IOP 2018-19
Barbara O'Connell

In what ways can we differentiate homework to increase student achievement, motivation, and integrity?

Some background...

Like many of my colleagues I am aware of Carol Dweck's work on growth mindset. I recognize the need to meet every student at their current level and appropriately challenge them to reach their greatest potential. To do so often means that lessons have to be differentiated and that students need to be assessed in a variety of ways at different intervals.

In addition, our school has been closely working with Stanford's Challenge Success. One of our goals has been looking at the daily demands placed on students' time and working towards ways to help students minimize stress and anxiety. In particular, my classes participated in a survey of classes, designed by an administrative team, analyzing our students' habits and time commitments related to homework.

Within my own Math Department, the focus continues to be on helping students develop the Habits of Mind (such as persistence, utilization of prior knowledge, flexibility, resilience, metacognition, communicating with clarity and precision) as described by Arthur L. Costa and Bena Kallick. We continue to value a problem-solving approach where the emphasis is on making connections, developing a deeper and more conceptual understanding of topics, rather than an algorithmic recall of facts, sharing these ideas with others through strong oral and written communication, and relating mathematics to its real-world applications.

What led me to this research?

In the last few years through IOP I have made many changes to how I teach Math. Students now work collaboratively at round tables, instead of traditional, individual desks. More lessons are differentiated not only for academic levels, but also offer choice based on interest or how a student wants to present their learning to others. I have reached out to students to develop a set of class guidelines which positively frame the behaviors and habits that lead to a classroom valuing risk taking, learning from mistakes, and collaboration. I have used Standards Based Grading in some of my classes, opposed to a traditional grading system, which allows students to be more cognizant of their areas of strength and those areas that need further work and remediation. I allow for multiple opportunities to retest and show personal growth. I now focus on making my lessons inquiry based where students are more independent in their learning and my role is more of a facilitator. There have been many revisions and my students are very much part of each shift I make in the classroom.

This year I wanted to look more closely at homework. I started by first reflecting on my own beliefs. Why do I give homework? What purpose does it serve for me? How does it benefit my students? What expectations do I have and do they match those of my students? I started with a general survey assessing the views of my students regarding current homework practices they have encountered in Math and other disciplines.

The first survey related to homework in general and was given in late September. The survey was given to five freshmen classes of varying levels.

- Almost 58% felt that homework was very important to classroom success, 28% felt that it was somewhat important, and 14% felt it had little or no impact on classroom success.
- A little more than 77% felt the primary purpose of homework was to practice skills/concepts learned in class, another 9% felt its primary purpose was to give a grade besides tests/quizzes, 7% thought it was to be sure students completed readings or classwork, and the other responses were varied.
- The amount of homework assigned varied greatly, as did whether homework was usually due the next day or over time. The breakdown seemed more consistent subject by subject.
- About 54% of the students felt that they were consistently given choice or some flexibility with assignment topics.

I then met with subgroups of students in mid October and the following were some comments which came from those discussions.

“I definitely have more homework than I did before, but it tends to be spread out. I sometimes wait until it is really due and then it adds up. “

“ I like that some teachers let you do a rewrite. It lets me see the mistakes, get better, and also get a better grade. Some of my friends just see this as extra work.”

“I am realizing that I can’t wait to do it right before like I used to. Some teachers don’t check it, so I do the checked homework first.”

“I admit I have copied homework. (laughter from group) I think most people have. Some teachers just want to see work completed and there isn’t time so I copy. I do that more in subjects that are easy and I could have done it, but I needed time for the harder ones. Even if I copy, I do know that work.”

“ I don’t think I NEED most of the homework I get. I understand writing up labs, but most of my other homework I don’t find helpful.”

“ My problem is that I do the subjects I like first because they are fun or easy. Then I am too tired to do the hard ones. Teachers don’t count homework as much in HS, so I guess I don’t work as hard on it.”

After reading my students' responses and interviewing a few others for more clarification, I decided to focus on three areas related to good homework practices: student achievement, motivated students, and students practicing integrity.

Actions Taken

I read many articles related to homework, particularly related to differentiation. I decided to pursue 4 different areas: technology related (Delta math), problem-based learning (Portfolios), traditional with differentiated options (menu), and real life applications (end of task projects and presentations).

Each is described on the following pages along with particulars on how I used these to assess.

1. Delta Math

- The website deltamath.com is easy to access and use. There is currently no subscription fee.
- Includes many leveled skill-based questions for Math 8-12. Easily customized.
- Students can ask for a similar sample question to be shown with all steps and an explanation.
  Based on student progress, difficulty level adjusts.
- Gives students immediate feedback and if incorrect, will show a correct completed response so students can find their error(s).
- Records for teacher student responses. Easy to reference a particular topic for student remediation.
- I usually gave students 4-7 days to complete for assignment. Graded for COMPLETION only.
- In general, assigned Delta Math 1-4 times per marking period.
- Suppose students had 5 questions to complete. Stronger students did 5 and were done. Others may need to complete 8 or 12 or 25. Had no effect on grade, but allowed for more practice to those who needed it most.
- Students could revisit any topic previously assigned and do additional practice/review.

Sampling of Delta Math Topics

Area / Perimeter M	Volume of Figures M	Angles M
Function Key Features A	Piecewise Functions A	Factoring GCF / DPS A
Factoring Trinomials A	Solve Quadratics (Factoring) A	Quadratic Formula A
Complete the Square A	Parabolas A	Polynomial Factoring and Graphs A
Circle Theorems G	Circle Equations G	Similarity G
Triangle Congruence G	Transformations of Coordinates G	Transformations Geometrically G
Volume G	Exponent Rules A2	Fractional Exponents A2
Simplify Radicals A2	Radicals and Fractional Exponents A2	Imaginary / Complex Numbers A2
Factoring A2	Advanced Factoring A2	Quadratic Formula A2
Continuity C	Definition of Derivative and Tangent Lines C	Power Rule Derivatives C
Product / Quotient / Chain Rules C	Advanced Derivatives C	Differentiability Algebraically C

Sample Assignments and Information Available to Teacher

Customize topics

Overview | Skills | Due Dates

- Quadratic Functions (Level 2)
- Polynomial Vocabulary
- Multiply Binomials
- Binomials to Powers
- Greatest Common Factor (Level 2)
- Difference of Perfect Squares (Level 2)

Sample shown to students who need help starting

Interval: $-9 \leq x \leq 2$

Point 1: $(-9, -40)$ Point 2: $(2, 70)$ (x, f(x))

Average Rate of Change:

$\frac{f(x_2) - f(x_1)}{x_2 - x_1}$ The formula

$\frac{f(2) - f(-9)}{(2) - (-9)}$ Plug in x

$\frac{(70) - (-40)}{(2) - (-9)}$ Evaluate function (y-values)

$\frac{110}{11}$ Combine

10 Divide

Quick overall view of class understanding

mplete	Adding and Subtracting Polynomials	Multiply Polynomials (Level 1)	Line Equation from Two Points	Standard to Slope Intercept Form	Distribute and Subtract Algebraic Expre...	Integer Solutions to Inequalities	Average Rate of Change from a Graph	Find Average Rate of Change from Table	Multi-step Factoring
%	100%	100%	97%	97%	97%	91%	94%	94%	92%
%	3/3	3/3	4/4	4/4	6/6	3/3	4/4	3/3	6/6
%	3/3	3/3	4/4	4/4	6/6	3/3	4/4	3/3	6/6
%	3/3	3/3	4/4	4/4	6/6	3/3	4/4	3/3	6/6
%	3/3	3/3	4/4	4/4	6/6	3/3	4/4	3/3	6/6
6	3/3	3/3	4/4	4/4	6/6	0/3	0/4	0/3	0/6
%	3/3	3/3	4/4	4/4	6/6	3/3	4/4	3/3	6/6
%	3/3	3/3	4/4	4/4	6/6	3/3	4/4	3/3	6/6
%	3/3	3/3	4/4	4/4	6/6	3/3	4/4	3/3	6/6
%	3/3	3/3	4/4	4/4	6/6	3/3	4/4	3/3	6/6
%	3/3	3/3	4/4	4/4	6/6	3/3	4/4	3/3	6/6
6	3/3	3/3	0/4	0/4	0/6	0/3	0/4	0/3	0/6

Individual Analysis of Each Student

Quadratic Functions (Level 2)	5/5	✓ ✓ ✓ ✓ ✓
Polynomial Vocabulary	6/6	✗ ✓ ✗ ✗ ✗ ✓ ✗ ✓ ✓ ✓ ✓
Multiply Binomials	10/10	✗ ✗ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✗ ✓ ✓ ✓
Binomials to Powers	3/3	✗ ✗ ✗ ✓ ✗ ✗ ✓ ✓
Greatest Common Factor (Level 2)	5/5	✓ ✓ ✓ ✓ ✓
Difference of Perfect Squares (Level 2)	5/5	✓ ✓ ✓ ✓ ✓

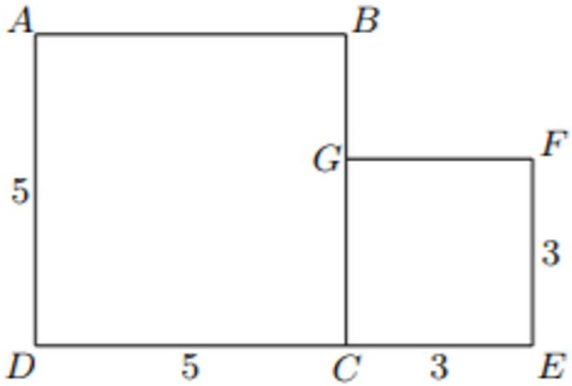
2. Portfolio Homework

- Delta Math was very skill based and I needed students to work on problem-solving and applications of concepts.
- Throughout unit students were given more “interesting” problems to explore. Any time up to 2 days before it was due, students could come after school and ask for feedback.
- Allowed me to have students see interesting questions that could be too time-consuming in a normal class period.
- Encouraged students to plan time better. Waiting to the last minute meant little to no feedback from me before grading.
- Allowed for flexible approaches and risk taking.
- Grade included accuracy, presentation, use of mathematical language and notation, ability to connect concepts and problem-solve. Generally assigned 1-2 portfolios per marking period. Number of portfolio questions varied depending on difficulty level and topic being studied.
- At times, similar questions were placed on exam to help assess if students had gained understanding and the work they were submitting was their own.

Sample Question

This activity will help you explore the Pythagorean Theorem in a non-algebraic way.
Read through the activity carefully.
*I am giving you an additional printout of this activity since it involves cutting and pasting. Also note that it is NOT necessarily drawn to scale.

A 5 x 5 square and a 3 x 3 square can be cut into pieces in such a way that the pieces create a third square. Your goal is to find the dimensions of the third square.



(A) In the diagram, mark P on $\overline{DC}$ such that $PD = 3$. Draw $\overline{PA}$ and $\overline{PF}$.

(B) Calculate the lengths of these segments.

(C) $\overline{PA}$ and $\overline{PF}$ divide the squares into pieces. Arrange the pieces to form the third square.

(D) Change the sizes of the squares to AD = 8 and EF = 4, and redraw the diagram. Where should point P be marked this time? Form the third square again.

(E) Will the preceding method always produce pieces that form a new square? If your answer is yes, prepare a written explanation. If your answer is no, provide a counterexample — two specific squares that cannot be converted to a single square.

Note: Activity Adapted from Exeter Academy, NH Mathematics 2

3. Menu Selection

- All students received the same “menu” of problems.
- Menu questions were grouped with their “price” (numerical point value). Easier questions were assigned lower point values and prices rose in response to the challenge level.
- Every student had to ‘spend” a minimum number of dollars assigned by me.
- At first students chose independently, but later I intervened a bit more when students were not spending ‘wisely”. For example, a student who should have chosen more challenging questions chose to do more of the easier level because it was faster. Students who struggled wanted to do 3 challenging instead of 7 easier because of fewer problems, and then became frustrated.
- This choice underwent several major revisions throughout the process. Many times it was not meeting the goals I intended and I had to rethink the process, I also had a colleague use it in their classroom and they encountered some of the same issues. Due to this, I was only able to implement it about 5 times this year.
- I usually didn’t assign a formal grade, but often collected for personal analysis.

Portion of a Student Menu

Tonight's Restaurant: Le Cafe de Trinomial Factoring
Must spend a minimum of $20

Dinner Choices	Pricing
1. $x^2+7x+12$	$2
2. $x^2-10x+16$	$2
3. $p^2+10p+9$	$2
4. $x^2-11x+24$	$2
5. $m^2-29m+100$	$2
6. x^2+x-12	$3
7. $x^2-5x-14$	$3
8. $r^2+13r-48$	$3
9. $x^2-13x-30$	$4
10. y^2+5y-6	$4
11. $x^2+8xy+15y^2$	$5
12. $m^2-7mn-60n^2$	$5
13. $3x^2-13x-10$	$5
14. x^4-13x^2+36	$5

I purchased items _____ for a total of $ _____

4. End of Task Projects and Presentations

- For each unit (my class refers to these as tasks as we are using a problem-based approach) students were placed into new collaborative groups (referred to as teams). At the end of some tasks students had to use their knowledge and apply it to a real-world situation. They then presented their findings to the class through a 10-20 minute presentation.

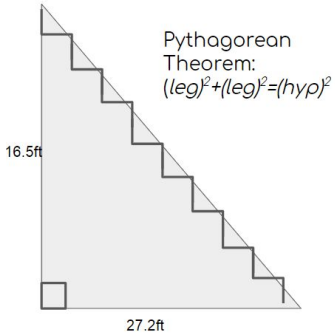
- We had 5 tasks end in presentations.
  Some highlights: students using coordinate grids and coordinate geometry to calculate the average distance traveled by an average freshman during the school day, logic gates, logics related to circuits, using facts about concurrency to discuss “balance” in sculptures, practical applications of similarity and trig in land surveys.

- Tessellation project: interdisciplinary

- Each were graded for content, effective communication, and creativity.

Some student work from " How many steps does an average student take during the school day?"

The Staircase "Issue"



Pythagorean Theorem:
$(leg)^2+(leg)^2=(hyp)^2$

We determined the average freshman goes up and down the stairs twice.

The total amount of feet a freshman walks on the stairs in one school day:
31.81ft x 4 = 127.24ft

$(leg)^2+(leg)^2=(hyp)^2$

$(27.2ft)^2 + (16.5ft)^2 = (hyp)^2$

$739.84 + 272.25 = (hyp)^2$

$1,012.09 = (hyp)^2$

$\sqrt{1,012.09} = hyp$

$\sim 31.81ft$

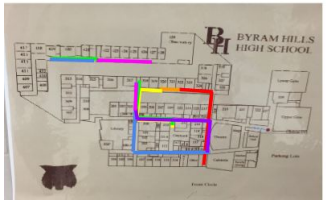
Distance the "Average" Freshman Walked

$\frac{1cm}{29.235ft} = \frac{130.9cm}{xft}$ Using our ratio to determine the average freshman walks in feet

x = 3,826.86ft

3,826.86ft + 127.24ft = 3,954.1ft

Adding the amount of feet it takes the average freshman to walk up and down the stairs to come out to our grand total



A day
Mentor (rm 322)
English (rm 320)
Science (rm 210)
Lab (rm 210)
Studio in art (rm 419)
Lunch (cafeteria)
Global (rm 205)
Math (rm 427)

The Stairs Calculations

For landings:

1) Convert tiles to feet
2) Convert feet to meters (1 ft = .3048m)
3) The cm value corresponds to our model

For stairs:

1) Convert steps to meters
2) 3 steps=1 meter

1st landing: 16 tiles=16ft ≈4.9m 16 x .3048=4.8768 (4.9cm)
2nd landing: 11 tiles=11 ft ≈3.4m 11 x .3048=3.3528 (3.4 cm)
3rd landing: 10 tiles=10ft ≈3m 10 x .3048=3.048 (3 cm)
1st set of stairs: 7 steps =2.3m 7/3=2.3 (2.3 cm)
2nd set of stairs: 15 steps =5m 15/3=5 (5 cm)
Totals: 4.9m+3.4m+3m+2.3m+5m=18.6m 18.6m x 4=**74.4 m**

Converting into Steps

The average stride is 2.2 feet.

5,630/2.2=2,559(rounded to nearest whole number)

So the average freshman takes around 2,559 steps a day.

How did we define the "average freshman"?

Using the map, each member of our group calculated how far we travel on A day, which differs based on when and where we have certain classes. We then averaged out the four of our schedules.

Tessellation Project

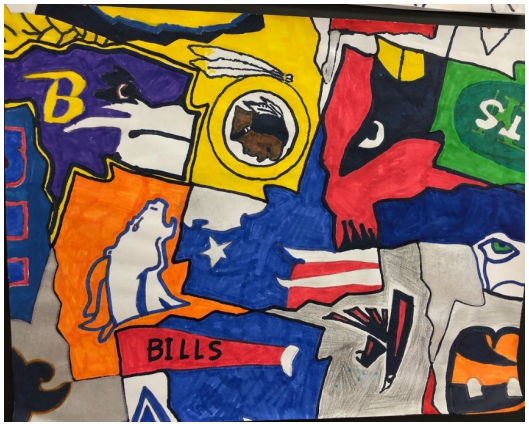
Part 1: Researched the Dutch artist M.C. Escher. Chose two his works (one a tessellation and one not) and discussed the medium used and interesting observations about the works. - ART

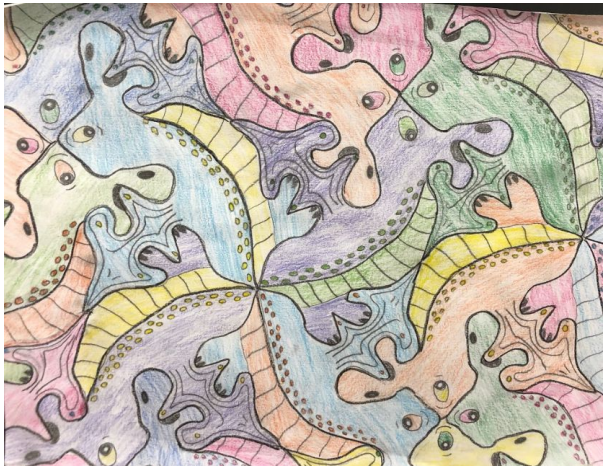
Part 2: Worked through activities related to the interior and exterior angles of various polygons. Also developed understanding of transformations such as translations, reflections, rotations, and dilations. Determined under what conditions polygons would tessellate a plane. Created computer generated geometric tessellations.- MATH

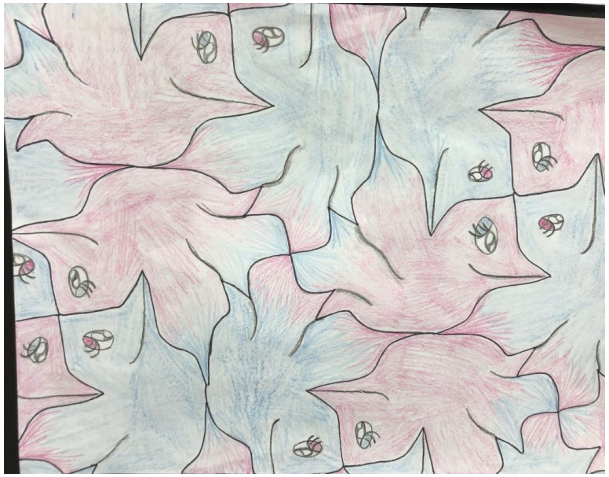
Part 3: Explored the role of tessellations in Islamic and Moorish architecture and tilings. Wrote about the historical and religious significance of the shapes, styles, and colors used. Also explored pictures of the tilings and mosaic designs found in the Alhambra in Spain. - HISTORY

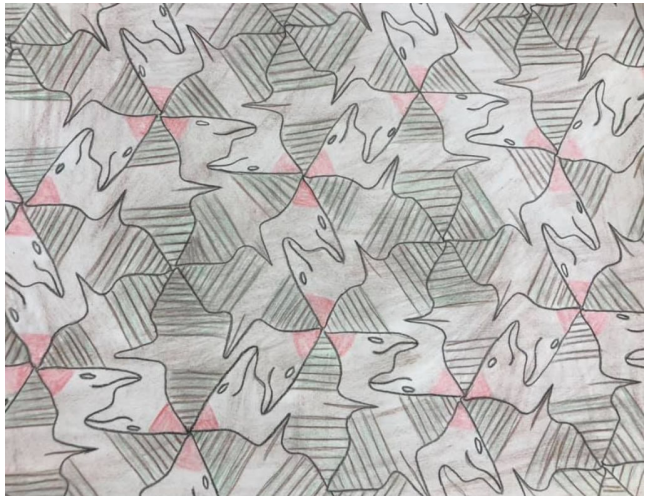
Part 4- Watched videos on how to create their own tessellation. Given a rubric and submitted individual works. Works titled and displayed in the classroom as a gallery.-PERSONAL EXPLORATION AND CREATIVITY

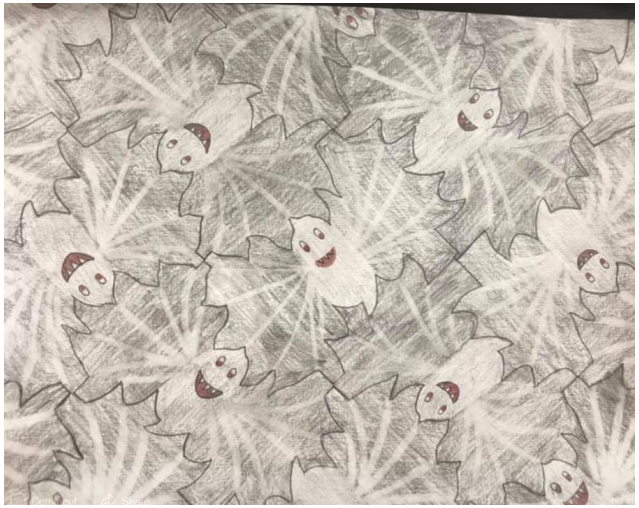
A Sample of Tessellations Created by hand by the Students



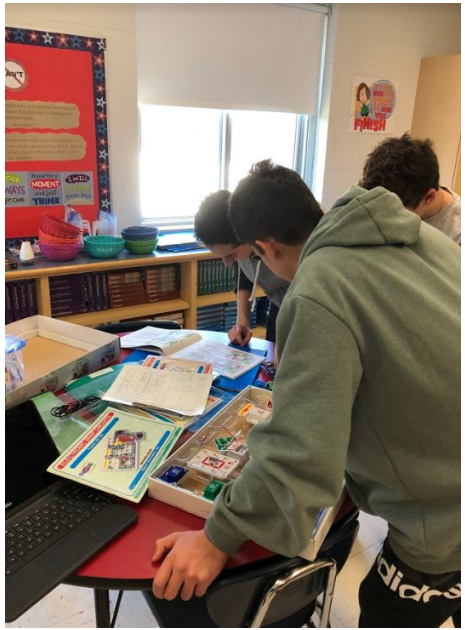








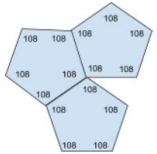
Additional Student Work



Students working on circuit board

B. I do not think that it is possible to tessellate a regular pentagon. I do think it's always possible to tessellate a scalene triangle and an irregular quadrilateral. I have found that any polygon can tessellate as long as it meets the following conditions:

1. 1 of the interior <s is divisible by 360
2. The sum of the interior <s is divisible by 360



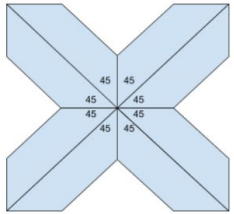
180(n-2)

180(5-2)=540

540/5=108

360/108=10/3

A shape can't have 10/3 sides or <s

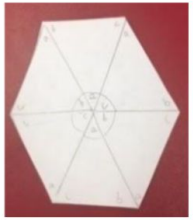


45 x 8 = 360

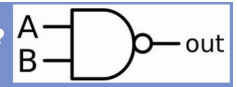
As long as the <s surrounding the vertex add to 360 even irregular quadrilaterals can tessellate. Also, every quad has a sum of 360. Since 360 is divisible by 360, the quad can just be rotated around the vertex should 1 of the <s not go evenly into 360

a+b+c+a+b+c=360

It doesn't matter what the 2 remote <s are as long as the ones surrounding the vertex add to 360. So, scalene triangles can tessellate. Also, every triangle has a sum of 180. since 180 goes evenly into 360, the triangle can just be rotated around the vertex should 1 of the <s not go evenly into 360



What's a "nand" gate?

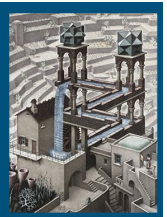


AND gate followed by a NOT gate.
The output is false if both inputs are true.
Otherwise the output is true.

Input A	Input B	Output
false	false	true
false	true	true
true	false	true
true	true	false

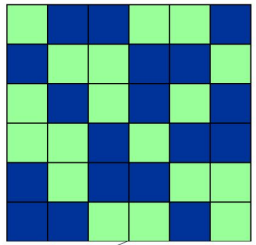
So What is a Paradox..???

CATEGORIES OF PARADOXES	DEFINITIONS
Antimonious:	Leads to a contradictory or false conclusion through correct reasoning
Veridical:	Leads to a counterintuitive, but true conclusion
Falsidical:	Leads to a contradictory or false conclusion through bad reasoning



What is a Three-In-A-Row?

The three-in-a-row originates from Japan. These Japanese logic puzzles form out of the most popular one, Sudoku (same concept as these but with numbers.) The Japanese solved these logic puzzles in their free time. There is an equal number of blue and white squares (we will be using green instead for clarity), and you must try to place the colors into the squares. **You can't place all 3 of the same color right next to each other!** For example, if you have a 6x6, you can't place the 3 blues and 3 greens right next to each other, but you can put 2 greens or 2 blues next to each other or each color mixed up individually.



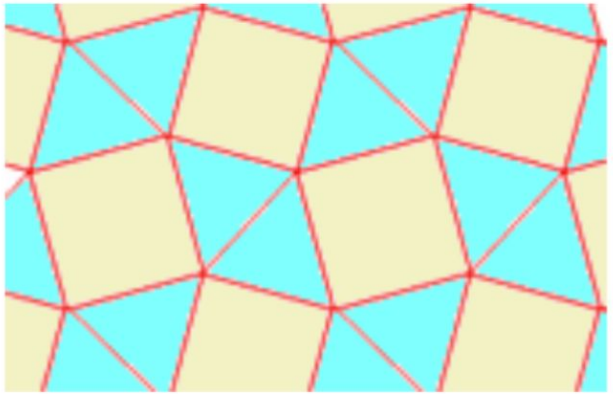
There are never 3 greens or blues all together!!!

There are 2 blues and 2 greens next to each other

https://Shah_Nematollah_Vali_Shrine.com

An especially striking example of Islamic tessellation is the pattern on the Shah Nematollah Vali Shrine in Iran, as shown in the picture above. This shrine honors Saint Shah Nur ad-Din Ni'matullah Vali, who established an order of dervishes in a village outside of Kirman. This shrine has now actually become a pilgrimage site for many Muslims. The dome is made of beautiful blue girih tiles, which are tiles of specific geometric shapes that were used to create complex and intricate woven strapwork patterns. The pattern on the dome of the shrine consists of a sequence of stars, from the top, containing 5, 7, 9, 12, 11, 9 and 10 points. Eleven point stars tend to be very rare in Islamic geometric art. These stars, when combined, create a complex tessellation that accents the dome's shape.

Islam is one of the three Abrahamic religions. This means Muslims worship one and only one god; idolatry and worship of images is completely against their beliefs. Because making art of human or animal figures was off limits, Muslims turned to abstract art involving mathematics. In Islam, tessellated designs are called "zillij" meaning an art based in learning, discipline and faith. Islamic religion teaches a life governed by intelligence and universal laws, so the goal of many ancient zillij art is to inspire viewers to believe in those teachings. This artform can be seen in classic Islamic architecture, on pottery, or lining the walls of mosques.



F) This semi-regular tessellation is a {4,4,3,3,3} because each vertex has a two squares and three equilateral triangles. It works because 90+90+60+60+60=360.

Overall Observations and Conclusions

During each quarter students completed reflections addressing many aspects of my classroom practices. I focused this time on their responses related to homework and assessments completed outside of class. I also had a post survey about homework to see if any of their views had changed and if I had made any progress in my areas of interest.

Here are some of the students' comments...

** I like Delta Math because I can do a little whenever I have time. I can even work from my phone. Getting credit for having it done no matter how many mistakes I make takes the pressure off.

**At first I hated the Portfolio because I waited to about a day before it was due and the questions were hard! I could have come in if I had started before that. I did that on the next few and your suggestions helped a lot. I actually liked the questions near the end.

**I have had group presentations in other subjects, but not Math where we could basically do anything matching the topic. I really didn't like my team for the third one, but that actually was our best. Even though I didn't pick them, they had a lot of different ideas than mine. I would work with them again actually.

**I am pretty strong in Math and hate when teachers make you do a lot of simple questions over and over. The menus and delta let me not waste time. I still wish Delta was totally optional. I did like the portfolio questions. They were challenging, but we had time.

** Math is my worst subject. No offense. I study a lot but the tests are hard. Delta Math was my favorite because I could go slow if I needed. There were examples I could follow. I liked that you could see the ones I got wrong when I came for extra help. If you had counted right and wrong instead of just finishing it, I would not have liked it as much because I got a lot wrong. I wait in the car for my sister to finish dance and I could do extra Delta practice on my phone.

**I did not like the menu because it was hard for me to choose which ones I should pick and I ended up doing more. I would like it more if you assigned different kids different problems and we didn't pick.

**The portfolios were SO MUCH WORK!!! I did like that we could come to you with questions before it was due. I think it was very helpful that we could talk through the problems with our team. I think that helped when I saw harder questions on test. For all the work, I wish it was worth more points.

**I loved my tessellation. Even though I take honors Math, I am an art kid at heart. It was nice when students commented on my piece after the gallery display. I don't feel like the smartest kid in this class (even though I try), but I loved this project and I even used the Alhambra information for Spanish and Global discussions.

**I think it was fun seeing how the other groups presented. It made me want to do a better job on mine. I am not someone who likes to speak in front of other people, but I felt better with these presentations because it was a topic I likes and I had my friends with me. I think it helped me improve and that will be helpful for Science research if I need to present.

**I know you asked us if our attitude toward homework changed and I still don't like it. I will say that you gave us many ways to do homework and that was positive. You also let us explore things like circuits and coding, which was fun. I realized I remembered more from the projects than the written work. I also appreciate that you tried to make sure we actually didn't waste time doing homework.

Overall, I think the homework options worked well.

Delta Math was received positively by almost all students in all levels. Many students mentioned they liked that it was graded for completeness only. The stronger students appreciated that when they showed they understood a topic, they were able to move on and not have a lot of repetition of basic skills. It was also mentioned various times by students that the immediate feedback allowed them to catch mistakes before they made the same mistake over and over and had to redo many problems. It was very easy to use for the students to use and allowed me to see where individuals struggled or if a particular topic was difficult for a large group and needed further work from me. I think this is one of the easier ways to differentiate skill set assignments. To me, the negatives would be that it does cover only skills, so you definitely need to supplement with higher order problem-solving assignments and that you need to make sure that students are writing their work somewhere since the program only shows which questions students got right or wrong and you still need to analyze errors in person.

The Portfolio assignments were only given in the 3 Geometry classes (accelerated and A level). The first one was done poorly for the most part. Many of the students admitted they had waited too long and then never had the opportunity to come in for feedback. This changed right away with the second one due. More students were coming in after school to work with their peers or get feedback or suggestions from me. I found through the surveys that this type of assignment gained popularity as the quarters progressed. Students became more familiar with my expectations and began to value the more non-traditional questions. I often let students present their varied approaches to the class and I saw students begin to more flexible in their thinking. It was through portfolios that I saw the greatest increase in the habits of mind.

The menus were an idea that didn't pan out the way I hoped. They took a great deal of time to write and students complained the most about them. Some of the stronger students worked quickly and just did many of the easier problems, while those who needed those easier starters chose to do the harder problems, limiting the amount of problems they needed to do. I had to have many individual conversations and there were some problems that never got done by anyone. I had to abandon this halfway through the year, but will reflect on better ways to make this possibly work. I used this mainly in the on level classes and it was overwhelmingly their least favorite at the end of the year.

I think the projects and tessellations were quite successful. Students became more of a community as the year progressed because for each task they were assigned a new team with new members. Almost a third of the students mentioned that they were not entirely pleased with the team members at first, but came to appreciate the talents and insights of their peers. Students definitely worked the hardest on these with little intervention from me. The students looked forward to the 2-3 presentation days for the tasks and I noticed a positive difference in their ability to present as the year progressed. Throughout the year, I found students referencing the concepts from past presentations (both their own and those from other teams). They rated this homework highest for choice and interest. I also liked hearing from seven students who told me they used concepts they researched in Math and applied them in other subjects. My favorite moment this year was a team who used their phone during our class planning time to facetime in a member who was home sick, but still wanted to work on the project with her team!

In what ways can we differentiate homework to increase student achievement, motivation, and integrity?

The biggest changes I made to my homework practices involved:

- offering more choice
- allowing for collaboration
- giving more time for completion
- allowing opportunities for feedback BEFORE the final product was handed in
- grading skill based assessments for completeness
- constantly reflecting if homework was meeting the needs of both my students and myself
- looking for opportunities to differentiate

As I move forward to next year, I will delve deeper into my students' responses during the year and look for more ways to help my students see a value in homework. For me, it is not about assigning more or less, but rather finding ways to motivate my students to practice, explore, and question more on their own outside the classroom.