

## Teaching Math with Grace: Lessons from a Master Teacher

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*The purpose of this article is to share a master teacher's insights into turning young people on to mathematics and seeing them succeed. It is important to note that to be a successful teacher and to be able to get students interested in math is not all in the curriculum. This article is a case story of a master teacher who will share his curricular, instructional, management and interpersonal beliefs and how all of them relate to the make-up of his own success story as an effective teacher. Ideas about interpersonal relationships with students and teaching philosophy about the curriculum and instructional practices showed for this teacher to be important areas in the making of a success story as a teacher.*

### Introduction

Mr. Grace shares some of the following with his students, parents, teachers, and administrators when they come into his classroom:

WELCOME TO ROOM 208!

SOMETHING TO THINK ABOUT:

\*\*\*Beethoven's music teacher once told him that as a composer, he was hopeless!

\*\*\*Walt Disney was fired by a newspaper editor because he had "no good ideas."

\*\*\*Winston Churchill failed sixth grade.

\*\*\*Louisa May Alcott was told by an editor that she'd never write anything with popular appeal.

\*\*\*As a boy, Thomas Edison was told by his teachers that he was too stupid to learn anything.

\*\*\*Einstein was four before he could speak and seven before he could read.

### YOUR ASSIGNMENT:

\*\*\*\*Read the previous statements every time you think your child is a little different or not being quite what "we" WANT THEM TO BE. Maybe their goals are a bit higher. Maybe, just maybe, they have a different way of reaching their own standard of excellence.

LUCK IS WHAT HAPPENS  
WHEN PREPARATION MEETS  
OPPORTUNITY.

INDIAN PINES ELEM. STAFF

PREPARING YOUR CHILD FOR  
OPPORTUNITIES

The above list is the first set of rules Mr. Grace goes over with both parents and students at the beginning of each school year. "Mr. G", what his students call him, makes sure that his students and their parents know that in his class all students will succeed. Mr. G believes that there are five powers children need. The need to: perceive, interpret, want, feel, and express. Mr. G feels that this can happen when children's basic needs are met which include: security, self-worth, self-value, strokes, stimulation, and structure. Mr.

G repeats constantly, “You know what ever I’m going to teach, you are going to learn.” Mr. G has a strong passion for math and science. Mr. G says, “They believe that I can teach them math.” “I use magic, humor, and through the use of higher-level math concepts get kids hooked on math.” Mr. G likes to use a hands-on /active approach to teaching math as well as relating math to science. Mr. G teaches basic skills by introducing algebra and factorials to students. He makes the students feel they are learning about high level math concepts like algebra and factorials while also having them practice computational skills like adding, subtracting, multiplying, and dividing. Mr. G, who classifies himself as a random abstract thinker, was a teacher for 30+ years and claims that for him “teaching is a hobby.”

The purpose of this article is to share a master teacher's insights into turning kids on to mathematics and preparing them for successful lives as young adults. It is important to note that to be an effective teacher and to be able to get students interested in math is not all in the curriculum. This article is a case story of a master teacher who will share his curricular, instructional, management and interpersonal beliefs and how all of them relate to the make-up of a truly effective teacher.

Mr. G, as his students might refer to him as, admits that he is not good with names of researchers and current research, but seems to be practicing all of what current research findings recommend or deem “best practice” when teaching mathematics. Of course Mr. G has heard of the National Council of Teachers of Mathematics (NCTM, 2006, 2000, &1989) and some of their reforms and recommendations for teaching math. One thing that he has found in his many

years of teaching is that the first thing to recognize is the child as a whole and his/her need to be nurtured before real learning can occur. See Appendix A. Like Marzano (1992) contends, students must first have a sense of security and positive attitudes and perceptions toward learning before true learning can occur. Mr. G is constantly monitoring his class for student dispositions toward learning. As part of NCTM, Standard 10, teachers need to evaluate their students’ dispositions toward mathematics so that students develop confidence in their ability to do math (NCTM, 1989). Mr. G also considers research by Beilock & Willingham, 2014; Finlayson, 2014; Quander, 2013; Burns, 1998; Furner, 1996; and Hembree, 1990, and feels that too many adults and young people today are math anxious. He strives to prevent math anxiety by using best practices, but also builds confidence by using math anxiety reduction techniques like discussion, study and test taking strategies, etc. Mr. Grace has realized over the years, as is pointed out in the study by Jackson and Leffingwell (1999), that ultimately it is the teacher who makes or breaks the child in the development of his/her mathematical disposition. Mr. G feels that many teachers are not aware that they are teaching their students to hate math, as was found in the study by Oberlin (1982). He feels that in this day and age of living in a globally competitive technological era, we must strive to prepare students who are confident in their ability to do math. As the Third International Mathematics and Science Study (TIMSS) points out, in the U.S., as our students increase in grade level from 4<sup>th</sup> Grade to 12<sup>th</sup> Grade, our students’ scores decrease in mathematics (Schmidt, 1998). Mr. G realizes that his students must feel good about math, but he also knows that kids

must feel good about themselves in order to care and do well.

Mr. G strongly feels that the main reasons for his success as a teacher include the following musts:

- enjoy your work
- don't be afraid to laugh
- know that kids today want to learn
- know that they will learn
- accept students where they are; not where we think they should be
- appreciate your students as fellow human beings
- appreciate the effort of the teachers who had those students before us
- know that when the students leave your room, many fine teachers will cross their paths in the coming years; and
- understand that math is part of everyday life.

The themes that are looked at in this case study will focus around curricular, instructional, classroom management and interpersonal relationships as they relate to being an effective teacher.

### **Curricular and Instructional Issues**

Mr. G feels that if there were an ideal class of students, he wishes he could have experienced one. He feels that students come to us on many different levels, as well as from a variety of life experiences. Because of this, he plans his year first, and then makes day-to-day plans based on student needs and the state curriculum.

The yearly planning includes arithmetic, geometry, measurement, algebra, and logic. He feels they should not be taught in isolation from other disciplines. They are taught in conjunction with life, not as a bit of

knowledge acquired for which they will get a grade. Mr. G feels that while we still have lessons where we stand at the overhead and model problems and then wonder afterwards, "What went wrong in this lesson?" However, Mr. G feels that our instructional goal as teachers is to get students involved in learning; instruction should be a happening, not a footnote in students' lives.

Geometry plays a year-long role in Mr. G's class. It begins in August and ends the last day of school. We do line drawings, tessellations, build, construct, and yes, tear down. The class will construct polyhedron with straws and string, build kites, rockets, metal airplanes, and just really "live" geometry. Mr. G's philosophy is consistent with the TIMSS (Third International Mathematics and Science Study) (Schmidt, 1998), study which has found that many other countries are doing more at the intermediate grade levels to incorporate and emphasize more geometry and algebra preparing students better for higher-level courses in high school and college (Schmidt, 1998). Mr. G says that time is an important element and he believes he allows time to work for him, not against him. Mr. G said that he read somewhere, maybe in something related to Montessori, that students need time to practice, so true learning and internalization can take place. It always seemed strange to him that coaches always have their team practice.....but, so often in schools, a skill is taught.....tested.....forgotten. What is missing? Mr. G believes some form of practice is very important. In addition, if we emphasize the use of correct terminology, by the end of the year, students use geometry terms correctly, but more importantly, naturally.

Measurement is like geometry Mr. G feels. It is taught and used. Students are given opportunities daily inside and outside of school to practice using measurement and a wide variety of measurement tools. Not just the typical compass and ruler, but also a balance, graduated containers, levels, plum lines, protractors, Triman compasses, standard, non-standard, and metric forms of measurement. Mr. G is a real advocate of using didactics or math manipulatives which are highly advocated today in the teaching of mathematics (Scandrett, 2008). Also discussed are estimates and common sense. Again, measurement is not isolated from a child's life, but made part of it.

In arithmetic the focus is on what is known, while providing remediation in problem areas. Students often have past records and test scores indicating low achievement simply because at the time, a student was not ready to learn what someone thought he/she should learn. Mr. G says this happened with Albert Einstein. What needs to be done is look past test scores, not the total score, but individual skills for at least a two year period and see if you can find areas where a child needs work. Mr. G has found that often students who have problems in math with basic skills are likely to have a negative attitude. The "I can't, my parents had trouble with math too" or "My brother says he never uses that stuff so why bother studying?" These are just truths in the mind of a child. To overcome this, we need to begin with what the child does know. Good grades and incremental success lead to great success. The following problems are things Mr. G uses with his students to have them practice the basics with a challenge and have them believing they can solve difficult math:

$$6 + 2 = 4 + \underline{\quad}$$

$$9 + 1 = 3 + \underline{\quad}$$

$$8 + \underline{\quad} = 7 + 5$$

$$3 \times 10 = 15 + \underline{\quad}$$

$$3(11) = 30 + \underline{\quad}$$

$$9\sqrt{100} = 50 + \underline{\quad}$$

See Appendices B and C.

Mr. G feels that when you slip in a  $\sqrt{\quad}$  and they say they can't you show them that they can. It is good to show them how wrong they are if they feel they cannot do the math and how they are capable of learning so much, often by challenging them. Mr. G feels that you are then able to see an attitude develop that is beautiful to watch. "The teachers before me do a good job of setting the stage and I get to watch the performance."

Mr. G feels that once this idea occurs that we are "in the together" mode, then we begin the remediation of the skills in our book. If a child could not understand fractions in 3<sup>rd</sup> or 4<sup>th</sup> grade, Mr. G feels we need to look at their foundation skills before asking them to do 5<sup>th</sup> grade fractions. A step back allows for a leap forward. Also, by using manipulatives, storytelling, a student's real life and imagination we can help these students begin on the road to grade level skills. Like the picture book *Math Curse* by Scieszka and Smith (1995) children's literature books can also be used with students to promote discussion by students as to their feelings toward math as a first step to addressing their math anxiety. A children's book today can be used to teach many math concepts all in the context of a story making math more real and meaningful. At the same time, a story can also teach high level math concepts, provide a challenge, be visually appealing, and entertaining. Mr. G feels that remediation often takes

the form of a short class with him, some practice, and then showing others (parents, classmates, other students, and school staff) how to do this type of problem. Mr. G allows his students to make videos and reports on topics like LCM, divisibility, and prime numbers. In addition, the students that are receiving remediation in one area of math still play an integral part of the math class as one who is having trouble with the times tables may be teaching the class about platonic solids. Each student has his/her own particular strengths and that is the foundation upon which a teacher must build.

Mr. G uses his textbook, but it is used only as a tool. Mr. G says that the textbook is just a tool, a diagnostic tool and/or a great resource. Mr. G creates most of his own worksheets/activities for his students and focuses on skill rather than following the textbook from page to page or chapter to chapter. He feels that as teachers we need to teach the big concepts and skills. Mr. G loves using the Southeast Consortium for Minorities in Engineering resources/curriculum (Crawley & Measelle, 2004), with which he can allow his students to apply math concepts while building rockets, Ferris Wheels, and robots. His students are completely turned on to math and he feels that by using this curriculum, he encourages his students' interest in engineering.

Should Algebra and logic be taught in 5<sup>th</sup> grade? Mr. G says, "Absolutely." Math is such an integral part of life that it should not be taught in little subsets. Both logic and algebra are used on a daily basis to solve problems and support arguments and thinking. All students do algebra and logic. Mr. G has found that there is a tendency to see students who score low on standardized tests as being poor students

or "slow." Mr. G feels that when you show students the basics of algebra you will be surprised when students get turned on to math and feel they are doing something very advanced. The size of the problem is not as important as the process...."How" should be what is emphasized. Mr. G's 5<sup>th</sup> Graders solve problems like the following while practicing basic facts:

$$3x = 12$$

$$x/3 = 12$$

$$36/x = 12$$

$$\sqrt{100} (37!/36!)$$

$$\pi^2/18 \cdot 7/253 \cdot 9/\sqrt{36} \cdot 6/\pi \cdot 11(23)/13$$

The amazement students feel when they discover they can. They show their parents, friends, the office staff, anyone who will listen...they love it. Each of the above problems to Mr. G is what he considers "a basic problem." Each provides a foundation for how our number system works, they help students understand while manipulating them and there is also a sense of logic as they go about solving them. Mr. G's students love solving problems with exponents, radicals, and factorials, they feel it is a real challenge for them. Mr. G feels that all students have strengths and weaknesses. He is concerned with gender issues and tries very hard to encourage all students regardless of gender to develop a love and appreciation for math as discussed in the research by Hyde, Fennema and Lamon (1990). He feels that some come to us so well prepared, but many need a great deal of support and guidance. Mr. G. feels that it is important that all students have a strong background and an understanding of how math really works. The program discussed above for remediation works great for these students too; it allows them to be challenged as well. They aren't waiting

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or hearing the same skill taught a second time. The gifted student also has the opportunity to explore and to have his/her mind stretched and his/her imagination unfold. Mr. G. has learned from many years of teaching experience about what the overall best practices for teaching math consists. He knows that cooperative learning, manipulatives, writing, projects, discussion, self-assessment, and children's literature are all effective, as cited in research by Reys, Suydam, Lindquist, & Smith (2015); NCTM (2006, 2000, and 1989); and Zemelman, Daniels, and Hyde (2012).

### **Classroom Management Issues**

Mr. G feels that successful classroom management is vital to an environment conducive to learning. Attitude is everything in Mr. G's class. Mr. G feels that this may sound simplistic but there is a lot of truth to it. Students need to see themselves as being able to learn. They need to see the relevance of what they are doing and how what they are doing fits into the learning equation.

Mr. G believes that classroom management means discipline and in his opinion discipline means direction. He has noticed that when he has problems in his class it is often due to his loss of focus or his failure to adequately model the behavior he is expecting. He stresses the discipline by reinforcing the idea that "we are here to learn; we are here to teach." So he sends the message that as a class we should enjoy each day together.

Mr. G has found that evaluation is really easy. He expects good grades. He discusses as a class as a whole what the goals are and how as class members, individuals can achieve those goals and determine how "we will evaluate each other." From the first day of class as a

teacher, Mr. G, emphasizes that if any of us has a problem, "we" have a problem. No student is in this alone.

Mr. G said that he read somewhere that success breed's success; and he said that over the years he finds this to be true. As students do well, there is a desire to continue to do well. A big part of his classroom management is that his students must work together and they know this. Mr. G uses a great deal of cooperative problem-solving in his class as well as peer teaching. He sees this as a way of placing much of the responsibility on the students for their learning as kids work and teach each other. In Mr. G's classroom students know that if many students are trying to share at the same time that confusion breaks out. Students learn this by experience and learn very early that they must respect the person holding the floor. Mr. G. tries to model the democratic process in his classroom and allows his students to have input and experience what works best.

Mr. G uses motivational methods like posing higher-level concepts to students to challenge and interest them in the topics being learned. He sees this as a preventative measure of classroom management and discipline. To practice times table facts Mr. G uses problems like  $\sqrt{100}$  (3!). Students' practice not only their times tables, but also they learn about square roots, factorials, and work with parentheses. See Appendices A, B, and C. Most importantly, Mr. G says students learn the attitude....."I can!" This is what teachers must really do to see students succeed, and to have their kids really believe that they can succeed. When you tell students they are doing something very advanced or "difficult" it stirs the imagination of the students into what could happen and

you know how powerful a dream can be when it's put into reality!

Mr. G also uses a student grading form that teaches his students accountability for their grades and success. He claims he teaches and assesses based on the "big concepts" in math and all subjects for that matter. He makes the students keep track of all their scores in each subject area and then calculate their decimal and percent values; he creates a continuous math lesson as well as a lesson on responsibility and success in life in his classroom.

### **Interpersonal/Psychological/**

#### **Emotional Issues**

*Once you see a child's self-image begin to improve, you will see significant gains in achievement areas, but even more important, you will see a child who is beginning to enjoy life more. -Wayne Dyer*

The above quote encapsulates Mr. Grace's teaching philosophy. Mr. Grace excels in the area of teaching because he focuses on his students' interpersonal, psychological, and emotional needs. Through my observations of his teaching and interactions with his students, my discussions with him, his students' comments to me, and his outstanding student performance on state and national exams, I have come to believe he is one of the finest teachers I have come across as an educator. I rarely see a teacher like Mr. Grace in schools today. His humor, high expectations, content knowledge, dedication, and love for teaching are all apparent when you enter his classroom. Mr. G has over 30 years of teaching experience and in that

time he has mastered the art and science of teaching.

Mr. G really emphasizes to his students the importance of math in daily life. Mr. G stresses the importance of math with his students and how it impacts the quality of life. Mr. G's students participate in the Florida Stock Market Game, chess tournaments, art displays, Math League Competitions, model rocket, and plane competitions; Mr. G defends that math is part of each students' life and he tries to help them recognize this. He empowers his students by allowing them to create booths for the Family Math and Literacy Nights at the school which is based on the *Family Math Model* (Stenmark, Thompson, Cossey, 1986). His students do demonstrations, math tricks, and teach math and science concepts to children and families like how to build a rocket or do line designs.

A common comment of Mr. G's is "If you have a bad grade...we need to work together ...it's not your problem, it's ours." The students know that Mr. G is serious about teaching and their right to learn. "We talk with each other; not at each other," says Mr. Grace. There is a lot of smiling, laughing, and acceptance going on in Mr. G's classroom. He believes it is okay to say, "I don't know" and "I need some help." Mr. G tells his students that we need to have high expectations. The students' effort will be recognized, but he must also see results. It is also very acceptable to teach the teacher a different approach to solving a problem as well.

By accepting students where they are we are also saying "you're ok!" or "things will be fine" or "together we can make this work." Mr. G has noticed and learned over the past 38 years that when a child is resistant to learning, at that moment he needs to

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take a step back and not push learning. Often he may switch to a new subject or topic like geography, talk about animals, or even it is not uncommon for him to perform a magic trick. Mr. G feels that it is his role to model behavior. Mr. G says he expresses his pleasure with their effort. He applauds and cheers and lets them know that he appreciates his students' effort and hard work. After a while, he begins to notice the students doing this with each other. Spontaneous applause is not uncommon in Mr. G's classroom. Mr. G lets his students know how fortunate he feels he is to have each of the students in his class. Teaching is a privilege for Mr. G and he honors his oath as a teacher. His students are fortunate too; a student who leaves Mr. G's classroom at the end of the day or end of the school year is a better person, one who can function well in society, one who has self-worth, and one filled with a wealth of knowledge and a passion for mathematics.

Mr G's knows that classroom practices can influence the goals his students adopt, and the extant literature suggests educators can encourage mastery-approach goals by engaging their students in tasks that involve variety and reasonable challenge and capitalize on student interest and the activity's real-world significance; by reflecting on the degree they involve students in academic decision-making; by emphasizing evaluation practices that highlight the goals of understanding and improvement; and cultivating an environment that helps students to feel they can take risks, make mistakes, and reveal their lack of understanding (Furner & Gonzalez-DeHass, 2011). This includes addressing entity (or fixed) orientations towards learning math where students see math skills are fixed and unchangeable. Whereas students with a fixed mindset are likely Furner, J. M., & Grace, B. (2016). Teaching math with grace: Lessons from a master teacher, *Mathitudes* 1(1), 1-18.

to become discouraged when encountering difficulty, and ultimately weakening self-efficacy, students with a growth mindset are likely to persist, seek help, self-regulate and alter their learning approach (Schunk, 2012). Such a targeted approach will afford more precise strategies for attenuating students' math anxiety and encouraging a more beneficial motivational outlook for learning math. It didn't take Mr. G to know all this research to put it into practice in his classroom with his students.

The overall lessons Mr. G's students learn are consistent with recent research by Guillaume & Kirtman (2005) who contend good math instruction includes the following: a) teachers believe in their students and convey that conviction, b) teachers drive their instruction by goals for student learning, c) teachers teach for conceptual understanding, d) teachers use methods that are interesting and engaging to students, e) teachers create settings in which students feel safe to take risks, and f) teachers show the connection between math and other facets of life. Mr. G exemplifies these key components as lessons in his daily instruction.

### Summary

*"I love being his student because we get to build rockets, build and connect Ferris wheels, and make robots; he is a great math teacher!"* – Mr.G's Student

I have known and worked with Mr. Grace for many years now as part of my work with his school, Indian Pines Elementary School, and my university, Florida Atlantic University. I worked with the school regularly. I go into classrooms and work with teachers and children each week. Mr. Grace and I have done in-service workshops for the



teachers at his school as well as presented at the Florida Council of Teachers of Mathematics Conference in Orlando on a topic related to motivating and having high expectations for children in math using math tricks and challenges.

Mr. Grace has been an active mentor for future teachers. He regularly has student-teacher interns and methods students in his classroom doing observations and modeling lessons. He has been actively involved in the Family Nights at the school as well as After Care and many other school related programs. He truly is a dedicated professional.

Mr. Grace demonstrates a caring classroom environment with very high expectations. No matter what ability level his students come in at the beginning of the year, they all leave gifted and feeling positive about school, especially math and science. Barry Grace's passion for these subjects wear off on his students. Mr. G challenges his students with upper level math and science concepts. His students learn about algebra, factorials, thrust, etc. Mr. Grace keeps his students accountable for keeping track of their own grades and learning responsibility for their own success. In the process of their doing this, they learn about averaging, decimals, and percents---everything is a math lesson for his students. He also has each of his students keep a binder called "Proud to Be Me" where he has them highlight all of their successes and knowledge in the work they have completed, similar to a portfolio. When you ask one of his kids to show you their "Proud to Be Me" portfolio their eyes just light up, you can tell they are proud of their hard work and knowledge. Mr. Grace's approach to reach each child is accomplished in his methods of teaching.

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Mr. Grace incorporates the National Council of Teachers of Mathematics principles and standards (2006 and 2000) in his teaching as a whole. EQUITY is important to him and he caters to all students needs whether ESOL, ESE, gifted, or attention deficit. He believes all students have the right to learn and will. He maintains a rigorous CURRICULUM following the Florida Sunshine State Standards while adding challenge and self-exploration. Mr. Grace's TEACHING is very eclectic using cooperative learning groups, technology, manipulatives, humor, and structure. He believes in reaching all students by teaching to all modalities of LEARNING. Mr. Grace uses a mixture of ASSESSMENT techniques. One effective method I have seen in his classroom is that he invites students to come up and re-teach concepts to the class as if they were the teacher demonstrating their full understanding to their classmates. Mr. Grace instills in his kids a sense for wanting to learn for the sake of learning and interest and it really shows. He does not stress his students out by creating test anxiety. Mr. Grace uses a great deal of TECHNOLOGY ---he uses computers, calculators, kits from IBM teaching about the workings of a computer, and science experiments involving technology. Mr. Grace truly is preparing his students for the new millennium by boosting their skills in math, the sciences, and technology while building important social skills. Science, technology, engineering, and mathematics (STEM) have always been the underlying areas that Mr. G emphasized in is teaching for most of his career, even before the term STEM was even coined.

If I were to compare Mr. Grace with another outstanding and inspiring teacher, that would be Mr. Jaime

Escalante from the movie, *Stand and Deliver*, based on a true story of a teacher who brought a group of inner-city low ability students to pass the AP Calculus exam. Although Mr. Grace is his own man, he too, like Mr. Escalante, has high expectations for his students and also believes his kids can and will succeed. His students know how he feels; hence, they know that with Mr. Grace as their teacher they will excel. As teachers, we do not only teach subject matter, we teach so much more, we need to push young people to believe they can succeed. As educators we must teach with the philosophy that if we can teach our students to love themselves and each other and if they also know that we as their teacher love them and want the best for them, then they will have the capability to learn anything. Self-esteem is key to the motivation for true learning. Mr. Grace can turn any child, even if they are math anxious, into a real mathematician. He builds their confidence and turns kids on to learning. He makes kids enjoy life more; he builds self-esteem, and truly prepares them for a successful future. Mr. G is a very humble person. For him to talk about his successes and effective practices was not easy. Mr. Grace encapsulates the qualities of a stimulating, caring, innovative, and effective teacher. He exemplifies teaching attributes that any school, principal, child, or parent would desire in a teacher. He is not the type of person to brag about himself; one only needs to step inside his classroom to see him in action with his students to recognize his effectiveness in the classroom. Mr. Grace's students adore him, they feel safe in his classroom and are genuinely interested in learning and know they will learn because they are with Mr. G. Mr. G motivates all his students and gets them turned on to rich topics. How it all works for Mr. G may

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be difficult to summarize, but one can see that by setting up a classroom environment which is safe for the students, by instilling in all students the power to learn and the capacity to achieve, and by providing a challenging and rigorous math curriculum that is connected to students' lives may all be the critical elements for success. We as educators must look at master teachers like Mr. Grace and see what it is that works for him that can then be identified and then practiced by all educators in the field. Mr. Grace was the 2005 Palm Beach County Elementary Teacher of the Year. He feels that educators need to better reach and prepare students mathematically as all young peoples' futures depend heavily on their knowledge of mathematics, science, and the use of technologies in a globally competitive world. Mr. Grace was ahead of his time talking about STEM a decade or more before it became a common buzz term in education.

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### About the Authors:



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**Barry Grace** was more recently a Fifth Grade Teacher at Indian Pines Community Elementary School in Lake Worth, Florida. He was a teacher for 30+ years. He helped to organize to send school resources to Haiti and Peru getting his students involved in civic causes. His students love his teaching style and he is credited to always motivate learners. His students always knew that he believed in them. He has a great love for teaching, especially mathematics and science. He was the 2005 Palm Beach County School District *Elementary Teacher of the Year*.

Furner, J. M., & Grace, B. (2016). Teaching math with grace: Lessons from a master teacher, *Mathitudes 1(1)*, 1-18.

## Appendix A

### Mr. G's Rules to Live by as a Teacher

#### Mr. G's Rules to Live by as a Teacher

- Tie math into daily life.
- Stress the importance of math.
- Talk with students not at them.
- Plenty of practice--dittos, examples, teach class, tutor others, credit for showing siblings or parents
- It is serious business when I am teaching and kids know this.
- We can laugh and play
- Laugh every day...sometimes at me
- Don't take myself too seriously, I have to trust the middle school teachers to do a fine job
- Confident in me...so kids feel confident too
- Enjoy...so they enjoy
- Tie in chess/magic/puzzles/stock market game/nail tricks, etc
- Pizzzzz proud of you (fingers touching)
- High expectations--effort is great, but also need results
- Say "If you have a bad grade...we need to work together...it's not your problem, it's our problem"
- Smile
- Laugh
- Here is my way, maybe you know of a way that is better than mine....ok (Asian way)
- Respect ....goes "all" 'ways", always
- Believe they can learn
- Believe I can learn
- Lots of hands-on stuff
- Look at things from a different view
- Geometry is a yearly subject---lots of projects and art
- Some algebra or yearly activities
- Write problems----six multiplied by.... (Use to teach English too)
- Build our own math book
- This is their class and I am lucky to be part of it...and they are lucky too.
- We are here to learn together
- It's normal to forget
- Time to explain, try
- Don't make kids feel rushed
- Never give work so that they feel they can't learn.
- The kids are spontaneous, applaud...we express ourselves
- Build rockets and tie to math
- No homework on weekends
- A child's emotional needs are more important over academic needs
- Challenge kids
- Stop teaching when you notice child is resistant, stop and go on to another concept
- Most kids in the class feel they can learn when they know you believe in them
- Students are in charge of their own grades by calculating them
- They believe that I can teach math
- Reasons for involvement in weekly in-service----practical/hands-on activities to use with kids

**Appendix B**  
**Photos with Mr. Grace Teaching**

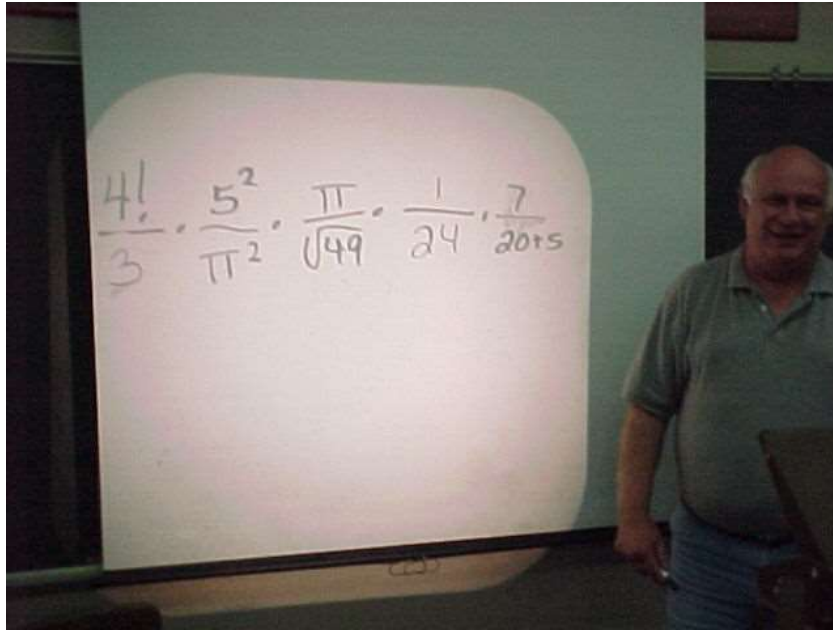


Mr. Grace is very animated in his instructions.



Mr. Grace motivates all his students to participate.

Furner, J. M., & Grace, B. (2016). Teaching math with grace: Lessons from a master teacher, *Mathitudes 1(1)*, 1-18.



Mr. G challenges his 5<sup>th</sup> Graders with simplifying algebraic expressions using  $\pi$  and factorials (!). He allows his students to show what they know as they walk through their understanding of solving the expression while coming up to the overhead.

Appendix C  
Mr. G's Sample Worksheets for his 5<sup>th</sup> Graders

Let's Have Some fun!

Read Think Solve

MATH Rules

①  $\sqrt{25}(3^2)$     ②  $4!(\sqrt{100})$     ③  $4^2 + 5^2$

④  $6^2 - 5^2$     ⑤  $3!(4!)$     ⑥  $6\sqrt{100} + 3^2$

R  
T  
S

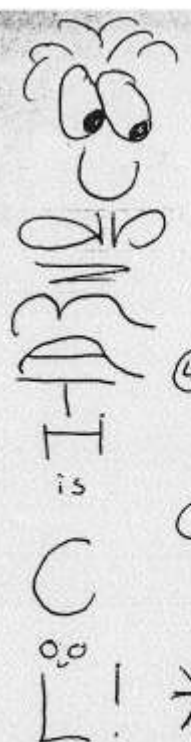
⑦  $5\sqrt{36} + \sqrt{25}$     ⑧  $7(10-9) + \sqrt{4}$     ⑨  $3\sqrt{49} + \sqrt{100}$

RTS

⑩  $7\sqrt{100} - 3!$     ⑪  $2! + 3! + 4!$     ⑫  $0(39648 + 97164)$

u R so nice!





/29

①  $\frac{3}{4} = \frac{1}{8}$     ②  $\frac{4}{5} = \frac{1}{15}$     ③  $\frac{1}{2} = \frac{1}{10}$

TOTAL  
Remember: Zero!

④  $\frac{2}{5} = \frac{1}{20}$     ⑤  $\frac{1}{3} = \frac{1}{12}$     ⑥  $\frac{2}{2} = \frac{4}{10}$     ⑦  $\frac{3}{7} = \frac{1}{14}$

⑧  $\frac{4}{7} = \frac{1}{14}$     ⑨  $\frac{3}{4} = \frac{15}{12}$     ⑩  $\frac{1}{8} = \frac{1}{16}$     ⑪  $\frac{2}{3} = \frac{1}{12}$

\*  $a=2$     $b=3$     $c=4$     $d=5$     $e=0$

/11  
/7

①  $ab$     ②  $b(cd)$     ③  $d(b+c)$     ④  $e(d^5)$   
     $-( )$      $-( )$      $-( + )$     \_\_\_\_\_

⑤  $bd$     ⑥  $cd - a$     ⑦  $a \cdot b \cdot c \cdot d \cdot e$   
    \_\_\_\_\_

\*  $\frac{5}{\pi^2} \cdot \frac{4^2}{3^2} \cdot \frac{7}{16} \cdot \frac{\pi}{\sqrt{25}} \cdot \frac{9}{\sqrt{36}} \cdot \frac{6}{11} =$  \_\_\_\_\_

/11



# The War of the Worlds

Lesson	page	fraction	0. decimal	% percent	Page	fraction	0. decimal	% percent
51	10				11			
52	16				17			
53	22				23			
54	28				29			
55	34				35			
56	40				41			
57	46				47			
58	52				53			
59	58				59			
60	64				65			
Average	Comp.	—			Voc.	—		
								Math —