Accommodated Lesson Plan on Solving Systems of Equations by Elimination for Diego

Courtney O’Donovan  
Class: Algebra 1  
Day #: 6-7  
Grade: 8th  
Number of Students: 25  
Date: May 12-13, 2011

Goal:  
Students will learn how to solve systems of equations using elimination by adding and subtracting.

Objectives:  
Students will solve systems of equations using elimination by addition and subtraction.  
Students will collaborate with each other as they work through problems using algebra tiles and examples.

Standards:  
8.EE b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.

NCTM Standards:  
The NCTM Standard being addressed in this lesson is problem solving and representation. Students will be completing an activity in which they will use algebra squares to represent linear equations. This way, students can begin to see how to use elimination to solve systems of equations. They can see how the variables are eliminated by either adding or subtracting the equations. Problem solving will be emphasized so that students know they can use whatever method they would like to solve the systems. 
The NCTM Standard of representation is also being addressed. Students are using algebra squares to represent the equations and their solutions to solve the system of linear equations.

Materials:  
Elmo  
Paper  
14 bags of Algebra Tiles  
1 Bag of Algebra Tiles with the symbol that the tile represents written on the tile  
25 Algebra Tile Activity worksheets  
25 worksheets for homework  
LiveScribe Pen

Warm-Up:  
Solve this system using substitution and check your answers using the graph to find the point of intersection:  
2y +x = - 4
\[ y - x = -5 \]

I will allow students to work on this Warm-Up for about 3 minutes.

**Diego will be allowed to use his graphic organizer during the warm-up.** Since it has been a couple of days since Diego has solved systems of equations by substitution, the graphic organizer will help him recall the steps. It will also help him with the material that the students will be learning during the current lesson because they will be required to use substitution with elimination. He will also be given a calculator which he will be allowed to use throughout the two days of the lesson during the warm-up, activity and notes.

During their working time, I will walk around the classroom and observe their work and answer questions they may have. We will then go over the problem as a class. I will ask a student to come up to the board and show the class how he or she solved the problem. I will then ask if anyone has any questions about using the substitution method for solving systems of equations.

- If there are still questions and concerns, I will address them. I will then have the following problem to work out as a class and discuss the concept again.

\[
\begin{align*}
5x - y &= 27 \\
-2x + y &= 3
\end{align*}
\]

If there are not further questions, I will continue with the lesson.

(15 min) I will then proceed to pass out their graded quizzes. I will go over the answers to the quiz. I will answer any questions that they have.

Following this, will be the motivation for Section 7.3.

Transition: “For the past couple of days, we have been solving systems of linear equations using graphing and substitution. We will now learn a new method to solve equations called elimination.”

Motivation:
I will begin by asking students, “What does it mean to eliminate something?” I expect students to respond by saying to get rid of it or some variation of this. If no one has an answer, I will ask them what they think it means.
Then I will say, “We can apply this idea of elimination to solve systems of equations by getting rid of or eliminating variables.”
I will then proceed to have students do the following activity using algebra tiles.

Transition: “We are now going to do an activity involving solving systems of equations using algebra tiles. While we do this think about what it means to eliminate something and how that relates to the activity.”

Algebra Tiles Activity:
1. I will have students break into groups of three (there will be one group of four) and I will hand out to each group a bag filled with algebra tiles.

   I will be breaking students up into pairs and take extra care in pairing Diego with someone who gets along with and feels comfortable working with. I will then go through the algebra tiles. This will reinforce to students, especially Diego how to use them. For Diego’s group, I will label each tile with the appropriate symbol. Since Diego does not learn well using visuals, this will help him see the symbol representation of each square so that he can set up the equations. (They will have seen and worked with algebra tiles before so I will not need to explain how to use the tiles but each bag will contain a key to identify each type of tile.)

2. I will then explain how we are going to use the tiles to solve linear equations. I will have the following system of equations to use as an example and show them how to work it. I will use the Elmo to project the tiles on to the board so students can work through the example with me.

   “In your groups, use the algebra tiles to represent these two equations. Follow along with me as I go. If you have any questions as we go through them, please raise your hand and I will call on you.”

   Ex. \(x + y = 5\)
   \(x - y = 3\)

   I will address any questions they have about the activity and then have them begin to work in their groups working out a couple of problems.

   I will write the process of how to use the algebra tiles on the Elmo for Diego and the other students to look at when they need to. As the students do the activity, I will go to Diego and his partner and ask how the activity is going.

3. I will then give each group of students a piece of paper with two systems of equations. It will state: Solve the following linear systems using the algebra tiles. Explain how you solve the systems?

   1. \(3x - y = 5\)
      \(x + y = 3\)

   2. \(x + 4y = 10\)
      \(x + 2y = 6\)

   I will explain what the expectations are for working on groups. This includes talking about math, raising your hand when you need help and talking to only your group. This will reinforce to Diego and the other students what they are expected to do during this activity and to help keep them focused on the task at hand.

4. The students will work on the problems for about 15 minutes.
I will go over to Diego’s group and ask his group if they have any questions. I will just go through what is required again so he understands. If will ask him if he needs any more help and then proceed to have his group work on the activity.

I will walk around the class checking in with students’ progress and answering any questions they might have. Then we will come back as a class and discuss problems. I will ask the groups to share their results on the board and explain to the class what they did.

**Diego will be allowed extra time to complete the activity, approximately 5 to 10 minutes more.**

Closure:
I will tell students that tomorrow we will review how to formally solve systems of linear equations using elimination by addition and subtraction. I will ask them to hand in their worksheets for class credit.
Warm-Up:
(5-10 min) Discuss the activity that we did the previous day.

Transition: “Now please take out a piece of paper and a pencil to take notes with and we will begin to discuss what it means to solve systems of equations by elimination by adding and subtracting.”

Procedure (25 min):
1. Using the Elmo, I will write notes on a piece of loose leaf paper, and the class will take notes on what I write down and what we discuss as a class involving the method of elimination. I will begin by asking the students what was the definition of elimination that we discussed yesterday. We will write down the definition.

During the notes section of section I will use a LiveScribe Pen, which is an assistive technology. This would allow me to record the notes and then post them on the class website for Diego and other students to review later. I will also be highlighting important words and steps, such as the word elimination and adding and subtracting and the steps.

2. We will then what it means to eliminate by adding and subtracting as it pertains to systems of equations. I will stress that we are getting rid of a variable and that is where elimination comes into play. This may confuse them at first so I am prepared to address any questions they may have.

3. Then I will explain when we eliminate by addition and when we eliminate by subtraction. Here I will use the mathematical process notes as described in the article by Sally Hunt. These notes are set up in a way where there is a table that contains the examples and on the side an explanation for what is means and why. This helps to outline the process so that Diego can better understand how to use the process to solve the problems.

They will be set up their notes like this in their notebooks:

<table>
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<tr>
<th>Problem</th>
<th>Process</th>
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<tr>
<td>-6x + 3y = 4</td>
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<tr>
<td>6x + 2y = 6</td>
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Describe what we did:

Write directions for solving systems of linear equations by elimination:

We add the two equations if the coefficients of one variable are opposite of each other (i.e. -6x and 6x, the coefficients are -6 and 6 respectively so they are opposite of each other so we add the equations because then -6x+6x =0 and we eliminate the x variable)

Ex. -6x + 3y = 4
    6x + 2y = 6

We add these equations because the coefficients attached to the x are -6 and 6. Since -6 and 6 are opposite integers.

We subtract two equations if the coefficients of one variable are the same (i.e. 6x and 6x both have coefficients of 6, so we subtract the equations because 6-6=0 and that eliminates the x-variable)

Ex. 6x + 3y = 4
    6x + 2y = 6

We subtract these equations because looking at the x-variable the coefficients attached are 6 and 6. Since these are the same integers in order to eliminate...
4. Then we will discuss the general steps for solving systems of linear equations by elimination.

**Students will create graphic organizers for the steps for solving systems of linear equations by elimination.** This will be particularly helpful for Diego as he tries to recall the process later on in the class and for homework. It will also help organize the steps. The graphic organizer will be a foldable with each page having the steps for each method used to solve systems of equations.

Step 1: Add or subtract the equations to eliminate one variable.
   a. Add equations if the coefficients of one variable are opposites
   b. Subtract equations if the coefficients of one variable are the same.

Step 2: Solve the resulting equation for the other variable.

Step 3: Substitute in either original equation to find the value of the eliminated variable.

5. I will then give an example to model these steps. I will have students return to the system of equations in the Warm-Up. **Using the same process notes from above**, I will ask the students about what we can eliminate from these two equations. I expect them to say the y-variables. If they do not, I will ask by looking at the two equations, what variable, x or y, can we get rid of. Again, I will look for the students to say the y-variables. Then I will discuss that this is a method of solving equations called elimination by addition and subtraction. By adding these two equations, we are eliminating the y-variables.

\[
\begin{align*}
5x - y &= 27 \\
-2x + y &= 3
\end{align*}
\]

6. Then I will tell the students to add these two equations together by putting the equations in column form. This means that they need to line up the variables under each other and the constants on the right side of the equal sign. I will then show them how to add the equations together and then to solve for x.

\[
\begin{align*}
5x - y &= 27 \\
-2x + y &= 3 \\
3x &= 30 \\
x &= 10
\end{align*}
\]

7. Now I will explain to them that they will need to use their knowledge of substitution to finish the problem. I will say, “Now that we have solved for x, we need to find the y-value. We do this by substituting our x-value into either of the equations. Which equation should we use?” After the class chooses the equation they want to substitute x in for, I will then discuss how this is just like the substitutions they were doing before and ask someone to come to the board and finish the problem.

4. I will ask them to compare the answers that they got for solving the system by substitution and solving the system by elimination. They will see that they got the same answers and so both methods work.

5. I will then have one more problem for us to solve as a class. It will be an elimination problem by subtraction. **I will use the same process notes.** This will be the system:

\[
\begin{align*}
x + 2y &= 7 \\
x + y &= 6
\end{align*}
\]

I will first ask the class which variable we should eliminate. I anticipate they will say x because the x-values have the same coefficient. If they do not come up with this, I will tell them which
I will then ask if the coefficients on the x-values are opposites. Then I will show them they are not because the coefficient on both x-variables are 1 and if we used addition we would still have the x-variable and we would not have eliminated any variable. Since the signs on the coefficients are the same, we subtract the equations.

8. In order to subtract the equation, I will show them that they must do the following:

\[
\begin{align*}
x + 2y &= 7 \\
-(x + y) &= 6
\end{align*}
\]

I will explain that they are not only subtracting the x-values but they must subtract all the terms in the bottom equation from all the terms in the top equation. To make this clearer for students, I will show them that they can distribute the negative sign to all the terms in the bottom equation to get:

\[
\begin{align*}
x + 2y &= 7 \\
-x - y &= -6
\end{align*}
\]

So now they just subtract and get the following answer:

\[
y = 1
\]

9. (10 min) I will then tell them that they will use substitution again to find the x-value now that they have the y-value. I will ask them to choose from the original equations which one they would like to use. I will emphasize that they need to choose from the original equations in order to get the correct solution. So as a class we will work out the rest of the problem.

Walk over to Diego and make sure that he is writing his notes down and that he is working on the material. Ask him how he feels about the new material and if I need to make any clarifications.

10. Now that we have solved a couple of systems as a class, I will have the students work on some in partners.

Students will be partnered with the same peers they were the day before. This way Diego will be partnered with the same peer who he is comfortable working with. He will also be allowed 10 extra minutes to work on them. Diego will also be given a worksheet with the Word Problem Process Notes and the word problems will be written to be more coherent for him to address his reading level.

They will be put on the Elmo. They will be word problems. This way they can begin to use the method on their own. The problems will be the following:

1. Six Flags was chosen for a senior trip. The senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 8 vans and 8 buses with 240 students. High School B rented and filled 4 vans and 1 bus with 54 students. Ever van had the same number of students in it as did the buses. Find the number of students in each van and in each bus.

2. Sharon and Paul are selling flower bulbs for a school fundraiser. Customers can buy bags of windflower bulbs and bags of daffodil bulbs, Sharon sold 10 bags of windflower bulbs and 12 bags of daffodil bulbs for a total of $380. Paul sold 6 bags of windflower bulbs and 8 bags
of daffodil bulbs for a total of $244. What is the cost each of one bag of windflower bulbs and one bag of daffodil bulbs?

After giving them about 10 minutes to work, during which I will be walking around observing student work and answering questions, I will have a pair come to the board and show their work and explain what they did to the class. I will then ask if everyone came up with the same answer and if there are any questions, I will address them then.

For the word problems, I will have the following sheet for Diego to work on as he solves them. They are Word Problem Process Notes. He will have used these process notes when he solved word problems that required him to solve systems of equations by substitution. So this will be familiar to him. They are found after the lesson. I also decreased the reading in the word problem and left the vital information needed to solve the problem. He will turn this in at the end of class. If I notice that Diego is doing the correct work, I will ask him if he would like to present the problem to the class. If not, then he can continue working or listen.

Closing:
(5 min) I will close by reviewing this new method of solving systems by elimination. I will ask them what are the steps involved by solving systems of equations. I will also discuss how there are multiple ways of solving these systems of equations and the way they choose to solve them is up to them. Students will turn in their work on the examples for class participation for the day.

Extension:
If time allows, I will allow students to begin their homework for that night which will be a worksheet with the systems of equations that they will need to solve by elimination by adding and subtracting. There will also be a part in which students can choose which method, of the methods they have learned thus far, to solve them.

Assessment:
I will be assessing students throughout the lesson. I will be walking around when they are working on the algebra tiles to begin to see what the students are coming up with. The worksheets that they turn in will be checked for class participation but I will go through the worksheets and see if students understand the concept. I will also be observing and assessing their work on the examples in class they turned in. The final assessment will be a homework sheet that students will complete and turn in for a grade. This will be able to help me in determining where students stand on solving systems of equations by elimination. It will help me decide whether or not to take more time to go over this concept or to see if they understand enough to move on to solving systems of equations by multiplying.
Fun with Algebra Tiles

Directions: Solve the following systems of equations using the algebra tiles. Explain what how you solved the system.

a. \[3x - y = 5\]
   \[x + y = 3\]

b. \[x + 4y = 10\]
   \[x + 2y = 6\]
Fun with Algebra Tiles
(Accommodated)

Directions: Use algebra tiles to solve the problems. Write the steps you took to solve the problems.

a. \[3x - y = 5\]
   \[x + y = 3\]

   Steps:

b. \[x + 4y = 10\]
   \[x + 2y = 6\]

   Steps:
This will be on a foldable so that students can open it up to the right page to find the steps.

Solving Systems of Equations

- **Graphing**
  - Steps:

- **Substitution**
  - Steps:

- **Elimination**
  - Steps:

- **Matrices**
  - Steps:
### Word Problem Process Notes

**Number 3:**
- There are **8 vans** and **8 buses** with **240 students**.
- There are **4 vans** and **1 bus** with **54 students**.

**Question:** How many students can the van hold and the bus hold?

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Number 4:

- Sharon sold 10 bags of sunflowers and 12 bags of daffodils for a total of $380.

- Paul sold 6 bags of sunflowers and 8 bags of daffodils for a total of $244.

- **Question:** What is the cost each of one bag of sunflowers and one bag of daffodils?

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Solving Systems of Equations by Elimination

Solve the systems of equations using elimination.
1. \( x + 2y = 13 \)
   \(-x + y = 5\)
2. \( 3x - y = 30 \)
   \(-3x + 7y = 6\)

3. \( 5x + 6y = 50 \)
   \(-x + 6y = 26\)
4. \( 4x - 9y = -21 \)
   \(4x + 3y = -9\)

Solve the systems of equations using any method you have learned so far.
5. \( x + 2y = 1 \)
   \(-2x + y = -4\)
6. \( 6x + 12y = -6 \)
   \(2x + 5y = 0\)

Solve the following word problem:
Two small jugs and one large jug can hold 8 cups of Kool-aid. One large jug minus one small jug holds 2 cups of Kool-aid. How many cups of Kool-aid can each jug hold?
Solving Systems of Equations by Elimination
(Accommodated Homework)

Solve the systems of equations using substitution. You can use your graphic organizer.

1. \[ \begin{align*}
    x + 2y &= 13 \\
    -x + y &= 5
\end{align*} \]

2. \[ \begin{align*}
    3x - y &= 30 \\
    2x + y &= -4
\end{align*} \]

Solve the systems of linear equations using elimination. You can use your graphic organizer.

3. \[ \begin{align*}
    5x + 6y &= 50 \\
    -x + 6y &= 26
\end{align*} \]

4. \[ \begin{align*}
    4x - 9y &= -21 \\
    4x + 3y &= -9
\end{align*} \]
Solve the following word problem by **filling out the Word Problem Process Notes**: 

- Suppose Ken has 25 coins in nickels and dimes only and has a total of $1.65. How many of each coin does he have?
- There are 25 nickels and dimes.
- The total amount of money in nickels and dimes is $1.65
- How many nickels and dimes does Ken have?

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Co-Teaching This Lesson

If I were to co-teach this lesson, I would use the “Alternative Teaching” style. This would most benefit my students because I could teach to the larger portion of the class while my co-teacher taught to a smaller group comprised of students who may need extra help. I would put Diego in this smaller group. He would have the directions of the activity read to him again and he would be able to have more one-on-one time with the co-teacher. I would teach the activity and the notes section to this larger portion and then have the co-teacher do the same with the other group. During the activity, we would both walk around the classroom observing how the class is getting along with the activity. This will give me a chance to work with the students in the smaller groups and determine if they understand the material and if there needs to be any more clarifications. I think that it is important that both teachers interact with all the students so that if one misses an important fact or needs help making students understand, the other can step in and give further explanations.

I think that all the co-teaching styles are beneficial to student’s learning. I do not think that any teaching style is better than the other and there are definitely times during a class that one style may work better than another. In the case of this lesson, I used the alternative teaching style as way to reach those students who may still be struggling with the material and need more assistance. They get more individual attention by working with the co-teacher. I could also set up to co-teaching the opposite way such that I teach to the smaller group and the co-teacher teaches to the larger portion of the class. I think that it is important that one teacher does not always teach to the smaller group, which may have students who need extra help or that has students who are excelling, and the other teacher teaches to everyone else. Each teacher should be interacting with all the students for those same reasons.
that I stated above when both teachers are walking around the classroom. It is important that both teachers build relationships with all the students, so that students feel comfortable seeking help from both teachers and that they are valued by both.
Reflection

This assignment has made me more aware of the ways in which I can accommodate my lessons for students with disabilities. For this assignment, I chose to accommodate my lesson for Diego. The lesson I chose to make the accommodations was already written for a class comprised of unmotivated students. In order to make the lesson more engaging for students, I created an activity using algebra tiles. I used this activity to help make abstract algebraic ideas more concrete for them by providing them with these manipulatives so they could work hands on with the algebra. The lesson was on solving systems of linear equations by elimination.

Although this activity may be more engaging for the unmotivated students, it may cause difficulty for Diego who learns better orally rather than with visuals. To accommodate the activity for Diego, I first split the groups up into pairs. By working in pairs, students need to work together to solve the problems using the tiles and share the ideas about how to go about this. I would pair Diego with someone he is comfortable working with because he has a fear of looking stupid in front of his classmates. I would also ask him to show his work in front of the class, if I knew that it was correct and he felt comfortable in doing so. This would increase his confidence in his work and may lessen any frustration he might feel.

I will make sure that I repeat directions to his pair to ensure that he understood what he is supposed to do. I will again explain how to use the algebra tiles and I will be writing the process for solving the systems with the tiles on the Elmo so students, especially Diego may reference them throughout the activity. Diego does well in memorizing processes so this will be of use to him. I will ask him if he needs any more clarification and make sure to praise him for being on task and working hard. I think it is important to provide this moral to
support to Diego and to all students as a way to make sure that they feel that they are valued members of the classroom as well as help with classroom management. Finally, I will give Diego algebra tiles that are labeled so that he can see how the tiles represent each symbol in the system. This will help with his difficulty with visuals. By giving him this extra support, he will not be focused on what square represents what symbol but rather it will aid him in setting up the equations and then to solve them. It will be more focused on the mathematical content rather than the ability to use algebra tiles.

Other accommodations I made for Diego was to use the LiveScribe pen. This pen automatically records the lesson as I write which I can then load up on the classroom website. This is where students, especially Diego, can go and review the material that we went over in class. Diego could make sure that the notes he took in class matches up with the ones on the website and fill in any gaps he may have or clarify any concepts he was having difficulty with. This is especially helpful since Diego learns best orally. In addition to using the LiveScribe pen, I also used two different process notes, mathematical process notes during the notes portion of class and the world problem process notes that will be used while the class is working on their own problems and that Diego may use on his homework. These notes help organize students and match examples to the more abstract concepts. Because Diego does well at memorizing formulas and processes, these notes will help match up the processes he needs to know to specific examples and give a reason for doing them.

In order to address Diego’s reading level, I limited the amount of information in the word problems and also wrote them in bullet form so that Diego will be able to look at each bullet and see what the problem is asking him to do. The bullets will be able to organize the information. I think this will help Diego focus more on the math rather than the reading
involved. I also addressed some vocabulary by changing certain words. They were minor vocabulary words but they could still distract Diego and cause some frustration. They were windflower bulbs and daffodil bulbs which I just changed to sunflowers and daffodils.

With regards to assessment, Diego will turn in his “Fun with Algebra Tiles Worksheet” and his Word Problem Process Notes at the end of each day’s class, just like the rest of the class turns in their in-class assignment sheets. The Word Problem Process Notes were an accommodation to the in-class problems. Diego was given the same word problem but it was broken up using bullet points so that it was not too much reading. The homework which Diego will turn in also was accommodated. I explicitly told him what method to use to solve the equations because he has difficulty choosing the appropriate mathematical method. The word problem is also different because Diego does well with monetary problems. So I changed his word problem to one about money that would peak his interest and show off his strength but still assess whether or not he can take a word problem and solve it using the elimination method from class.

Although I did make many accommodations to the lesson, there are a couple of aspects during the lesson that remained unchanged. I kept the part of the lesson where I went over the answers to the quiz. I think that this is important in order for students to see where their mistakes are. By giving the answers orally in addition to visually writing them on the board, Diego can correct any mistakes he made and see why he made them. I also did not change the warm-up for day two because it was a discussion on the algebra tiles activity from the day before. This discussion will help Diego to recall what we learned the day before which we will go in depth this day.
These accommodations are necessary for Diego to succeed in the class. It is important, as a teacher that I differentiate my lessons appropriately and plan prior to the lesson how I am going to support my students to help them gain a deeper understanding of the mathematical content. I believe that these accommodations address the areas of concerns with regards to Diego’s ability to learn.
The General Educator’s Role in Special Education  
SPED 405B - Carty  
Fall 2011

### Accommodations assignment RUBRIC

Name: Courtney O’Donovan  
Signature:

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<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
<th>Comments</th>
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| Brainstorming checklist attached and clearly addresses these things for the lesson provided:  
Input (what the teacher does/instruction)  
Output (what the student does / produces)  
Student Behavior  
Testing / Evaluation  
*Note: There may be crossover between categories* | /15 | |
| Lesson Plan makes it very clear where accommodations were made compared to the original. (fonts, underlined, bold, color, headings, etc…) | /5 | |
| **Accommodations** are present for:  
☐ a reading component of some kind  
☐ at least one handout  
☐ a student product (something that the student will produce)  
☐ preferably, some sort of student-centered or guided activity  
☐ an assessment of student learning that targets your lesson objective(s) | /30 | |
| Accommodations are valid and meet the needs of the student chosen. There are no components of the lesson that were not addressed and remain a hindrance to learning for the student chosen. | | |
| Reading component – clearly labeled as original and accommodated and text is at a lower level / more accessible | | |
| **Description of a way to co-teach this lesson** includes:  
*Model(s) of co-teaching you would use of those discussed in class and why it/they would work for this lesson.  
*The responsibilities of each teacher during the lesson (where will they be? How will students be grouped? What will each teacher be doing instructionally during the class period?) | /10 | |
| **Reflection includes:**  
*A clear, succinct explanation and rationale for the changes and accommodations made to my lesson and how they match the needs of my selected student.  
*An explanation of where the lesson did not need to be changed or accommodated since it already was planned in such a way that it met the needs of the student chosen.  
*Overall reflection on the process / assignment. | /10 | |
| **TOTAL** | /70 | |