

Chapter 13

Cubing

Few people think more than two or three times a year; I have made an international reputation for myself by thinking once or twice a week.

George Bernard Shaw

Motivation ✓

Acquisition

EXtension ✓

Cubing (Cowan and Cowan, 1980; Morgan, Forget, and Antinarella, 1996; Vaughan and Estes, 1986; Richardson and Morgan, 2003) is a writing activity that permits students to look at a subject from six different perspectives. Six labels are printed on a cube, one on each of the six sides of a square box — the cube — covered with plain paper. Each side has labeled instructions for the different levels of thinking, including description, comparison, association, analysis, application, and argument (see Appendix 4). As each side of the cube is presented to the students, they write about their topic from that perspective until the teacher calls time and moves on to the next side of the cube.

The obvious value of this activity is that it turns an otherwise abstract thinking exercise into one that is very concrete in nature, and even involves the tactile-kinesthetic activity of writing. It is not advisable to spend too much time on a single side. Rather, you should fairly quickly cover a topic from six points of view. Depending on the depth of the topic, it is advisable to spend anywhere from 2-5 minutes per side. All six sides should be used since the six sides represent the six levels of thinking of recall, comprehension, application, analysis, synthesis, and evaluation.

Cubing can be used in a number of ways, and you will find it more interesting for students if you can vary the use of this strategy. It can be used as:

1. a pre-reading activity to help students think about what they already know about a topic,
2. a post-reading activity to help students think about what they have learned about the topic,

3. both a pre-reading and post-reading activity over a longer period of study, enabling students to compare the two products to see their growth,
4. a pre-writing strategy to enable students to consider a topic for a written assignment and to begin to narrow the focus of their writing to one aspect of the topic,
5. a vehicle for discussion if used in small groups in which students turn their own cube and use it to stimulate sharing and oral discussion of ideas as either a pre-reading or post-reading activity or discussion or to review for a test.

Cubing, as a writing activity, should also be done following the cooperative learning paradigm suggested in chapter 4 in which students first commit their ideas to paper before meeting in small groups to compare their understanding of the topic, and then proceed to full-class discussion.

Teaching the Cubing Procedure

Lifelong Learning Skill(s) to be Practiced During Learning:

- Extending beyond the reading through manipulation of ideas — applying a thinking taxonomy to better understand learned subject matter.
- Writing as a tool for comprehension.

Quick Overview of Lesson:

(This strategy may be used before the learning if it is assumed that students have a good deal of prior knowledge about the subject to be studied. It is the author's experience that Cubing is best used as an EXtension activity — a tool for analysis of what has been learned.)

1. Explain and model use of the skill of higher order thinking.
2. Each student prepares to write about topic. (Paper & pencil out)
3. Use a prepared cube (Appendix 4) to help students write about the topic at each level of thinking.
4. Students share what they have written.

Materials:

- Six-inch by six-inch cube made from a cardboard box and covered with the six thinking levels of the cubing process (optional)
- Student-owned paper & writing implement
- Textbook or other reading matter
- Overhead projector (optional) and transparency of the "Thinking Cube"

Detailed version of lesson:

1. Explain to students that by using higher order thinking about a topic, they can understand it better and remember it more easily. Let them know that by using the “Thinking Cube” they can think about a topic at six different levels.
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2. Show students the “Thinking Cube” either by using a transparency or by having an actual six-sided figure to manipulate in the classroom. (It is easy to make a cube of six to eight inches in diameter to be used for this purpose. Once made, it will last for years.) Model the use of the cube by thinking out loud for students as you “cube” something. You may wish to cube something concrete like a pencil, or you might wish to cube what you had studied the previous day. The important thing is not what you choose to cube as much as the idea that you are modeling the thinking process involved. *This modeling is best done by adlibbing, not with a prepared slide. This shows that thinking is not so difficult, and that it is a process, not a product.*
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3. Have each student prepare to write by obtaining clean paper and a writing implement.
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4. Each of the six sides should be explained carefully and you should model the thinking involved:
 - A. Describe it. Consider/visualize the subject in detail and describe what you see — colors, shapes, sizes, memories — what does it look like?
 - B. Compare it. To what is it similar? From what is it different? Explain how.
 - C. Associate it. What does it make you think of? You might associate it with similar things, or you can think of different things, times, places, people, etc. Just let your mind go and see what associations you have for this subject.
 - D. Analyze it. Tell how it is made or how it functions. If you do not know, make it up! (Used in pre-reading activities, students are making predictions.)
 - E. Apply it. Tell what you can do with it. How can it be used? How does it work?
 - F. Argue for or against it. Go ahead and take a stand. Be sure that you are able to substantiate your stand with reasons why you think so through reference to the text or to your prior knowledge or both.

You may wish to model the thinking involved by cubing a wooden pencil as follows:

Cubing a Pencil

A person can use this thinking strategy to think about anything from something as simple as a pencil to something as complex as the space shuttle program. Naturally, the more complex the thing or issue, the more thought that goes into it. Just for practice, let's "cube" a pencil. We will use each of the six sides of the cube to do so.

Description: A pencil is a long, cylindrical (sometimes hexagonal), device used to write on paper.

Comparison: It is different than a pen because you can erase what you have written, which you cannot do with most pens.

Association: It makes me think of drawing because I like to draw with one. (It might make you think of just about anything, such as standardized tests or sharpening before class or your book bag. There is much room for personal thought at this level of thinking.)

Analysis: Pencils are generally made of wood surrounding and supporting a thin piece of graphite, which is the substance that marks the paper. It usually has a metal cylindrical clasp at the top, which holds an eraser.

Application: It is used by rubbing the graphite tip onto a piece of paper...When an error occurs, the pencil is inverted in the hand, and ...

Argument: An argument in favor of pencils is that they are efficient tools for the taking of notes or writing a rough draft of something. It is easy to make corrections if you make a mistake, simply by inverting the pencil and using the attached eraser to rub out the error. They are also light weight and convenient to carry. Arguments against pencils are that they frequently need sharpening, the graphite tips break too easily, the graphite gets all over my clothes, I always leave it at home, etc....

5. Once the topic is agreed upon (usually the main idea of the lesson you have just completed, but it could be any aspect of what was learned today or in the past) have each student write individually on each level of thinking as you either rotate a pre-made cube or refer to the various levels from a transparency or wall poster of the six levels of thinking. It is my experience that a physical cube is useful to manipulate so everyone can see each of the six sides in succession. Times may vary, but do not spend more than 2-5 minutes at each level of the cube. In some cases, depending on the topic and its complexity, you may spend as little as one minute on some of the sides. Feel this out by moving around the class to see what students are doing. *Take the time to do the same writing on your own onto a transparency so that students will, later on, be able to see how you think about the same topic. This way, you may get the last word if you choose.*

6. Be sure that each student understands the meaning of each of the labels from each side of the cube. Move around the classroom to look over the shoulders of the writing students to observe their thinking. Especially during the first few times you use cubing, you will want to fully define the labels and move around to assure that the correct level of thinking is taking place. Be tolerant of different interpretations, but feel free to help out an individual student, quietly whispering ideas. If it is apparent that several students are not succeeding at a certain writing/thinking level, stop the class and address the thinking by modeling. Think out loud for them so that they can see what is involved at that level of thinking. (You will only have to do this once or twice with most students. It is not that students do not know how to perform higher order thinking — it's just that they often have not had to do too much of it at school relating to academic work.)
7. Have students share by reading aloud each of their six writings of the cube process in small groups to compare notes and improve their understandings of the topic. Let them know that, by hearing others' interpretations of the learning, they will better understand the concepts themselves. Have them work to select the best description, comparison, association, etc. (or some synthesized combination of several) of the six levels of thinking *to prepare for sharing out loud with the rest of the class.*
8. Use the cube in your hands (or a cube on a transparency) to work through the six levels, randomly selecting a cooperative learning group for each level of thinking, and have that group share the response they agreed on for that level of thinking. This can be done by using the cube as a die, tossing it to see which side lands facing up, having a randomly selected group prepared to share their writing about that level of thinking. The cube can also be thrown from one group to the next, having the group catch the cube and respond to the side that ends up facing toward the ceiling. This adds a tactile-kinesthetic level of behavior that seems to engage many students, even though the real focus is on thinking. (There are many ways to run this last part of the cubing process. Be creative, and come up with your own. You may just wish to collect the students' collective writing to evaluate on your own. My experience suggests that the sharing aloud of student cubing writings is helpful in developing understanding of the subject matter.) (Figure 13-1 shows how one group in a 9th-grade algebra class cubed the slope-intercept form of linear equations.)
9. Ask students to report on their use of the skill. Ask them, "By a show of hands, how many of you felt that by thinking about this topic at six different levels, and then comparing it with the thoughts of others, it helped you to better understand what we learned in here today?" "Do you feel that you have a better understanding of the topic that was cubed than you might have had by doing a worksheet about the topic?"

10. You might extend the learning into homework by asking students to make some additional notes about each level of writing they have done, citing elaborative details, or otherwise reflecting on the learning.

Figure 13-1

CUBING THE SLOPE-INTERCEPT FORM OF LINEAR EQUATIONS:

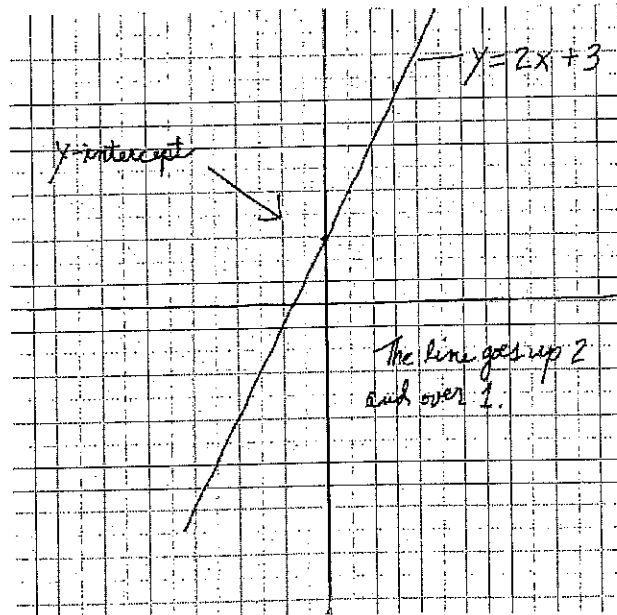
DESCRIBE: It is the equation of a line, and it has two variables. It is written with the y -variable all by itself on one side.

COMPARE: Compared to the standard form, $Ax + By = C$, it is easier to use to find the line.

ASSOCIATE: It makes me think of the coordinate plane with the X and Y axis.

ANALYZE: It is $y = mx + b$. The y is a variable, and so is the x . The m tells the slope of the line (how steep it is). The slope, m , is the rise over run, the change in y over the change in x . The b tells where the line crosses the y -axis. It is called the y -intercept.

APPLY: For the line written $y = mx + b$, which has a slope of m and a y -intercept at b , there are an infinite number of solutions for x and y . For each x , there is a y , and vice-versa. An example is $y = 2x + 3$. The slope is 2 which means the rise in the y -value is two for every increase in the run of the x -value. The line crosses the y -axis at 3. So it looks like this:



Every point on the line is a solution to the equation.

ARGUE: The slope intercept form of writing linear equations is the easiest one to be able to see the line quickly. It is better than the standard form because you don't need to change the signs or anything to calculate the slope or intercept. I can just look at the equation and picture the line in my head.

What you do after the writing is up to you. You may wish to collect them as an informal evaluation of how well the students learned the subject matter. The writings could then be used to start the next day's class by sharing some of the more accurate or more confused understandings as articulated in the cubing exercise.

The more practice students have with cubing, the easier it gets for them to do it. I recommend, after a good bit of practice, using cubing as an assessment activity on a test, in lieu of an essay question — just ask students to cube something that they have studied. It is a good idea to give them the six prompts on the test. You will see that cubing becomes a good assessment tool since they are actually easier to grade than essays. After all, you already know the outline of the answer.

Cubing may be done orally as a “last five minutes of class” activity, it can be done as a cooperative writing activity as described above, or it might be done in place of a major essay on a test. The last couple of years that I taught U.S. Government, I used cubing as a major part of my final exam. For 50% of the test grade, students had to “cube” the six principles of the U.S. Constitution. Without even considering introductory or concluding paragraphs, students were placed in a position to write 36 paragraphs for their final “essay” of the year. The shortest one, from an inclusion student, was six pages long. Most were thirteen to sixteen pages in length. I would argue that those students were much better prepared for college than students who leave high school thinking that a final exam essay is 40-50 words long.

In sum, cubing is a thinking activity that helps to apply Bloom's Taxonomy to the learning of subject matter. It works in any classroom and over just about any subject matter. Some of the concepts I have had students cube are the slope-intercept form of linear equations, federalism, physical geography of the eastern United States, group 1 of the periodic table of elements, adding and subtracting fractions, the digestive process, and many others. If you use cubing with your students, you will see that their understanding of your subject matter improves as does their ability to process new ideas.

Extra Scaffolds for Disadvantaged Readers

As in any of the classroom activities that call for individual or small group work, the teacher, in a special education or other needs classroom where heterogeneous grouping is not an option, can become more involved in the discussion. Instead of having students do individual writing before meeting in groups, the teacher might spend more time modeling by actually going through the whole process using student responses to write onto an overhead transparency or onto the chalkboard. Even in special needs classes, though, students should be weaned from dependence on the teacher as soon as possible. The fact is that cubing is a very concrete exercise, yet it allows students to perform higher order thinking without realizing they are doing so. If the teacher models cubing several times over a period of a few weeks, students of all ability levels can perform the task with relative ease (and a little one-on-one support).

Forget, M. A. (2004). Chapter 13: Cubing. In *MAX teaching with reading and writing: classroom activities to help students learn subject matter while acquiring new skills*. Trafford Publishing.

Additional resource for Cubing a MAX Strategy:

MAX Teaching Materials. (2017). Cubing. Resources. MAX Teaching. Retrieved January 17, 2018, from <http://www.maxteaching.com/max-teaching-materials>