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Equity In The Math Classroom How Math Teachers Can Achieve Equity Despite District's Budget

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EQUITY IN THE MATH CLASSROOM
HOW MATH TEACHERS CAN ACHIEVE EQUITY DESPITE DISTRICT'S BUDGET

by

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"Equity can never become a reality in education if it's viewed as charity instead of professional obligation."
Dr. Anthony Muhammad

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Introduction

Introduction

I'm sure everybody's heard this saying before "life isn't fair." Another way to put it is "things aren't always equal and just." However, sad to say, there isn't a place these two quotes couldn't ring more true than in the educational system where we continually send children in the hopes of preparing them for their adult lives. This being said, one would hope that every child is getting the same opportunity with the same resources and experiences, and their outcomes are determined only by their effort. Unfortunately, due to unequal funding, population density, and other factors, this is not the case. According to a report put out in 2020 from the Albert Shanker institute, a nonprofit organization out of Washington DC, and Rutgers University, based off of data from the 2015-2016 school year, the conclusion the authors draw after analyzing the data is that "Moreover, while there are, to be sure, laudable exceptions, the results of our models of how much states would have to spend in order to achieve national average test scores (i.e., adequacy) indicate that the vast majority of states spend only a fraction of estimated requirements, particularly among their higher-poverty district" (Baker, DiCarlo, & Weber, 2020).

Ever since schools were a thing, especially in subjects like math where to truly understand the content, manipulatives, and other resources were generally required, the disparity among math test schools and outcomes has existed between school districts with the impeccable funding, and those where the funding is lacking. These things have to do with a highly important topic in math called equity. This word sounds like equality, but

there is a very important distinction to be made. Equity refers to something being fair, whereas equality just means everybody has access to the same resources, but it does not take into account other outside factors that may make either the ability to use those resources, or the impact of those resources different.In the year 2007, a professor out of the Universidad Diego Portales in Chili, Oscar Espinoza(2007) writes, when talking about the difference between Equity and Equality that, "While 'equality' involves only a quantitative assessment, ''equity'' involves both a quantitative assessment and a subjective moral or ethical judgement that might bypass the letter of the law in the interest of the spirit of the law" (Espinoza, 2007). We must not just look at what policies or rules we implement as teachers, but the impact or in Espinoza's wording "spirit" in which they are being used.

Because math relies on calculators, counting manipulatives, figure representations, measuring, and other processes that require things outside of just brain power, equity in the math classroom is vital for every student to have a chance for success. For school districts where there's more money, and the families that have children attending those schools usually are more financially able, those students already are starting a mile ahead of districts where students come from less financially stable homes, and their schools are underfunded. Because of this I wonder*,how can math teachers help close the opportunity gap in equity for students who come from lower economic backgrounds and go to school in less funded districts?*

It doesn't seem fair that students should receive an education of lesser quality because they are sent to a school district that has less funds than some other districts. Children, regardless of location and economic standing, should be able to receive the

same level of education. By having every student receive a quality education across the board, then they will all have the same opportunities for their future endeavors. According to the OCED, the Organisation for Economic Co-operation and Development(2012), which is an intergovernmental organization with 38 member countries, founded in 1961 to stimulate economic progress and world trade, the cost of not having equity in education now will be a much higher cost in the future and is hard to remedy(OECD,2012). In the following chapter I will take you on a journey through my own experiences in both my personal student experience, and my professional experiences working in schools. I will then go on to explain more my rationale for choosing this topic and hopefully help you understand why this topic is so important to me and maybe it will find its way into a special place in your heart as well

Personal Significance

Going back as far as I can remember, math was always my favorite subject in school. Sure, I was decent enough in all my other classes, even being one of the top three readers in Kindergarten, but math is where I felt most comfortable and where the information came easiest. I think this had something to do with my mother, who after working all day, would still come home, after picking me up from my grandparents. She would then still play games that would help my math knowledge such as school and store where I'd have to figure out the right amount of change. My mother stressed how important school was that even after working all day she came home, cooked dinner, and made sure to both read and do things like this to help increase my mathematical and reading abilities.

All of this prep with my mother really helped in elementary school where my love

of math continued to grow. I went to a small private Lutheran school where the grades were combined, so 1-2 were together, 3-4 were in another room, and 5-8th were all together. Because of this our teacher would teach one subject to us first graders then move on to second and so on. I distinctly remember one time when our teacher was working with the 2nd graders on multiplication facts and she asked the kids something like “what is 4x5” and without thinking I raised my hand and answered it correctly. The look on everybody’s faces was one of shock. I didn't mean to show anybody up or be a disruption, something just came over me. I continued to do well up until that school closed in 2004, and I was forced to find a new school for my upper elementary years. Those two years, 5th and 6th grade, were spent at an even smaller private school where instead of direct instruction we worked on self paced workbooks. I still managed to understand and have a decent enough math experience, but it was not for me.

My later middle school years (7th-8th) are probably where everything went off the rails. Up until this new school I did well and was under stricter supervision by my mother to make sure I got my homework done and it was checked. When I left the self paced school for many reasons not limited to the style just wasn’t for me, I transferred to a Catholic K-8 school, where a friend of mine had gone, so we figured it would be a good fit. My self esteem, and grades took a downward spiral because I was more in charge of my own learning at home due to being almost a teenager, though with the math my mother would still occasionally check over that to be sure I was at least attempting it. When I entered 8th grade we all had to take a test to determine whether we’d be in 8th grade math, or Algebra. I barely made it into Algebra and subsequently was placed into Algebra. Sadly my habit of not really caring plus not having many friends since my only

true friend graduated the year prior, made understanding and retaining the material very difficult, though easier than it should have been because I still loved the subject. Then the one thing that you really shouldn't do, especially for math, I did and that was switch schools partway through my spring semester of my 8th grade year. The transition in schools was really challenging in my new algebra class as they had already done factoring, simplifying expressions and square roots and we hadn't touched that yet in my first school. So on top of starting a new school, new routine, I had to play catch up with my math class. Still, at the end of the year subject award assembly thing, I still got the math excellence award. My teacher loved my determination for trying to make up the deficit in math learning from switching schools, and while I know I annoyed the heck out of her with my questions, she appreciated that I would ask questions at least and I was trying to understand the new material.

As a student coming from a single parent household living on a single middle class salary going to school with students who mostly grew up in vastly different experience, I can say that I am fortunate that my mother prioritized education and made plenty of sacrificed in order to ensure I had access both at home and in school to the proper tools to understand math. One other part of my social identity that can come into play is I have a growth disability that causes my legs and arms to be significantly shorter than the average person. This made going to school challenging, especially high school where students could be incredibly cruel and rude just because one doesn't "fit in."

While the school I went to for the final quarter and change for 8th grade had a 9th grade, I decided I'd rather try and go for a real high school experience and go to a more traditional 9-12 high school with sports, homecoming, and all of those truly insignificant

things in the long run, but damn it I wanted to experience it. So I settled on another small private school in a rather well off suburb. Of course I took an entrance exam to determine what math I was to be placed in, even with my shaky experience with Algebra, I was placed into geometry. Looking back, that was dumb, as the teacher would tell my mother in a conference, she could easily tell I didn't have certain algebraic concepts down. I would continue to struggle but still enjoyed the classes I had with those teachers. It was in my precalc class though that I met my sort of role model mentor, eventual friend, who truly inspired me to go to school and become a math teacher. Whether it was his enthusiasm for the subject, his lively vigor (even though he was in his 60's), or just his personality as I couldn't point to one single thing, he was who I aspired to be in the classroom.

Because I experienced school through these different lenses as compared to most, I see things, both literally, and figuratively from a different perspective. Coming from a home with one parent, and with an understanding of how financially taxing sending me to private school was. She didn't let this get in the way of ensuring I had every tool or resource I needed to be successful. I can only imagine what a toll it takes on other kids whose parents are in the same if not worse situation and maybe don't or simply can't prioritize education because of either financial means.When this happens, the student is left going to school at a significant disadvantage compared to their peers and in the environment of tests we live in, it's hard to make up that ground. Because of these factors, and having two teachers in my high school, one was a history teacher that first sparked my interest in teaching, and then in my junior year during precalc, a math teacher who's passion just oozed out of him. He really inspired me to take my love of math,

though probably wasn't evident during my time in high school, and do as he did, pass it on to the future generation and that's what I eventually ended up going to undergrad for.

Personal Adult Experience

After high school, I went on to a private college within literally 15 minutes of said high school and was off to pursue my dreams of becoming a high school math teacher and becoming the first in my family to go to and graduate from a four year university. My first two years at college were nothing short of sub par. I apparently wasn't able to tell myself "hey sit down and do work." So after my spring semester, I ended up switching from 5-12 math, to K-6 with a 5-8 math endorsement. However, I would end up graduating with no license and a hobbled together degree in "child development" because I wasn't made to teach the younger kids, and it was only through my screw ups was I forced to take that diverted major path.

Professional Significance

My first job following graduation from my undergrad was being an Advancement Via Individual Determination (AVID) tutor. AVID is a college preparatory elective course that, depending on the school district, that goes from elementary all the way through high school and they offer study strategies, note taking techniques, organizational strategies such as using a planner and a 3 ring binder, holding tutorials, where students get in groups and one presents a problem and the others in said group ask questions to help the student figure out their sticking point, as well as other things that help the students in AVID become better students. The students that typically are in AVID come from families where they are to be the first to go to college and just need some extra help to get there. AVID focuses on note tak During AVID secondary (9-12), students do a lot of stuff

related to their college preparation such as go on tours, work on their college application, work on the FAFSA, make a road map that maps out their future plans, explore different colleges including Community colleges and technical schools.

My first AVID tutor position was in a less economically advantageous school district than I was used to and boy did they open my eyes to a lot of the things I missed going to private schools most of my school life. Some examples are, not every student had their own calculator, their own loose leaf paper pencils, and other basic supplies, a lot of the students had jobs after school, and just things I had taken for granted being in private schools my entire life.

While I was an AVID tutor and helped with all subjects, I was drawn towards the math kids that needed help because I knew the most math out of any of the other tutors so I became the go to math guy. While I was working with them a fire was lit inside me and I knew I had to go back to school to realize my dream of being a 5-12 math teacher. So I started on my journey to get an M.A.T in Secondary Math Education at Hamline University while gaining vital experience working with kids at this high school. The semester I officially started at Hamline, I took a different AVID tutoring job at a district within 10minutes of my first district, due to more hours and better pay, and I saw a lot of the same economic hardships at this district that I did in the first district that I worked at. Compared to my first district, this school seemed to have more supplies for the students to use in class, like more calculators, more just resources. Seeing this really made me wonder how can students like this expect to compete with students in districts with better funding?

When we went distant due to the COVID-19 Pandemic, I got the chance to pop

into some math classes to help kids other than my AVID students. This also gave me chances to pick the brains of other math teachers as I was working my way through the Hamline coursework in preparation for obtaining my teaching license. Through this experience I met people who I still talk to and who are still there to offer advice and help as I continue my career.

Coming from a high school where students had their own cars and thousand dollar clothes, to a school where the basic school supplies were lacking to some of the families, and some even experienced homelisness, really made me realize how vital it is for every student to get the support and access they need. For teachers who teach in lower funded districts, and/or have students that come from families where they may not be able to provide the tools needed to be successful in math, there needs to be access to materials and resources to help balance the equity. Because when these students go off to college and apply for jobs, they will be competing against students who were in much better funded districts with access to more tools and better resources.

Rationale

When I went to school, I was always with kids whose families were far more well off money wise than my own. Most of my peers had both parents living together, I lived with my single mother and occasionally visited with my dad. Most families had enough money to send their kids to private school and still be able to afford other luxuries like cars for their kids at 16, or fancy clothing and shoes. My mother sacrificed a lot to ensure I was given a proper education in a safe environment away from bullying and physical violence. So I never had my own car at 16 or the fanciest clothes as my peers did, but because my mother sacrificed, I was still able to get the same level of education and have

the needed tools such as expensive calculators.

While I was never beaten up or robbed of lunch money, I did experience bullying, though maybe less than if I had gone to a bigger public school, just due to the numbers game, less kids, less bullies. When I started working with the two districts I mentioned above, I was shocked to see just how much of a difference there was, not only in some of the equipment in the rooms, but just in what the kids actually had and could bring to school. When I was in school, we all had our own calculators and it was rare to have the teacher being asked for one to borrow, most of the time it was because of batteries dying or something silly like that.

In the two other districts I ended up working in, I don't even think I could count on both my hands, over those four years, the number of kids that owned their own graphing or scientific calculator. The need for other supplies too by students shocked and amazed me too, simple things like a pencil, or extra paper. At my high school this never happened or if it did it was rare someone didn't have a pencil or paper. Then another thing that sort of blew me away, was that these kids couldn't just go home and do homework, or go to practice and then go home, a lot of them had jobs after school, so for them getting homework done was an extra hop skip and a jump compared to the families I went to school with.

Based on all of these comparisons and just thinking how some districts in for example, Minnesota, are way better funded, and have families who are much better off, financially, compared to districts where families are struggling to provide the basic necessities students need to be successful such as something as simple as time to do the homework that's given. The American dream was if you worked hard, anybody could do

and achieve anything they wanted. Now, on paper that may be true, but when you have children starting out practically a mile ahead because of their family's status, wealth, and better school district, how is that fair or equitable to those who aren't as privileged to be born into that same family lifestyle? What's even more troubling, is that, according to Andy Porter(n,d) over at Penn State's GSE, Graduate School of Education, before students are even in school, there's already a standard deviation sized gap in the achievement gap between children of color and white students (Porter, n.d).

I would love to delve deep and discover some ways to help teachers who teach in less economically advantageous school districts, and make that information available to them on some type of website. I'd also like to make resources for kids as well to help them to aid in what the teacher is doing. While doing this research and developing this project I intend to find out what other professionals are doing, how they are doing it, look at some basic differences in schools with higher funding and lower funding, and then develop some strategies using some free resources found online, to help bridge the gap so students living with a single parent in a rent controlled apartment, can have the same education is a child living in a half a million dollar home with two parents and their own car going to a district whose funding triples that of the former student.

Conclusion

Thinking back on my K-12 education experience, I never really knew just how fortunate I was in my educational upbringing until I saw first hand what some students had to go through. I always knew I was lucky, obviously in some ways more than others, but for the most part lucky, but it hits home a lot differently when you come face to face with these kids and with the fact that there's a good chance, unless some incredible

intervention or extremely hard work is done by the teacher and kid, that these kids' limit is much lower than those I went to school with. It really makes me wonder if we're not creating or participating in an educational system where we are creating America's own version of the caste system found in India.

It makes me sad thinking that not only is this happening to this extent within my own state, but in other states it could be much worse, the divide between the have and the have nots and that in some cases, this divide is based on skintone or their parents' own access to education. Schools should be a place where when students walk in, they should be given the same chance, same tools, same resources, and same opportunity to learn regardless of which district, whether it be rural or urban, and which state in the country they are born into or end up going to school in.

We as a society owe it to these students to help them get a proper education and be able to compete with the students from private and more wealthier districts. We can think of society as one big interconnected chain and like Thomas Reid said, "a chain is only as strong as its weakest link" (Reid & Brody, 1969). Everybody in society must be built up and strong. Through equal education and equity, this can be achieved.

With all the data, technology, and resources we have at our disposal, it's more critical now than ever to tackle this great issue of equity disparity in our school districts to ensure students have the best fighting chance possible to be successful adults. I've seen both sides of the same coin, students that come from well off families, come to adequately funded rooms where all their needs are met to succeed, and students who have to work, aren't prepared materialistically for math, and who end up struggling compared to those other students. It shouldn't matter where a student is coming from to determine

where they are going, it should only matter the effort and work they put in.

In the following chapter we will look at some literature that pertains to this topic such as (Porter, n.d) and Riser-Kositsky, 2022. and others that go hand and hand such as achievement gap (Ladson-Billings,2006) school funding (Skinner, 2019), and relevance to equity (Bellan, 2019).Then, in chapter three, we'll look at an overview of the project I plan on doing to help combat this disparity, why I chose this topic, and how I feel it will impact the world of education. Finally, in chapter four, I will wrap up my experience doing this project in my final chapter which will go over what I learned by doing this, some implications in projects and studies having to do with equity, limitations as to the impact teachers can have, and then how I plan to go forward and my future impact with this topic.

Chapter Two

Literature Review

Introduction

Ever since the Emancipation Proclamation that President Abreham Lincoln gave on January 1st 1863 declaring that “that all persons held as slaves" within the rebellious states "are, and henceforward shall be free” and the end of the civil war, the country has been slowing trying to figure out a way for both POC (person, or people of color) and white children to be educated (National Archieves, 2022). Ever since then, this country has come a long way, however, there are still some noticeable differences between the education of POC and white children. That’s why the topic of my capstone is equity and my question that I am going to be developing a project to help answer, or attempt to answer is: *how can math teachers help close the opportunity gap in equity for students who come from lower economic backgrounds and go to school in less funded districts?*

In order to answer this question, or to be frank, fully understand what the question is asking, some subtopics need to be explored more before a solid approach can be taken to help reduce the achievement gap caused by lack of equity. For example, to talk about the achievement gap, it would behoove us to know what the achievement gap is, some backstory on how it has grown, and where it's most prevalent. Another factor that could impact equity is the amount of parental involvement or lack thereof. Efficacy can also play a huge role in how teachers foster learning in their classroom and work to narrow the achievement gap. To understand the achievement gap, the opportunity gap needs to be looked at as well because that is what eventually leads to the achievement gap. Finally

once those topics have been flushed out and a firm understanding of the issue at hand is achieved, how to be able to work to fix said issues will be a vital part of the research

Next this chapter will include the research based foundation for the subtopics mentioned above. By looking into them and building a foundation of understanding surrounding those subtopics, finding resources and ways to help close the achievement gap through making education more equitous can be done much more precisely and coming from a more research based approach. Different types of funding models, different types of schools, the different levels of funding, and how districts have figured out a way to get more money than they are entitled to based on how laws are worded will also be explored. By exploring all of these different topics, a firm understanding of the root of the equity problem can be understood more thoroughly, and by gaining that new understanding, a solution can be developed in order to help combat the problem.

History of Stereotype Threat / History of Limiting Factors to Access in Education

In order to be able to get to the heart of the problem at hand, it first will be beneficial to look at the history of stereotype threats and other limiting factors for POC's access to education. By doing this, it will make developing a plan to help fix the problem a lot easier. The achievement gap, which has been pervasive as long as public schools have been educating both POC, people of color, and white students. Another topic that follows neatly right along with the achievement gap, is the opportunity gap, nature vs nurture, different types of schools, and the different types of areas in which schools are built.

When a word like gap comes up there's a lot of different images that may appear, a gap in a road, a gap in teeth, a gap between a bed and the wall, maybe even the store,

the Gap. In all of these instances a gap can mostly be thought of as a space between two things. The achievement gap can be thought of as the gap between two different people or groups in their achievement. Educational researcher and author Gloria Ladson-Billings says that “the achievement gap” is one of the most common phrases in today’s education literature. It is invoked by people on both ends of the political spectrum and its meaning has become so universal that few actually argue over its meaning or its importance (Ladson-Billings, 2006). According to the National Governors Association the achievement gap is “a matter of race and class” (Ladson-BIllings, 2006). The National Governors Association goes on to say that currently this (the achievement gap) is one of the most pressing education-policy challenges that the states are facing (Ladson-Billings, 2006).

The achievement gap has been around since the beginning of time, as noted above, however when do students start feeling the effect within their lives? Well according to Andy Porter(n.d), students don’t even need to be in school for an achievement gap to start appearing between whites and POC, people of color, students(Porter, n.d). By the time students are even three or four years old, a full standard deviation can be measured between the achievement gap in whites and minority children (Porter, n.d).

What is standard deviation exactly? The term is used in social sciences such as psychology and sociology, mathematics, specifically statistics, and education when talking about test scores and achievement gaps. What the standard deviation measures is how dispersed or spaced out the values are. If the value of the standard deviation of a particular study or research project is low, that means that more than half or most of the

data points are around the mean or average. In the context of the data from the NAEP, the gap of one standard deviation is enormous. Take a kid who's right around the 50% mark, if you moved them up one standard deviation, they would be measuring closer to the 84th percentile (Porter, n,d). Now any teacher would be delighted to see such a growth in a student, however to see this huge gap has developed just based on something like race or ethnicity is disconcerting and disheartening. Basically, a one standard deviation shift in any direction, up or down, is very significant, and when one group of students performs one standard deviation away from another, either better in the case of the white students, or worse in the case of POC, there's a problem.

What's even more shocking, is that the gap doesn't increase while students are in school, but rather when students go off for their summertime break. Both white and POC students experience the same amount of achievement growth during the school year. The big difference can be found during summer vacations. While both white students and POC students experience some level of decrease due to not being in school, POC students experience a higher decrease than white students (Porter, n.d).

Something else that has been changing as far as the achievement gap over the years and that most likely will be changing as the shift in focus from comparing white students to minority students, to comparing students based on their socio-economic status continues. Right now, the Census allows reporting of multiple ethnicities, for example being mixed, or both white and black, makes it hard to accurately report (Porter, n.d).

One big topic that has permeated many educational discussions is whether the standardized test accurately tests what students know, or it's more geared towards testing one's ability to test. As far as showing any biases between races, there has not been any

conclusive proof found by any researchers to indicate any bias (Porter n.d). Some in the community have theorized that instead of administering multiple choice bubble tests, giving students performance assessments to really allow students to show their learning, would decrease the achievement gap. However, the opposite seems to be true. Whereas on a multiple choice assessment there seems to be a 1 standard deviation gap, on a performance assessment the gap jumps to 1.2 standard deviations. (Porter n.d). Porter's theory about this is that minority students, on average, aren't receiving the schooling required for them to do well on the performance assessments vs their white counterparts (Porter, n.d).

What are some of the consequences of a gap like this existing? There isn't a lot of data available from prior to 1970, however we can look at some more recent data. We can start by looking at data from the 1970-1990s from the National Assessment of Education Progress (NAEP), which is a probability sampling, where the data is grouped by age rather than grade. It can be noted that by looking at reading performance in nine year olds from 71-99, The achievement gap does narrow a bit early on, but then stabilizes back to where it was beforehand. Looking at the subjects of science and mathematics, the results are very similar (Porter, n.d).

Bottom line, there has been progress made but obviously there's still a long way to go overall. Not to say that there aren't pockets in America that have done better than others. For example in Maine, the achievement gap is much smaller at a third of a standard deviation, compared with places such as Wisconsin and Connecticut where the achievement gap in both of those states is over one standard deviation (Porter, n.d).

The topic of national debt and the national deficit are usually hotly debated during election times, both of which involve how much money the country has and how much it has spent and currently owes to other countries. Both sides of the political spectrum have opinions on this, mostly disagreeing which causes there to be two main political ideologies. Gloria Ladson-Billings uses this metaphor to look at effects of having an achievement gap, an educational debt, which is considered forgone schooling resources that schools should have or could have been investing in low income kids, which an educational deficit can lead to a variety of social problems, crime, low wages, low productivity, smaller labor force, which then requires on-going public resources. These are the exact same resources that could have been directed earlier to schools to help reduce the educational debt and deficit and help stop these problems from happening in the first place and also narrow the achievement debt, or gap (Ladson-Billings, 2006).

So what exactly has caused such an achievement gap between POC, person of color, and white children? Well to answer that, we need to take a look at another type of gap, and it was created by our own country's less than pristine history of treatment towards POC and minorities. This gap is more properly known as the opportunity gap. Whereas the achievement gap is based on gaps between two groups of students' test scores, the opportunity gap or gaps are gaps that are formed when one group of people, mostly white and wealthy families, have access to resources and schooling that lower socioeconomic students or poc students don't have access to. Alot of these gaps are consequences of things like Plessy V Ferguson, Jim Crow, slavery, and other forms of discrimination that have impacted black idenity and success (Milner, 2019).

Unfortunately right now, schools, even at their best, are focused on test prep. It cannot become a truly transformative school that black and other POC students need and deserve (Milner, 2019). What differentiates a transformative school from a traditional school is instead of focusing on fitting black students into the current educational and social system, they work towards giving black students less schooling and more education (Millner, 2019). What's wrong with schooling? Well, school is a process intended to perpetuate and maintain the society's existing power relations and the institutional structures that support those arrangements. Because of the country's troubled history, these structures can be detrimental to POC students.

One thing that tends to underpin these types of discussions, is the conflict between nature and nurture. To better understand what exactly nature and nurture is in this context, we turn to Saul McLeod over at Simple Psychology to help us define these terms. According to Mcleod(2018), nature refers to things such as how our genetics and biology affect us (McLeod, 2018). For example, our eye color, hair color, are examples of influences of nature. Nurture on the other hand has more to do with the environment children are raised in, people children are around, experiences children go through, and things children see happen (McLeod, 2018).

Richard Nisbitt, an American social psychologist and writer, says that according to all the studies that have been published, there is no indication that there's a genetic component to any IQ, intelligence quotient, superiority in whites vs minorities, but rather evidence point to more of environmental factors that cause the achievement gap (Porter, n.d). Bottom line, it seems that it is not the ability to learn that's the root of the

achievement gap, but the opportunity and or access to learning that's created a disparity in learning between minority and white students.

Why is this important? Well, how important is it that everybody receives a fair and equal opportunity at education? America is supposedly the greatest country in the world, and continually touts that everybody has the same opportunity and anybody can succeed if they try. This is made evident by a quote from the junior senator from Utah, and former Republican presidential candidate Mitt Romney (2012) "We still believe in the America that is a land of opportunity and a beacon of freedom. We believe in the America that challenges each of us to be better and bigger than ourselves" (Romney, 2012). However, judging by so many discrepancies in educational gains and opportunities for minority children vs white children, it's apparent and easy to say that the America Mitt Romney is talking about and believes in only exists in theory and in dreams.

Context of Focus: District Resources (How have limiting factors manifested in district funding?)

There's an old song from an old movie called Pete's Dragon. The song is about how the antagonists of the film were going to steal Pete's dragon and sell it for parts and they'd be raking in the money. Whether the population likes to believe it to be true or not, money does make things happen and unless America plans to go back to the barter system of yesteryear, money is needed. Running a school costs money and it isn't cheap. Money to pay teachers, buy supplies, pay staff, keep the building or buildings up and running with heat, air electricity, water, pay for athletics and extracurriculars, and more. According to Melanie Hanson over at Education data initiative, currently, the US spends roughly $586.4 billion or *$14,455* per pupil annually between federal, state and local

governments. (Hanson, 2022). Let's simplify the math so it's easier to grasp and understand. For example, if there exists a school with 100 students, that school would roughly cost $1,445,500 to run per year. Currently the average school size is roughly around 500 (512) so if the average number spent per pupil is then multiplied that by 512 then it ends up costing roughly $7,400,960 to run the average school. Clearly there is a need for money when the topic is education.

Public Schools

Schools typically come in two flavors or types public and private and each have different subtypes. For example, when it comes to public schools, you have magnet schools, charter schools, and virtual schools (Grand Canyon University, 2021). Lately, because of the COVID-19 pandemic, virtual learning has become more and more necessary so schools that are strictly virtual learning, like K12 and Connections Academy are becoming more and more popular. Public school districts have also begun offering a virtual academy to help meet the needs of all different types of learners. Charter schools are still public schools, funded by the government, but were formed by parents, organizations, or individuals who decide there's a need for a school that can offer something the local public school either can't, won't or does, but not in a way desired (Grand Canyon University, 2021). What this person or people will end up doing is writing a charter, hence the name, and they submit it to the state to get it approved. As stated above these charters tend to focus on things that set them apart from local public schools. For example, focusing on STEM (science, technology, engineering, mathematics) the arts, project based learning, a student centered teaching method in which students learn by actively engaging in real-world and personally meaningful

projects (Buck Institute for Education, n.d) or college prep (Grand Canyon University, 2021).

Private Schools

Private schools however, are not funded by the government, but instead the families of students in attendance pay an attendance fee, or tuition. Since they are not funded by the government, private schools tend to have more control over what they teach, what classes they offer, and whether those subjects are taught through the lens of a specific faith or religion, and how much or how little they want to charge for tuition (Grand Canyon University, 2021). Because their funding doesn't come from local taxes or federal and state grants, usually private schools tend to have less funding in comparison to public schools, but have a smaller student body to which disperse those funds across.

Like public schools, there are different types of private schools. A lot of schools are private and are chosen because their students' families want them to be taught through the lens of a particular faith. Those schools are called religious private schools and typically are associated with a faction of a specific religion and sometimes even have a church directly attached to the school to help drive in more students. They also tend to use their religious teachings to guide everything from teaching to even discipline. Which means they tend to follow religious policies as well as non religious policies (Grand Canyon University, 2021). The next type of private school is what is classified as independent, which means they are not associated with a religion, but they still want to be in control of what they teach and how they teach it (Grand Canyon University 2021).

Next you have what are known as boarding schools, where students live on campus while they attend classes, and because they all live together, these types of schools help build a stronger community within the student body. They may specialize in specific areas such as nature or other overarching topics (Grand Canyon University 2021) The final two types of private schools are Special education schools and language immersion schools. Both of these schools offer something that can be found in a lot of public schools, but instead of it being a part of the curriculum, these special private schools make it part of their whole curriculum. In the Special Education schools, students are given more individual attention, there's professionals on staff that are more familiar with accommodations, treatments and therapies, and teachers are more so there to assess children's skill and learning requirements and they determine how best to deliver those needs (Grand Canyon University, 2021).

Homeschools

Aside from the public and private schools, some families decide to homeschool their students. In these schools funding isn't an issue because it's only them and their family. Families who decide that this is the best for their kid, either are not satisfied with local schools, may live too far away from the closest school making it challenging to commute to and from every day, then there's students who are involved with their family in different types of work like farming and such so they can't attend schools on a regular basis (Grand Canyon University, 2021) For families who feel like homeschooling is right for their kid, they need to request permission from the state to homeschool their child, and if approved they can either follow an already developed curriculum or develop their own. The teacher of record typically is a parent or other guardian and member of the

family unless they've chosen to hire an educational aid. (Grand Canyon University, 2021)

Funding Model

For the topic of funding and equity, public schools are generally where people's minds go since their funding tends to be greater and more students are affected because in general private schools are smaller than public schools. When talking about funding and public schools, it's important to look at the three different categories of public schools based on where they are located in relation to a major city. Picture a map with a major city dead in the center, now draw a circle around it encompassing the city limits. Any schools that are within this circle would be known as city schools, the next ring out while still somewhat connected to said city but are in their own city are called suburbs, further out are what are known as town schools and then any schools that are beyond this, but don't cross into another major city or suburb or town are known as rural schools (Riser-Kositsky, 2022). Another term used for city and even suburban schools is urban, and rural sometimes covers both rural and town. Based on the research done by Maya Riser-Kositsky even though cities tend to have higher populations than suburbs, more students attend suburban schools vs city schools, but not much more. As of 2018, suburban students made up 39.6% whereas students in city schools make up only 30.3% of public school students. (Riser-Kositsky, 2022). One must wonder, if more people tend to live in cities (31% of the population lives in urban, or city cores compared with 25% of people living in the suburbs), why are more students attending school in the suburbs as opposed to the city (Fry,2020)?

Wait, what exactly is a suburb? According to the Merriam Webster dictionary, a

suburb is an outlying part of a city or town, or a smaller community adjacent to or within commuting distance of a city. (Webster, n.d). So in other words, the first ring of smaller cities, towns or communities right outside a major metro area. To figure out why students are commuting out to suburbs for schooling instead of attending school closer to their home, it's important to remember how schools are funded. Public schools are funded from all three levels of government, federal, state, and local (city or town).

Federal Government: The Federal government contributes roughly 10% of the overall funding and this is through Title I, which provides financial assistance to local education agencies and schools with a high population of students from low income families to help balance the equity caused by lack of family funds (Skinner, 2019). The specific percentages vary from state to state and they ranged from 4.2% in the state of New Jersey all the way up to 14.7% in the state of Mississippi. These percentages averaged out to the federal government contributing 8.3% of all the states' educational funds plus DC, the District of Columbia (Skinner, 2019).

State Government: The next level of government to help contribute money to help fund public education would be the state level. Its share of a district's overall funding can range from 0% in the District of Columbia to a whopping 90% in both Hawaii and Vermont (Skinner, 2019). Funds garnered at the state level are raised from a plethora of sources, including corporate and personal income taxes, sales tax, excise tax (a tax levied on the manufacture, sale, or consumption of a commodity) such as those on tobacco and alcohol, plus lotteries in some states (Skinner, 2019). These funds get distributed to local educational agencies, or LEAs for short, and they in-turn distribute the funds to the schools. The five types of LEAs are Foundation Programs, Full State

Funding Programs, Flat Grants, District Power Equalizing, and Categorical Grants (Skinner, 2019). In most cases, states often have elements of two or more of these programs in their school financial policies (Skinner, 2019).

Ultimately, the big goal of all these different school finance programs is to provide some sort of equalization of spending and resources and or local ability to raise funds for public elementary and secondary education across all of the LEA's in the state. The problem that gets run into is what exactly does equal mean? It would be reasonable to assume that equal means equal per pupil. However, both equal and per pupil may vary widely (Skinner, 2019). Factors like local willingness to pay for public education, difference in costs of educating the different types of high need students, or differences in cost, based simply on where the district is located to provide certain education services (Skinner, 2019). These LEAs do try to account for high need pupils, which include students with disabilities, students from low income families, that live in a high concentration of poverty, with limited proficiency in the English language, or living in sparsely populated areas, or rural areas (Skinner, 2019).

Regardless of how the program adjusts for the distribution of different types of pupils, there are really two different ways that these programs can go about deciding how to distribute their funds. One way is by a certain amount of money "per pupil", whatever they take that to mean. The other way, though less common, is trying to make the amount of funds per pupil that each LEA could raise per unit of local tax rate. This method, rather than the equalization of funds per student, equalizes the locals' ability to raise revenues. Thus, the latter method gives everybody an equal chance to raise the most money.

Local Government: The final layer of funding schools receive is local funding. The percentage of a school district's funding from the local government varies just like with the state and federal government's funding. These percentages can range from 1.9% in the state of Hawaii to 90.1% in the District of Columbia. Recall that the District of Columbia does not garner any state revenue since it's not a state, so all of its funding comes from either local government revenue or the small percentage of funding from the Federal government given for explicit use for Title I. (Skinner, 2019). Local funds are generated through things like property taxes, sales taxes, individual and corporate income taxes, and some miscellaneous taxes as well. The majority contributor is property taxes, which make up 72% of local government tax revenue (Skinner, 2019).

What are property taxes exactly? Well, property taxes are taxes that are assessed on things like property, both residential and commercial, sometimes even boats and vehicles. How much property tax a person ends up paying is dependent on the value of the property being assessed. Each city imposes its own set percentage, so for example, a house costing 300k in one city would garner one value of property tax and in a totally different city, a house valued at the same might have a lower or higher property tax depending on local ordinances.

Relevance to Equity

Alright, that was a great lesson on school funding 101, now what does all of this have to do with equity and ensuring students, regardless of where they are enrolled in school, receive an "equal" education? A quick recap on the different revenue streams of funding for public schools.. Roughly 10% is from the federal government and used specifically for Title II use, then, depending on the state, roughly 40% comes from the

state and is distributed to different LEAs to then be distributed to schools. The final roughly 50% comes from local government taxes. Based on this model, it appears that half of the funding gets distributed somewhat equally regardless of where a school is located within a state. For example, take a kid in rural Sleepy Eye, MN, who receives roughly the same piece of the pie as someone in urban Minneapolis, MN.

In thirty-four states, however, the state government, under the theory that some fixed costs in schools are the same regardless of the number of students, ends up providing extra funds to smaller and more sparsely populated school districts to help these rural remote schools and their districts help manage the diseconomies of scale (Bellan, 2019). So, if a school is smaller and thus has less resources, theoretically, the state will pitch in to help with costs that are unavoidable regardless of enrollment. Unfortunately, that's not always what ends up happening. According to Rebecca Sibilia, CEO of Edbuild, the company who did the study where these numbers are from, what happens is wealthier districts will draw their district boundaries smaller around themselves so they can petition the state and receive that bonus that's supposed to be for small and sparsely populated school districts, while only being small (Bellan, 2019). Why this can even happen is that a lot of the formulas states use to determine which school districts should receive the extra funding rarely look at the word "sparsely" and end up just looking at districts that are "small" in area. What this ends up creating are very wealthy enclaves that already have a lot of money due to their wealth, getting extra money from the state because of their size, but don't necessarily have the diseconomies of scale (Bellan, 2019).

Now, let's talk about local government district funding. Since these come from local taxes such as property taxes, sales tax and individual taxes of those who live in said local area such as city, or county, these can differ greatly. According to the National Association of Home Builders, when taking someone who lives in a state with the highest property tax levied, New Jersey who pay an average of $8,485 a year in real estate taxes and comparing them to someone who lives in the state with the lowest property tax levied, Alabama, who pay an average of $678 in real estate taxes per year (Logan, 2019). That comes out to be just about $8,000 a year difference of property tax that can be used in New Jersey more than schools in Alabama. Already just talking on a state level, there appears to be a huge difference in the average tax levied. That means there's that big of a difference at how much schools in those respectful states get funding. When taking into account the fact that urban, or city-centered, districts receive on average around $2,100 less funding per pupil vs their suburban counterparts and a staggering $4,000 less per pupil than students in rural remote districts, it's no surprise that even though more students live in urban areas, more students tend to migrate out to suburban schools (Bellan, 2019).

Looking at school districts that serve mostly students of color compared with districts that serve a predominantly white student body, there is a huge disparity in the amount of students these districts serve. Districts who serve mostly POCs serve on average about 10,500 students, which is about three times the national average (Bellan, 2019). Compare that with districts who primarily enroll white students, serve on average 1,500 students, which is roughly half of the national average if the math is correct (Bellan, 2019). As for districts who serve high poverty white students, they are

predominantly rural and average an even smaller number of students per district (Bellan, 2019). What ends up happening because of this is it forms a situation where 57% of nonwhite students end up being enrolled in city districts, but for poor nonwhite kids, or poor students of color, that number climbs up to 66%. What this means is a majority of low-income students of color residing and attending school in overpopulated and underfunded school districts (Bellan, 2019). Obviously a district that has a high level of poverty will have less local funding opportunities as property values will be lower thus causing property taxes levied will be lower. On the other hand, properties in wealthier, or higher income districts cost more, thus they can have higher property taxes levied on them thus collecting more revenue for the district (Bellan, 2019). What also tends to happen is that since these properties cost more, they generally attract people with higher incomes who can afford to not only pay the high purchase price, but also the higher property tax. Which also means their personal taxed income is more, thus even more funding directed towards the local district. One great example of this, but for sure not the only example that can be looked at, is in Texas, specifically the South San Antonio school district and the Doss school district. Now first, the student population of the Doss school district area is around 12 students who come from middle class or wealthy families whereas the student population of the South San Antonio Independent School District area is roughly 50,000 and is primarily made up of students of color and has a 28% poverty ratin.. Now, let's look at funding per student in these districts. Doss receives $16,749 per student from the state (whereas the "fixed" state funding per student is $5,140) and another $31,848 from local funding. Adding those together, Doss Schools get around $48,597 per student (Bellan, 2019). Compare that with the South San Antonio

School district, which receives $6,264 from the state per student and around $2,209 from local funding. Adding those two together and San Antonio receives around $8,473 of funding per student (Bellan, 2019).

To sum up, from the looks of things, nonwhite and poorer students end up drastically receiving less state and local funding for their school districts based on some perceived notion that almost half the country thinks that smaller school districts lack the funding to help manage fixed costs so end up throwing more money their way, which these districts typically are comprised of wealthy and mostly white students. Districts draw their boundaries as small as possible to give the appearance of being a smaller district thus prompting the state to give them extra funding regardless of if they are a sparsely populated district or not.

How have limiting factors manifested in the math classroom?

Tangible Materials and Supplies+Barriers to Students Having Access to Them

What sort of implications do these funding limitations have on math classrooms? What are some other implications of not having a properly funded math classroom outside of just being able to do math? Some impacts can be made on students in the math classroom that either could have changed their perception on their skill in math, changed their view of the subject itself, or just generally changed their overall attitude in regards to learning math.

What would one typically find in a math classroom? There needs to be a class set of the required textbook, given the class average is around 25 plus a teacher's copy, generally will stock around 30 books. Some resources to consider would be a class set of calculators, handheld whiteboards, markers, erasers for said whiteboards or even paper

towels, pencils, erasers, compasses, protractors, paper, possibly some colored pencils, and even some graph paper. As far as things that you don't necessarily need a "class set" of but would be beneficial is a smartboard, or even a projector, some math manipulatives such as connect blocks, pattern tiles, some meter or yard sticks, big poster paper, a whiteboard style compass, then let's not forget all the fun posters of different formulas, figures, and other math related artwork. Now shocker, but all of these things cost money and for school districts that are less funded, such as city districts with a higher poverty and student of color population, some of the more expensive and "nicer but not necessary" items on this list will need to be forgone entirely, or replaced with a cheaper alternative. One example is instead of having a projector or smart boards, some districts may still rely on old overhead projectors and use transparencies. According to research done by the American multinational technology company, UKG, after surveying 200 central office administrators in K-12 public schools, they found that 63% of the administrators say they lost teachers to other districts because of a more "cutting edge" technology experience (Mullen,2021).

Web-based Resources

There's another huge set of resources that exist on the world wide web for students to be able to manipulate math and be able to explore concepts in ways that can't be done with regular pencil and paper. These require each student to have access to a computer or some other device such as an Ipad or other type of tablet. Now, the one good thing that could be said came out of the COVID-19 pandemic is the fact that it created this sort of mad rush, without regard to budgeting concerns, for schools to become a 1 to 1 school, which means each student either has a laptop or access to a laptop to take home

and use in class. The reason for this mad rush is students were being sent home in hopes of containing the virus and preventing more exposures and keeping our youth, and their subsequent families, which may contain elderly or immunocompromised people that are at a much higher risk from death due to COVID-19. According to a survey done by the EdWeek Research Center back in March of 2021 found that ⅔ or 66% of middle and high schools recalled that they had 1 school issued device for every student, with only 42% of Elementary schools reporting the same thing (Klein, 2021). In that same survey it asked currently how many schools are 1-1 and the numbers report 90% of middle and high schools have one device for every student and 84% of elementary educators said the same for their students (Klein, 2021).

The big thing to take note of here is that this became not a purchase of want or desire, but a purchase of need. These educators had their backs up against the wall and faced an undetermined amount of time where their students would be at home and many without access to a device, let alone internet. Something that helped these schools were the one time federal funds that the government distributed to districts during this great pandemic. The result of this is now 90% of middle and secondary and 84% of elementary schools have 1-1 devices. Once those one time funds have dried up, or been used and the country can go back to a place of normalcy, the question arises how are school districts going to keep their status as 1-1 schools going? According to EdWeek a lot of the schools that ended up purchasing these devices had no intention of remaining a 1 to 1 school, so going forward they will need to figure out if they are to continue it and I'm sure that will have a lot to do with budgeting and funding concerns (Klein, 2021).

Barriers to Student Engagement

The subject of math, as well as other STEM fields (Science Technology Engineering and Mathematics), has had a tough time getting females interested in the subject matter. Several decades ago, during the twenty year period between 1970-1990, there was a noted disparity between women and men and certains metrics of concern in the mathematics educational community. For example, completion of high school math courses, and obtaining bachelor degrees in the study of mathematics (Lubienski, 2020). Lately however the disparities have ultimately narrowed according to research. Because of this, the focus on gender has received less attention at the turn of the century vs. back in the 1970s (Lubienski, 2020).

Work in fields such as psychology and sociology is being done to continue to look at the whole disparity in gender gaps in math fields. Now according to some other key metrics the progress towards gender equality in math has stalled. Some reasons to believe this to have happened are the facts that at least in the US, there still is a gender disparity in scores in k-12 schools that favors boys who end up being over represented in the top percentiles of the math achievement distribution (Lubineski, 2020). What's fascinating though is the gap in performance is viewed relatively small when compared to the gap in confidence between boys and girls when it comes to mathematics both in the US and even worldwide (Lubienski, 2020).

The gender disparity isn't only limited to K-12 schools as it seems to persist beyond and into the collegiate and professional world where not only are there less women in fields of mathematics, but since the turn of the century there's even seem to have been a regression in women's representation (Lubienski, 2020). What's interesting

is that according to the Pew Research Center, there's a growing gender gap in higher education, both in simple enrollment and completion. Women are more likely not only to enroll in college, but also to complete their four year degree (Parker, 2021). Up until about 2010 it was the exact opposite for adults 25 and older as men had been finishing college at a higher percentage. Currently, as of 2021, 39% of women adults hold a college degree whereas 37% of men within the same age range hold a college degree (Parker, 2021). Now, despite these numbers overall concerning obtaining a college degree, when it comes to STEM degrees, there's a different story to tell. Back in 1997 the percentage of Bachelor's degrees in mathematics earned by women was 46% and today it's closer to 42% (Lubienski, 2020). Looking at degrees higher than the bachelors, women end up earning less than 29% of doctoral degrees in mathematics (Lubienski, 2020).

Some results from women obtaining less degrees in mathematics are for example, the median salary for women who are college graduates and employed full time is 74% of the median salary of men with a similar education level (Lubienski, 2020). One interesting thing to note too is that according to Business Insider, college graduates who earned a degree in a STEM field earned on average 65,000 overall, with those specifically in math earning around $50,400, while those who earned a non-STEM major earned around $15,000 less a year (Jacobs, 2014). Those in STEM fields were also more likely to hold one full time job in comparison to holding a part time job or multiple jobs (Jacobs, 2021). This can have to do with the fact that those in the STEM field make more and don't have to worry so much about making ends meet and the job market for STEM is expanding at a rapid pace.

So, why is this happening? What factors are happening in girls' and young womens' K-12 education that is causing them to steer clear of STEM and more specifically, the math field? There are many factors, according to the AAUW, American Association of University Women, that they have determined play a key role in deterring women away from math and other STEM fields. These key factors include, gender stereotypes, male dominated cultures, fewer role models, and math anxiety that teachers, who are already predominantly women, often have math anxiety that they subconsciously pass on to girls. They also often grade girls harder for the same work because they have this assumption that girls need to work harder to achieve the same level as the boys (AAUW, n.d).

Something else that is not talked about as much, but is very real, is the confidence gap that can be created by the subconscious sharing of math anxiety talked about above. According to the AAUW, many girls lose their confidence in math by the third grade, whereas boys are more likely to say they are strong in math by the second before even any performance differences are evident (AAUW, n.d). Basically just from how they feel, without any scores showing them otherwise young girls are already losing their confidence in math at a young age in our math classrooms.

There also seems to be a gap within the socio economic realm of reality. As far as performance scores, the only gender based math gap in elementary grades that exists are among boys who come from higher- income and predominantly white areas who perform significantly higher compared to girls attending those same schools (AAUW, n.d.) On the flip side when looking at lower-income predominantly black areas that represent around 25% of school districts, girls score higher than boys in math. However, even so, their

scores are still disproportionately low compared to boys from predominantly white and high income areas (AAUW, n.d).

What Gaps are there Still in the Research?

There is no perfect study as many who have conducted experiments or done research papers have found out the hard way. There are simply topics and ideas that either nobody has bothered to research, or they've researched, but haven't drawn a direct connection between their research and the topic at hand. I think one big topic that has been researched and proven effective, but there really hasn't been a link drawn between them is a correlation of parental involvement and student's doing better. There have been studies showing that parents who are involved with their kids are less likely to end up in trouble, and have less problems with such things as drugs and alcohol. One can make the argument that students who come from wealthier homes do better because parents seem more involved and are more caring. However, that can't be proven and the argument can be made that that family is wealthy and has more money because both parents work long hours and the students are left home more often and only succeed because, while their parents do love and care for them and offer to buy anything they need to succeed such as calculators, computers, math tools, they may not be around or attending school functions such as athletics, fine arts, or other functions.

Conclusion

Not only are there unfair advantages when looking at districts as a whole, but it's looking as though a lot of those advantages seem to magnify themselves when you look at individual classes, especially anything related to the STEM field. There's a quote from Nancy Grace Roman, who is considered the mother of the Hubble Telescope about her

time in high school. “I still remember asking my high school guidance teacher to take a second year of algebra instead of a fif year of Latin. She looked down her nose at me and sneered, ‘What lady would take mathematics instead of Latin?’” Based on the number of women who actually end up getting a degree in anything math or even overall STEM related, this type of conversation has happened and is continuing to happen many times in high schools across the country and world. It’s unfortunate to come to realize that there are several factors beyond the control of the student just doing the work and showing up that has and will contribute to affect not only their academic achievement which in turn can affect their ultimate potential earning, but as seen from the very real confidence gap, these biases and lack of equity can do real emotional and psychological damage to students who end up perceive people as either having a math brain or not having a math brain. This sort of thinking really can limit a student’s full potential and this is the key difference in having a growth mindset vs a fixed mindset.

The next chapter, chapter three, will look at taking all of this information, stats, data, and research, and putting it all to use in the creation of a blog to help address the equity imbalance in the math classroom. Chapter three will also go over a detailed description of the project, the audience for whom the project is developed for, the timeline, a summary of the goals for said project, ahd now assessment of meeting those goals will go. The final chapter, chapter four, will be a reflection over the process of creating this blog, some major learning that occurred during the process of working on this project, a reflection on the literature review presented in this chapter the implications for educators, and some limitations that exist when doing a project like this.

Chapter Three

Project Description

Introduction

According to Maya Riser-Kositsky of Edweek, there will be an estimated 50.7million kids enrolled in school in the fall 2022 (Kositsky, 2021). These children will be going to school all across this country from the northernmost point in Alaska, to the southernmost point in Florida, from the westernmost point in Hawaii, to the Easternmost point in Maine. These children represent the new generation of workers, teachers, doctors, lawyers, truck drivers, bus drivers, dentists, and thousands of other professions. What is needed is to ensure this next generation is properly educated to be prepared to enter into whatever trade, field, or educational institute. Considering that, on average unfortunately, students of color already enter school one standard deviation behind white students before they even enter the classroom, it is more important than ever that students, regardless of where they are from, born, or attend school have the same opportunity to receive an education that will prepare them for what comes after their K-12 education (Porter, n.d).

The stark reality is there are certain factors such as school funding, students' homelife, socio economic standing, racial identity, gender, and support structure that teachers are never fully aware of until they begin their first teaching job and get a feel for the atmosphere of the school in which they are working. As noted in chapter two of this paper, students do not come to school with the same head start in life. Recall, according to Andy Porter, students of color as compared to primarily white students are already a full standard deviation behind in achievement by the time the children are even three or

four years old (Porter, n.d). So, before students even step into a school building and meet their first teacher, a good percentage of the children are coming in already behind before even cracking open a book.

Once children are enrolled in school and begin their education, factors such as funding, size, and location can all determine the quality of education. A lot of these boil down one simple overarching topic, funding. Money makes the world go round and some districts get more than others, which is why a big change when looking at the achievement gap, instead of looking primarily at ethnicity and comparing white students vs minority students, they are moving more towards comparing students based on their socio economic status (Porter, n.d). This makes sense as lately the US Census allows people to report multiple ethnicities, so people can declare they are mixed, which makes comparing white vs POC (person of color) more difficult.

Because money is so important to basically everything, smaller districts have found a way to get some extra funds from the state that it has reserved for “small and sparsely populated districts” by literally drawing their district zoning lines as tight as possible in order to appear smaller than they actually are in order to qualify for these extra funds (Bellan, 2019). So when an already wealthy district which has the ability to fund its school district just from property taxes alone, finds a loophole in the system, and garners more money from the state by drawing their boundaries as small as possible, thus increasing the revenue for their districts and increasing the amount of money per child is available to spend. Something that also helps drive a wedge in ensuring the achievement gap stays right where it is is the fact that just above half of nonwhite or students of color end up attending city districts where schools on average receive $2,100 dollars per

student less than suburban schools and close to 4,000 less per student in rural districts (Bellan, 2019).

Purpose of the Capstone Project & Chapter Overview

For these reasons I decided to look into how teachers in lower funded districts can help balance the equity, or in other words "*how can math teachers help close the opportunity gap in equity for students who come from lower economic backgrounds and go to school in less funded districts*? My project idea is to find a way to get free or inexpensive resources in the hands of teachers for whom the district they work for lacks funding to adequately supply its teachers with resources and supplies such as calculators, protractors etc.

Since just about every public school has some form of access to the internet, 99% of US public schools have access to broadband and are able to support digital learning according to the National governors association (Van Ness,2021), most of the resources that I looked at were virtual or digital. Because of this, not only can the teacher easily display them with their projector and a laptop, but since 99% of schools can support digital learning, students have as much access to the resources as teachers.

The rest of this chapter will focus on what sort of project I will be doing as well as a breakdown of the specifics of each post or sets of posts. The audience, or groups for which this project is being designed for will also be taken into consideration and discussed as well as the timeline for completion of this project. Finally, to know if this project was as successful as planned, some sort of assessment will be taken and my plans for assessment will be discussed in detail below followed by a sneak peak of chapter 4.

Description of Project

Keeping these facts in mind and the changing world in which educators are forced to work in, my idea was to create a series of blog posts for which educators and even students can go onto and each blog post will contain links to a specific resource, This will not only allow educators to view already created resources and be able to access them in one central location, but it provides a way to locate, save, and create files of these resources for future use without the need to purchase new technology. The good thing with the internet is it is always evolving so those tools once upon a time ago that were used hands-on within the classroom such as calculators, graph paper, pattern tiles, these all can be found online and manipulated with no extra cost.

Some resources I highlighted in my blog are virtual pattern blocks, an online scientific calculator, a link to a graphing calculator website that includes lessons and activities which teachers can assign. One of the first resources I talked about though was algebraic tiles and how important having a visual representation of these abstract concepts are. Plus, according to a study conducted by C Muchoko*A Jupri and S Prabawanto out of Universita s Pendidikan in Indonesia, students often have a really tough time with algebraic concepts because this is one of the first times students go from concrete math to more abstract(Muchoko, 2019). Included with the resource, description, my opinion, I also talked about some of the research that supports using the particular resource and included those so teachers can check them out as well as youtube videos demonstrating ideas on how to use the particular resource.

My goal is to upload a blog 2 times a week which most of the time gave me enough time to be able to find a good amount of resources to talk about, try them out, and

to be able to thoughtfully and honestly write a review on them citing their pros and cons a long with some good types of mathematics that can be enhanced with the use of said resource. However, life get's in the way and one or two weeks I only ended up doing one.

I decided to create to categories for this blog, high school and middle school mathematics, with obviously many resources going into both groups. This way, if a teacher was strictly teaching 6th grade, they'd not have to slog through all of my posts, but instead could just go to one section and find the resources that are applicable to him or her.

Summary of Project Goals

My goal with these blog posts is to try to give students who are in schools that receive less funding, or are overpopulated, or a combination of both,a chance to close the achievement gap between them and students who are in schools that are better off in terms of funding and resources. Half the problem is getting these resources in the hands of teachers, some of them are oblivious to what can be found and that's why I want to do the searching for them so they can focus on teaching the students of tomorrow.

Audience/Timeline

The audience of a particular project is very important. When considering how to phrase things, in what style to write, and what tone is being presented. For example if writing to children or students, authors and writers tend to steer clear of really big and over complex words or technical words. Even if the definition is given, if a child can't pronounce the word they will struggle every time they come upon that word. An example of this would be using a word like vexillology within a book on the flags of the world instead of saying "there's a whole group of people that study flags."

For this project my primary audience are teachers and educational staff who work primarily at schools in the city center or the main metropolitan area as those schools tend to be the most underfunded compared to those in suburbs and rural areas. These teachers and staff who work with children who's schools receive up to 4 grand less per pupil in funding are in need of ways to help balance out the equity between schools so students don't end up suffering or lacking because they are in a less funded district based on where they live, their family's socioeconomic status or other factors that have sent the students to a less funded school. I also am inviting parents to check these out as well as a way to help their children in the chance that their teacher does not find my blog or isn't using them in their classroom. Family of course is a child's first teacher, they teach them how to walk, talk, eat, ride a bike. Why shouldn't a students' family be involved in the child's education .

The plan was to upload a blog post twice a week. The goal was Monday and Friday however because some of the resources were more complex the post was either pushed back, or moved to another week and a different post was needed to be found for that day As this is was first ever blog, It unfortunately took me a bit longer to actually get the webpage up and running due to trying to figure out which platform to use, and the actual creation of the page itself.

Assessment

Assessment is important for any project or even lesson. How can it be known how effective a lesson or how impactful was a project if an assessment isn't done? There are multiple types of assessments used in schools these days from exit tickets, to quizzes, end of unit tests, end of year tests, and those state given tests that every student takes and are

assessed according to their peers. Unfortunately, due to it being summer, while I did receive some traffic, it was not enough to really get a good assessment on how the blog was doing. I feel like going forward into the school year there will be more activity as teachers are looking for things to bring into their classroom.

Conclusion

The goal is to get these resources into classrooms so by getting them seen by many people there is a greater likilook that they will find their way into classrooms, helping students to lessen the achievement gap and give more students a better opportunity to be better prepared for college, inturn giving them more opportunities to get a high paying job and to be able to make a better life for themselves and their future generation of children and grandchildren. My project was designed with an emphasis on access, low cost, ease of use, and the ability for teachers to be able to quickly find resources for their classroom and also recommend resources to their colleagues.

Looking ahead to the final chapter, chapter 4, there will be an overall reflection on the process of creating this blog, the effect it has seemed to have had on the educational community that's interacted with the blog, and what new understanding the author has garnered just by doing the project. It would be unwise to believe this blog is going to single handedly end the noticeable achievement gap, and get rid of opportunity gaps that exist due to race, gender, and socio-economic status. However, if some changes occur and this blog can impact a handful of educators and the students they come in contact with, then it is worth the effort.

Chapter Four

Conclusion

Introduction

All across the United States, teachers and students are getting ready to head back into the classroom to begin another year of teaching and learning. During the process of making my project, the equity blog, and writing each post, I always wondered to myself "can I make a difference just with my one site?" Thankfully, a quote by Sylvie Guillem, a French Ballet dancer, came across my desk that said "No one person can change the world, but one and one can add up"(BrainyQuote, n.d). Reading this made me realize that hopefully my blog, which was founded off my research into the question, "*How can math teachers help close the opportunity gap in equity for students who come from lower economic backgrounds and go to school in less funded districts,"* will hopefully inspire one or two teachers to use some of the resources I've gathered in their own room and maybe change the future for their students and so on and so forth.

The following chapter will be an exploratory journey through my project, the blog on equity in the math classroom. First up this chapter will discuss some of the things I learned throughout the process of my research and making this blog. This includes deciding which website to use to host it, design ideas, getting the word out, and all of the different and fun new research I did to help support my rationale for each resource I spotlighted. After that will be a review of the literature review back from chapter two and zeroing in on some of the most important research that I found most helpful for my paper. Then, as everything in life, there's limitations that I discovered while doing both my initial research and the ensuing blog posts that I'll go into, and finally I'll try to wrap up

my entire journey these past two semesters and touch on where I plan to go from here with my career and this project.

Major Learning

To say I came away from this process, both the research, writing, and blog formation, without having learned alot about not only the topics I researched, but myself as well, would be a big lie. These last two semesters have opened my eyes to so many different aspects of the different levels of education funding, how POC, people of color, and even women and girls were not adequately served by educational institutes, and just how far behind certain groups were even before they reached school. That will tie into the limitations later on in this chapter, but it's unfortunate that there are students that come into schools already behind. After learning that I honestly felt like they were already being set up to fail before they even had a chance to try.

The process in creating this blog was a great learning experience in the fact that I had never created a webpage, website, or blog before. Deciding on a blog topic itself was quite simple since it was the theme of my paper, however trying to decide between three different platforms on which to host it on, turned into an ordeal. My original intention was to get a page somewhat set up on each platform and then make a decision as to which would be the easiest to use and most user-friendly. My three options were Wix, Wordpress and Blogger.com

Blogger.com seemed to be the most obvious and best choice, just from the name alone, which is why it was my first pick. However, early on I discovered it wasn't really a platform more just a place to do blogging, which is fine and all, but I wanted a more

website feel, with a homepage, a contact page, subscriber form, rather than just, all that's on this page are blog posts.

My second choice ended up becoming my final choice, Wix.com seemed to be a great fit, took me a while to get everything how I liked it with fonts, and having a dedicated homepage, different pages you could add in, like the subscriber form, a contact me section. It seemed like while it would be more work to get it set up, it would work for what I needed. So I got it set up about 70% when, colleague of mine, who also was doing a blog, but in literacy, swore by her host, WordPress, and even tried to walk me through how to set it up to function like an actual blog, but I just couldn't figure it out. I tried maybe three or four attempts and made a page that looked anything remotely resembling inviting and usable both before and after my colleague tried to walk me through it. I just couldn't figure it out.

I ultimately went back to Wix and as the deadline for getting the project rolling was approaching and I had already done about 70% of the set-up work, I figured it would do. So Wix became my platform, and while it does everything I need, there obviously are things on it that I'd want to be different, such as setting up being alittle easier, and changing things to be more user-friendly. However, once the page was up, it was very user-friendly for my readers, and in the end, that's all I really cared about.

Finally, some final things I learned while doing the blog posts, and the supplemental research that goes into finding resources, as well as getting your blog out there. Networking is beyond important, which I found out when I attended a seminar geared at math teachers and helping reach apathetic students. Just from throwing my blog into the Zoom chat, I got 6 more readers in an instant and my view count almost doubled

just from that one evening. It's also important for self discipline and for keeping viewers to set a schedule for when to post because it's very easy to slack off and not do one for a week or so and if readers don't see them being added for a duration of time, they won't be bothered to pay attention when a new one appears.

Assessment of Impact

It's hard to know, especially during the summer semester, how impactful your blog or anything having to do with teaching will be as most teachers or educators won't be able to implement your resources you spotlighted until months down the road. I suppose an assessment on effectiveness is how many views each post got, which again for being summer time, while not bad, it hopefully will be better in the fall and spring. From the feedback I got from former coworkers, they love the idea, like the posts, the site, and will continue to be checking for updates.

Reflection of Literature Review

The lit review I did in preparation for this project was essential as it allowed me not only to understand what types of gaps exist, but where they come from, and to what extent the schools play in expanding or shrinking that gap. Then I learned a lot about the funding model that our country uses and how it has not only kept the already born gaps in their place, but has formed new ones because of financial means and how exactly these financial differences have direct impact on the math classroom.

Achievement Gap vs Opportunity Gap

Both of these are crucial barriers to students being able to successfully thrive. The big thing about the achievement gap that truly shocked me was the fact that, according to Andy Porter, out of Penn State's graduate school of education notes that before students

even enroll in school, by the time they are 3 or 4 years old, an achievement gap of one standard deviation can already be measured between White children and POC, people of color, children (Porter, n.d).

Gloria Ladson-Billings uses this metaphor to look at effects of having an achievement gap, an educational debt, which is considered forgone schooling resources that schools should have or could have been investing in low income kids, which an educational deficit can lead to a variety of social problems, crime, low wages, low productivity, smaller labor force, which then requires on-going public resources (Gloria Landson-Billings, 2006).

The cause of the achievement gap is brought on by the opportunity gap. Whereas the achievement gap is based on gaps between two groups of students' test scores, or other measurable metrics, the opportunity gap is a gap that is formed when one group of people, mostly white and wealthy families, have access to resources and schooling that lower socioeconomic students, or poc students don't have access to. Alot of these gaps are consequences of things like Plessy V Ferguson, Jim Crow, slavery, and other forms of discrimination that have impacted black idenity and success (Milner, 2019). Both of these gaps have made it harder for students who are either less socioeconomically well off, or are POC, to not only get ahead of their white or wealthy peers, but just to keep up with them.

Public School Funding

In this country there are many many school districts, each of which has school funding that they receive from three levels of government, Federal, State, and Local. The Federal government contributes roughly 10% of the overall funding and this is through

Title I, which provides financial assistance to local education agencies and schools with a high population of students from low income families to help balance the equity caused by lack of family funds (Skinner, 2019).

The next tier is the state government which distributes their portion, roughly 40-50%, though it can range from 0-90% on the extremes, of funding through different groups called LEA, local educational agencies. These LEA's are supposedly used to help ensure equality in distribution, however the word equal is relative. Is it each district receives an equal amount regardless of size or equal per pupil? Then they get into the policy in thirty-four of the states that says regardless of number of students, they end up providing extra funds to smaller and more sparsely populated school districts to help these rural remote schools and their districts help manage the diseconomies of scale (Bellan, 2019). They do this because there are some costs that are fixed regardless of how many students, such as building cost, rent, electricity etc. What more wealthy districts have found out is by drawing their district boundaries as small as possible, they can get access to this extra money, regardless of how many students attend their schools because the state ends up noticing how small the district is not how "sparsely" populated it is (Bellan, 2019). So because of this you end up with districts with way more money than needed which gives their students more access to resources.

Now, let's talk about local government district funding, which make up the remaining percentage of school funding. Since these come from local taxes such as property taxes, sales tax and individual taxes of those who live in said local area such as city, or county, these can differ greatly. According to the National Association of Home Builders, when taking someone who lives in a state with the highest property tax levied,

New Jersey who pay an average of $8,485 a year in real estate taxes and comparing them to someone who lives in the state with the lowest property tax levied, Alabama, who pay an average of $678 in real estate taxes per year (Logan, 2019). That comes out to be just about $8,000 a year difference of property tax that can be used in New Jersey more than schools in Alabama. Already just talking on a state level, there appears to be a huge difference in the average tax levied. That means there's that big of a difference at how much schools in those respectful states get funding.

In the grand scheme of things, the Federal government's 10% really doesn't seem to have much impact on disparities in funding, whereas the State and Local funding seems to vary widely from state to state, and can even vary widely from city to city. This is a problem because it means that by going to school where you're "supposed to" city kid going to a city school or suburban kid going to a suburban school, can really change the type of education you can get. There's no wonder that even though the majority of people live in cities or urban areas, most students end up going to schools in suburban districts (Bellan, 2019).

Limitations

As with any study, research project, or well anything in life, there will be limitations as to how much information can be gathered and how many factors can be accurately accounted for. We see early on in a child's life that by the time they reach an age of 3-4, before they even enter into school, already an achievement gap has formed on average between White and POC students. What we don't know is what type of homelife is there? How involved are the parents? Can a parent who reads to their child every night

help combat the 1 standard deviation gap? Maybe, but it's impossible to know all this from just a researched based exploration.

As stated above in my intro, because I did this project during the summer, it's really difficult to assess the usefulness of the resources that I found, and talked about on my blog because while their is summer school, that's a small segment of the school age population and teachers actively engaged in teaching compared with during the fall and spring semester. This lack of teachers being actually teaching also forms a limitation on the amount of feedback and participation in my blog as it relates to getting new suggestions for ideas on what resources teachers are interested in, what I can do better as a blogger, and what I'm doing well already.

Implications for Educators

Whether we like it or not, we as educators are on the front line of ensuring our students graduate elem, middle, and high school with the ability to compete with students from around the state and country at college opportunities and eventually job opportunities. It's not enough for educators to acknowledge that equity is important, and that there are gaps based on socio-economic and racial identification, but there also needs to be this push to ensure that in the classroom students have access to not only keep them moving forward, but help fill the gaps that they are lacking for whatever reason. We are their advocates and mentors. If we fail, they fail.

Conclusion

This chapter has summarized in which I have researched, and feel like I have adequately answered the question, *How can math teachers help close the opportunity gap in equity for students who come from lower economic backgrounds and go to school in*

less funded districts? This chapter first took a look at my own personal major learning journey I took throughout this process in writing this paper and creating the blog. It then looked at the effectiveness of said blog, followed by looking at some of the major literature that was used, some limitations that I found while doing my research, and finally what implications this topic and research has on educators, especially educators in the math classroom.

As a secondary math teacher in a world that is becoming more and more technologically advanced and fields like engineering and computer science are exploding, I know that I need to ensure my students leave my class with every possible advantage they can in order to succeed. Even if they don't go into a math related field, the skills taught while learning math are some of the most valuable skills students can learn in school and will be priceless to them in the future.

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