***Teachers Empowered to Advance Change in Mathematics (TEACH Math) Project***

This project addresses the key challenge: “How can we enhance the ability of teachers to provide quality mathematics education?” The primary audience is preK-8 mathematics teacher educators, as well as pre-service and early career preK-8 teachers.

In particular, *TEACH Math* aims to transform preK-8 mathematics teacher preparation so that new generations of teachers will have powerful tools to increase student learning and achievement in mathematics in our nation’s increasingly diverse public schools. We intend to accomplish this through studying:

* the iterative refinement of instructional modules for preK-8 mathematics methods course that explicitly develop teacher competencies related to mathematics, children’s mathematical thinking and community/cultural funds of knowledge,
* the development of an innovative model of structures support and mentoring for new teachers in the initial years of full-time teaching, and
* the use of on-line networks to facilitate ongoing teacher and teacher educator collaboration.

For more information: <http://www.mathconnect.hs.iastate.edu/>

**Community Mathematics Exploration Module**

Summary: *Examine and document mathematical resources for lesson planning*

* Community Walk
* Lesson Planning

***Moving Beyond Awareness***

Exploring how students and community members use mathematics is an opportunity for teachers to bridge students’ community-based and school-based mathematical experiences while engaging in mathematical modeling.

Evidence of Common Core State Standards Mathematical Practice 4: Model with Mathematics

* *They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas.*
* *They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.*

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| **We chose the numbers because the $1.35, the $0.35 forces them to read an extra 30 minutes.** This will teach them to reason about remainders. |

* *They can analyze those relationships mathematically to draw conclusions.*

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| **We will make sure students include mathematical evidence in their letter.** |

**Example Lesson Plan**

*Connecting Children’s Mathematical Thinking,*

*Mathematical Practice, and Funds of Knowledge*

**Library Math**



Late fee rates (per day)

Adult: $0.25

Minor: $0.10

The TASK and WHY:

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| *Problem 1:*If your mom was 23 days late returning her adult novel, and you are 16 days late returning your book, *The Diary of a Wimpy Kid*. What is your combined total of fines? ($7.35). You can get $1.00 taken off for every 30 minutes that you read—this Book Bucks program applies only to children. If your mom has $6.00 to pay for late fees, how much would you have to read to help your mom get a $0.00 balance? (read 1 hour)*Why?:* We chose this because it is a realistic situation and families don’t always have enough money to pay late fees. If they are put in this situation how do you solve it? We chose the numbers because the $1.35, the $0.35 forces them to read an extra 30 minutes. This will teach them to reason about remainders.*Problem 2:*If your brother and your dad both owe $2.50 each in late fees at the library, then how many days late was your dad’s DVD and how many days late was your brother’s picture book? (Dad: 10 days; brother: 25 days). Create a graph of each person’s late fees over a period of time. Extension: is there any other set of days where they both owe the same amount?*Why?:* We chose the problem because we want students to know that there is a difference in adult late fees and children late fees. We chose $2.50 because it was a reasonable amount that overlapped, and was still under the maximum fine for children. The extension was designed to see if they can analyze and understand their own graph.*Problem 3:*Is the late fee system fair? Is it fair to charge adults more than kids? Write a letter to the Library, and defend your stance on the late fee system and back it up with mathematical evidence. If you have a better system include it in your letter. *Why?:* It allows students to form an opinion based on their findings from the first 2 problems. It shows if they are passionate about this issue. It also allows them to become an active community member.  |





1) BEFORE: Introduction

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| Students will go to the Library and get a library card if they do not have one. They will also be allowed to check out books. We will then have a librarian discuss how the late fee system works with the students. Once we are back at school students will be presented with the task. As a group the students will go through and use yellow to highlight the information needed for the problem, in red they will highlight the questions that are posed, and green will show their answer. We will be sure that the students understand the late fee system by asking them how much adults are charged and how much children are charged. We will also ask what the maximum fine is for adults and children. We will also ask them to summarize the Book Bucks program to be sure they understand. The main concept that students will need to understand to get ready for the task is the adult and children late fees. |

2) DURING: Exploring the Task

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| *Problem 1:* * Students may forget that there is a difference in fines between adults and children. If this does happen we would say, “Can you look back at your chart?”
* Since this is a multi step problem students may forget to do one of the steps. We would tell them to re-read the problem and make sure they have highlighted it. (Green, yellow, and red).

*What might we see?*For problem 1, one strategy we may see is solving using numbers. The student may figure out the corresponding fee for adult and child and multiply the days to figure out each person’s fines. Then, add the 2 together to get the total amount of fines due. Then, they may see that if they only have $6.00 they have to reduce the total amount by $1.35. Since they know that 30 minutes of reading takes off $1.00, they will need to read another 30 minutes to lose the $0.35. *Problem 2:** Students will get the graph wrong if the first part of the problem is incorrect. We will make sure that the first part is done correctly.
* Students may combine the totals to get $5.00 and then trying to figure it out. We would tell them to look at the chart and figure out how much they each owe, and to keep it separate.
* They may do the wrong type of graph or write the wrong labels on the axis. We would tell them to read the graph to us and ask them if it answers the question.
* Students may get confused with the decimals in the problem. (Child .10 fines; adults .25 fines). They might may change $2.50 to 250, but keep the fines with the correct decimal. This would create a whole different number. We would ask why they chose to change the decimal, and what is the correct value that we are looking at. We would tell them that they cant just change one number, if they manipulate one they have to manipulate them all.

*What might we see?*Students may guess and check to see how many times they need to add $0.10 until it adds up to $2.50, and same for adult with $0.25. This will give them the amount of days for each. Then, they may graph you each persons’ late fee on one graph to show it.*Problem 3:** We will make sure students include mathematical evidence in their letter.
* To support diverse groups of learners we will have them highlight the problem in 3 colors, so they are completely sure about what they are looking for. The chart will be provided, which will be beneficial to visualize. When they are writing a letter, they will be using their linguistic skills. The graph will also help them represent their data in a different way.
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**3) AFTER: Summarizing**

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| We would discuss problem 2 first. We would first bring up someone who didn’t do it correctly to create discussion. Next, we would try to have a student whose strategy is common amongst most students, which we believe will be the example chosen above. We would ask them to explain their thinking. If they did it using an algorithm, we would ask “why did you decide to divide by 10 and 25?” There is more than one way to solve this so we would want to see why they started with that step. And the last person we would want to have share would be someone who used a different method completely to solve the problem. We would ask them to explain their thinking. Then we would ask the students to find similarities and differences between the 2 strategies. This will help them understand how it can be applied with 2 different strategies. Once we have agreed on the correct answer we will have the students present their graphs. We would choose someone that neatly made a correct graph and is able to be analyzed well. We could ask questions like, “Can you explain why you labeled your x axis with “days” and y axis with “fines?” Using just this students graph we will have the students help interpret the data. Have another student answer where there is another set of days that the brother and father have the same amount of fines. We could also ask, “how do you know that by looking at this graph why the brother and father have an equal fine?” “What does the space in between the two dots mean?” Once we’re finished with analyzing the graph we will ask for two volunteers with opposing views to share their letters. We will wrap it up with a discussion about how important it is to be an active participant in the community.  |