



Good morning! ITAG hopes everyone had a relaxing, refreshing break, and that everyone's back in the groove. Thanks for your continued advocacy and hard work on behalf of gifted children around Iowa! The January *Spotlight on Gifted Education* comes from Marilyn Buxton, 4-6 TAG at Waverly-Shell Rock. She is the author of two math books for TAG classrooms, and is an endorsed TAG teacher. Feel free to contact her at marilynn.buxton@wsr.k12.ia.us

Challenge Math

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At Waverly-Shell Rock, every fall means a new group of students for 6th grade Challenge Math class. Students must meet these criteria:

- 90%+ average in math total on ITBS during 3rd, 4th, and 5th grades
- 120 + on quantitative CogAT
- strong teacher recommendation from 5th grade math teacher

CM class is open to high-ability math students. Students and parents receive a letter informing them that the 6th grader qualifies for the class, and both sign a permission slip. Students meet weekly for 30 minutes in addition to doing regular classroom math.

There are separate segments to the class so that other students may add in without having to complete the previous segment. For example, a student may be hesitant to begin the year, and then join later. We use:

- “Hands-On Equations”, a set of manipulatives by Henry Borenson
- algebra chapter from Ed Zaccaro’s “Challenge Math”
- algebra matrix puzzles from “Math Logic Mysteries” and “More Math Logic Mysteries” by Marilyn Buxton
- problem solving chapter from Ed Zaccaro’s “Challenge Math”
- sets chapter from “Math-A-Logic”

There are three difficulty levels in the “Hands-On”. CM does all three levels, whereas classroom students only do Level 1 unless the teacher feels they can do more.

"When young students are successful with sophisticated looking concepts, their sense of self-esteem is enhanced. They see themselves as having a greater capacity for learning. This change in self-perception can lead to a dramatic improvement in student achievement."

- Henry Borenson, Ed.D.

Hands-On Equations[®] is a visual and kinesthetic supplementary math program for introducing algebraic concepts to students in grades 3 to 8. This teaching system enables young children as early as 3rd grade and in only seven lessons to understand and solve algebraic equations such as $4x + 3 = 3x + 9$ and $2(x + 3) = x + 8$, thereby **enhancing student self-esteem and interest in mathematics**. Later lessons teach additional algebraic concepts.

For more information and demonstrations, see: <http://www.borenson.com/index.html>

Peer Teaching “Hands-On Equations”

Manipulatives are set up on a laminated “scale” beginning with a simple equation such as $\blacktriangle = 7$. Students begin by learning that a blue pawn represents “ n ”, the unknown variable. Red cubes marked 0-5 and 5-10 represent number values. For the first example, the pawn (n) is set up on the left side of the scale and 7 is set up on the right side of the scale. The sides balance, so $n = 7$.

Students learn “Legal Moves” such as removing one pawn (n) from each side of an equation without changing the value of the equation, adding a negative number to make the positive number zero, etc. Number cubes and ns may also be removed from each side of the scale



Tanner explains how to subtract equal number values (red cubes) from each side of an equation. That enables students to simplify complex algebra problems.

Kali watched Ali remove 2 pawns ($2n$) from each side of the equation on her scale, and then remove the value of 1 (red cubes) from each side. Then $5 = n$. To check their solution, substituting 5 for each n becomes $2(5) + 6 = 3(5) + 1$, and then $16 = 16$.

Students easily complete problems such as $5n - 3n + 1 = n + 5$ or $2(2n + 5) = 22$. They learn that $2(2n + 5)$ means two sets of $2n + 5$. Set up $(2n + 5) + (2n + 5)$ on the left side of the scale. Subtract 10 from each side. Then $4n = 12$, and $n = 3$. Every problem is set back up on the scale and checked. In this case, $22 = 22$.



In a matter of two 30-minute class periods, students are confidently able to solve algebraic problems beginning with simple equations such as $3n = 9$ and advancing to equations such as $2(2n + 3) + n = 3n + 6 + 2n$.

David Sousa claims in *How the Brain Learns* that we remember up to 90% of what we teach to someone else. I decided to test their abilities and see if they could teach one another and remember more. CM students practiced with one another, and then the “peer teaching” idea hatched!

Students learn the “Hands-On” process in my room. Then I provide problems for them to practice “teaching” peers from the group. By the end of the third class, most students are comfortable “teaching” it to one another and are anxious to show the process to classmates. Classroom teachers invite them to peer teach the entire class

which is divided into small groups of 3-4 for each CM peer teacher. It is a “win-win” for everyone. Most CM students really enjoy getting to share their knowledge; classroom students like learning from peers; teachers have time to circulate and see how everyone is doing.

We have been peer teaching “Hands-On Equations” for over ten years now! One suggestion: make sure the classroom teacher monitors behavior issues as that is not the peer teacher’s responsibility.

One team of 6th graders presented a 10 minute demonstration one-on-one with each school board member. Every student was 100% confident. One board member was a former math teacher who gave high praise to the kids and the system.

When we do written algebra, we sometimes use the manipulatives again so students can see they are doing the same exact steps, but just writing out each step...collecting, isolating, just one n.

With a variety of units and activities, we all really enjoy CM class, and it is an opportunity for high ability math students to work with other good math students.

We offer the Iowa Algebra Aptitude Test at the end of 6th grade. One section of students receives compacted 7th and 8th grade math in 7th grade, takes 9th grade math during 8th grade, and becomes a full year ahead in math during high school. Wartburg College is an alternative for advanced students.

