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## Perspective from the Classroom

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As a teacher in the beginning of my ninth year at Nova Blanche Forman Elementary School in Broward County, Florida, I have taught third and fourth grades. For the exception of this past school year, I have had the same group of students for both third grade and looped with them to fourth grade. I will do this again with my third grade students entering fourth grade this fall.

Math is my favorite subject to teach. Since I was introduced to Chartworld in 2003, I have implemented it into my math curriculum, with the students and I reaping the benefits of it. My motto is that Chartworld equals success plus enthusiasm. This program is impressive in so many aspects. First, it holds each student's attention through the duration of the lesson. Not only are they seeing how "cool" this program is, but they are eager to want to learn more and create patterns no one else has created. They then explain their creation through dialogue or journal entries. My students' learning levels range from very low and very slow to gifted. I also have a student who is dyslexic and this program is the highlight of his day. His success and enthusiasm is the epitome of the Chartworld program.

To begin teaching Basic Chartworld, I introduce the ordinary hundred chart with ten columns. I ask the students if they notice anything about this familiar chart. Some say it has all the numbers 1 to 100, each row has 10 numbers and each column has 10 numbers. In each column the numbers all end with the top number. For example: 3, 13, 23, 33, etc.

Now, I introduce patterns in Chartworld. I ask them what they think will happen if I click on the number 2 in this 10-column chart? They don't know. I click on 2 and a striped pattern is shown. I teach them that this pattern is called stripes because there are solid vertical lines. I then ask what would happen if you click a 3? Will you get stripes? I get some that say yes and some that say no. I click 3 and we notice no stripes, but what we call diagonals. I click on 4 - no stripes. I click on 5 and get stripes! 6-9 no stripes. 10- a single stripe. Last, I ask them to predict what would happen if I click 1. We fill the chart. It is 10 "squished together" stripes. Question: What numbers made stripes in a 10-column chart? In a 10-column chart, 2, 5, and 10 made stripes! This we will put in our journals.

My next lesson would begin by making a 2-column chart. I say that when we click 2, this makes the main stripe. We press the right arrow key one time to increase the chart to a 3-column chart. We now see a checkerboard pattern. We press the right arrow to get a 4-column chart and see that we now have two stripes. We hit the right arrow once to get a 5-column chart and see another checkerboard pattern. I ask the students to keep pressing the right arrow key to see what we get. We journal:

### The Pattern

2 makes stripes in an even number chart.

2 makes checkerboard in an odd number chart.

On the board, I write:

Learning the Pattern

# columns: 2 4 6 8 10 12

# stripes: 1 2 3 4 5 6

We discuss the simple pattern and write multiplication sentences.

<u># clicked</u>				<u>#stripes</u>	<u>#columns</u>
2	X	1	=	2	
2	X	2	=	4	
2	X	3	=	6	
2	X	4	=	8	
2	X	5	=	10	
2	X	6	=	12	

From here, I introduce Turn-around Facts with the above chart. On the computer I ask the students, how many stripes does 2 make in a 6-column chart? Check your answer. What is the multiplication reason that tells us that 2 makes 3 stripes in a 6 column chart? 2 x 3 = 6. What will happen if we click 3 in a 6-column chart? 3 makes 2 stripes in a 6-column chart. Look at those two number facts.  $2 \times 3 = 6$       $3 \times 2 = 6$

These are called Turn-around Facts. These occur because you can multiply two numbers in either order, and you will still get the same answer. For most multiplication examples, there will be a turn-around fact. From there we do the same in an 8-column chart and a 10-column chart.

After learning Turn-around Facts, we move to a lesson for Finding All The Factors. We start by asking some review questions:

1. In a 10-column chart, what will happen if you click 1? (It makes 10 “squished together” stripes.)
2. What happens if you click 10 in a 10-column chart? (It makes a single stripe.)
3. In a 10-column chart, do any other numbers make stripes? (2 makes 5 stripes and 5 makes 2 stripes.)

Now, let’s go to a 4-column chart and go through all the charts.

\*4-column Chart: We only need to check the numbers greater than one and less than 4. We see that 2 makes 2 stripes because  $2 \times 2 = 4$ . We journal this AND write that there’s no turn-around fact.

\*5-column Chart: only 1 and 5 makes stripes.

\*6-column Chart: In addition to 1 and 6, 2 makes 3 stripes. We know, by the turn-around fact, that 3 makes 2 stripes.

\*7-column Chart: only 1 and seven make stripes.

\*8-column chart: 2 makes 4 stripes and 4 makes 2 stripes.

\*9-column Chart: 3 makes 3 stripes, and there's no turn-around fact.

\*10-column Chart: 2 makes 5 stripes and 5 makes 2 stripes.

\*11-column Chart: only 1 and 11 makes stripes,

\*12-column Chart: 2 makes 6 stripes and this tells us that 6 makes 2 stripes. AND 3 makes 4 stripes and 4 makes 3 stripes.

## Summary of Journals:

$$2 \times 2 = 4$$

no turn-around fact

$$2 \times 3 = 6$$

$$3 \times 2 = 6$$

$$2 \times 4 = 8$$

$$4 \times 2 = 8$$

$$3 \times 3 = 9$$

no turn-around fact

$$2 \times 5 = 10$$

$$5 \times 2 = 10$$

$$2 \times 6 = 12$$

$$6 \times 2 = 12$$

$$3 \times 4 = 12$$

$$4 \times 3 = 12$$

DISCOVERY: In charts with 2, 3, 5, 7 and 11 columns, the only numbers to make stripes were 1 and the number itself.

We can go to a 10-column chart, pick our color ink, and click on 2. We get 5 yellow stripes. We click red and 5 and get 2 stripes that are red. We notice that in the last column, we have both colors stacked on the numbers: 10, 20, 30, 40, 50, 60, 70, 80, 90, & 100. (All of these numbers have 2 and 5 as factors.) We click on “Show Factors.” We now see 4 numbers: 1, 2, 5, and 10. 1 and 10 are both blue, identity property,  $1 \times 10 = 10 \times 1$ . 2 and 5 are both green because  $2 \times 5 = 5 \times 2$ .

We can go to a 12-column chart and pick a color-purple and click on 2 and get 6 stripes: 2, 4, 6, 8, 10, 12 are all purple. We click on a new color- green and click on 3 and get 4 stripes: 3, 6, 9, 12. We choose another color-pink, and click on the 4 to get 3 stripes: 4, 8, 12. We choose our fourth color- yellow, and click on 6 to get 2 stripes: 6, 12.

We sit back and really look at this pattern. We journal all of our factors of 12: We click “Show Factors”. 1, 2, 3, 4, 6, 12. 1 and 12 are blue-identity  $1 \times 12 = 12 \times 1$ . 2 and 6 are green  $2 \times 6 = 6 \times 2$ . 3 and 4 are red  $3 \times 4 = 4 \times 3$ .

We click “Back to Chartworld” and study this colorful pattern that we created again. We notice some numbers have more than 1 color stacked on them. We have a discussion on all of our discoveries. This is so exciting and interesting! The students can’t get enough, and why not keep them even more enthused?! Let’s *act* these out!

“Living Fact Families:” The students have invited other classes to come in several times to demonstrate and teach Chartworld to them. Now they will act-out Chartworld for their audience.

My students and I make up the necessary posters for the factors of 6, 8, and 12 - 1, 2, 3, 4, 6, 12. 12 is definitely their favorite! We also make an = sign and a sign that has x on one side and a division sign on the other side. We have 1 student guide us with Chartworld shown on a projector screen so as to captivate our audience in two ways. We take turns playing parts and narrating. The narrator begins by telling us what chart we’ll be working with - the computer person follows by showing the correct number chart, and the students with any of the factors for that number, plus the x/ division sign and = signs go stand in the front of the class in the order the narrator tells us that is shown. For example: “2 makes 3 stripes in a 6 column chart.” When those numbers are called out, the student with that poster moves forward and then back when the next number is called. “Now, we’ll show the Turn-around fact.” The 2 and 3 change places. “And now 3 makes 2 stripes in a 6-column chart.” Now, we even use division! The children rotate to show: 6 divided by 2 = 3. The children rotate again. 6 divided by 3 = 2. \*All of this is also being demonstrated on the computer.

From here we show all of the factors of 6. (The student with the 1 poster also comes up, x / division sign, and = move to the side.) The students line up in order 1, 2, 3, 6. We ask for audience participation to suggest how they should order themselves; thus captivating them in a third way. The fourth way to captivate our audience and share what we’ve learned from Chartworld, is by asking for audience participation to help us create a Living Fact Family for 8. The audience is extremely enthusiastic because they already “get it.” We have to guarantee that all will participate so as not to disappoint. It seems like we can’t act out all the fact families fast

enough. They all want to participate and their eagerness to share the limelight has diminished. They love this!

Chartworld has provided an outlet for their inability to sit still by not only acting out fact families, turn-around facts, factors, and mathematical reasoning, multiplication, and division, but by creating their own Chartworld patterns and going and showing another student, or presenting in front of the whole class as our “teacher.” Their enthusiasm is endless and contagious. They have been able to apply what they’ve learned visually and hands-on to other students and their parents. The students’ ability to “get it” and have the “AHA!” moment is absolutely beneficial and priceless. Chartworld goes so much further. The students easily grasp Prime numbers and Composite numbers and will continue with the Buzz Bang Game, Greatest Common Factors, Least Common Multiples, Long Division and Fractions.

My students can write essays about each step of the process and use their journals as references, as well as from referring to their own creative patterns that we have printed out and laminated. In my opinion, and experience, Chartworld is by far the easiest tool to teach with and learn from in an appealing presentation through hands-on experience that motivates students to want to learn more and go further with a new passion for math. They feel “special” like the number 1 in a chart. They get to learn Chartworld, and unfortunately not all of the others are. I see the curiosity and the want to learn Chartworld from students in other classes, as well as other teachers on my team and other teams! This program is such a vital and successful tool.

A teacher is typically inundated with so many “pieces” of the adopted subject materials. All those materials together can’t do what Chartworld does. I have used this tool successfully with different types of autistic students, speech or language students, ADHD/ADD students, dyslexic students, gifted students, low students, high achievers, and average students. I think that the parents are next in line! This truly is an easy, hands-on, motivating, captivating, higher-order thinking tool. From older students and adults, I constantly hear, “Why couldn’t we have learned that way? Life would have been so much easier and maybe I wouldn’t hate math or have had a difficult struggle with it.” I believe Chartworld is the answer. We have the proof and its irreplaceable experiences. Just thinking of my students going through different stages of Chartworld brings a smile to my face and warms my heart because I witnessed those precious memories of learning Math!

- **Reflections on Using Chartworld Software in the Classroom**
  - Margaret Nelson
  - Teacher of 4<sup>th</sup> Grade Gifted
  - Nova Blanche Forman Elementary

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Over the past thirty years I have taught in schools in Scotland, Texas, and Florida. For the past ten years I worked at Nova Blanche Forman. I currently teach fourth grade gifted/high achieving students. I have always felt comfortable teaching mathematics, and have endeavored to make it fun for my students by using manipulatives and games.

In my classroom curriculum I predominately use an alternate math program; Everyday Mathematics. This program was developed at the University of Chicago. It is sequenced to continually build on, and revisit concepts as they are taught. It also offers alternative approaches to teaching basic concepts, a great deal of manipulative use, and “games” that reinforce concepts. To supplement Everyday Math, I provide daily practice in computation, in particular in multiplication and division. Because of the way I have utilized it, it is a fast moving program that requires students to acquire and master concepts quickly.

My classroom is rich in use of technology. Students have access to using a laptop computer for a large portion of the school day. I use an interactive Promethean whiteboard, and the internet provides enrichment through video and written presentation of information.

Four years ago, I was asked to participate in a study which utilized the Chartworld computer program, and associated spinoffs. I was first introduced to it as I watched Mr. Rooney, math specialist at Elementary School, use the program with his class. His demonstration had me hooked. Students in general were very focused on the lesson. The use of individual journals to record and respond to lessons allowed the teacher to see who was demonstrating understanding, and it ensured students stayed on task.

I have continued to use it with my students, as I have found it to be a wonderful learning tool for all of my students. As I have become more proficient in using it, I have found more and more ways that I can help my students build their math concepts. Initially I just used Chart world basics, in conjunction with journaling. This portion of the program assists students to visualize multiplication patterns. During the first year I used the program, I found that in general I had to move at a much faster pace than it was designed to be used. I could often cover two or three lessons in the thirty minutes a general education class would require to complete one. One student in particular found it very pedantic, as he had already mastered most of the mathematically concepts that are taught in elementary schools. I gave him the task of mentoring the students who were struggling with mastering multiplication. Everyone benefited.

Although my students are academically gifted, it does not necessarily follow that they are strong in mathematics. Most of my students have strong basic math skills; scoring above the 80<sup>h</sup> percentile on norm references tests. However, many have weaknesses that begin to surface in fourth grade as the basic mathematical knowledge is expanded, and concepts become more complex.

Each year that I have worked with the programs, I have found that it allows for my lower ability students to master concepts quickly. Their basic multiplication and division skills are improved as measured by weekly math quizzes. The visualization of concepts helps all students to develop understanding much faster than by using manipulatives. It is very time consuming to lay out manipulatives, and in today’s classroom time is a precious commodity not to be wasted.

However, allowing time to explore and journal findings is a key aspect of the program. Recording the findings allows students to see numerical patterns, and leads to making mathematical discoveries. The insight offered by individuals often allows others to 'get it' when they would otherwise be struggling to grasp concepts.

The use of Ultra Chartworld to introduce Lowest Common Factor, Lowest Common Multiple and Greatest Common Factor, has become an essential part of my introduction to fraction manipulation. As I already indicated, my math curriculum moves quickly. I was finding that many of my lower students did not grasp the concepts of LCM, LCF, and GCF very fast. By using Ultra Chartworld, the time needed for understanding these concepts is rapidly decreased. It is not only the lower students that benefit from using the software. The color and visualization of the mathematical patterns appeals to nearly all students. My exceptional math students relish the patterns and order of math. Some of them find it difficult to explain how they arrived at an answer. This is where the journaling really is important as it provides these students with the opportunity to translate the patterns they see into words.

Each year I discover more and more ways that I can utilize the Chartworld and related software to introduce and develop mathematical concepts. I know my enthusiasm for using it has grown. It has also rubbed off on the students who look forward to the time we spend working with the program. I will continue to use it in my classroom next year.

**Perspective of a First Year Teacher**  
Sylvia Ramgadoo

**Reaction to Chartworld**

Throughout my professional development, I have sought instructional opportunities that enhance communication with children and enliven classroom interaction. I discovered Chartworld while I was in Dr. Ploger's Methods of Mathematics course at Florida Atlantic University. During this time as a college student, I was given the opportunity to make school visits at Nova Blanche Forman Elementary. I was able to observe the effectiveness of utilizing Chartworld in the classroom. I am pleased that Chartworld inspired my very first fourth grade students at the same very school we made the school visit during my undergraduate studies. Currently, I am approaching my second year of teaching. I have watched my students this past year become enthusiastic and motivated to learn mathematics through the computer program, *Chartworld*. *Chartworld* has many features that allow students to learn in a very unique way. While I was working with the children, I realized how fortunate they were to explore numbers in such a feasible manner. I was particularly fascinated with the way students were able to learn about the following:

- Spatial patterns
- Prime and composite numbers
- Divisibility Rules/ Tests

One thing that automatically captures the attention of anyone about *Chartworld* is the patterns that the program makes. If a student clicks on 5 on a 10-column chart, the result will color all the multiples of five. The pattern will be two vertical columns. These stripes represent  $5 \times 2 = 10$ . This appeared so attractive to the students because they can explore with different colors. Another interesting pattern was an odd number column chart vs. an even number column chart. If a student clicks on the number 2 in an even number chart, let's say for example a 6-column chart, the pattern will be stripes. However, if a student clicks on the number 2 in a seven-column chart, the pattern will be checkerboard. While children were amazed with the patterns, they were also very interested in why this worked. This happened this way because no odd number is evenly divisible by 2.

Another discovery children can make with *Chartworld* is the difference between a prime number and a composite number. A prime number has exactly two factors, 1 and itself. A composite number has more than two factors. Students also had the opportunity to explore the smallest prime factor (SPF). For example, the number 51 is divisible by 3, which is the smallest prime factor other than 1. Students can discover whether a number is prime or composite by clicking on a number. For example, if students were given the number, 91, they would have to find out if the number is prime or composite. The chart shows that 91 is a multiple of 7 by 91 being highlighted. When a student clicks on 2, 3, 5, 7, 9, all the left over numbers are prime numbers. This shows that these numbers can only have two factors, one and itself.

Another important concept the children practiced was the divisibility rules. The children used the numbers 2, 3, 5, 7 to test for divisibility. For example, every multiple of 3 has a digit sum of 3, 6, and 9. The number 87 has a digit sum of 15, but the digit sum of 15 is 6. The students that I worked with were very intrigued by this discovery. Another discovery was the checkerboard pattern made for the multiples of 3 in a 10-column chart. All the numbers in the diagonal have a digit sum of 3, 6, and 9. There are so many ways to discover the divisibility rules, which in turn will help students decipher whether numbers are prime or composite. Students ultimately become independent thinkers by exploring *Chartworld* further through testing their own devised numbers, without the instructor saying the numbers.

Overall, I think *Chartworld* is an effective program that truly inspires children. What makes this program so great is the fact that it is multifaceted. There are so many ways in which children can learn. It also connects key ideas like spatial patterns, prime and composite numbers, and divisibility rules/ tests. Furthermore, it helps students with multiplication. It provides an alternative to the notion of rote learning when it comes to multiplication. Usually students can sit there and recite the products of numbers, but can they truly form connections and apply that skill to another math problem? Often times, the acquisition of prime and composite numbers and divisibility testing can be introduced at an awkward point in a child's education. It can be introduced so sporadically, without any connection to multiplication facts. Showing the students a multiplication chart when introducing this concept promotes students to form mental connections. *Chartworld* provides many visual models for connections to be made between many mathematical concepts that students often struggle with. In particular, many students that had a negative attitude towards math thoroughly enjoy the allotted time spent on *Chartworld* instruction. This form of teaching played a pivotal role with many students not knowing their multiplication facts. One student in particular, had low self-esteem when it came to his performance in math. I'll never forget the day he said, "With *Chartworld*, things are so much clearer." This student was inspired to utilize *Chartworld* after he completed in class assignments to reinforce what was already taught. Often times, students need a chance to replay what was already taught on their own schedules. *Chartworld's* easy to use features, makes revisiting certain topics especially useful for students that need a chance to catch up with their peers. This student attributes his higher performance in math to his ability to navigate and explore the many features of *Chartworld*. *Chartworld* truly inspires children!

## **Delivery Methods**

### *Use of Journals*

Guided instruction is used during a *Chartworld* lesson. Each student works through a concept under the teacher's direct supervision (guided practice) during mathematics (*Chartworld*) instruction. I begin with whole group instruction where the *Chartworld* program is projected on the wall through the LCD projector. I circulate the room to determine the level of mastery and to provide individual remediation as needed. This is to ensure that students understand before proceeding to individual practice on their laptops. Once students are given the opportunity to practice independently, closure statements are used to bring the lesson presentation to an appropriate conclusion. This is a time where students are able to share any discoveries and more importantly use their journals to document the lesson experience. This is used to cue students to the fact that they have arrived at an important point in the lesson, which

brings ideas together in their own minds. It is very important for students to be able to write down their experiences with math...why only do this with language arts. Just like adults need to constantly write down notes, children need to also. The use of journals during math in the intermediate grades, prepare students for higher levels of math, as they are practicing notetaking skills.

### *Plays*

The class consisted of 18 students, 3 of the students were classified as ELLs and 1 of the students was classified as ESE. The target group for the lessons was fourth grade students. The students had various cultural and linguistic backgrounds. All of the students were proficient in both writing and speaking the English language. To accommodate the different learning styles, students were given the opportunity to supplement their learning by participating in their very own Chartworld play.

The implementation of the plays provided a forum for students to connect with both language and math simultaneously. Students were actively involved as they performed multiplication and division sentences.

### *Summary*

Overall, I think Chartworld is an effective program that truly inspires children. What makes this program so great is the fact that it is multifaceted. There are so many ways in which children can learn. It also connects key ideas like spatial patterns, prime and composite numbers, and divisibility rules/ tests. Furthermore, it helps students with multiplication. It provides an alternative to rote learning when it comes to multiplication. Usually students can sit there and recite the products of numbers, but can they truly form connections and apply that skill to another math problem? The acquisition of prime and composite numbers and divisibility testing can be introduced at an awkward point in a child's education. The teacher can introduce Chartworld spontaneously, at many opportunities. For example, Chartworld provides many visual models for the multiplication facts. Showing the students a multiplication chart when introducing this concept promotes students to form meaningful mathematical connections.