**Lesson Plan 2: Place Value**

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**Date:** 11/26/12

**Subject:** Mathematics

**Grade Level:** Third Grade

**Intended of Duration Lesson:** 30 minutes

**State of Michigan Standards/Benchmarks:**

3.NBT.2 Number & Operations in Base Ten

Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationships between addition and subtraction.

**Lesson Goal:**

Using a calculator, the student will play a place value game called, Wipe Out, in which the student will problem solve to find the solution to multiple place value tasks. The student will demonstrate his understanding of place value by using a strategy of his choice to solve the problems, as well as participate in a discussion about the procedures he uses.

**Lesson Objectives:**

1. Using the calculator on the Ipad, the student will accurately “wipe out” the correct number in four or less attempts on 4 out of 5 tasks.
2. During instructional game, Joseph will give the correct response for each prompt 5 out of 5 times.

**IEP Goal/Objectives (if appropriate)**

Current Annual IEP Goal: Solve multi-digit math problems involving place value and properties of operations.

**Materials:**

* Calculator
* Ipad (with calculator App)
* Paper for work
* Thousands, hundreds, tens, and ones cubes as manipulatives
* Chart paper with tasks written on them
* Sticky notes
* Pens and pencils

**Prior Knowledge:**

* How to use a calculator to add or subtract numbers
* Basic addition and subtraction operations
* Basic understanding to place value with thousands, hundreds, tens, and ones (and using those manipulatives)
* Exposure to place value concepts
* Basic understanding of number sense

**Procedure:**

* Ask students to sit around the half moon table facing the chart paper
* Tell them right away that they are going to play a game called, Wipe Out (Allsopp, 2007, pg. 209).
* Explain the rules of the game with steps and rules written on chart paper
  + Wipe out is a game in which the goal is to wipe out one digit in the number so that it becomes 0. You can only subtract one number to wipe out the digit. You will put the number in the calculator and try different solutions to wipe out the number. Students should keep track of what they did so they can share their procedures with their friends.
* Pass out calculators (Ipad calculator to Joseph)
* Do a sample of the game using the Ipad calculator with a two-digit number: 12
  + Tell students they need to subtract one number to wipe out the 2
  + Let students make predictions and talk through strategies
  + Test student answers and talk about why it was wrong or right
  + Allow Joseph a turn to discuss what he would do and let him try it on the calculator
  + Discuss place value of the 2
  + Reinforce with manipulatives
* Start game: give frequent reminders that it is okay to try multiple solutions!
  + Read each number that is written on the chart paper.
  + Have Joseph touch the numbers as you read them and highlight the digit that is wiped out
  + Prompt 1: *368: “Subtract one number so that the 8 is wiped out.”*
  + Prompt 2: *729: “Subtract one number so that the 2 is wiped out.”*
  + Prompt 3: *3,091: “Subtract one number so that the 9 is wiped out.”*
  + Prompt 4*: 6,925: “Subtract one number so that the 6 is wiped out.”*
  + Prompt 5: *21,309: “Subtract one number so that the 1 is wiped out.”*
* Use ones, tens, hundreds, and thousands blocks to reinforce numbers.
* After each prompt have students write answer on sticky note and place it on chart paper
  + Assess accuracy of each answer for each student
* Restate directions if students are subtracting multiple numbers in a row to get an answer instead of subtracting ONE number to wipe out the specified digit.
* During game, keep track of number of attempts for Joseph on each prompt
* Discuss strategies and procedures student’s used.
* Allow Joseph to talk about what he did and show using manipulatives (if necessary)
* Use precise language during discussion “subtract” “take away” “less than” “more than” when talking about numbers
* Ask students what they learned; what was easy, what was difficult?
* Think about methods or error patterns seen in the game and discuss those errors with students. Why were they incorrect? How did you know?
* Discuss place value with students. Talk about how those numbers have value, they are not just digits.

**Assessment:**

For this lesson I used two types of assessment; informal observation and completion and accuracy of responses given during the game. The results will be written on the chart below for tracking purposes.

Informal observation: For this portion of the assessment I took notes on error pattern analysis. An error pattern analysis is an assessment approach that allows for determining whether students are making consistent mistakes (Allsopp, 2007, pg 98).

1. Monitor Joseph’s problem solving skills by taking notes of the ways in which Joseph plays the game
2. Look for common patterns
3. Look for examples of exceptions to pattern
4. List in simple words the simple words the patterns and whether Joseph is struggling with the concept or the procedure.
5. Open up a discussion with Joseph to better understand his thinking or misconceptions

Completion and accuracy: I used the blank template of the chart below to keep track of the accuracy of Joseph’s answers for each of the five prompts or tasks in the game. The results helped me determine whether or not Joseph accomplished the objectives stated for the lesson.

|  |  |  |
| --- | --- | --- |
| Prompt | Number of attempts | Accuracy |
| 1: 386 |  |  |
| 2: 729 |  |  |
| 3:3,091 |  |  |
| 4: 6,925 |  |  |
| 5: 21,309 |  |  |

**Expansion:**

To easily differentiate the game for students who might be struggling, or who find the prompts in the game too easy, I can change the prompts to fit the learning levels of each student. If Joseph shows difficulty wiping out numbers in the hundreds place, I might ask him to wipe out the digit in the ones place, then work up to the hundreds place so that I can scaffold him into using looking at larger place value digits. For student’s who are getting the answer too quickly and might possibly be giving away the answer to other students (namely Joseph), I will have him wipe out larger digits in larger numbers. For example, if Joseph finds the task of wiping out a number in the tens place too easy, I might ask him to wipe out the thousands or hundreds place of that number instead. Providing this differentiation allows Joseph a chance to explore the answer independently and at an appropriate level of difficulty, while also building on his strengths and addressing their weaknesses as we play the game.

**Implementation**:

In general, Joseph responded very well to this lesson. He was on task the entire time and even contributed in the discussion about his procedures and the methods he used during the game. Because he got to use the Ipad calculator throughout the entire game, he was very motivated to give multiple attempts for each question. Also, I think having a heavy Ipad in his hands kept his attention focused on the game for longer periods of time so that he was able to notice patterns and learn from the mistakes he was making.

I feel that the pacing of the lesson was appropriate for Joseph, although it did feel a little rushed during the discussion at the end. In each of the game prompts Joseph never needed more than five attempts to find the answer, therefore we were able to move along at a good pace. After he found his answer I let him move on to the next question so that he could start to notice patterns before stopping him to discuss each of his attempts. In doing this, Joseph was making mistakes, but learning independently from his own mistakes to try a new method on the next attempt.

One problem Joseph ran into multiple times was re-entering the given number after he made an error. Often times Joseph would subtract an incorrect number, then keep subtracting numbers to try to get the specified digit to 0. I think it would have been helpful for Joseph to have a visual cue that told him to erase the calculator and try again if he made an error. Instead, I had to give him many verbal reminders to clear the calculator being trying another attempt.

Overall, Joseph was able to meet my goals and objectives for this lesson. In part, I think this was because I made the goals fit what I expected his instructional level to be. I made the objectives obtainable since this lesson required him to take risks and explore in a way that he is not typically used to doing.

**Reflection**:

My motivation for creating this lesson was inspired by a quote by Bley & Thornton that says, “Problem solving involves the confidence and willingness to take a risk. Good problems solvers know that they will make mistakes and are willing and able to learn from their mistakes,” (Bley & Thornton, 2001, pg 36). In reflecting on my teaching during Lesson 1, as well as Joseph’s (pseudo name) willingness to consider multiple procedures during the lesson, it became very clear that Joseph was used to mathematics instruction that involved one path and one right answer. I feel that Joseph needs to develop his problem solving skills by being exposed to more problems that invite him to take risks, use guess and check procedures, discover patterns, and incorporate language and vocabulary that can build connections to other meaningful parts of his life. What’s more, “If student’s immediately have a way to solve a given problem, the task is likely to be a routine exercise, not a genuine problem,” (Allsopp, 2007, pg 26). As we have discussed many times in class, mathematics need to be meaningful in order for true learning to take place.

In conducting Joseph’s assessment report, it became very clear that place value and number sense were two of Joseph’s main weaknesses. Joseph also has place value goals in mathematics stated on his Individualized Education Plan (IEP) for this school year so it was a major area of concern for both myself and his other teachers. On multiple classroom-based assessments, Joseph demonstrated the ability to identify the place value of an underlined digit in a three or four digit number, however all of those tasks involved one single answer in which Joseph was told exactly which digit to look at. Because of this, it cannot be assumed that Joseph has a true understanding of place value. This lesson asks Joseph to take risks, play around with numbers, and explore on his own to notice patterns and examine what he truly understands about place value. Also included in the assessment report was a Student Attitude Survey in which Joseph said math makes him feel tired and bored. Knowing this, I wanted this lesson to include a game that would keep Joseph engaged, as well as motivate him to explore different pathways and *learn* from the mistakes he makes.

Overall, Joseph did seem very engaged in this lesson. Allowing Joseph to use a calculator really motivated him to keep trying even if he made a mistake. It seemed as though the calculator offered Joseph some sense of security because he was not presented with a page full of numbers that could be overwhelming and intimidating to him. In order, “for struggling learners to fully engage in any instructional game they need to believe they have a good chance for success,” (Allsopp, 2007, pg. 155). To allow Joseph to feel successful and capable, I started the game with a number I knew he could, “wipe out.” I think starting the game with a task Joseph could accomplish independently helped to scaffold him into feeling capable of being able to take risks when he was playing the game.

When stating my expectations to Joseph and the other students in the small group, I was very conscious about my delivery. I made sure to tell the students that it was okay to explore different answers and test them on the calculator since problem solving was a main focus of the lesson. When we started the game, Joseph looked alert and showed willingness to, “wipe out,” a number on the first question. I did have to use some prompting to remind Joseph, which place value digit we were trying to change to zero, but after two attempts he got the correct answer. Joseph verbally expressed his excitement for this game, so I could tell he was engaged enough to continue on with more difficult questions and larger numbers. Throughout the entire game, Joseph was surprisingly willing to use trial and error to find the answer to each question. I did need to give him some extra support and verbal direction for the first three tasks, but on the last two I had him try on his own. Although it took him a couple more attempts to find the right answer, he demonstrated great problem solving strategies as he talked through his procedures and thinking with the whole group.

Paired with the exploring component of the lesson, the discussion during this lesson was another main focus. Simply monitoring Joseph’s attempts to solve each task during the game was not enough for me to truly assess Joseph’s knowledge about place value. Using discussion and conversation during mathematics is something I have tried to incorporate in every math lesson, so this lesson was no exception. More importantly, when teachers are consistent and ask students to explain their thinking, even when they are correct, students will begin to realize math is more than just finding a right or wrong answer (Allsopp, 2007, pg. 28). It was through my discussion with Joseph that I was able to understand how much he really understands about place value. Our ongoing discussion throughout the game gave him to chance to talk through his own learning to identify his strengths and weaknesses as they pertain to place value. It also helped me to see that Joseph does well when he is working with numbers in the ones and tens place values, but struggles when working with larger numbers.

Additionally, attention greatly impacts Joseph’s learning in all academic areas including math. Although Joseph did express positive feelings about mathematics on his Student Attitude Survey in his Assessment Report, he also mentioned that mathematics makes him feel tired and bored. Because he feels uninterested or tired during math instruction, his attention difficulties are multiplied; therefore accommodations must be put in place. For students with attention difficulties, “Using visual, auditory, tactile, and kinesthetic cues to highlight the relevant features of a concept is a helpful teaching technique,” (Allsopp, 2007, pg 54). As a visual and tactile cue, I wrote each number used in the game on a sheet of chart paper and had Joseph touch the digits in each number as I read it aloud. I then had him underline the digit that was being wiped out so he could look at the poster as a reminder. I think this helped Joseph remember which digits should be put in the calculator, especially when it took him a few attempts to get the correct answer, which meant he would need to re-enter the number. I also allowed Joseph to use the calculator App on the Ipad, rather than a regular calculator. For one, the screen and buttons are larger on the Ipad making it easier for Joseph to tap the keys, as well as for myself to see the numbers he put in the calculator so I could monitor and track his progress. Another accommodation I provided for Joseph was access to ones, tens, hundreds, and thousands blocks to be used as a concrete representation of the number. Although Joseph did not use these manipulatives on his own, I felt it was necessary to have them in order to reinforce the true value of larger numbers he had a more difficult time with. Whether or not Joseph felt he needed the manipulatives to play the game, I was able to monitor Joseph’s learning and bring those concrete objects out myself to help build his understanding where I felt he needed support.

The chart below summarizes the results of Joseph’s performance during the lesson. The results were charted based on the observational notes I collected during the implementation of the lesson.

|  |  |  |
| --- | --- | --- |
| Prompt | Number of attempts | Accuracy |
| 1 | 1 | Correct |
| 2 | 2 | Correct |
| 3 | 5 | Correct |
| 4 | 4 | Correct |
| 5 | 3 | Correct |

Specifically, I tried to follow error pattern analysis in obtaining observation notes during the lesson. Using this approach allowed me to determine whether Joseph was making consistent mistakes, which in turn allowed me to see exactly where the holes in Joseph’s learning might be. The main error pattern I noticed is that Joseph would consistently subtract from the ones digit on his first attempt in all five tasks during the game. On the first task, Joseph was asked to wipe out the 8 in the number 368. On his first attempt he wiped out the 8 by simply subtracting 8, therefore he got it right. While using that method did allow him to feel successful on the first task and helped motivate him to continue playing the game, it did not give him the right answer on the other questions in the game (which is okay!). On the next four questions, Joseph had to wipe out numbers in the tens, hundreds, or thousands places, but he kept subtracting a digit from the ones. In noticing this pattern, I was able to discuss the error after the game was over and have Joseph see exactly why that method did not work. Additionally, I was able to use the manipulatives to reinforce why that method was giving him the wrong answer on some of the tasks.

Based on my observation notes and error pattern analysis, I do feel that Joseph is struggling with the actual concept of place value rather than the procedural methods used to play the game. Because the discussion aspect of this lesson was cut short due to time constraints, I definitely feel a follow up lesson that discusses place value more explicitly would be beneficial for Joseph. Although he was able to get the correct answer for every task in the game, he did not demonstrate a firm and consistent understanding of place value. Based on the results of this lesson, I feel that Joseph responds really well with discovery learning activities, therefore I think another lesson that involves this kind of pattern seeking and exploration would be ideal for Joseph. Playing a modified version of the Towers Board Game we played in class might be a great lesson for Joseph. As opposed to using the Towers game with fractions and decimals, it could be used to create numbers that incorporate 6 different digits and must be ordered from smallest to largest to fill up the tower. This activity would allow Joseph yet another opportunity to explore with numbers and gain a true understanding of place value.

Resources:

Allsopp, D, Kyger M, and Lovin, L. (2007). Teaching Mathematics Meaningfully: Solutions for Reaching Struggling Learners. Baltimore: Paul H. Brookes Publishing

Bley, S. & Thornton, N. (2001). *Teaching Mathematics to Students with Learning Disabilities*. Austin, TX: Pro Ed Publishing