The Project

Learning activity presented to
Professors Malkevitch and Weinberg
of Department of Mathematics Education
Teachers College of Columbia University

In Partial Fulfillment of the Requirement
for Mathematical Model
Summer, 2017

Rashidul Bari

Contents:

CONTEXT FOR LEARNING INFORMATION
About the School Where I'm Teaching

My name is Rashidul Bari. I'm a Physics teacher at Brooklyn Tech, one of the 7 specialized high schools in New York City. The majority of the students here have four different ethnicities: 55% Asian, 22% white, 7% Hispanic, and 6% Black. The student-teacher ratio at our school is 22:1. I don't have any cooperating teacher although I've had 3 IEP students. I'm teaching an algebra course in this summer beginning July 10.

During the first couple of days, I took many informal surveys to find out what my students would like to learn for the last topic of an algebra course—mathematical modeling or hands on experiment. However, many students expressed their interest to learn about mathematical modeling. One student even wrote an interesting paper on "How can we model more effective voting system so that the election outcome won't make majority of the population feel like they should leave America". This paper motivated me so much that I decided to do a project on Voting and Apportionment rather than hands on activities such as constructing a polyhedron. So I immediately wrote 2 consecutive lessons plans (double periods) for the next two days—starting next Monday:

1. Day 1: American Voting System (about 80 minutes)
2. Day 2: Apportionment method (about 80 minutes)

About the Class Featured in this Assessment:

1. What is the name of this course?
   Algebra (9^{th} grade)

2. What is the length of the course?
   1 month long Summer School

3. What is the class schedule?
   About 80 minutes

4. Is there any ability grouping?
   Yes.

5. Identify any textbook you use for instruction.
   Handouts from Professors Malkevitch and Weinberg
6. List other resources you used for the instruction?

Overhead projector and Booklets (Instead of giving worksheets, I give booklets which consist of a Do-now, a worksheet and an assessment). About the students of the class featured in this assessment:

1. Grade level composition
   9^{th} grade algebra course

2. Number of Students in the class 27
   - Males: 12, Females: 15
3. Summarizing needed support for my summer algebra course:

Learning Needs Category	Number of Students	Supports, Accommodations, Modifications & IEP goals.
English language learners	0	N/A
Gifted students needing greater challenge	12	Differentiated Homework
Students with IEP	3	See lesson plan
Struggling readers	3	See lesson plan
Underperforming students	2	See lesson plan

Overview of the lesson plan # 1 & 2

Lesson 1: Voting system (Double period)	
Agenda	Time
Do now	15 minutes
Dialogue based problem solving	50 minutes
Assessment/discussion	10 minutes
Mini lesson topics:	
1. Plurality method 2. Borda Count method	3. Pairwise Comparison Method 4. Approval voting

Lesson 2: Apportionment Method (Double period)	
Agenda	Time
Do now	15 minutes
Dialogue based problem solving	50 minutes
Assessment	10 minutes
Mini lesson topics:	
1. What is Apportionment? 2. Hamilton Method	3. Jefferson Method 4. Webster Method

G O A L

Democracy is the most beautiful product of human mind because its gives citizens' rights to vote and it makes the government accountable to the citizens, "government of the people, by the people, for the people"

The main goal of this learning activity is to help students understand the mathematics behind Article 1, Section 2, of the Constitution of the United States of America:

"Representatives shall be apportioned among the several states according to their respective numbers…"

LESSON PLAN # 1 (Double Period)	Voting System
Grade Level: High School	
Subject/Content area: Algebra	
Unit of the Study: Mathematical Model Day 1 : Voting System	
Standard: Students will use mathematical analysis, scientific inquiry as appropriate, to pose questions, seek answers, and develop solutions for the American voting system.	
Central Focus: In this lesson, students will learn four different models of the American voting system : (1) Plurality Method; (2) Borda Count Method; (3) Pairwise Comparison Method and (4) Approval voting	
Learning objectives: Students will be able to identify the differences between preferential (e.g., plurality) and non-preferential (e.g., Approval)	
Materials: Projector, Booklets	
Note: In my Booklet, differentiation represents by Code 5. Differentiations (stretching it) for struggling students: I will apply pedagogical technique—s*tretching the concept* because the sequence of learning does not end with the right answer. In fact, stretching it should be an integral part of the learning process.There are six effective ways to stretch it: 1) Explain how and why; 2) Paraphrase the answer; 3) Answer using examples; 4) Provide evidence; 5) Relate with experience; 6) Apply problem/concept in a new setting/context. There are many ways I'll achieve this goal—including asking a follow-up question like this: Question: How many fundamental voting methods are there in America, and what are they? Answer: Preferential and Non-preferential Follow-up-question: What is the Plurality Method? Answer: Each voter votes for one candidate & the candidate with the most votes in first place wins This shows us a path of hope amid low expectations by many teachers in our classroom. Differentiations (stretching it) for struggling students: Challenging question for 12 advance student: Write the difference between Preferential and Non-preferential system (only for advance students). Also, these 12 students will solve more problems in the assessment. Teacher Activity The booklet that students receive is organized with enough space for students to take notes and appropriately show their thinking by solving selected problems. I will also ask students to work in pairs so that they can share ideas and ask each other questions. I will also be circulating while the students work, to provide more individualized instruction to struggling students. Furthermore, there will be a class discussion after students complete the "Do Now". Finally I will utilize a turn-and-talk after I go over the "Do Now" allowing all students to share their ideas with a partner and to help formulate their thoughts for the class discussion.	

Lesson components	
1.1 Do now (1- 15 minutes)	Students will complete the Do Now in 10 minutes (See Page # 1 on the booklet). Then one group will present it (5 minutes).
1.2 Lesson (16 minutes to -66 minutes)	Dialogue based mini lesson (50 minutes) Student Activities: Students will work as a group (5/6 students in one group) to complete the Booklet. I will also be circulating while students work as a group to provide more individualized instruction to struggling groups/students (if any). See the Booklet #1 for details.
1.3: Assessment (67-77) minutes	Student will complete the Assessment in 10 minutes
1.4: Recap 78-end	Ask students to summarize what they have learned

Every second matters!

Time	Section	Teaching activities	Student activities
0-1	1.1	Teacher distributes the booklet for students to work independently/pairs. Explain the "Do now"	Listening to instructions
1-10		Teacher is Circulating while students are completing "Do Now"	Solving the Do Now
11-15		Going over "Do Now"	Student will check their answers to verify
16-66	1.2	Mini-lesson	Students and teacher will struggle together to solve the problems in the Booklet #1
67-77	1.3	Assessment	Students will complete the Assessment in 10 Minutes
78-end		Recap I briefly overview what we discussed throughout the period in 1 minute.	Ask one student to summarize what they have learned in 2 minutes

LESSON PLAN # 2 (Double Period)	Apportionment
Code 5 means differentiated for advance students	

Grade Level: 9th grade

Subject/Content area: Algebra

Unit of the Study: Mathematical Model Day 2 : Apportionment

Standard: Students will use quantitative skills to understand mathematical model such as the difference between Hamilton vs. Jefferson.

Central Focus:
In this lesson, students will be introduced to voting system. They will learn four three different apportion model: (1) Hamilton (2) Jefferson and (3) Adam

Learning objectives: Students will be able to identify the differences between Hamilton and Jefferson Methods.

Materials:
Projector, Booklet # 2

Instructional strategies: One size does not fil all and Right is Right

One size does not fil all:

"We don't see things as they are, we see things as we are" to help us understand why, as a teacher, I should not treat my students only from my perspective—especially when it comes to teaching them in diverse classroom dominated by three ethnicity: Asian, White, Black and Hispanic. That is I do not agree with the status quo: one size fit all.

Right is Right:

Right is Right, is a technique I learned from Lemov. It is, in my opinion, one of the most powerful and all-encompassing ideas to be applied in student teaching because it's set a high standard of correctness in the classroom. Lemov stresses the importance of having a student give a totally correct accurate answer. He emphasizes that accepting a partial answer from the student is not good enough. This faith in the quality of a right answer, I believe, will send a powerful message to my students that will eventually guide them long after they have left my classroom. There is a huge difference between almost winning the Nobel Prize and winning it. In same way, there is a big difference between partially right and all the way right, thanks to Lemov. According to Lemov, there are four main criteria: 1) Is the answer 100% correct; 2) Has the student answer my question; 3) Is this the right answer at the right time-and 4) Are my student using technical vocabulary?

Hold out for all the way: I will reward my student for the effort but my reward for the 100% correct answer is always greater. Consider following example:

Mr. Bari to Student K: What is the difference between Hamilton and Jefferson?
Student K: There is almost no difference
Mr. Bari: How so?
Student K: Both method calculate divisor same way
Mr. Bari: I did not ask for similarity between two methods, I asked for difference.

Teacher Activity

The booklet that students receive is organized with enough space for students to take notes and appropriately show their thinking by solving selected problems. I will also ask students to work in pairs so that they can share ideas and ask each other question. I will also be circulating while the students work to provide more individualized instruction. Furthermore, there will be a whole class discussion after students complete the "Do Now". Finally I will utilize a turn-and-talk after I go over the "Do Now" allowing all students to share their ideas with a partner and to help formulate their thoughts for whole class discussion.

Lesson component	
1.1 Do now (0- 15 minutes)	Students will complete the Do Now in 10 minutes (See Page # 1 on the booklet). Then one group will present it (5 minutes).
1.2 Mini lesson: 16 minutes -66 minutes	Dialogue based mini lesson (50 minutes) Student Activities: Students will work as a group (5/6 students in one group) to complete the Booklet # 2. I will facilitate dialogue by following the instructions in booklet # 2
	Component II: Group activities (Student will lead)
1.3 (37—67 minutes)	Student Activities: Students will work as a group (5/6 students in one group) to complete the Booklet # 2. I will also be circulating while students work as a group to provide more individualized instruction to struggling groups/students.
1.4: Assessment (68-78) minutes	Student will complete the Assessment in 5 minutes
1.5: Recap 79-End	I briefly overview what we discussed throughout the period in 5 minutes.

Every second matters!

Time	Section	Teaching activities	Student activities
0-1		Teacher distributes the booklet #2 for students to work independently/pairs. Explains"Do now"	Listening to instructions
2-10	1.1	Teacher is Circulating while students complete "Do Now"	Solving the Do Now

11-15		Going over the "Do Now"	Student will verify their answers by checking
16-36	1.2	Mini-lesson (Part 1)	Students should take notes while paying attention
67-77	1.4	Assessment	Students complete Assessment in 10 Minutes
78-end		Recap I briefly overview what we discussed throughout the period in 1minute.	Ask one student from each group to summarize what they have learned

Booklet #1 || **VOTING SYSTEM** Student Name:

Do Now (10 Minutes)

1) Why is the election of senators and governors easier than that of the president?
   A) Local election, candidate with most vote in final election wins
   B) Elections for the president are complicated by electoral college
   C) A & B
   D) None the above

2) How many fundamental voting methods are there in America?
   A) Preferential
   B) Non preferential
   C) A & B
   D) None the above

3) What is the Plurality Method?
   A) Each voter votes for one candidate & candidate with the most first place wins
   B) Each voter votes for two candidates and candidate with the most votes wins
   C) A & B
   D) None the above

4) Fill in the blanks below:
Plurality: Each voter votes for ---------- candidate. If a ---------- receive a majority of votes, that candidate is the -------.

5) Fill in the blanks below:
Borda Count Method : Voters rank candidates from ---------- to ---------- favorable. Each last-place vote is awarded no point; each next-to-last-place vote is awarded ----------, each third-from-last-place vote is awarded ---------, and so on. The candidate who receives the ---------- points is the winner.

6) Fillin the blanks below:

Pairwise comparison Method: Voters rank candidates from ----------to ---------- favorable. Each candidate is then compared with ---------- of the -------- candidates. If candidate ---------- is preferred to candidate ----------, then ---------- receives one point. If candidate ---------- is preferred to candidate -------, then B receives one point.

Mini Lesson (Dialogue based classroom where students struggle & teacher facilitate) 50 minutes

Instruction for Dialogue based Lesson:
Students will be invited to solve each problem as a group in a given time. One group will make the presentation at the end of the given time and teacher will facilitate:

Now that we have some conceptual understanding of the voting method, we can move forward to understand it mathematically.

Problem 1 (5 minutes): [I'll walk around in case a group need my help to solve it]
Approximately 500,000 votes were cast in Florida Palm County, and of those, 3000 were for Mr. Buchanan. There are 6 million votes cast in Florida in 2000. How many votes has Mr. Buchanan received? Why has he received more votes than he deserved (Hint: The number of registered voters for Mr. Buchanan party (Reform Party) is about 300 voters). I give 5 minutes to try as a group. At the end of the 5 minutes, one group will make the presentation. I will help you if needed.

Space for student to write answer:

Discussion:
The answer shows that (see the answer key), Buchanan would expect about 36000 Florida votes for him using the vote he received from Palm County. It should be noted that he got very close to 36000 votes although he should have received less than 300 votes. Who can guess why he should have received less than 300 votes?
Problem 2 (5 minutes)

As we discussed in the Donow, there are two fundamentally different types of voting methods : (1) preferential, in which the voters states their preference by ranking and (2) non preferential such as Approval voting. Here's an example of Preferential system: Mr. Bari orders Dominos pizzas to celebrate the end of their summer algebra class, which is divided in three groups: Jack, Jasmine and Joan are the group leaders of three algebra groups of my class. Here's what Dominos offer: three different one-topping pizzas—one Big, one Medium, and one small—for $30. Which topping should they order on which pizza? Students decide that the most popular topping such as sausage (S), pepperoni (P), Mushrooms (M), Anchovies (A)--should go on the Big pizza, the second-choice topping on the Medium pizza, and the third choice on the small pizza; the topping choices are pepperoni, sausage, mushrooms, or anchovies. Create a preference table as a group. You have 5 minutes.

Student will write their answer below; Hint: Create a Preference Table:

Problem # 3 (5 minutes to solve and 5 minutes to present)
The Plurality Method : Plurality is the Preferential methods. One thing we have learned from Domino's pizza is that if there are three or more candidates (toppings) it is possible that no toppings receives a majority (more than 50%) of the votes. Think about American election in 2000 or 2016, the candidates with most popular votes lost the election! So let's solve the problem below. The algebra class conducted an election, and the results were as shown in the box below (Take 10 minutes and then one group will make the presentation) :

(a) Did any of the rankings get the majority of the votes?
(b) Which topping is the plurality winner?
(c) Which topping comes in second?
(d) Which topping comes in last?

7	5	4	2
A	S	P	P
S	P	S	M
M	M	M	s
P	A	A	A

Use the space below to write your answer.

Problem # 4 (3 minutes to solve and 3 minutes to present)
Borda Count Method : Another Preferential method is known as Borda count. Voters rank candidates from most to least favorable, with the last place getting zero points. Question: Find the winner of the election using the Borda count method. You have 5 minutes to solve it:

Points	7	5	4	2
3	A	S	P	P
2	S	P	S	M
1	M	M	M	S
0	P	A	A	A

Write your answer below:

Problem # 4 (3 minutes to solve and 3 minutes to present)
Pairwise Comparison Method: It is also one of the Preferential methods. Voters rank candidates from most to least favorable. Each candidate is then compared with each of the other candidates. If candidate A is preferred to candidate B, then A receives one point. If candidate B is preferred to candidate A, then B receives one point. Example: The results of an election involving three candidates, A, B, and C, are shown in the box below. Who wins the election using the pairwise comparison method? Take 3 minutes to try.

2	3	4
A	B	C
B	C	A
C	A	B

Problem # 5 (4 minutes to solve and 4 minutes to present)

Non Preferential Method: Approval voting is an example of Non Preferential method which uses a different kind of preference table: Instead of ranking the candidates, voter approves (A) or disapproves (D) each candidate. Try the example below: Each row in the diagram below corresponds to a four candidates--W, X, Y, and Z and each column corresponds to a different voter. An A means "approve" and a D means "disapprove". Take 5 minutes to figure out which of the candidates wins using approval voting?

Candidates	Voter 1	Voter 2	Voter 3	Voter 4	Voter 5	Voter 6	Voter 7	Voter 8
W	A	D	A	A	D	D	D	D
X	A	A	D	D	A	D	A	A
Y	D	D	A	D	D	A	A	A
Z	D	D	A	D	A	A	D	A

Write your answer in the space below (5 minutes) :

Assessment (10 minutes)

1.The results of an election involving four candidates, A, B, C, and D, are shown in the table to the left.

a. Did any of the candidate receive a majority?

b. Which candidate is the plurality winner?

10	8	7	5
A	C	D	D
C	D	C	B
B	B	B	C
D	A	A	A

c. Which candidate comes in second?

d. Which candidate comes in last?

2. Using the Borda count method, who is the winner of the election in problem 1?

3. The results of a hypothetical election using approval voting are summarized in the table below. An X indicates that the voter approves of the candidate; a blank indicates no approval.

Candidates	Voters					
	Thomas	Uma	Vera	Walter	Yvette	Zoe
Jack	X	X	X		X	X
Jasmine	X		X	X		
Joan			X		X	

a. Who is the winner using approval voting?

b. Who is the winner if Adams drops out of the race?

Code 5 (See lesson plan to understand what does Code 5 means)

In Pairwise comparison method, find the number of comparison if the n = 10 person.

I will collect the Booklet to grade it. I will return it to you tomorrow.

Booklet #2 || Apportionment Method Student Name:

DONOW (10 minutes)

1) Mr. Trump won most electoral votes whereas Ms. Clinton won most popular votes. Who should have won the election?:

a) Trump
b) Clinton
c) None the above

(2) If we use the Plurality Method, who would have won?

a) Trump
b) Clinton
c) None the above

(3) Who would win in terms of a majority criterion?

a) Candidate who received the majority of first place vote
b) Candidate who received majority votes

(4) What year were the three branches of the American government created?

a) 1787 b) 1788 c) 1789 d) 1786

(5) Fill in the blank

In 1787, at the Constitutional Convention in ----------, delegates of the ---------- original states created a system of government with three branches: (1) ---------- (2) ----------(3) ----------

However, there was a problem with the representation of the ---------- branch. Smaller states wanted ------- representation. In response, a ---------- in which two ---------- represent each state was created. Larger states preferred ---------- representation. Thus, a House of Representatives, in which each state receives a number of representatives ---------- to its population, was created. Unfortunately, the founding fathers did not decide on the ---------- number of representatives for each state. In fact, Article 1, Section 2, of the Constitution states:

"Representatives shall be ---------- among the several states... according to their respective numbers. The number of representatives shall not exceed one for every thirty thousand, but each state shall have at least ---------- representative".

Historically, at least ---------- apportionment methods have been implemented (1) Jeferson method (1792 -1891); (2) Webster method (1842-1851); (3) Hamilton Method (1852-1900) and (4) Hill Huntington (1941 to Present)

Problem 1 (5 minutes to solve & 5 minutes to present)

The college system in a New York City University consists of 27 colleges. In 1999, the general budget allocation for the system amounted to more than 1 billion dollars—$1,000,000,000 to be exact. How can we fairly distribute the money among the 27 colleges?

Problem 2 (5 minutes to solve & 5 minutes to present)

The five largest colleges in CUNY received about $324 million in total general education and general fund revenues. The number of FTEs (to the nearest 1000) in each of the five colleges is shown in the box below. Find the standard divisor SD and the standard quota SQ for each college.

BMCC	CCNY	Baruch	Queens	Hunter	Total
30,00	17,000	13000	12000	9000	81000

Write your answer in the space below:

Problem 3 (5 minutes to solve & 5 minutes to present)

Hamilton Method: As we discussed during the Do Now, the Hamiltonian Method is based on four criteria: (1) Calculating the standard divisor; (2) Assigning each state its lower quota and (3) Awarding a seat to the state in descending order of fractional part of SQ if and only if there is a surplus.

Problem: Recently Brooklyn Tech received 1000 computers for students of five different departments: Physics (300 students), Mathematics (600 students), Computer Science (240 students), Engineering (160 students) and Chemistry (500 students). There are a total of 1800 students. Brooklyn Tech has received 1000 computers to be distributed among the five units. Use Hamiltonian Method to apportion the 1000 computers on the basis of numbers of students in each Department. Take 10 minutes to complete it as a group.

Problem 4 (5 minutes to solve & 5 minutes to present)

Jefferson Method: As we discussed during the Do-now, the Jefferson Method based on four criteria: (1) Calculating standard divisor; (2) Calculating each state's standard Quota (3) Assigning each state lower quota and (4) Repeat the process until the quota is equal to the number of seats. Now use the

Jefferson Method to solve the same problem:
Recently Brooklyn Tech received 1000 computers for students of five different departments: Physics (300 students), Mathematics (600 students), Computer Science (240 students), Engineering (160 students) and Chemistry (500 students). There are a total of 1800 students. Brooklyn Tech has received 1000 computers to be distributed among the five units. Use Hamiltonian Method to apportion the 1000 computers on the basis of numbers of students in each Department. Take 10 minutes to complete it as a group.

Problem 5 (5 minutes to solve & 5 minutes to present)
Webster Method: Jefferson Method was replaced by Webster Method in 1832. This method is mathematically more correct than the previous two methods because because modified quota does not require to down to nearest integer.

Problem: Use the information provided in the box below to apportion 90 seats to the five states shown with their respective populations in the 1830 census. The modified divisor MD selected by Webster was 49,800, and the total population was 12,860,702.

State	Population
New York	1,918,608
Pennsylvania	1,348, 233
Kentucky	687,917
Vermont	280,652
Louisiana	215,739

Assessment (10 minutes)

1. Bangladesh has two states, Dhaka and Chittagong with the population 804 and 312 (in thousands) shown in the table to the left and 41 seats in the parliament. Find the apportionments for Dhaka and Chittagong using Hamilton's method.

Code 5 (See lesson plan to understand what does Code 5 means)

Consider above problem (Problem number 1)
Suppose a third state Sylhet with a population of 228 (thousands) is added to Bangladesh with 8 additional seats. Does the new-states paradox occur using Hamilton's method? Explain.

I will collect the Booklet to grade it. I will return it to you tomorrow.

CHAPTER 2

DEFINE LEARNERS:

I.

The audience of this course are High School Students—more specifically 9th grade math students. It's very difficult to explain population characteristics—because statistics is not the best tool to apply to represent students—nevertheless I will use it because there is no better alternative: there are 27 students—among which, 15 are girls. Another aspect of characterizing my students is that I have three IEP students, each of their issues are described below (I use Pseudonyms to protect student privacy):

	Student A	Student B	Student C
Likes/dislikes	Does not like math	Likes math but lack attention	Hates both: math and reading.
Intelligent/strength	Kinesthetic	Logical	Visual learner
Communication	Linguistic (word smart)	Needs to improve math skills	Needs to improve Math and English skills.
Behavior	Interpersonal	Intrapersonal	Intrapersonal
Performance	Little above average	Little below average	Near two standard to the left

Other	N/A	Migrated to USA	Migrated to USA
Disability	Learning disability	Speech and language impairment	Math phobia

I will use a Backwards Design strategy to enrich my lesson plan. One of the good aspects of Backward Design is that it will enable me to apply useful tools such as alignment to incorporate the best-fit modalities for my respective lesson plan. There are 20 ways to teach and 20 ways to learn. Hence, I will use alignment tool to pick the best one and incorporate it into my lesson plan. I will also use every single modality (visual, auditory, kinesthetic and tactile.) because I believe in the prophecy of Howard Gardner: one size does not fit all. That is, multiple modalities stand a better chance of being remembered by students—especially students A, B and C— even after the lesson is over:

	Strategy	How would I differentiate
Lesson # 1	Backward design alignment & zone of proximal development	Stretching it
Lesson # II	Dunn and Dunn Model & zone of proximal development	Right is right and One Size does not fit all

Regarding lesson grouping: I usually try to categorize my students using normal distribution: that is, 50% of my students are on the right side of the normal curve and 50% on the left. I try to use the empirical rule (68-95-99)—to identify students that are near three standard divisions to the right and use them to help their counterparts by keeping Lev Vygotsky‘s theory, zone of proximal development, in mind, “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers”. Let’s say the topic of the lesson is the American Voting System, and let’s say Student A, who is near two standard divisions to the left, understands only 30% of my demonstration, whereas Student K, a student who is near three standard divisions to the right, understand 80% of it. Neither Student A nor K can solve the Apportionment problem alone because none of them have 100% understanding of the topic. However, when I combine them, they will be able to solve the problem quickly.

STANDARDS:

II.

I have decided to teach my student mathematical modeling in apportionment to satisfy the common core requirement. I'm a big supporter of the common core because it allows teachers to motivate more students to actively pursue a career in mathematics. Inspired by the motto of Singapore, "Teach less, learn More"—the Common Core State Standards, formulated by a team of 75 experts led by Jason Zimba has developed a consistent, clear understanding of what students are expected to learn. "These standards are designed to be robust and relevant to the real world", said Jason Zimba, "reflecting the knowledge and skills that our students need for success in college and careers". With American students become stronger in mathematical modeling, our nation will better positioned to compete successfully in the global economy.

CURRICULUM LINKS:

This lesson—"Into to Apportionment" will fit with the rest of the unit because we are simply following the New York State Regent Scope and Sequence order: Algebra, function, statistics & probability and mathematical modeling.

OBJECTIVES:

I'll engage students cognitively: By asking innovative questions, such as why is the plurality method described not the best method?

I'll use of technology: Digital learning starts with the classroom teacher. Hence, I will use video tutorials because integrating technology into a school classroom is important. I will have all the technology available for students who think a second watch of the video tutorial on a specific topic will make the subject clearer. That is, by creating video tutorials on selective topics (e.g., Voting and Apportionment)—and by making them available publicly on Youtube—I will ensure that all my students—especially Students A, B and C— have a fair chance of learning the concept.

Strategies: Like my mathematical modeling video tutorials, my classroom lessons also incorporate Howard Gardener's Multiple Intelligence Theories, including: musical, bodily-kinesthetic, spatial, interpersonal, intrapersonal and linguistic intelligences.

In my mini-lesson, I will apply Smith's nurtures views to incorporate Howard Gardner's Multiple intelligence theory—which taught me some innovative ways to help students—especially Student A, B and C— discover and tap into their unique and natural process to ensure success in learning. Multiple intelligence theory is the actually the brainchild of Adam Smith: the difference between the most dissimilar characters, between Student A, who is near two standard deviations to the left, and K who is near three standard deviations to the right—seemed to arise not so much from nature, but from nurture, and thus, this vacuum of difference between Student A & K can be resolved by using the right methods.

SCOPE & SEQUENCE

Algebra (each lesson is 80 minutes long)		
Topics	Sub-topics	Data
1	Algebra (10 lessons)	Feb 2, 2015
2	Function (10 lesson)	Feb 3, 2015
3	Statistics & probability (5 lessons)	Feb 4, 2015
4	Mathematical Modeling (2 lessons)	Feb 5, 2015

CHAPTER 3

Video tutorials links:

Video # 1 for Lesson 1	Video # 2 for Lesson 2
Go to Youtube and write the following: Mathematical Modeling : Voting System by Rashidul Bari	Go to Youtube and write the following: Mathematical Modeling : Apportionment by Rashidul Bari

Below is the Answer Key of Booklet 1 and Booklet 2:

Bibliography:

Handouts from Professors Malkevitch and Weinberg

https://www.census.gov/population/censusdata/table-16.pdf

Professor William Webb of Washington State University and funded by a National Science Foundation grant

Assessment for the Classroom by Dr. Catherine Milne

Differentiated Instructional Strategies for Science by Gregory and Hammerman

Science Content Storylines by Kathleen Roth

Is Democracy Fair? The Mathematics of Voting and Apportionment by Leslie Johnson Nielsen and Michael de Villiers

What is Backward Design by Grant Wiggins and Jay McTighe

Teaching of Science as Inquiry by Joseph Schwab

Changing Conceptions of Curriculum by Tanner and Tanner

Culturally Relevant Science Teaching by Judson Laughter

Culturally Responsive Science Teaching by Hernandez and Morales

NYS Common Core for Mathematics ||

http://www.p12.nysed.gov/ciai/common_core_standards/pdfdocs/nysp12cclsmath.pdf

NYS Scope and Sequence for Algebra 1 || http://www.p12.nysed.gov/guides/mst/partI3.pdf

The Politics of Apportionment by Peter H. Argersinger