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| **Rhonda Marquardt TGC Unit Plan** |
| Prepared by: Rhonda Marquardt School/Location: Mariner High School, Everett, WA |
| Subject: Grade: 9 Interdisciplinary Unit Title: Making G.A.I.N.s in Poverty (Global Awareness by Investigating Numbers)Time Needed: 3 weeks |
| ***Unit Summary: Students will be exposed to the Declaration of the Rights of the child and explore the global issue of poverty and utilize technology to find current and reliable data. Students will perform regression on data sets to determine whether the trend is best modeled with a linear or exponential model. They will use that model as a means of interpreting data, predicting future outcomes, and exploring various factors that contribute to increased levels of poverty. They will research current political policies, as well as proposed solutions using a variety of media.*** |
| STAGE 1: Desired Results |
| ESTABLISHED GOALS:CCSS Supported by this unit: ● Reason quantitatively and use units to solve problems. ● Write expressions in equivalent forms to solve problems. ● Create equations that describe numbers or relationships ● Represent and solve equations and ~~inequalities~~ graphically. ● Interpret functions that arise in applications in terms of the context. ● Analyze functions using different representations ● Build a function that models a relationship between two quantities ● Construct and compare linear, ~~quadratic,~~ and exponential models and solve problems. ● Interpret expressions for functions in terms of the situation they model. ● Summarize, represent, and interpret data on two categorical and quantitative variablesStandards for mathematical practice supported by this unit:● Reason abstractly and quantitatively ● Construct viable arguments and critique the reasoning of others. ● Model with mathematics. ● Use appropriate tools strategically. ● Attend to precision. ● Look for and make use of structure ● Look for and express regularity in repeated reasoning**GLOBAL COMPETENCY:**From Education for Global Competence: Preparing Our Youth to Engage the WorldStudents will: * Investigate the world beyond their immediate environment, framing significant problems and conducting well-crafted and age-appropriate research.
* Communicate ideas effectively with diverse audiences, bridging geographic, linguistic, ideological, and cultural barriers.
* Take action to improve conditions, viewing themselves as players in the world and participating reflectively.

From Oxfam’s “Maths and Global Citizenship”Students will be:* Provided with opportunities to illustrate mathematical concepts and processes by means of global issues and data
* Using and applying mathematics to real-world problems and data (for example, international development data)
* Developing critical thinking around use, presentation and manipulation of data

 TECHNOLOGY USED:ChromebooksGoogle Classroom/Google SheetsExcel, Desmos, Quizlet, Kahoot, Padlet RESOURCES:<http://data.worldbank.org><https://ourworldindata.org> <https://www.gapminder.org>[*http://www.newseum.org/todaysfrontpages*](http://www.newseum.org/todaysfrontpages)[*http://www.world-newspapers.com*](http://www.world-newspapers.com)[*http://www.newspapersglobal.com*](http://www.newspapersglobal.com)[*http://www.thebigproject.co.uk/news/#.WfTDE2iPIoy*](http://www.thebigproject.co.uk/news/#.WfTDE2iPIoy)[*https://povertyresolutions.org/povertyweek/education.php*](https://povertyresolutions.org/povertyweek/education.php)[*https://www.washingtonpost.com/blogs/post-partisan/wp/2014/11/21/why-wont-the-u-s-ratify-the-u-n-s-child-rights-treaty/?utm\_term=.3062c8b1f232*](https://www.washingtonpost.com/blogs/post-partisan/wp/2014/11/21/why-wont-the-u-s-ratify-the-u-n-s-child-rights-treaty/?utm_term=.3062c8b1f232)[*https://www.youtube.com/watch?v=5KQGz-toMnk*](https://www.youtube.com/watch?v=5KQGz-toMnk)[*https://www.gapminder.org/dollar-street/matrix?thing=Families&countries=World&regions=World&zoom=4&row=1&lowIncome=26&highIncome=15000&lang=en*](https://www.gapminder.org/dollar-street/matrix?thing=Families&countries=World&regions=World&zoom=4&row=1&lowIncome=26&highIncome=15000&lang=en) | *Transfer* |
| *Students will be able to independently use their learning to:** To create and analyze graphs to make informed decisions.
* Interpret and persevere in solving complex problems using strategic thinking.
* Express appropriate mathematical reasoning by constructing viable arguments, critiquing the reasoning of others, and attending to precision when making mathematical statements.
* Apply mathematical knowledge to analyze and model mathematical relationships in the context of a situation in order to make decisions, draw conclusions, and solve problems.
* Use appropriate tools, such as desmos, excel, and google sheets to deepen understanding of mathematical concepts.
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| *Meaning* |
| UNDERSTANDINGS*Students will understand that:** The UN created a declaration of global rights of child.
* Use real data on global issues with a focus on practical solutions.
* Build on their mathematics knowledge while using critical thinking, collaboration with peers, and applying global perspectives.
* Build on their skills for future problem solving activities they will encounter as active, engaged citizens.
* Quantifying data brings it to life and is able to shed light on global issues that would otherwise go unnoticed.
* Not all data can be analyzed using the same type of function.
* Data can allow for future predictions and analysis of proposed solutions or interventions.
 | ESSENTIAL QUESTIONS:* Has the world made substantial gains to eradicate poverty? Has the US made gains with respect to poverty?
* How can data analysis be used to answer questions and make predictions about real-world contexts?
* How do you decide which mathematical model will most accurately represent a set of data?
* What are limitations to using exponential models to investigate scenarios involving growth and/or decay?
* What are limitations to using linear models to investigate global issues.
* What role do mathematicians (and others possessing mathematical tools) have in addressing world problems?
* What are some useful tools for searching for relevant data?
* How can a model be constructed from a data set?
* How can the degree of confidence in a prediction be expressed, understood and contextualized?
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| Acquisition |
| *Students will know:** The basic rights of a child established by the United Nations.
* How to access data sets.
* *What constitutes a reliable data set.*
* *Data can be used to inform society about global issues and drive change.*
* When a linear model is appropriate to model a situation.
* When an exponential model is appropriate to model a situation.
* Whether an exponential or linear model is a better predictor of future trends based on residuals.
 | *Students will be able to:** Use both linear and exponential functions to model global poverty data.
* Understand residuals and how it is useful in determining the validity of a mathematical model.
* Determine when a linear model or an exponential model more appropriately represents a data set.
* Use given models to make predictions about the future state of poverty.
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| **Stage 2 – Evidence** |
| **Assessment** | **Evaluation Criteria (Learning target or Student Will Be Able To)** |
|  Assessments **FOR** Learning: | **KWL Chart:** Before and after their initial data exploration, students will complete KWL charts on topic of their initial exploration. **Observation:** Teacher will observe students as they make choices of data sets to compare. These choices include appropriate comparisons to make and strategic selection of data visualization types (line graph, bar charts, etc.). **Discussion:** Students will discuss, in both small and large groups, their findings, as well as the mathematics used to analyze their data. **Surveys:** Through the use of global awareness surveys, students will be able to self-reflect, as well as see the collective views of their classmates. These will be used at various stages of the unit. Surveys may be implemented via Google forms, Survey Monkey, or another media. **Peer Assessment:** Students will construct exercises based on their topics (either with data or given exponential models) to share with their classmates. |
| Assessments **OF** Learning: | Students will present a **G.A.I.N. (Global Awareness by Investigating Numbers) Plan** that will demonstrate one of the following: 1) the need for potential change in a specific area, by making use of and analyzing past, current and (predicted) future data, 2) the importance for a current program to continue by making use of and analyzing past, current and (predicted) future data, or 3) the necessity of further investigation, exploration, and research in specific areas by making use of and analyzing past, current and (predicted) future data. These G.A.I.N. areas will be selected from a list of eight from Oxfam’s “Change the World in Eight Steps” – or other approved area. |
| **Stage 3 - Learning Plan** |
| In terms of the scope and sequence of my Algebra 1 course, this unit will be utilized at the end of the linear and exponential units. Nearly every mathematical situation the students encounter in this unit will be in a context that either the students have selected or I have placed in front of them. Week One: Students will explore smaller data sets that can be modeled by linear or exponential growth and be reminded of the behaviors of each type of function. Students will be utilizing Desmos, Excel, and Google Sheets to develop regression models and analyze the validity of each one. Students should be able to distinguish between data sets that can be modeled with linear or exponential functions and keep the contexts of the data in mind when exploring. Students will begin to explore larger data sets that represent the issues of poverty.Students will be asked to research poverty rates from various Countries around the world and put this data in google sheets or excel in order to generate linear or exponential functions that model the data, and be able to determine if one type of mathematical model is a better fit for the data. Experts will be brought into class and/or accessed through video conferences to discuss the issues in eradicating global poverty and address how the use of numbers and statistics is driving their work and their approach to finding solutions. These speakers, in addition to their individual and group research and analysis will lead to the work on their G.A.I.N. Plan.Week Two: Students will move from studying poverty on a global lesson to researching the issue of poverty from a National and local level. Students will be asked to research poverty rates in the US and locally and put this data in google sheets or excel in order to generate linear or exponential functions that model the data, and be able to determine if one type of mathematical model is a better fit for the data. Local experts will be brought into class and/or accessed through video conferences to discuss the issues in eradicating local and national poverty and address how the use of numbers and statistics is driving their work and their approach to finding solutions. These speakers, in addition to their individual and group research and analysis will lead to the work on their G.A.I.N. Plan. Week Three: Students will present their G.A.I.N. Plan and share their work with students from other classes via PowerPoints, google slides, or live presentations. They will write a summary reflection of their experience and complete an individual analysis of a given global set of data as a final summative project. Their project will incorporate a call to action or a proposed way of becoming locally involved as an adolescent in our local community. |

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| **TGC FELLOWS UBD Lesson Template** |
| Lesson Title: Making G.A.I.N.s in Poverty (Global Awareness by Investigating Numbers)Subject: Algebra 1 Prepared by: Rhonda MarquardtMaterials Needed: \*Chromebooks Global Competency: **Apply Disciplinary and Interdisciplinary Expertise, Investigate the World, and Weigh Perspectives** |
| **W**here is the lesson going?(Learning Target or SWBAT) | Students will be exposed to the topic of poverty, become aware of the history behind creating the Declaration of the Rights of the Child, and understand the value of a dollar around the world in order to more accurately weigh in on the conversation and complexity of the math behind investigating local and global poverty. |
| **H**ook: (5-10 min) | **T**ailored Differentiation: |
| Students will then use a think-pair-share in order to create a KWL chart on what they know about poverty around the world and what factors may affect poverty rates. They will do a gallery walk to see what their peers are thinking.  | Some teachers may prefer to skip the KWL chart and go straight to GapMinder to gain interest in topic. They may also opt for a group discussion of the map of extreme poverty on the projector rather than giving all students access in consideration of limited time for the lesson.\*Chromebooks are not essential and the lesson can be done as a whole group discussion if preferred by the teacher.Google classroom is not utilized by all teachers, but many students as freshmen are being exposed to this at the high school level, so this supports and encourages our school wide attempt to promote independent learning.The movement around the room at the start of class will be good for the kinesthetic learners and numerous ADHD students on my rosters this school year.Access to Chromebooks and variety of media will also reach several types of learners. |
| **E**quip: Chromebooks |
| **L**esson Progression: (40 min) |
| Students will access [https://data.unicef.org/topic/overview/child-poverty/#](https://data.unicef.org/topic/overview/child-poverty/) and read about poverty and interact with the map of extreme poverty rates by country. Discuss the mathematics on the interactive map and investigate the differing percentages. (10 minutes)Students will be utilize Gapminder Dollar Street to look at the finances and living conditions of various families around the world in order to gain an understanding of the vast differences of wealth across the globe. (10 minutes)Through google classroom students will watch (5 min)<https://www.youtube.com/watch?v=5KQGz-toMnk>Students will be given a user friendly copy of the Declaration of the Rights of a child and asked to read it over independently for two minutes. Pair the students and ask them to identify which articles speak to Poverty. Share out. (10 min)Students will be shown the following data and asked about their thoughts, as well as what the math tells us (5 min)Poverty: As of 2010, the U.S. [ranked](http://www.oecd.org/els/soc/CO2_2_ChildPoverty_Jan2014.xl) 30th out of 34 OECD countries in terms of child poverty. 21.2% of children in the United States live in poverty. The average for OECD countries is 13.3%. Only Chile, Turkey, Mexico and Israel had higher child poverty rates.<https://www.washingtonpost.com/blogs/post-partisan/wp/2014/11/21/why-wont-the-u-s-ratify-the-u-n-s-child-rights-treaty/?utm_term=.3062c8b1f232> |
| **Rethink and revise:** |
| Students will be given a chance to add to their KWL chart in their groups with their new learning. (5 min) |
| **Evaluate:**  |
| **Exit Ticket: Complete a 3-2-1 (5 min)**After the lesson, have each student record **three** things he or she learned from the lesson. Next, have students record **two** things that they found interesting and that they’d like to learn more about. Then, have students record **one** question they still have.\*Teachers may opt for a written reflection via google classroom |
| Notes: In order for students to see themselves as citizens of the world, they have to understand that we all connect to it and that mathematics is a universal way of trying to make sense of global issues and for creating and assessing change. This lesson is an important step in helping my students define and understand their role as global citizens and also obtain a basic understanding of the issue of poverty. Engagement is a fundamental part of this lesson, as this lesson is the essential catalyst for the upcoming unit on utilizing linear and exponential models to understand poverty and make predictions about the future of children around the world and in the United States. |
| **O**rganization:  |
| Students will be in familiar teams of four in order to more easily facilitate conversations about brainstorming their ideas on poverty. Markers and paper will be readily accessible so that brainstorming can begin immediately. Desks will arranged in a circular format for movement around the room. Chromebooks will be readily available and websites and videos will either be clearly written for students to access, or given as a link through google classroom. |