THE CHARACTERISTICS OF NUMBERS PROJECT (Bob Krech)

21st Century Competencies Involved: Effective Communicator, Collaborative Team Member, Information Literate Researcher, Innovative and Practical Problem Solver, Flexible and Self-Directed Learner, Globally Aware Student

Overview: This is a project that can be used from Kindergarten through 12th Grade. It basically asks students to research a number in terms of its mathematical and social/ historical characteristics and to become experts on that number with the intent of teaching the rest of the class about it by creating a poster and doing an oral presentation. Some teachers have substituted a PowerPoint presentation in lieu of a poster.

Differentiation: The type of concepts explored can and should vary from grade to grade. First graders can explore ideas such as where their number falls on a number line, how it might be made with an array of dots, and where it could be found in real life (ie; 16 can be found on a calendar). While fifth graders can think about their numbers in terms of more sophisticated mathematics and social ideas such as prime/ composite, creating the number with division or exponents, and how the number is used in different cultures (ie; some students found that there were 16 prophets in the Old Testament and 16 pawns in a chess set).

The project can be repeated from grade to grade because each year students learn new mathematics, research skills, and social/cultural ideas and this growth and new knowledge should be reflected in their work on the project.

Procedures: Many numbers can be used. Some good ones are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 20, 21, 24, 27, 28, 36, 52. These are good because they have a great deal of use in social/historical/cultural contexts and many interesting mathematical aspects.

1. Begin by asking the class, what are "characteristics" or "traits?" Refer to a character from a current class read-aloud or popular story. Have the class engage in a discussion of the traits of this character. Organize student responses on the board in three categories:

    a. Outside/External (ie; glasses, brown hair, boy) – these are physically observable.

    b. Inside/Internal (ie; brave, smart) – these are observable through actions. Someone brave would demonstrate by doing a brave thing.

    c. Social/Cultural/Historical (ie; orphan, British) – these are not readily observable and not demonstrated by action, but they are true about a person.

2. Tell class you will now focus on a different character and once again brainstorm about that character in terms of the three categories of traits. Write the number seven (7) on the board. Ask students to describe this number using the characteristics or traits they recognize. Brainstorm and share together. Some possible responses include:

   *Odd

   *Prime

   *Factors are 1 x 7 or 7 x 1

   *Has 5 letters in its name (seven).

   *Has 8 addition facts that create the sum of 7.

   *There are 7 days in a week.

   *There are 7 continents.

   *Opposite sides of dice add to 7.

   *All U.S. phone numbers (without the area code) consist of 7 digits

   *Mickey Mantle wore number 7.

   *Snow White and the 7 Dwarves is a book and movie.

   *7-11 is a store.

   *In some cultures 7 is considered lucky.

   *7 is created by two straight lines. One line is horizontal. The other line is a diagonal.

3. Don't worry too much about where a certain trait falls in the three categories. Many traits could belong in more than one category. The categories only help to urge students to think about a number from different vantage points and to make connections.

   Assign students partners. Tell partnerships that they are about to pick a number from the number bag (or be assigned a number). This is the number they will be

learning about. Give them 5 minutes to brainstorm about their number and share back one trait with the class. Teachers keep notes about traits, characteristics, and terms used to help plan lessons (ie; if someone says I have a prime number or odd number, we need a lesson on what makes a number prime or odd unless it has already been covered).

4. One way to do this project is to have students begin brainstorming with the partner, everything they know about the number and then move into research.

5. Another choice would be after brainstorming to tell students that over the next few days, lessons will be presented on the characteristics and traits of numbers. They should go into these lessons ready to see how these ideas relate to their particular number. They can then do additional brainstorming and research.

6. At the end of the brainstorming/research and/or series of lessons each partnership will do a presentation and create a poster (or PowerPoint) on their number and the characteristics and traits of it, using what they have learned in the series of lessons, brainstorming, and research.

7. Two good sources for research include the website Numberopedia and the section there called Number Zoo as well as the book, Number Freak. Both sources need teachers to help students glean what is useful and appropriate. It is important that students understand that simply writing a fact about a number that they don't understand is not helpful to them or the audience, but running across something like this can also provide an opportunity to learn something new. For example some third graders researching 16 saw that it was a square number. They didn't know what it meant, but after some further reading and teacher guidance they found the idea of square numbers intriguing and tried to find other square numbers, which since they knew multiplication, was not beyond their capacity.

8. Teachers can create a poster or handout that includes the concepts about the number that they would like to see in the presentation and poster (ie; prime or

composite, odd or even, a number sentence using each operation that creates the number, how the number would be represented using coins). This could serve as the criteria or requirements for students as they create their presentations and posters.

9. A day should be set aside to share expectations and criteria about what a good presentation looks like. Some criteria to include could be:

    a. Make eye contact with audience.
    b. Voice Control: not too loud, not too soft
    c. Voice Speed: not too fast, not too slow
    d. Remember to introduce yourself and your number
    e. Do not talk to the poster. Point at a fact on the poster, mentally rehearse it, then turn and tell audience.
    f. Share oral presentation equally.

10. You may want to limit each presenter in a partnership to three facts each during the presentation for a total of six facts. Two facts from each category.

11. When presenters are presenting the rest of the class will be listening carefully and writing down three facts they learn about the number being presented; one inside, one outside, and one social/cultural/historical. This helps keep the audience focused, listening, and learning. It also gives the presenters a very real reason to present clearly and in an engaging manner. The audience should have time at the end of the presentation to ask questions and get clarification on the information they have seen and heard.

12. After all presentations are done, posters can be put up on the wall or in the hall for students to tour and read in more depth.