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**Recognizing and encouraging skillful thinking and behavior**

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*The claim is often made (in this issue as well as elsewhere) that schools give a disproportionate emphasis to logical/mathematical and verbal material and intelligence. My sense is that this is only superficially true. The* content *may have this character, and lip service may be given to these forms of intelligence, but the actual educational process remains focused on low level skills. The real development of thinking skills, even within these areas of intelligence, is usually as neglected as the rest of our mental capacities.*

*If this changes soon, Professor Costa will be one of the reasons. His recent book,* Developing Minds; A Resource Book For Teaching Thinking*, provides a comprehensive overview of the growing Thinking Skills Movement, and he has also recently been elected president of the Association for Supervision and Curriculum Development. He is currently Professor of Education at California State University, Sacramento.*

*This article aims at clarifying and expanding our sense of what intelligent behavior is and how we can encourage it.*

*- Robert Gilman*

In teaching for thinking, we are interested in how students *produce* knowledge rather than how they merely *re*produce it. Intelligent behavior is performed in response to questions and problems the answers to which are NOT immediately known. Thus, we are interested in focusing on student performance under those challenging conditions that demand strategic reasoning, insightfulness, perseverance, creativity, and craftsmanship to resolve complex problems.

What behaviors are indicative of the efficient, effective problem solver? Just what do human beings do when they behave intelligently? Research in effective thinking and intelligent behavior by Feuerstein (1980), Glatthorn and Baron (1985), Sternberg (1984), Perkins (1985), and Ennis (1985) indicates that there are some identifiable characteristics of effective thinkers. It is not only some scientists, artists, or mathematicians who demonstrate these behaviors. These characteristics have been identified in successful mechanics, teachers, entrepreneurs, salespeople, parents – people in all walks of life.

**WHAT HUMAN BEINGS DO WHEN THEY BEHAVE INTELLIGENTLY…**

What follows are a dozen suggested characteristics of intelligent behaviors that teachers and parents can teach and observe. This list is not meant to be complete. As we think and study more about intelligent behavior we will discover additional indicators of growth in thinking abilities.

**1. Persistence: persevering when the solution to a problem is not immediately apparent \*** Students often give up in despair when the answer to a problem is not immediately known. They often say, "I can’t do this," "It’s too hard," or, they write down any answer to get the task over with as quickly as possible. They don’t take the time to analyze the problem, to develop a system of problem attack.

Students demonstrate growth in thinking abilities by increasing their use of alternative strategies of problem-solving. They collect evidence to indicate their problem-solving strategy is working, and if one strategy doesn’t work, they know how to back up and try another. They use systematic methods of analyzing a problem, knowing ways to begin, knowing what steps must be performed, what data need to be generated or collected. This is what I’m meaning by perseverance.

**2. Decreasing impulsiveness \*** Often students blurt the first answer that comes to mind rather than considering alternatives.

As students become less impulsive, we can observe them clarifying goals, planning and exploring alternative problem solving strategies, and considering consequences of actions before they begin. They will decrease trial and error, they will gather much information before they begin a task, take time to reflect on an answer before giving it, make sure they understand directions before beginning a task, and listen to alternative points of view.

**3. Listening to others – with understanding and empathy \*** Some psychologists believe that the ability to listen to another person, to empathize with, and to understand their point of view is one of the highest forms of intelligent behavior. Some children laugh at or put down other students’ ideas. They are unable to consider the merits of, or build upon, another person’s ideas. We will know students are getting better at their listening skills when they can attend to another person, demonstrate an understanding of that idea or feeling by paraphrasing it accurately, building upon it, or giving an example of it. When students can say, "Peter’s idea is…, but Sarah’s idea is…" or "Let’s try Shelley’s idea and see if it works," or "Let me show you how Gina solved the problem, then I’ll show you how I solved it," then we’ll know students are listening to and internalizing others’ ideas and feelings.

**4. Flexibility in thinking \*** Some students have difficulty in considering alternative points of view or dealing with several sources of information simultaneously. *Their* way to solve a problem seems to be the *only* way. They are more interested in knowing whether their answer is correct, rather than being challenged by the process of finding the answer.

As students become more flexible in their thinking they can be heard considering or paraphrasing another person’s point of view or rationale. They can state several ways of solving the same problem and can evaluate the merits and consequences of two or more alternate courses of action. When making decisions they will often use such words as "however," "on the other hand," or, "If you look at it the other way…" While increasingly they develop a set of moral principles to govern their own behavior, they are also prone to change their mind in light of convincing data, argument or rationale. Working in groups they often resolve conflicts through compromise, express a willingness to experiment with another person’s idea, and strive for consensus.

**5. Metacognition: awareness of our own thinking \*** We can determine if students are becoming more aware of their own thinking if they are able to describe what goes on in their head when they think. When asked, they can describe what they know and what they need to know. They can describe their plan of action before they begin to solve a problem; they can list the steps and tell where they are in the sequence of a problem solving strategy; they can trace the pathways and blind alleys they took on the road to a problem solution.

They can apply cognitive vocabulary correctly as they describe their thinking skills and strategies. We will hear students using such terms and phrases as: "I have an hypothesis…," "My theory is…," "When I compare these points of view…," "By way of summary…," "What I need to know is…," or "The assumptions on which I am working are…"

**6. Checking for accuracy and precision \*** Some students are often careless when turning in their completed work. Speed of getting the assignment over with surpasses their desire for craftsmanship. We can observe students growing in their desire for accuracy as they take time to check over their work, as they grow more conscientious about precision, clarity and perfection.

**7. Questioning and problem posing \*** One of the distinguishing characteristics between humans and other forms of life is our inclination and ability to *find* problems to solve. We want students to be alert to discrepancies and puzzling phenomena in their environment and to inquire into their causes: "Why do cats purr?" "How high can birds fly?" "Why does the hair on my head grow so fast, but the hair on my arms and legs grows so slowly?" "What would happen if we put the saltwater fish in a fresh water aquarium?" "What are some alternative solutions to international conflicts other than wars?"

Over time, we want to observe a shift from teacher-posed questions and problems toward having students ask questions and find problems for themselves. Furthermore, the types of questions students ask should change and become more specific and profound. For example: requests for data to support others’ conclusions and assumptions – such questions as "What evidence do you have…?" or "How do you know that’s true?" will increasingly be heard. We will hear them pose more hypothetical problems characterized by the "iffy"-type questions: "What do you think would happen IF…?" or "IF that is true, then what might happen if…?"

**8. Drawing on past knowledge and applying it to new situations \*** Probably the ultimate goal of teaching is for the students to apply school-learned knowledge to real-life situations and to content areas beyond that in which it was learned. Yet we find that while students can pass mastery tests in mathematics, for example, they often have difficulty deciding to buy six items for $2.39 or seven for $2.86 at the supermarket.

Too often students begin each new task as if it were being approached for the very first time. Intelligent human beings learn from experience and apply it in new situations. Students can be observed growing in this ability as they are heard to say, "This reminds me of…" or "This is just like the time when I…" They explain what they are doing now in terms of analogies with or references to previous experiences. They call upon their store of knowledge and experience as sources of data to support, theories to explain, or processes to solve each new challenge.

**9. Precision of language and thought \*** As students’ language becomes more precise, we will hear them using more descriptive words to distinguish attributes. They will more often use correct names and when universal labels are unavailable, they will use analogies such as "crescent shaped," or "like a bowtie." They will spontaneously provide criteria for their value judgments describing why they think one product is better than another. They will speak in complete sentences, voluntarily provide supportive evidence for their ideas, elaborate, clarify, and operationally define their terminology. Their oral and written expressions will become more concise, descriptive, and coherent.

**10. Using all the senses \*** All information gets into the brain through the sensory pathways: visual, tactile, kinesthetic, auditory, olfactory, gustatory. To know a wine it must be drunk; to know a role it must be acted; to know a game it must be played; to know a dance it must be moved; to know a goal it must be envisioned. Those whose sensory pathways are open, alert, and acute absorb more information from the environment than those whose pathways are withered or oblivious.

We can observe students using all the senses as they touch, feel, and rub various objects in their environment. They will request a story or rhyme be read again and again. They will act out roles and " be" the thing: a father, a flatbed or a fish. "Let me see, let me see." " I want to feel it." "Let me try it." "Let me hold it…," they will plead.

As they mature, we can observe that they conceive and express many ways of solving problems by use of the senses: Making observations, gathering data, experimenting, manipulating, scrutinizing, identifying variables, interviewing, breaking problems down into components, visualizing, role playing, illustrating, or model building. Their expressions will use a range and variety of sensory words: "I FEEL like…" "It TOUCHES me." "I HEAR your idea." "It leaves a bad TASTE in my mouth." "Got the PICTURE?"

**11. Ingenuity, originality, insightfulness: creativity \*** "I can’t draw." "I was never very good at art." "I can’t sing a note." Some people think creative humans are just born that way, yet increasingly we are coming to realize that all human beings have the capacity to generate original, clever or ingenious products, solutions, and techniques – if that capacity is developed.

Intelligent human beings are creative. They often try to conceive problem solutions differently, examining alternative possibilities from many angles (lateral thinking). They tend to project themselves into different roles using analogies, starting with a vision and working backward, imagining they are the object being considered. Creative people take risks – they "live on the edge of their competence," testing their limits (Perkins 1985). They are intrinsically rather than extrinsically motivated, working on the task because of the aesthetic challenge rather than the material rewards. Creative people are open to criticism. They hold up their products for others to judge and seek feedback in an ever increasing effort to refine their technique. They are uneasy with the status-quo. They constantly strive for greater fluency, elaboration, novelty, parsimony, simplicity, craftsmanship, perfection, beauty, harmony, and balance.

**12. Wonderment, inquisitiveness, curiosity, and the enjoyment of problem solving – a sense of efficacy as a thinker \*** Many people perceive thinking as hard work and therefore recoil from situations which demand "too much" of it. We therefore want students to move not only from an "I CAN" attitude, but also towards an "I ENJOY" feeling. We want them to seek problems to solve for themselves and to submit to others. Furthermore, we want students to solve problems with increasing independence – without parents’ or teachers’ help or intervention. Such statements as, "Don’t tell me the answer, I can figure it out by myself," will indicate growing autonomy. We will see them voluntarily continuing to learn throughout a lifetime.

We will observe them communing with the world around them. They will reflect on the changing formations of a cloud; be charmed by the opening of a bud; sense the logical simplicity of mathematical order. They will find beauty in a sunset, intrigue in the geometry of a spider web, and exhilaration in the iridescence of a hummingbird’s wings. They will see the congruity and intricacies in the derivation of a mathematical formula, recognize the orderliness and adroitness of a chemical change, and commune with the serenity of a distant constellation.

We will see them deriving more pleasure from thinking as they advance to higher grade levels. Their curiosity will become stronger as the problems they encounter become more complex. Their environment will attract their inquiry as their senses capture the rhythm, patterns, shapes, colors, and harmonies of the universe. They will display cognizant and compassionate behavior toward other life forms as they are able to understand the need for protecting their environment; respecting the roles and values of other human beings; and perceiving the delicate worth, uniqueness, and relationships of everything and everyone they encounter. Wonderment, awesomeness, passion, these are the prerequisites for intelligent behavior.

**…AND HOW THEY CAN BECOME MORE SO**

What type of environment can be created in which children learn and develop these types of intelligent behaviors? Much has been written about school and teacher effectiveness and it will not be repeated here. What follows is a brief summary of those school and classroom conditions in which intelligent behavior seems to prosper.

**Having faith that all students can think \*** For many years we thought that thinking skills programs were intended to challenge the intellectually gifted. Indeed, some thought that any child whose I.Q. fell bellow a certain static score forever rendered him or her doomed to remedial or compensatory drill and practice.

Much research with hydrocephalic, Down’s syndrome, senile and brain damaged persons demonstrates that over time and with proper intervention, they can continue to make amazing growth in intelligent behavior. Until recently, we would have given them up as hopeless. Indeed teachers *can* grow intelligence.

**Students must realize thinking as a goal \*** Because some students come from homes, previous teachers, or other schools where intelligent behavior was not valued, they often are dismayed by and resistant to the teacher’s invitations to think.

We must convey to students that the goal of their education is intelligent behavior – that the responsibility for thinking is theirs, that it is desirable to have more than one solution, that it is commendable when they take time to plan and reflect on an answer rather than responding rapidly or impulsively, and that it is desirable to change an answer with additional information.

Students are also helped to realize it as a goal when thinking becomes the content. Time should be taken to teach thinking skills and strategies directly. Discussion of students’ problem solving processes should be conducted, inviting them to share their metacognition, to reveal their intentions and plans for solving a problem.

**Challenging problem solving opportunities must be presented \*** Teachers’ questions can stimulate the brain to perform "higher order" thinking skills, problem solving and imagination. They will also want to provide perplexing situations, discrepancies, and intriguing phenomena to students. Day-to-day, real life problems are the best way to practice problem solving: What to take on the field trip, how to return the playground equipment more efficiently, how to make an equitable distribution of limited classroom supplies, etc..

**Creating a safe, risk-taking environment \*** Learning to think, as does any form of learning, requires experimentation. If children believe the products of their thought processes will be criticized or evaluated, they will probably learn to refrain from thinking. Teachers’ value judgments signal conformity rather than diversity. Listening to, paraphrasing, clarifying, translating, employing students’ ideas indicates that they have the power to produce meaningful ideas in the minds of others.

**Give it time \*** Unlike many other educational innovations and experiments, educators are viewing the infusion of thinking skills as a three to five year process. They are realizing that such a change cannot be a quick-fix. Research seems to indicate that it takes about two years of well defined instruction with qualified teachers and carefully constructed curriculum materials before a significant and enduring change in students’ behavior is observed.

**A rich, responsive environment \*** Many resources must be easily available to manipulate, experience, and observe. First and second-hand data sources – books, films, computers, knowledgeable people, and field trips will be available for students to gather data, to use as a source of theories and to test ideas.

**Attention to learners’ developmental readiness and sequence \*** The nature of thinking capabilities and the sequence in which they appear have been well established in human beings. Too often, however, educators disregard these theories and present learning activities before students are developmentally ready. The environment for learning intelligent behavior needs to introduce learnings in a sequence that matches children’s development.

**Modeling \*** With the understanding that imitation and emulation are the most basic forms of learning, teachers, parents, and administrators are realizing the importance of their own display of desirable intelligent behaviors in the presence of learners. Thus, in the day-to-day events and when problems arise, students must see adults employing the same types of intelligent behaviors listed above. Without this consistency, there is likely to be a credibility gap.

This list of intelligent behaviors and the conditions that promote them is not meant to be complete. There are many other indicators: displaying a sense of humor, ethical/moral reasoning and so forth. As educators we have great responsibility for instilling these intelligent behaviors in our students. We must teach them to value intelligent, creative, and rational action. To do so, however, we must provide the conditions for the behaviors of intelligence to be practiced and demonstrated. We must believe that ALL students can continue to grow in their ability to behave more intelligently. Finally, we must set an example by becoming models of these intelligent behaviors ourselves