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Managing the Math Class

For Maximum Success

Less grading!
More time!

Middle and High School

By Brad Fulton
Educator of the Year, 2005
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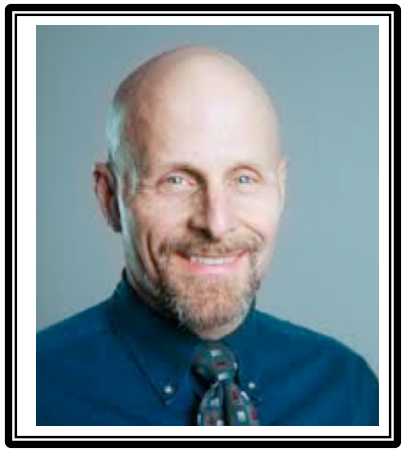
Brad Fulton

Educator of the Year



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- ♦ Consultant
- ♦ Educator
- ♦ Author
- ♦ Keynote presenter
- ♦ Teacher trainer
- ♦ Conference speaker

Known throughout the country for motivating and engaging teachers and students, Brad has co-authored over a dozen books that provide easy-to-teach yet mathematically rich activities for busy teachers while teaching full time for over 30 years. In addition, he has co-authored over 40 teacher training manuals full of activities and ideas that help teachers who believe mathematics must be both meaningful and powerful.

Seminar leader and trainer of mathematics teachers

- ♦ 2005 California League of Middle Schools Educator of the Year
- ♦ California Math Council and NCTM national featured presenter
- ♦ Lead trainer for summer teacher training institutes
- ♦ Trainer/consultant for district, county, regional, and national workshops

Author and co-author of mathematics curriculum

- ♦ Simply Great Math Activities series: six books covering all major strands
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Brad's math activities are the best I've seen in 38 years of teaching!
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Lisa Fellers, teacher

References available upon request

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Thanks and happy teaching,

Brad

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Managing the Math Class
For Maximum Success
Middle and High School

Overview:

Tired of the paper chase? Want to see your students develop responsible study habits and take ownership of their education? The following tips and techniques represent my best ideas from the past 35 years of teaching math. These strategies will minimize your paper work while maximizing student work, freeing you to do what you do best: teach! Your students will make fewer excuses and increase their learning and their engagement and take ownership of their work. They will improve their note-taking and test-taking skills and learn the value of completing their work on time as they empower themselves to succeed.

Procedure:

1. Perhaps a math teacher's biggest obstacle is time. It is easy to get so caught up in the paper chase, that we lose valuable time that could be better spent on instruction and planning. For this reason, I have adopted a management system that frees me from much number crunching and paper pushing. A very detailed description of the process follows, but here is a simplified outline of the system to guide you.
    a. Students are assigned work from a book or worksheet.
    b. This is collected on a weekly basis and graded for completion, not accuracy.
    c. Students take a weekly quiz. They are given back their graded work to use on the quiz.
        i. The quiz asks them the answers to random questions from their homework. Students copy the answers from their completed notes.
        ii. Students who did not turn in the work have no notes to use on the quiz and will not be able to answer the questions. ☹
2. My students get the full week's assignment on Monday. This can be a math packet that has been copied for them or a schedule of the week's work in a hardcopy or digital textbook. I prefer to give the work for the entire week at once with middle school and high school students. By this age, many of them are *very* busy. They are often involved in sports, youth groups, and other activities that often run well into the evening. I want them to learn good time management skills, so I have no problem if a student wants to skip their homework on a busy evening and double up the next night. However, this

system will work even if you assign homework on a nightly basis. You can also use this system if you grade classwork instead of homework.

3. Each day, I teach one of the pages of the packet or assignment. The students are responsible to take notes during class. This can be examples done on the board, vocabulary terms, diagrams, or anything else they find helpful.

4. As I put up examples, I'll often tell them, "This problem is similar to the 8th problem on the homework." I typically write that next to the example. We talk about how to use the notes to help them on their classwork and homework. I don't expect them to know how to use their notes without directly addressing the issue; **they are learning to be learners**.

5. Each day I ask them if they have any questions about the previous night's work. I may do a problem from the packet or one that is very similar. I don't spend more than about 5 minutes on this part of the lesson. If a student has numerous questions, I suggest they touch base with me one-on-one during class. Sometimes students will try to get me to do *every* example. They might ask for help on problem one, and as soon as I finish explaining it, they ask for help on the second problem, and so on. I smile and let them know we are going to move on; **they are learning to not manipulate their opportunity to get help**.

6. I also let the students know that I only grade work that is finished. I explain that often in lower grades they could get partial credit for partial work, but now that they are older, they need to learn the skills they will use as adults. "I never drive across bridges that are 95% finished," I joke. I challenge them to try to think of a job where you can get a paycheck when you don't finish your work. I ask them to imagine what would happen if I taught all my classes except the last period, went home early, and asked to get 80% of my paycheck. You can of course establish your own standards on this to suit your students.

7. I also tell them that I expect them to show their work. They often want to do their work in their head, but again I joke and tell them they can turn in their head! We discuss how not showing work would look in the real world. Often I will pick up the phone and pretend to call our basketball coach. "Hey coach," I say into the receiver, "What if I have the ball in a game, and we're down by a point. I'm wide open for my best shot – it's a shot you've seen me make a hundred times in practice. Can I just *think* about shooting the ball and get a couple of points on the scoreboard?...What?...I have to actually *shoot* the ball?" I then hang up and tell them the coach said I can't just shoot the ball in my head. We try to imagine a job where you could *think* about doing your work instead of actually doing it.

   "But we already know the answers," they protest. "So do I," I remind them. "I have an answer key."

8. I also give them the answers on their assignments, so of *course* they know the answers. Here is why I give them the answers: I want my students to self-assess their work. Steven Marcy of Marcy Mathworks did his doctoral research

on self assessment. He found that when students self-assess, they make fewer errors and they tend to correct their errors. We all know that If we correct every problem on an assignment, note the errors for the students, and put a grade at the top, the only thing the student sees is the grade.

On the other hand, when something goes wrong on our own work, and we don't get the expected results, our brains re-engage. Anomaly and discrepancy tends to draw our brain's attention. If I asked you to solve 36 + 17, you replied that it was 53, and then I gave you a funny look as if you were wrong, you would likely add the numbers again to be sure. That's simply how our brain works. It engages more strongly when it observes discrepancy.

I have the students self-assess using one of these strategies:

a. I put the answers in a key on the page in the packet, or write the answers from the textbook randomly on the board for them to copy down. As students solve a problem, they look for the answer in the key and cross it off. I often put in a couple of false answers just so they don't copy the final answer on the final problem. In any event, I will be checking that they showed their work, not whether their answers are correct; that is *their* responsibility.

b. Sometimes I have them solve the problem two ways. For example, we might solve systems of equations by substitution one day and solve *the same systems* by graphing another day.

c. If their work involves solving equations, I could have them check their solutions by substitution.

Again, you can decide how you want to address the issue of showing their work.

9. I collect the packet on Friday. I do this by telling them, "If your work is completely finished and you have shown your work, please staple it neatly and turn it in." I quickly check their assignment to see that they have shown their work adequately. If their work is incomplete or they didn't show their work, they get it back ungraded. I write "Please finish," at the top.

10. In my class, they get 40 points for a packet turned in on time. I deduct points for late assignments. They get *full credit* if their work is shown and complete, even if the answers are incorrect. Homework is practice toward mastery; we don't keep score when we are practicing basketball. This grade goes in my computer as "Packet, Week 1." I write "40" on the front of the packet.

11. I keep the completed work until the test day the following week. My middle school students actually prefer this. I give them the option on the first assignment, and they know they are more likely to lose it than I am. With older students you might want to do that differently. I also do this because I don't want them to give their packet to another student to copy.

12. On the day of the test, I tell them to *completely* clear their desk. They are not allowed to have out their book or any partially completed packet. Then I pass out the test.

13. The first section of the test has new questions they have not seen before. These questions are similar to what was covered the previous week and can also include review from earlier in the course. On this section, I am testing whether they learned the skills that were taught. As the students are solving the questions on the first section of the test, I pass back the completed homework packets.

14. The second part of the test asks them **questions about their homework**. The questions are simply written as, "Monday, #6." The student writes down the answer they have for the sixth question from Monday's assignment. I have already checked that they showed their work. *Now I am doing a spot check on their accuracy*. There is no need to ask them about every question; a random sampling will gather enough data. Students then staple their test to the front of their work and turn it in. (I collect the work again so they aren't tempted to give it to a friend in a subsequent class.)

    Notice that **students who have not turned in a packet cannot answer the questions** on this final section. They had to clear their desk, and I have no packet to give back to them. At the start of the year they will invariably ask, "Can I get out my partially finished packet?" To show them how this problem can occur and how it can be avoided, I always give a practice test the first week. They then see the importance of that completed packet.

15. I prefer to give my tests and quizzes on Wednesday of the week following the assignment. This gives a student who was absent or who didn't complete the packet on time and opportunity to turn it in.

16. After all the tests have been completed, we redistribute them and correct them in class. At the top of the test are three boxes as shown. The grader writes 40 in the Packet category if the test they are grading has a packet attached with 40 points written on it in my writing.

Packet	Test	Homework
_____/40	_____/30	_____/30

17. Then I give the answers to the questions on the first section of the test. If it has ten questions, then each one is worth 3 points. A student who has all ten correct would receive 30 points for this section.

18. Lastly we grade the final questions about the homework questions. Again, I might have ten 3-point questions on this section. **How you decide to assign the points and the weights of the categories is up to you**.

19. After all three of boxes have been filled in, I collect the packets and enter the final two categories – Test and Homework – into the computer. The Packet grade was already recorded on Friday.

20. I always put one extra credit question on the test, so a student can get 33/30 on the Test portion. My extra credit is always 10% of the possible points.

21. In addition, I give one extra credit assignment each week. Since my weekly homework is worth 40 points, and since my extra credit is 10% of the possible grade, they can earn 4 points extra credit. Most importantly, **their extra credit must be attached to their completed packet of work to get credit**. They cannot turn in extra credit with an incomplete packet. It is *extra* credit, not *instead of* credit.

22. The three boxes at the top of their test add up to 100 possible points, so it is easy for a student to monitor their progress.

Packet	Test	Homework
40/40	30/30	30/30

23. There are many reasons why both I and my students have come to appreciate this system. First here are some of the advantages for my students.

    a. If a student has a good work ethic but struggles in math, they can get a 70% even if they *miss every question* on the first section of the test, which isn't likely. First of all, they would get 40 points for turning in their packet on time. Then, even if they got no points on the Test section, they could get 30/30 on the part that asks them for their answers on the homework. Remember that all my homework is self-assessing, I ask them daily if they have any questions, and they have had a week to get help if they need it. This has helped students who feared they were doomed to fail because they thought they were bad at math.

Packet	Test	Homework
40/40	0/30	30/30

    b. Conversely, the student who doesn't do their homework is at a loss no matter how talented they are in math. They would get 0/40 on the packet, and even if they aced the test portion because they are bright, they have no packet on their desk. Their best hope would be a 30/100 with the way I have distributed the point values.

Packet	Test	Homework
0/40	30/30	0/30

    c. The student who turns in their packet late for partial credit can fix this dilemma. If I give half credit for the late work, they would earn 20/40 on the Packet. Then I allow them to record the answers to the Homework section of the test. This can earn them another 30 points for a potential total of 80/100.

Packet	Test	Homework
20/40	30/30	30/30

d. This system has helped foster an improved work ethic in many of my students. They see the relationship between their effort and their grade.

e. Because students have their homework while they are taking the test, I get fewer students asking me to help them during the test. Often they ask during class if they can take notes directly onto their homework for use on the upcoming test. I tell them that is an excellent idea! On the occasion when a student asks me for help on a test, I explain that I can't give them help when they are being tested. I may show them the part of their packet that is similar to their question. I also suggest that they ask for help in class *before* we get to test day.

f. Similarly, students often will not ask questions in class until it is time to work. Then they say they don't get it. My first response is to ask to see their notes. I will show them how the second example we did in class relates to the problem about which they are asking. Sometimes a student says they didn't write the notes down. We have a heart-to-heart talk. I explain that I will help them this time, but if they aren't going to attempt to help themselves, asking me to do so hardly seems fair. I keep the tone respectful, private, and sincere. I'm not trying to shame them; I'm trying to teach a life skill.

24. These are the reasons I like this system:

    a. I don't have to correct papers! I grade them, but I don't *correct* them. The students self-assess their work. As a class we correct the tests. My only tasks are to check that they showed their work on their packets and record scores in the computer. Grading all the work for all my classes takes under 2 hours per week.

    b. I get to see my students grow as learners as they see the value of taking good notes and completing work on time. Frequently we discuss how this system benefits their grades and their learning. We also compare it to life outside of the classroom in their future careers. They see that I have invested time in designing a system that will make them more successful.

    c. This system frees up a tremendous amount of time for me. As teachers, we have invested a lot of years and effort in our own educations. We have learned how to design effective instruction and manage students successfully. *Our least beneficial and least rewarding use of time is managing the paperw*ork. I find that I invest more and more time into creating a positive classroom and powerful lessons and activities for my students. It really makes my job more enjoyable!

25. Feel free to adjust the weighting and points to suit the needs of your students. Experiment with the system and customize it to fit your classroom. For example, you could include classwork or warmups as a part of the assessment.

26. I am often asked how I would start the implementation of a new system; should you wait until a new year or new grading period begins or start

midstream? Because middle and high school students can think at a higher level, I often try something new by first getting their permission. I say, "I saw something new that I think might benefit us, and I'd like to give it a try and hear your thoughts." This brings them on board with eager engagement.

27. I have included a sample test and homework packet on the following pages. The assignment "Foursquare Addition" is an activity that is available in my TeachersPayTeachers store. It involves addition of integers, a skill in which my middle school students need constant practice. As you can see from the instructions, the student gets the answer using two approaches – vertical and horizontal addition. Notice that in solving one problem, the student actually adds three times vertically and three times horizontally. If the sums in the triangles agree, the sub-problems are correct.

    You can find "Pyramid Math" in my store also. In this activity, students add adjacent numbers and write the answer above the pair. They work their way to the top of the pyramid. The number in the top square can be found in the key I provide so they can assess their work.

28. Lastly, I have provided a blank template should you wish to use it in designing your own tests.

Test: Adding and Subtracting Integers

Packet	Test	Homework
_____/40	_____/30	_____/30

Name_____

Date_____ Class_____

Solve:

1. (-8) + (-19) =
2. 8 + (-19) =
3. (-8) + 19 =
4. (-8) – (-19) =
5. 8 – (-19) =
6. (-8) – 19 =
7. 14 + (-22) + 6 =
8. (-9) + 16 + (-17) =
9. (-2) – (-7) + 15 =
10. (-11) + (-14) – (-8) =

11. What is the answer to question 4 on page 1 of the packet?
12. What is the answer to question 9 on page 1 of the packet?
13. What is the answer to question 15 on page 1 of the packet?
14. What is the answer to question 3 on page 2 of the packet?
15. What is the answer to question 11 on page 2 of the packet?
16. What is the answer to question 6 on page 3 of the packet?
17. What is the answer to question 12 on page 3 of the packet?
18. What is the answer to question 5 on page 4 of the packet?
19. What is the answer to question 8 on page 4 of the packet?
20. What is the answer to questions 10 on page 4 of the packet?

BONUS:

Mr. Fulton can eat 6 chocolate bars in 9 minutes. At $.89 per chocolate bars, how much money will he spend in one hour?

Answer Column:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

BONUS:

_____

Foursquare Math 2

Name_____

Add across as in the example. Then add downward. Add the sums on the right side and write the answer in the upper triangle. Then add the lower sums and right the sum in the lower triangle. Do your answers match? Congratulations!

-6	3	*-3*
-8	-12	*-20*
-14	*-9*	*-23* / *-23*

1

-8	-11	___
-5	-10	___
___	___	

2

-8	11	___
-5	10	___
___	___	

3

-8	-11	___
5	10	___
___	___	

4

4	-13	___
-6	-1	___
___	___	

5

14	0	___
-14	-3	___
___	___	

6

-25	6	___
12	-14	___
___	___	

7

-15	15	___
16	-16	___
___	___	

8

22	-11	___
11	-22	___
___	___	

9

-24	9	___
19	-16	___
___	___	

10

21	3	___
-3	-6	___
___	___	

11

24	-15	___
-4	-5	___
___	___	

12

18	-25	___
13	-7	___
___	___	

13

-18	25	___
13	-7	___
___	___	

14

-18	-25	___
13	7	___
___	___	

15

-18	-25	___
-13	-7	___
___	___	

Foursquare Math 5

Name_____

Find the missing addends to solve each problem as in the example. You will need to work backwards to be successful.

18	*26*	44	
9	*12*	21	
27	38	*65*	65

1

	8	-1	
12		32	
___	___		

2

24		___	
	36	___	
28	___		20

3

19		64	
		___	
15	27		

4

	35	___	
		39	
36	___		32

5

	-1	99	
34		___	
___	62		

6

-1		___	
		45	
___	87		101

7

	-19	73	
		24	
___	48		

8

		___	
	17	41	
___	28		-11

9

		___	
29		38	
-29	19		

10

		26	
17		0	
___	19		

11

23		55	
	16	___	
1	___		

12

	17	___	
		0	
70	___		59

13

	-46	___	
46		___	
72	___		0

14

-11		-44	
		___	
___	-38		-65

15

	33	-35	
41		___	
___	-51		

Pyramid Math 3

Name_____

Add pairs of adjacent numbers and write their sums in the box above them as in the first example. Keep going until you reach the top of the pyramid.

1

		-2	
-4	7	3	-5

2

4	-7	-3	5

3

4	7	-3	-5

4

-1	-2	-3	-4

5

-1	2	-3	-4

6

1	-2	3	-4

7

8	-6	15	-11

8

-13	-5	0	-6

9

11	-21	31	-41

10

40	-15	40	-15

11

8	2	-14	29

12

9	3	-13	30

Pyramid Math 8

Name_____

Each number is the sum of the two numbers below it. Work backward to fill in the bottom row.

1

7			
3			
2			
6			

2

-18			
-10			
	-6		
	-12		

3

-18			
8			
		-20	
	6		

4

-62			
-24			
	-15		
		-9	

5

11			
-8			
-8			-20

6

-3	10		
	10		
		16	

7

-71			
-16			
		-27	
21			

8

39			
	-16		
41			
			-14

9

-113			
-65			
		-2	
11			

10

0			
	20		
-20			
	-3		

11

1			
-20			
	-5	6	

12

	0		
		3	
18			-3

Answer Key:

If you wish, you can provide an answer bank on each page. This will not be necessary on Foursquare Math since each problem can be solved two ways.

Foursquare Math 2: The number in the triangles is given.

1.	-34	2.	8	3.	-4	4.	-16
5.	-3	6.	-21	7.	0	8.	0
9.	-12	10.	15	11.	0	12.	-1
13.	13	14.	-23	15.	-63		

Foursquare Math 5: The number in the highlighted box is given.

1.	3	2.	-44	3.	-18	4.	-42
5.	134	6.	15	7.	-43	8.	-63
9.	10	10.	36	11.	49	12.	28
13.	-26	14.	-16	15.	-78		

Pyramid Math 3: The number in the top box is given.

1.	21	2.	-21	3.	11	4.	-20
5.	-8	6.	0	7.	24	8.	-34
9.	0	10.	100	11.	1	12.	9

Pyramid Math 8: The number in the highlighted box given.

1.	-2	2.	-8	3.	-8	4.	-3
5.	29	6.	-7	7.	-8	8.	30
9.	14	10.	17	11.	49	12.	6

Test Answers:

1.	-27	2.	-11	3.	11	4.	11
5.	27	6.	-27	7.	-2	8.	-10
9.	20	10.	-17				
11.	-16	12.	-12	13.	-63	14.	-18
15.	49	16.	0	17.	9	18.	29
19.	30	20.	17	Bonus: $35.60			

Test: _____

Packet	Test	Homework
_____/40	_____/30	_____/30

Name_____

Date_____ Class_____

Answer Column:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

BONUS:

_____

If you liked this activity, you might also like some of the other lessons available in my TeachersPayTeachers store. Simply search for "Brad Fulton".

You can also find many free and inexpensive resources on my personal website, www.tttpress.com. Be sure to subscribe to receive monthly newsletters, blogs, and activities.

Similar activities include:

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- *Sum Thing Interesting: Finding Amazing Patterns in Addition*
- *Function Fun, Parts 1, 2, 3, 4, and 5*
- *Number Line: Middle School Version for fractions, decimals, percent, and algebra*
- *Math Maps: Developing the Mathematical Practices*
- *Developing Number Sense*

Feel free to contact me if you have questions or comments or would like to discuss a staff development training or keynote address at your site.

Happy teaching,

Brad