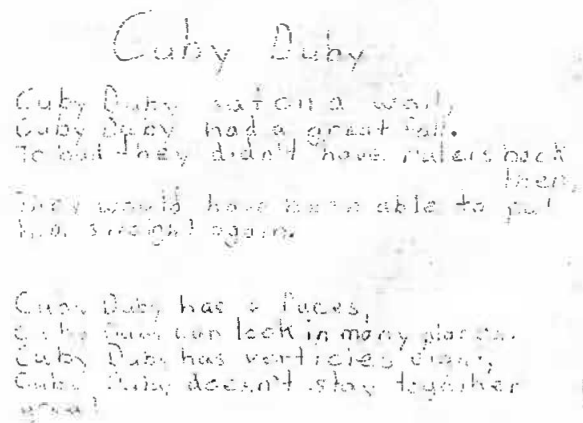


An Angle on Multiple Intelligences in Geometry

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Could this little song have sprung from a math class? Why would a math teacher request her students to write such a song?

Two girls in my Grades 4–5 class wrote this song during a math lesson to describe the attributes of a cube. But this was not a traditional math lesson; this lesson was one of several multiple-intelligences lessons that I used in an attempt to reach the energetic, often behaviorally challenged learners in my classroom. Not only did I have some children who exhibited off-task and sometimes violent behavior but also the range of learners' abilities in my class spanned eight years. I was looking for some strategies to make learning captivating, challenging and enjoyable.

Teaching in the 1990s means dealing with many issues, such as students who exhibit disruptive behaviors, large class sizes, a wide range of learning abilities and an overloaded and ever-changing curriculum. Today, teachers work with children who spend most of their free time in front of the television or playing computer games. Computer games present a new stimulus every 15 seconds, so it is little wonder that children are captivated by the myriad electronic and computerized devices around them. Students expect to be entertained and stimulated in

school the same way as they are by electronic toys. Some children have a difficult time focusing their attention on what they need to learn. Many teachers, including me, sense this challenge and try desperately to capture students' attention.

I lay awake night after night thinking about the challenges of being a teacher in the 1990s. I was frustrated with trying to cope with all that was going on inside and outside my classroom. I struggled to find a solution. Then, as if in answer to my questions and concerns, I discovered an article in my mailbox outlining the multiple intelligences approach to teaching. As I read, I wondered if the multiple intelligences strategies would help me deal with the issues that kept me awake. I was also hopeful that the multiple intelligences approach would help improve student learning and motivation. Finally, after months of researching the subject, I decided that the multiple intelligences technique was worth a try. I developed a geometry unit using multiple intelligences to find out for myself if the theory lived up to its promises.

What Is the Multiple Intelligences Approach?

The multiple intelligences approach is a teaching tool that allows students multiple options for taking in information, making sense of ideas and expressing what they learn. The multiple-intelligences approach recognizes that students have learning strengths and weaknesses. It also acknowledges that these strengths can be further developed and that the weaknesses, to at least some extent, alleviated. Teaching with multiple intelligences allows teachers to meet a wide range of student needs because information is presented in various ways. Both teachers and students can choose activities within the curriculum that will help the students learn best while strengthening minor intelligence areas. This concept is not new to most teachers. Teachers have been using a variety of strategies for years. However, multiple

intelligences provides a structured approach to adding variety in the classroom. It is a medium to reach children that corresponds with their learning strengths while giving them an opportunity to expand their list of strengths. Multiple intelligences also offers students a chance to challenge themselves in less dominant learning modes.

The multiple intelligences theory was first articulated by Howard Gardner, a neuropsychologist, who worked with brain-injured and savant individuals in the 1980s. Gardner (1983) concluded that each person has seven distinct intelligences:

- Visual/Spatial—the ability to create visual or spatial representations mentally or concretely
- Mathematical/Logical—the ability to use inductive and deductive reasoning, and to recognize and manipulate abstract patterns and relationships
- Bodily/Kinesthetic—the ability to use the body to solve problems or create products and convey ideas and emotions
- Verbal/Linguistic—the ability to read, write and work with words
- Musical—the ability to use music; this includes a sensitivity to pitch, timbre and rhythm of sounds
- Interpersonal—the ability to work with others and understand them
- Intrapersonal—to be deeply aware of one's own feelings, intentions and goals

Recently, Gardner has articulated an eighth intelligence and labeled it the *naturalist intelligence*, the ability to see similarities and differences in one's environment.

Multiple Intelligences Geometry Unit

The multiple intelligences geometry unit that I developed consisted of seven lessons. Each lesson (except the first) revolved around an objective drawn from the *Program of Studies* (Alberta Education 1993). The first lesson was designed to provide an overview of the multiple intelligences theory (see Figure 1). The remaining six lessons explored geometry concepts using a different intelligence in each lesson.

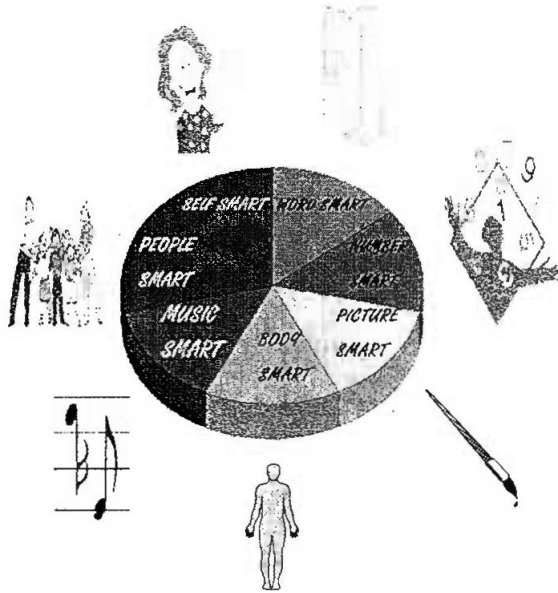
Lesson 1 (Introduction)

- ✓ Ask the students what they think it means to be smart.
- ✓ List the student replies on an overhead projector. (I was surprised to find that they knew there were many and varied kinds of intelligence other than linguistic and mathematical.)
- ✓ Show the students a chart listing all the intelligences, the characteristics of each and a famous person who displayed each intelligence (Figure 1).
- ✓ Discuss each of the intelligences. Ask the students to think about where their strongest and weakest intelligences might be.
- ✓ Show the students pictures and overheads of the famous people and what these people accomplished.
- ✓ Display a pie graph of the intelligences (Figure 2) that illustrates how each person holds all the intelligences within them but how some intelligences are stronger than others.

Figure 1
How Are You Smart?

Smart Area	Are You Good At...?	Do You Like To...?	Famous People
Word Smart	reading, writing, telling stories	read, write, talk, memorize	T. S. Eliot, Abraham Lincoln
Number Smart	math, problem solving, patterns	solve problems, work with numbers	Albert Einstein
Picture Smart	reading maps and charts, drawing	draw, design, look at pictures	Picasso, Frank Lloyd Wright
Body Smart	sports, dancing, crafts	play sports, dance, move around	Charlie Chaplin, Michael Jordan
Music Smart	singing, remembering songs	sing, hum, listen to music	Mozart
People Smart	understanding people, resolving arguments	be with friends, talk to people	Mother Teresa
Self Smart	recognizing your strengths, setting goals	work alone, think alone	Sigmund Freud

Figure 2



Lesson 2 (Mathematical/Logical)

Objective: *Students will use the terms line, segment, ray and angle.*

- ✓ Show and discuss pictures of cities and buildings where geometric shapes can be seen.
- ✓ Look around the classroom to find geometric shapes.
- ✓ On a sheet of chart paper, list the shapes and objects found, using terms such as *angle* and *line segment*. Discuss these terms—*ray*, *angle*, *line segment*, *vertex*, *edge* and *face*—as they apply to the shapes and objects.
- ✓ Go outside and find geometric shapes in the neighborhood. Add these items to the list.

Lesson 3 (Musical Intelligence)

Objective: *The students will distinguish two-dimensional figures from three-dimensional (3-D) objects by naming the 3-D objects as prisms or pyramids.*

- ✓ Show the children some two-dimensional figures and three-dimensional objects, especially those that are pyramids and prisms.
- ✓ Discuss the attributes of each geometric shape. Put these on large chart paper so children can see them throughout the lesson.
- ✓ Ask the students to write a rap or simple song or verse about a geometric shape of their choice.
- ✓ Play some rap songs and simple tunes on the tape player to help generate ideas.

- ✓ Share the songs and raps with the entire class. Be sure they can classify the shapes and name the prisms and pyramids.

Lesson 4 (Visual/Spatial)

Objective: *The students will construct three-dimensional objects, as well as name cylinders, cones and spheres.*

- ✓ Discuss the meaning of the term *three-dimensional*. Point out that geometric shapes contain vertices, angles, line segments and so on.
- ✓ Display a number of three-dimensional objects.
- ✓ Give each child several toothpicks and a bunch of miniature marshmallows and ask students to create a three-dimensional geometric shape of their choice.
- ✓ Have each child showcase the shape to the class and describe its characteristics.

Lesson 5 (Interpersonal)

Objective: *The students will classify and name two-dimensional shapes.*

- ✓ Have the students sit back to back, one with a clipboard holding an $8\frac{1}{2} \times 11$ " sheet of blank paper and the other with a slip of paper bearing the name of a two-dimensional shape. Use the following names of shapes: circle, triangle, rectangle, pentagon, hexagon, octagon.
- ✓ Ask the student with the name of the shape to, without looking at the paper, tell the student with the paper how to draw the shape. They are not allowed to mention the name of the shape itself or objects that obviously represent the shape.
- ✓ Ask the students to switch roles using another shape.

Lesson 6 (Bodily/Kinesthetic)

Objective: *The students will construct three-dimensional objects.*

- ✓ Allow the students to choose a group that they would like to work with. These can be groups of two to four. This activity involves touching so the children must be comfortable with the others in their group.
- ✓ Ask the groups to create a geometric shape of their choice with their bodies. For example, four children could hold out their arms and legs to create a cube.
- ✓ Have the groups demonstrate to the entire class how they made their shape and explain why the shape is three-dimensional. Make sure they use terms such as *line segments*, *angles*, *vertices*, *faces*, *edges* and *rays*.

Lesson 7 (Verbal/Linguistic)


Objective: *The students will describe the essential attributes of prisms, pyramids, cones, cylinders and spheres.*

- ✓ Discuss what a riddle is and share some with the class.
- ✓ Have the names of the three-dimensional objects listed in the objective above written on pieces of paper and give these to the children.
- ✓ Ask students to work alone or in pairs to create a riddle about the object on the piece of paper.
- ✓ Remind students that they need to use terms such as *vertices, edges, faces and angles.*

- ✓ Ask students to share their riddles and have the rest of the class try to solve them.

Each class lasted about 45 minutes and ended with time to write in a learning log (see Figure 3). This learning log asked the children to think about their learning in a deeper way (intrapersonal intelligence). The *Alberta Program of Studies for K-9 Mathematics* (Alberta Education 1996) requires that students communicate what they have learned in math, and this fits in well with the multiple intelligences approach. I prepared the learning log as a chart or graphic organizer. At the top of each column was a question to focus students' ideas.

Figure 3

Daily Learning Journal					
Name _____					
What I did not Like	What I Learned	How will this be useful to me?	Picture	How I feel about what I've learned	I'd like to try...
<p>May 17 1997</p> <p>I did not like cleaning my group with the class</p>	<p>May 20 1997</p> <p>I learned that people can be smart in many ways in groups</p>	<p>May 22 1997</p> <p>This lesson will be useful to me by helping me learn my shape better</p>	<p>May 20 1997</p>  <p>Charlie's top</p>	<p>May 21 1997</p> <p>which side to try to make a sculpture out of all the shapes the kind and how shapes will learn</p>	<p>May 25 1997</p> <p>to explain how to draw a 3D shape to my partner X</p>

When I taught these lessons, I asked the children to fill in one or two columns a day responding to a variety of questions such as what they learned, how they felt about the lesson, what they liked and did not like about the lesson, how this lesson could be applied to other areas of their lives and what they would like to learn more about. The child chose to fill out the log using either words or pictures.

By the end of the last lesson, students were aware of the intelligences and how they could be used and also were motivated and enthusiastic about their learning. Students who normally exhibited behavior problems were on-task and ready to learn in this way. Most students said they wanted to try more of the strategies. The log notes demonstrated a good knowledge of geometric terms and an ability to classify three-dimensional objects and two-dimensional shapes.

This approach is not the only way to teach using multiple intelligences. Many teachers use centres and/or integrate several subjects within one theme. In a centres approach, several concepts are taught at each centre so the children learn not only in their dominant intelligences but develop their minor intelligences as well. Math integrates well with music, science, language arts and even physical education. So, for example, a problem-solving theme could involve the students writing their own problems using a code language (verbal/linguistic), adding some musical effects to bring the story to life or putting the story to music (musical) and designing a gymnastics routine that demonstrates how problems such as balance and use of space can be solved (bodily/kinesthetic).

What Are the Benefits of Multiple Intelligences ?

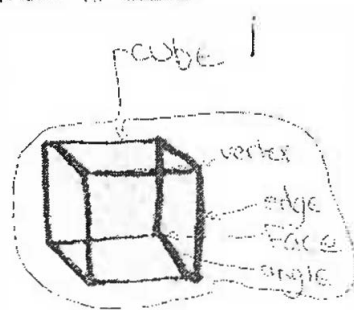
One main benefit of using the multiple-intelligences approach is that the same concept is taught in many ways, although not every concept needs to be taught using all the intelligences. Students can then assimilate the material in a way that they can understand. If one activity does not get the idea across, another activity will. Other benefits that teachers have found in their students include increased student leadership and responsibility for their own learning, improved behavior, improved cooperation, ability to work multimodally in student presentations and better retention of material.

The multiple-intelligences approach helped me individualize my math teaching. The students discovered what their dominant intelligences were,

participated more in their learning and felt better about learning. I witnessed improved on-task behavior: students who normally worked well worked even better, and students who were often off-task were both on-task and enjoying themselves. In general, my students demonstrated a love for learning and an eagerness to learn.

The Connections

The ~~vertices~~ connect to the ~~edges~~
 the edges connect to the faces and
 inside the ~~faces~~ connect to make a
 angle and a ~~face~~ connects to
 another angle and all the connections
 make a ~~cube~~.



The multiple-intelligences approach offers teachers and students multiple ways of teaching and learning math concepts. Some students have a negative outlook toward math but the multiple-intelligences approach can help change that attitude. Multiple intelligences is a tool that can help teachers reach more learners in the math classroom. As we reach more learners, students will experience more success in being able to make sense of the world of math.

Bibliography

- Alberta Education. *Program of Studies*. Edmonton: Author, 1993.
- . *Alberta Program of Studies for K-9 Mathematics*. Edmonton: Author, 1996.
- Gardner, H. *Frames of Mind: The Theory of Multiple Intelligences*. New York: Basic, 1983.
- Fogarty, R., and J. Stoehr. *Integrating Curricula with Multiple Intelligences*. Arlington Heights, Ill.: IRI/Skylight, 1995.
- Lazear, D. *Seven Ways of Teaching*. Arlington Heights, Ill.: IRI/Skylight, 1991.
- Nelson, K. "Nurturing Kids' Seven Intelligences." *Instructor* (July-August 1995): 26-34.