "Thanksgiving," a larger concept to which Thanksgiving belongs may be "Holidays," and an even larger (more inclusive) concept could be "Celebrations." By doing this level of thinking, students learn to see how many connections are possible, to connect to what they already know, and to create a web of concepts that helps them gain more clarity and understanding.

Compare the new to the already known. Students should be asked to stop and compare and connect new information to things they already know. For example, if they are about to read a chapter on electricity, they might think about what they already know about electricity. They will then be in a better position to absorb new information on electricity.

Teach inference

Students should be explicitly taught at a young age how to infer or make inferences. Start with "real life" examples. For example, when a teacher or parent tells a child to put on his coat and mittens or to get the umbrella before going outside, the adult may ask the child what that might mean about the weather outside. When students are a little older, a teacher may use bumper stickers or well-known slogans and have the class brainstorm the inferences that can be drawn from them.

Teach Question-Answer Relationships (QARs)

The Question-Answer Relationships (QARs) technique (Raphael 1986) teaches children to label the type of questions being asked and then to use this information to assist them in formulating the answers. Two major categories of question-answer relationships are taught: (1) whether the answer can be found in the text — "In the Book" questions, or (2) whether the reader must rely on his or her own knowledge — "In My Head" questions.

In the book QARs

Right There:

The answer is in the text, usually easy to find; the words used to make up the questions and words used to answer the questions are Right There in the same sentence.

Think and Search (Putting It Together):

The answer is in the story, but the student needs to put together different parts to find it; words for the questions and words for the answers are not found in the same sentences; they come from different parts of the text.

In my head QARs

Author and You:

The answer is not in the story; the student needs to think about what he/she already knows, what the author tells him/her in the text, and how it fits together.

On My Own:

The answer is not in the story; the student can even answer the question without reading the story; the student needs to use his/her own experience.

The QAR technique helps students become more aware of the relationship between textual information and prior knowledge and enable them to make appropriate decisions about which strategies to use as they seek answers to questions. This technique has proven to be especially beneficial for low-achieving students and those with learning differences in the elementary grades (Raphael 1984; Simmonds 1992).

Clarify the difference between understanding and memorizing

When a student is studying, his parents can make sure that he is not just memorizing, but rather attempting to understand the conceptual content of the subject matter. Parents can encourage the student to talk about concepts in his own words. His parents can also play concept games with him. For example, they can list some critical features and let him try to name the concept.

Elaborate and explain

The student should be encouraged to engage in elaboration and explanation of facts and ideas rather than rote repetition. His teachers and parents could have him relate new information to prior experience, make use of analogies and talk about various future applications of what he is learning.

A picture is worth a thousand words

Students should be encouraged to make a visual representation of what they are learning. They should try to associate a simple picture with a single concept.

Make mind movies

When concepts are complex and detailed, such as those that may be found in a classic novel, students should be actively encouraged to picture the action like a "movie" in their minds.

Teach concept mapping and graphic organizers

A specific strategy for teaching concepts is conceptual mapping by drawing diagrams of the concept and its critical features as well as its relationships to other concepts. Graphic organizers may provide a nice beginning framework for conceptual mapping. Students should develop the habit of mapping all the key concepts after completing a passage or chapter. Some students may enjoy using the computer software Inspiration for this task.

Make methods and answers count

To develop problem-solving strategies, teachers should stress both the correct method of accomplishing a task and the correct answer. In this way, students can learn to identify whether they need to select an alternative method if the first method has proven unsuccessful.

Methods matter

To develop problem-solving strategies, teachers should give credit to students for using a step-wise method of accomplishing a task in addition to arriving at the correct answer. Teachers should also teach students different methods for solving a problem and encourage students to consider alternative problem-solving methods if a particular strategy proves unrewarding. It is helpful for teachers and parents to model different problem-solving methods for every day problems that arise

from time to time.

Identify the problem

Psychologist Robert Sternberg states that precise problem identification is the first step in problem solving. According to Sternberg, problem identification consists of (1) knowing a problem when you see a problem and (2) stating the problem in its entirety. Teachers should have students practice problem identification, and let them defend their responses. Using cooperative learning groups for this process will aid the student who is having difficulty with problem identification as he/she will have a heightened opportunity to listen and learn from the discussion of his/her group members.

Encourage questioning

Divergent questions asked by students should not be discounted. When students realize that they can ask about what they want to know without negative reactions from teachers, their creative behavior tends to generalize to other areas. If time will not allow discussion at that time, the teacher can incorporate the use of a "Parking Lot" board where ideas are "parked" on post-it notes until a later time that day or the following day.

Cooperative learning

Many students who exhibit language challenges may benefit from cooperative learning. Cooperative learning provides oral language and listening practice and results in increases in the pragmatic speaking and listening skills of group members. Additionally, the National Reading Panel reported that cooperative learning increases students' reading comprehension and the learning of reading strategies. Cooperative learning requires that teachers carefully plan, structure, monitor, and evaluate for positive interdependence, individual accountability, group processing, face to face interaction, and social skills.

Use collaborative strategic reading

Collaborative Strategic Reading — CSR (Klinger, Vaughn, Dimino, Schumm & Bryant, 2001) is another way to engage students in reading and at the same time improve oral language skills. CSR is an ideal tactic for increasing reading comprehension of expository text in mixed-level classrooms across disciplines. Using this tactic, students are placed into cooperative learning groups of four to six students of mixed abilities. The students work together to accomplish four main tasks: (1) preview (skim over the material, determine what they know and what they want to learn), (2) identify clicks and clunks (clicks = we get it; clunks = we don't understand this concept, idea or word), (3) get the gist (main idea) and (4) wrap up (summarize important ideas and generate questions (think of questions the teacher might ask on a test)). Each student in the group is assigned a role such as the leader/involver/taskmaster, the clunk expert, the gist expert, and the timekeeper/pacer (positive interdependence). Each student should be prepared to report the on the group's conclusions (individual accountability).

Think with analogies, similes, and metaphors

Teach students to use analogies, similes and metaphors to explain a concept. Start by modeling ("I do"), then by doing several as a whole class ("We do") before finally asking the students to try one on their own ("You do"). Model both verbal and nonverbal metaphors.

Reward creative thinking

Most students will benefit from ample opportunity to develop their creative tendencies and divergent thinking skills. They should be rewarded for original, even "out of the box" thinking.

Include analytical, practical, and creative thinking

Teachers should provide lesson plans that include analytical, practical and creative thinking activities. Psychologist Robert Sternberg has developed a framework of higher order thinking called "Successful Intelligence." After analyzing successful adults from many different occupations, Sternberg discovered that successful adults utilize three kinds of higher order thinking: (1) analytical (for example, compare and contrast, evaluate, analyze, critique), (2) practical (for example, show how to use something, demonstrate how in the real world, utilize, apply, implement), and (3) creative (for example, invent, imagine, design, show how, what would happen if). Data show that using all three increases student understanding.

Teach components of the learning process

To build metacognition, students need to become consciously aware of the learning process. This changes students from passive recipients of information to active, productive, creative, generators of information. It is important, then for teachers to talk about and teach the components of the learning process: attention, memory, language, graphomotor, processing and organization, and higher order thinking.

Actively teach metacognition

Actively teach metacognition to facilitate acquisition of skills and knowledge. It is important for students to know how they think and learn. Teach students about what Robert Sternberg calls successful intelligence or mental self-management. Successful intelligence is a great way to explain metacognition.

In his book entitled *Successful Intelligence*, Sternberg lists six components of successful intelligence:

1. Know your strengths and weaknesses
2. Capitalize on your strengths and compensate for your weaknesses
3. Defy negative expectations
4. Believe in yourself. This is called self-efficacy
5. Seek out role models — people from whom you can learn
6. Seek out an environment where you can make a difference

Use resources

Several resource books by Robert Sternberg are available on higher order thinking. The following books should be helpful and are available at local bookstores or online.

- **Successful Intelligence** by Robert J. Sternberg
- **Teaching for Successful Intelligence** by Robert J. Sternberg and Elena L. Grigorenko
- **Teaching for Thinking** by Robert J. Sternberg and Louise Spear-Swerling

Consider individual evaluation

Many students with higher order thinking challenges benefit from individual evaluation and

remediation by highly qualified professionals.

Make students your partners

A teacher should let the student with higher order thinking challenges know that they will work together as partners to achieve increases in the student's skills. With this type of relationship, often the student will bring very practical and effective strategies to the table that the teacher may not have otherwise considered.

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Evaluation/Assessment

If consistent use of some of the above strategies does not seem to help a student, it may be worthwhile to consider having a comprehensive neurodevelopmental evaluation conducted by a qualified professional. Problem identification is the first step in problem solution; thus, if the problem is not accurately identified, the solutions that are attempted often will not reap rewards for the student and those working with him.

A comprehensive neurodevelopmental evaluation performed by a licensed psychologist should serve as the roadmap for parents, students and professionals working with the student. It should provide a complete picture of his attention, memory, oral language, organization, graphomotor/handwriting skills and higher order thinking. It should also include an assessment of the student's academic skills (reading, written language and math) and his social and emotional functioning. The evaluation should not only provide an accurate diagnosis but also descriptive information regarding the areas of functioning noted above.

When seeking professional services for an evaluation, it is important to understand what constitutes a good evaluation and also the purpose of the evaluation. Evaluations conducted by public school systems are generally for the purpose of determining whether a student meets criteria for a special education classification. Evaluations conducted by many private professionals are performed for the purpose of determining whether the student meets diagnostic criteria according to the Diagnostic and Statistical Manual (DSM) published by the American Psychiatric Association. While both of these types of evaluations are helpful in their own ways, they are generally not sufficient for providing the best roadmap. Therefore, parents should be informed consumers and ask questions about what kind of information they will walk away with after the evaluation has been completed.

The focus of an evaluation should be to address concerns and provide answers to specific questions asked by the parents and the student, and to identify the underlying causes of problems. For example, if the student has problems with reading comprehension, is it because she cannot decode the words, she has insufficient fluency or vocabulary, or she cannot understand discourse because of difficulty with attention or memory? It should also identify the student's strengths as well as challenges and specific strategies for managing these challenges.

A good evaluation should glean information from multiple sources such as interviews, questionnaires, rating scales and standardized tests. Contact CDL for more information about neurodevelopmental evaluations at (504) 840-9786 or learn@cdl.org.

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