Can You Teach Kids to Think?

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BACKGROUND

For several years now I have been interested in the idea that regular education students have the ability to think laterally and critically as well as many of their more gifted counterparts if given extra instruction and opportunity to do so. I began this quest to raise the bar for these students shortly after I myself completed a two year program aimed at assisting elementary teachers in the teaching of math beyond calculation. I will admit from the start that I was a very poor math student when it came to problem solving. In fact, my overall problem solving skills left a lot to be desired. So let me start with this period in my own development that led me to believe that ALL students have much more ability than they are given credit. Really this all started back in West Virginia when I learned the Kodaly method of teaching music.

When teaching in West Virginia, I was asked to help teach teachers in the primary grades to teach music using a method called Kodaly. Its basic premise was to present opportunities for exploration of a new skill many times, but also present music in fun ways. First, we presented a new skill in this manner and then practice this skill over and over again to obtain mastery. This does not sound like a technique for critical thinking; however I still use this same method when trying to get kids to think more deeply. I present various thinking skills using lots of puzzles and problems. Then by repeating the same kinds of problems for mastery, students begin to learn how to think.

My second encounter with alternate teaching strategies was when I was teaching in Alexandria City. My principal asked me if I would like to participate in a two-year math program for elementary students. Although I was extremely leery of entering into a program working with a subject matter that made me feel extremely uncomfortable, I said yes, because as a teacher, I have always liked new challenges.

We met monthly during the school year for full day sessions during which we worked on the NCTM standards. Having only barely passed Algebra I in junior high school and struggled through new math in college, I was completely lost. We might spend several hours or the entire day on just one or a few problems; problems like the now famous handshake problem and the ladder climbing situation. After we had had a chance to solve these problems, we discussed the "hows" and "whys" of our solutions worked. Each summer we met for a solid week, all day and worked through all the math standards for intermediate elementary students using problems and situations that forced us to use our newly developing thinking skills.

Sometime during those two years, I began to think differently. Slowly, but surely, I began to be able to solve the puzzles and problems, not all of them but some of them. We were also asked to teach these same problems to our students and help them become more fluent in critical and lateral thinking while still addressing the standards. I was thrilled when I could get the answer by myself and watched as the students were also so excited when they could solve them as well. Furthermore, they would write at the end of each year that they had loved math as opposed to their beginning of the year when I often heard, "I Hate Math!" The girls began to see themselves as math scholars and many students began to believe that their best subject was math. Finally, the test scores that were analyzed and reanalyzed each year actually showed that students were improving!

During my tenure at the Science Focus School in Arlington, I was exposed to two strategies that further influenced my belief that ALL students can become deep thinkers.

The first was hands on science, the constructivist's approach to science that advocates experimentation before presentation. The whole premise of this method, as I see it, is to allow students time to discover for themselves before rote learning takes place. I loved taking this approach when we had our bulbs and batteries unit. I would give each science team a bulb some wire and a battery. The team's job was to light the bulb in as many different ways as possible. Just watching the various strategies students were using was enlightening.

The second strategy to which I was introduced was that of the new brain research and this is what finally clinched it for me. As I began to take classes and workshops about the brain, I started really analyzing how I learn best. I also went back to rethink that whole math thing and realized that along the way, my critical thinking skills had improved greatly. I am certainly still not at the top of the game, but I am sure further up the ladder. So every year for the last seven to ten years, I have been experimenting with general education students to develop their abilities as real thinkers. One thing I have discovered loud and clear; many students are identified gifted because of their wealth of factual knowledge and the quickness by which they learn. But many other unnoticed students are really the gifted thinkers and the truly gifted possessing both skills are few and far between.

RESEARCH FOCUS

"Can You Teach Average Students to Think?" became my research question for my teacher research project this year. I designed the project so that I would systematically record student interactions and their responses to the strategies that I developed to get my students to think. My class this year of 25 students are of mixed gender, ethnicity, and academic levels. Based on my observations and interactions with the students, I would group them in three basic categories, those that love a challenge (5 students), academically interested (12 students), uninterested in academics (7 students). Using an informal aptitude test created by Lars Sondergaard, my students scores ranged from 88 to 140 related to ability. Twenty-one of these students scored in the average ability range and the other four's scores fell in the slightly below average or superior ranges. Lars Sondergaard's informal aptitude test can be found online at http://www.geocities.com/CapitolHill/1641/iqown.html.

INTERVENTIONS

In September, I gave a little quiz on riddles that I found in a critical thinking book. It is called the Wally quiz and it is found in the book entitled Great Lateral Thinking Puzzles. (See the Bibliography). After grading the Wally Quiz, I discovered that most of my students could not solve any of the riddles, and few could only solve one riddle. I then began using the few minutes at the end of the day to give a riddle and discuss it or send it home for family input. At this point I gave no strategies for solving. I also used the enrichment in math for all students as extra credit. Slowly the class became a bit interested in solving riddles and math challenges, but I will have to say, I was disappointed in their seemingly apparent lack of enthusiasm for that this particular class does not appear to like challenges of this nature.

In October, I began discussing with my students a few strategies that would help them figure out a riddle:

1. 1. Make sure you know the meaning of all the words in the riddle.
2. 2. Make a list or chart of all familiar terms and ideas in the riddle.
3. 3. List under each term or idea all the various ways that it might be used, silly or otherwise.

Many students began using these strategies and it appeared, based on their responses to daily challenges, that the strategies were helping most of them solve riddles.

I also started giving the answers to the word problems in the math book and asking the students to tell me why that is the answer and why the others are not. I also asked the students to tell why the non-chosen answers on the multiple-choice reading and science questions were not the correct answer. I heard much groaning from students, but this is helped them analyze their own learning which in turn, appeared to help them think more critically.

Other resources that I used in our daily problem-solving time came from Mensa materials. I used lateral thinking puzzles and activities from a Mensa quiz book. I also found that doing the exercises during the "down times" of the day, like waiting for buses to be called, held students' attention and kept my class quiet and gave them something constructive to do. (See the bibliography section for a complete list of the books that I used to select activities.)

On the second Wally Test that I gave in January, of the three groups I earlier identified, 70% of those scoring 50% or better came from the "Interested in Learning Group." Analyzing the Math Problems of the Day, I discovered that 53% of my students who were in interested and challenged categories 2-3 and they were scoring at the 50% mark or even higher. These same percentages seem to hold true throughout the other various activities and projects that we completed in class that required problem-solving skills.

Since my original question was Can You Teach Average Students to Think? I wanted to move beyond just riddles and isolated exercises. So, I began to look at classroom attitude and academic behavior. I observed and recorded student behaviors using five different criteria based on my definition of "thinking." In order to demonstrate competence in critical and logical thinking, I was looking for a student to demonstrate the following criteria at least 50% of the time in academic settings:

1. 1. Carefully weighs the problem.
2. 2. Be willing to work and rework the problem.
3. 3. Develops a mental image to use in analyzing the situation.
4. 4. Identifies and tries-out various possibilities with an open mind.
5. 5. Arrives at a conclusion only after careful analysis of the data collected.

After observing and recording students demonstrating these behaviors, I determined that students could think when they appeared interested in the task.

These results led me down another road, which I think locates another piece of the puzzle of why some students think better than other students do. The key is "desire." Those who want to do something, can, and those who don't want to, can't. Researchers now call this "Engaged" learning. Simply put, this means that students need to take charge of their own learning, and when they do, they are able to develop excellent thinking skills. Motivation is also a necessary component which, when positive in a student, nets the potential to develop critical and lateral thinking. My most motivated students fell in the 50% or more of the time in each of the criteria categories.

I sent a parent survey home with each of my students to ask parents to provide me with information about how their children solve problems at home. Unfortunately, only two parents responded to the survey. Because of such poor response from parents, I did not collect enough data to determine if students that demonstrated self-directed, highly motivated behaviors while trying to solve problems in my class were the very same students who are encouraged and expected to be independent thinkers and are self-directed at home.

However, when I surveyed my fellow teachers in my school to determine what classroom strategies they use to encourage problem-solving, I had a better return rate. I received eighteen responses from the faculty members (this is approximately 50% of the general education and special education teachers). The survey listed various strategies on the survey that research indicates help develop thinking, independent learners. Teachers were asked to indicate if they use these strategies in their classrooms. After compiling this data, I discovered that the teachers who responded use many strategies that have been identified by research to enhance thinking skills. However, many of these strategies are used only occasionally (See Appendix A).

This is certainly not a poor reflection on any teacher, but rather, I believe, based on the now prevalent attitude of learning based upon standardized testing. Too much content and memorization is often required eliminating time to think. According to Anthony Le Storti, assistant Professor and Director of the Center for Creative Studies at Gwynedd-Mercy College, "Learning should not be limited to acquiring more content or subject matter. It must include the development of powerful thinking skills as well as the personal traits and dispositions that energize a good thinker."

CONCLUSION:

This research project demonstrated a number of things that I can use in my future teaching. I have shared this project with my fellow teachers at our annual round table presentations that we hold at the end of every year. These are the points that I made in my presentation and I will keep in mind as I continue to try to find ways to teach children to think:

1. 1. Most students can develop a higher level of thinking. That is important to remember!
2. 2. Thinking skills and problem solving must start at home and continue throughout school years. I want to share this with parents when meeting with them at the beginning of the school year.
3. 3. "Intrinsic" motivation is a must. Students must want to take time to think through a problem or situation. I will share these two points with students as I encourage them to take "time" to work through problems.
4. 4. Some current educational practices are not conducive to thinking in the classroom. Too much rote learning and memorization that is now required in our standards-based curriculums can be at the expense of teaching our children to think.
5. 5. From the teacher survey, teachers occasionally use higher level thinking strategies. "Occasional" use of such strategies is probably not enough.

What does all this mean for the regular educator? I believe that all children can learn to be good thinkers, provided the proper stimulus and opportunity. I also believe that when children are placed in situations where they have no alternative but to solve problems, they often come up with viable solutions. It is also evident that different children learn thinking skills in the areas of their own interest. Whether a child wants to take the time and effort to really solve an academic problem is "the nature versus nurture issue." In all my research and observations, the success a student demonstrates does not seem to be linked to ability, but rather desire, motivation, and opportunity to learn how to think.

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i Jones, B. Valdez, G. ,Nowakowski, J., & Rasmussen, C. (1994). Designing Learning and Technology for Educational Reform. Oak Brook, IL: North Central Regional Educational Laboratory.

ii http://www.penngifted.org/bulletins/b3.html

Appendix A

TEACHER SURVEY TO DETERMINE USE OF PROBLEM-SOLVING STRATEGIES

TEACHING STRATEGY	OFTEN	OCCASIONALLY	NEVER	NA
1. Use riddles/jokes to teach content.	1	7	3	2
2. Analyze riddle vocabulary to teach vocabulary skills.	3	5	4	2
3. Look for serious, humorous, absurdities in content material.				
4. Use puzzles to teach or review content.	5	10	1	1
5. Answer student questions with a question.	6	7	2	0
6. Respond to student "I don't know" with What if you did know".	4	3	7	0
7. Respond to student "I don't understand with "What don't you understand".	10	5	1	0
8. Allow for student creativity with supervision.	10	5	0	0
9. Allow think time.	10	5	0	0
10. Allow students to articulate answers to math problems in words.	9	5	0	0
11. Encourage students to look at problems from others point of view.	10	4		
12. Allow for cooperative learning.	12	2	0	0
13. Give students the answers and have them write the questions.	0	9	6	1
14. Give students the answers and have them write how to find it.	1	7	6	1
15. Ask lots of why questions.	10	6	0	0
16. Use art as a learning tool.	5	10	0	0
17. Play music in the classroom during working times.	2	10	2	0
18 Allow for frequent	5	8	1	0

physical activity during learning time.				
20. Use analogies as a teaching tool.	5	10	1	0
19. Ask students to paraphrase.	5	9	0	0
20. Allow students to teach each other.	7	7	0	0
21. Explain to students how they learn and how the brain works.	5	7	4	0
22. Let students decide how they will learn content material.	4	8	2	1
23. Give students "down time" after learning new content.	3	8	2	1
24. Use humor as a teaching tool.	11	3	0	0
25. Allow competition among students.	3	9	2	0
26. Ask more questions than give answers.	4	9	1	0
27. Use lecture as a teaching tool.	0	12	1	0
28. Use lots of repetition.	7	5	1	0
29. Use guest speakers, field trips, and videos.	2	12	0	0
30. Have students set weekly or monthly goals.	3	10	1	0
31. Use grading rubrics.	5	9	0	0
32.Use debates and student presentations.	1	9	1	1
33. Allow students to fail without "Failing".	4	5	1	0
34. Integrate several content areas.	12	1	0	0
35. Use bright posters and other visual articles to teach content.	9	7	0	0
36. Limit instruction to 20 minute intervals before changing activity.	10	9	0	0

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Appendix B

INTERESTING PERCENTAGES

CRITERIA	STUDENT I.D.	PERCENTAGE CORRECT
Informal IQ Test	Challengers 5	100%
	Interested 13	54%
	Uninterested 7	0%

CRITERIA	STUDENT I.D.	PERCENTAGE
Level of interest	Challengers	71%
	Interested	45%
	Uninterested	49%