

**THE EFFECTS OF USING DIRECT INSTRUCTION AND MODEL, LEAD AND TEST WITH FOUR YOUNG ADULTS WITH DEVELOPMENTAL DISABILITIES.**

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***Abstract:** The purpose of this study was to increase the fluency and accuracy on think to say for coin identification, counting and giving change with four 20-year-old-students with developmental disabilities. The study was conducted in a special education classroom located at a community college campus in the Pacific Northwest. The behaviors measured were corrects and errors for money skills. These behaviors were measured almost daily. The students were taught using the model, lead, and test (MLT) error correction procedure. The results showed an increase of correct responses and a decrease in errors. Systematic instruction and MLT were shown to be an effective way to increase coin identification, how to give the proper dollar amounts, and how to give proper change with four 20-year-old students with developmental disabilities. The ease of employing these procedures was also highlighted*

***Key Words:** model, lead, and test error correction, rewards, money counting, young adults with developmental disabilities*

**Introduction**

Functional skills in math have been linked to employability (Rivera-Batiz, 1992). The importance of learning money skills for young adults with disabilities has been widely discussed (Heward, 2009). Money skills have been suggested as functional skills for individuals who will be working and transitioning into the community (Stood & Jitendra, 2007). Several ways to teach money skills have been examined in the literature. These have included fast money counting (Hastings, Raymond, & McLaughlin, 1989), next-dollar strategy (Colyer & Collins, 1996; Heward, 2013), and one-more-than technique (Denny & Test, 1995), and employing the procedures of direct instruction math (Silbert, Carnine, & Stein, 1981).

**Review of Literature**

Direct Instruction refers to a rigorously developed, highly scripted method for teaching that is fast-paced and provides constant interaction between students and the teacher (Marchand-Martella, Slocum, & Martella, 2004). It has been used to help inner-city children learn and excel, but it has proven successful for children regardless of economic level (Marchand-Martella et al., 2004). Many studies indicate that Direct Instruction works, providing rapid gains, gains that persist, gains that increase self-esteem because children have acquired skills (Gersten, Keating, & Becker, 1988; Gersten, Woodward, & Darch, 1986).

The basic tenants of Direct Instruction are that no child can be deemed “unteachable.” Using this method teachers learn to teach effectively through the use of clear wording and examples, a step-by-step instructional design and a field-tested instructional sequence (Gersten et al., 1986, 1988; Marchand-Martella et al., 2004). Teachers have been effectively teaching varying demographics of students specific skill sets with the goal of reaching mastery (Stein, Kinder, Silbert, & Carnine, 2006). The specificity of the objectives or learning targets in Direct Instruction makes it easier for teachers to create appropriate assessment tests that have high validity and high reliability (Gersten, Woodward, & Darch, 1986; Marchand-Martella et al., 2004). This helps teachers keep track of student progress and shows areas that may need to be revisited or retaught (Marchand-Martella et al., 2004).

To implement direct instruction students receive careful, step-by-step instruction appropriate for their current performance levels. Students can be worked with individually or in groups. Grouping and placement is monitored carefully and adjusted periodically as their performance indicates (Gersten et al., 1986, 1988). Students acquire critical skills that lay the foundation for more advanced skills and applications as they move through the subject material (Marchand Martella et al., 2004). Most students develop very positive attitudes toward school and their ability to learn new material because they are gaining greater levels of success at a higher rate. Some students even become more attentive and eager learners (Gersten et al., 1986).

Direct Instruction has been useful in teaching students with disabilities varying skills. One of the most important being computational skills (Kinder & Carnine, 1996; Stein et al., 2006; Stood & Jitendra, 2007) is counting money Teachers provide instruction in a step-by-step manner it makes it easier for the student to understand the steps needed to reach an answer. For example, when teaching the addition of decimals, teachers begin with a review of adding integers numbers (e.g., the importance of lining up the one’s column and then lining up each column to the left). Next, they review the meaning of the decimal point. They demonstrate how the decimals must be lined up and model problems that require the addition of decimals several times, perhaps talking their way through each problem. Each problem has a set of steps that may be scripted. Teachers model several problems like this, which they apply to practical situations, such as adding money. Then they allow students to practice a variety of addition problems, some involving skills the students have already mastered and some using the new skill. When the students achieve mastery, determined through continuous progress monitoring, teachers move to the next skill but continue, through practice, to reinforce earlier presented skills (Marchand-Martella et al., 2004).

It can not be stressed enough that being able to independently count money is a critical skill for any person to know (Baroody & Wilkins, 1999). In order to be independent in society it is important to be able to count basic amounts of money. Everyday people grocery shop, purchase meals, purchase movie tickets, and deposit checks. As more and more students with disabilities successfully transition into community involvement, they are faced with the challenge of dealing with money. Often times students with disabilities struggle with counting money and the concept of giving correct dollar amounts when purchasing items. Along with this they can be short changed in stores or taken advantage of because of their skill deficits (Denny & Test, 1995).

The “next dollar” strategy is a model, lead, test procedure that can be used to teach students how to give the correct sum of money when purchasing items. The One-More-Than technique

(Denny & Test, 1995) involves teaching individuals to pay one more dollar than requested (e.g., if a salesperson says "\$3.29," the student would provide four, one-dollar bills). Becoming proficient at this skill allows individuals to independently pay for items and give the right amount of money, while allowing for a smaller amount of money being returned as change. This strategy is taught by One-More-Than technique was taught by modeling the procedure (e.g., give one more dollar than the dollar amount requested. For example, the salesclerk says "ten dollars and twenty-eight cents," you count out eleven dollars). Individuals were taught the use of the technique by counting out up to 20 one-dollar bills in three different amount groups (i.e., 0-\$5.00, \$5.01-\$10.00, and \$10.01-\$20.00) in a multiple baseline design fashion using the one-more-than technique to teach money counting to individuals with moderate intellectual disabilities is important. Cilhak and Grim, (2008) used this strategy to teach a higher functioning female who was working on calculating sales tax and giving the proper amount of money needed, to purchase desired items.

The purpose of this study was to increase the fluency and accuracy for coin identification, counting and giving change. Four 20-year-old students with various disabilities were employed. There were three females and one male student. All four were being prepared to transition out of school and into the working world and were enrolled in a community-training program to help them make the transition.

## Methodology

### Participants and Setting

This study included research and instruction with four students. The first participant was 20 year-old female with Downs Syndrome. She was low in all subject areas and needed assisting with coin counting instruction. She was very echolalic and used a PECS system to communicate because her expressive speech was low. This participant demonstrated severe difficulty in remembering coin names and values. This student also was unable to accurately add up different sums of monies and had no ability to make change when given a price and total. The second participant was a 20-years-old female who had cerebral palsy with spastic diplegia and intellectual disabilities. Her IQ was 56 when she was administered the WISC III. This participant demonstrated some knowledge in remembering coin names and values. She was also unable to accurately add up different sums of monies and had no ability to make change when given a price and total because she would become very frustrated and give up on the task being presented. The third participant was a 20-year-old male who had Downs Syndrome. He had some problems with his expressive language and demonstrated a lot of behavioral issues that distracted from the learning environment. This participant engaged in a great deal of guesswork to determine his answers. He could identify a few coins due to guessing and demonstrated no understanding of the value of coins. This participant was also unable to accurately add up different sums of monies and had no ability to make change when given a price and total. The final participant in the study was a 20-year-old female who had a learning disability. Her academic functioning levels were equivalent to about the third grade level. This participant was able to identify all coins and dollars and their values. She was unable to accurately add up different sums of monies when factoring in tax and had minimal abilities to make change when given a price and total. All four participants had volunteer jobs within the community and

expressed interest in long-term paid positions. In order to make them more marketable and have a more probable rate of success in their job place, it was imperative that they acquire basic computational skills.

The study took place in a transition program in a special education classroom located on a community college campus in the Pacific Northwest. There were two transition classrooms in this program; the study took place in one class of the classrooms. There were 12 students in the class, one instructional assistant, the researcher's cooperating teacher, two job specialists, and one CTE (career technical education) instructor. The study took place some mornings after the daily question was completed upon arrival to school and most Friday afternoons. The classroom setting was always consistent with several large tables in the shape of a horseshoe and chairs arranged around the outside of each table. The number of students in the classroom was different almost every time the participants met with the researcher. The study never required for the participant to leave

### **Materials**

Materials included a fake dollars, coins, menus, rounding worksheets, and data sheets. The participants were provided with verbal praise. There was no cost associated with the implementation of the research project.

### **Dependent Variable**

The dependent variable in this study was the ability to accurately identify and add a certain number of coins, give the correct amount of money when purchasing items, and providing the proper amount of change from a given sum. These procedures and prompts were presented verbally in the same way each day. In the beginning phases of instruction the researcher presented the question, "What is the name of this coin and how much is it worth?" The participant was asked to name the coin and the value. If the participants made the correct identification on the first try the researcher would put a plus (+) on the data sheet. If the participant said an incorrect answer, did not respond within 3 seconds, or chose to not respond a minus (-) was provided on the data sheet. After the first question was mastered the researcher moved onto asking questions like, "If you want to buy a taco salad for \$4.99 how much money will you need to give the cashier?" Scoring was done in the same manner as above. The final kinds of questions asked were, "I would like to buy a cookie for .89 cents, I have \$1.00. How much money will I get back?" Scoring was done in the same manner as previously stated. Data were taken three to four times a week depending on the participants' work schedules and classroom activities.

### **Data Collection and Interobserver Agreement**

A data collection sheet was used to keep track of the participants' progress. For each session the participant was asked the same question three times. This allowed them to get enough practice with each denomination of money and with each assigned task (giving proper money amounts and giving proper change). In the data sheet the researcher provided three pluses and three minuses in each box so it could be easily indicated if the participants' answered the question correctly or incorrectly. The data table was set up in a chart form, the coin and dollar

denominations were the headers or each column, along the left side of the chart the date and phase was recorded. In the remaining boxes three pluses and minuses were written in each box (See Figure 1).

The participants wanted to reach 90% accuracy by the end of the study. Interobserver agreement was taken every third session. The agreement was 98% for all the data that was collected throughout the study.

### **Experimental Design and Conditions**

The experimental design was multiple baselines across participants (Kazdin, 2011). In the beginning of the research project data was taken for two to three days, once completed the intervention was implemented. The intervention was broken into a few stages in order to reach each participants level of need. Baseline was taken every time data was collected. Baseline was taken for 3 days at the beginning of the first phase of intervention. The participant was asked to name all the coins and dollar bills up to twenty dollars. Baseline was taken each time data were collected through all phases of intervention.

**Pretest.** All twelve of the students in the classroom were tested on their ability to identify coins and dollars and their ability to count change (See Table 1). The pretest was used to determine what students were going to be used for the study. The three students who scored the lowest and one who scored the highest were asked to participate in the study. The higher functioning student was selected to compare results and advance her skills.

**Baseline.** During baseline the participants were asked to identify 1, 5, 10, and 25 cents and 1, 5, 10, and 20 dollars using fake money. Each value was presented three times. If they gave the correct verbal response a "+" was recorded, if a verbal incorrect response was given a "-" was given. Baseline was taken for three sessions. The participants received positive feedback for their answers during baseline, but no corrective feedback were provided.

**Direct instruction with model, lead, and test.** This type of direct instruction technique was used to teach the participants how to properly recognize coins and dollars, how to give the proper amount of money when purchasing items, and how to return change. There were three steps in this process.

The researcher would model how to complete the desired goal. For example, if the researcher wanted the participant to identify coins or dollars she would point to a penny and say, "this is a penny." For more complex strategies, such as paying for food, the researcher would model how they would look at the price of their meal (\$5.50) and count out \$6.00 to give to the cashier.

After the researcher showed the participant how to complete the desired task the participant and the researcher completed the task together. This gave the researcher the opportunity to lead the participant through the task so they could be set up for success. The researcher would ask the participant to do the desired task independently. If an error occurred the researcher would go back to the model step and reteach the skills.

The first phase of instruction used a model, lead, test procedure to teach the participant to identify each coin; penny, nickel, dime, and quarter and the bills; one, five, ten, and twenty. Each

was taught in isolation and baseline was taken with every session. The researched presented the coin being taught and said, "This is a penny." Next the researcher would say, "say it with me." Lastly the researcher would ask the participant "What is this?" and point to the penny. If the participant said the wrong name or value the researcher would stop them and say, "this is a penny. What is this?" Then they would practice it three more times. After this the researcher would move onto the next coin and do the same procedure. This procedure was used on all the coin and dollar values.

After phase one was mastered the researcher worked on discrimination between the coins and dollars. The researcher would start the data collection by taking baseline. Next the researcher would lay out the coins and dollars and tell the participant to, "Show me the [coin/dollar]." If they answered correctly the researcher would move onto the next question. If the participant answered incorrectly the researcher would stop them and say, "This is the [coin/dollar]. What is this?" and then the researcher would mix up the pile and ask for the same [coin/dollar] again. This process would be repeated three times in a row before moving onto the next value.

The next phase of intervention was money counting. Participants were instructed using play money and real coins. They were given a series of bills and coins and were asked to add them together. One of the higher functioning participants was expected to add the values in her head; the other three were instructed with calculators. The researcher presented the participant with a mixture of different values coins and dollars and showed them how to enter them into the calculator then had them independently enter values into a calculator. This was practiced until mastery was met.

The next phase of intervention was practice with reading a menu/price list and factoring in sales tax in order to purchase items. The next dollar strategy was taught in order to teach participants to give one extra dollar when their sum total included cents. In order to teach this concept the researcher created a menu for a school cafeteria and a price list for a beauty salon. First the researcher modeled how to factor in tax and round to the nearest cent. A formula was created for the participant to use every time (See Table 2) they factored values. The researcher modeled how to use the formula to factor in tax and add it to the total price. After the researcher modeled the system the participant practiced and was corrected on errors if needed. First single items purchases were practiced, then multiple items were combined and practiced. After the menu was mastered the price list was presented and the same procedure was used.

For the final phase of intervention, the participant and the researcher switched roles, the researcher went shopping and the participant had to cash her out. The model, lead, test procedure was used for this phase as well. They were allowed to use calculators to add the values of things being purchased and to subtract the total price from the amount they were given by the customer (researcher). After they did this they were to count back proper change. If they made an error the researcher stopped them, instructed them to add the values up again, subtract them from the total monies again, and recount proper change with prompting.

### **Interobserver Agreement and Reliability of Measurement**

Interobserver agreement was completed by having a high functioning student in the class, the master teacher, or instructional assistant sit on one side of the participant while the researcher sat

on the other side during the session to take data. The reliability person was given a copy of the data sheet and filled it out as the session progressed. Interobserver agreement scores were computed by counting the number of agreements (both observers making the same notation) and dividing by the number of agreements plus disagreements and multiplying by 100. Interobserver reliability was collected for 33% of the sessions completed. For the first participant the mean agreement for score per session was 96% with a range of 92% to 100%. For the second participant the mean agreement for score per session was 99% with a range of 96% to 100%. For the third participant the mean agreement for score per session was 100%. For the fourth participant the mean agreement for score per session was 97% with a range of 92% to 100%.

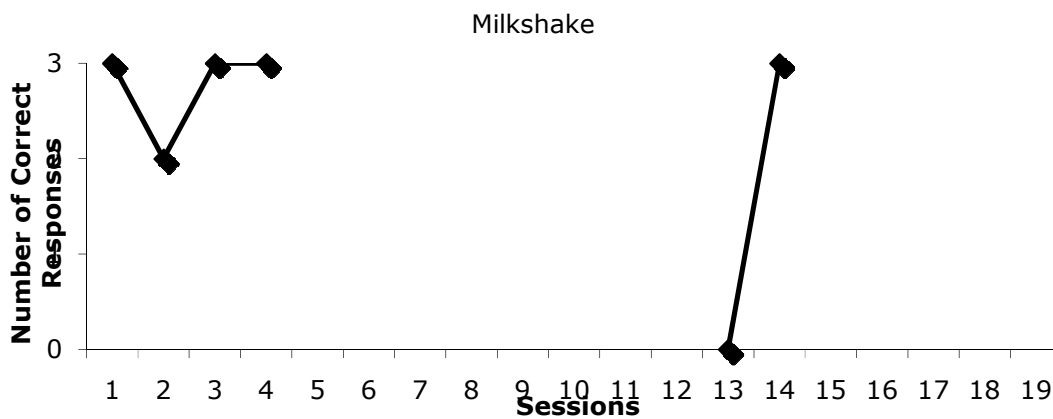
## Findings

The overall results of this study showed an increase in each participant's ability to handle money. Two of the participants increased their ability to identify and discriminate between coins and the remaining two participants increased their ability to count money and give/receive proper change. During baseline the first participant had an average score of 56% for 1 cent, 67% for 5 cents, 22% for 10 cents, 0 % for 25 cents, 100 % for \$1.00, 0.0% for \$5.00, 0.0% for \$10.00, 0.0% for \$20.00. During the Direct instruction model, lead, and scores improved for each denomination with the exception of \$1.00 for Participant 1. As seen in Figure 2, she showed mastery in one because she said "one" for almost every answer. For 1 cent her average increased to 87%. For 5 cents her average increased to 87%. For 10 cents her average increased to 80%. For 10 cents her average increased to 80%. For 25 cents her average increased to 80%. For \$1.00 her average decreased to 87 % . For \$5.00 her average increased to 73 % . For \$10.00 her average increased to 67 % . For \$20.00 her average increased to 73 % .

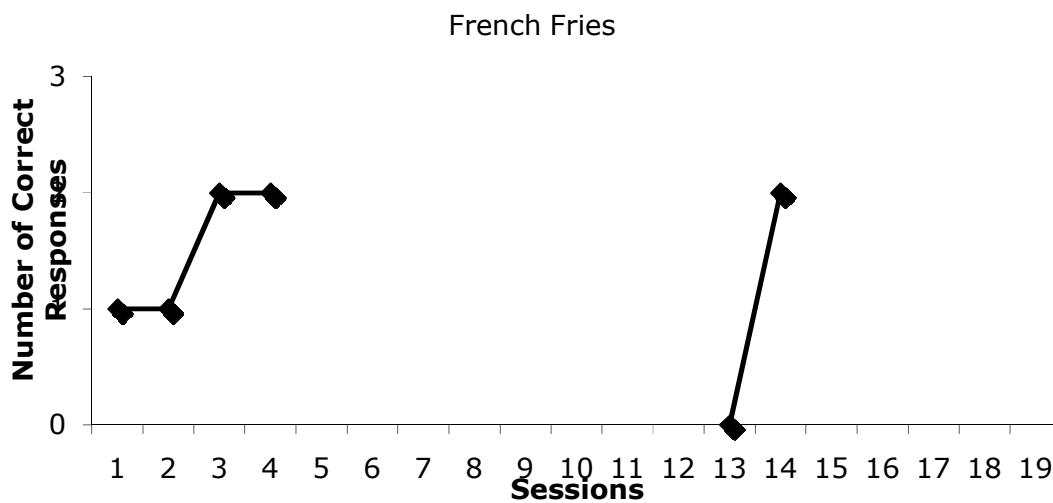
During baseline Participant 2 had an average score of 100 % for 1 cent, 78 % for 5 cents, 67 % for 10 cents, 100 % for 25 cents, 100 % for \$1.00, 100 % for \$5.00. 100 % for \$10.00, and 100 % for \$20.00. During the Direct instruction model, lead, and test conditions, the participants scores improved for each denomination that mastery had not been reached in during baseline. For 5 cents her average increased to 100 % . For 10 cents her average increased to 100 % . This participant was moved to the next phase of intervention where she was taught to count out designated amounts of money using different coins and dollars. In baseline her average score for \$11.00 was 100 % . For \$1.00 her average score was 33 % . For \$25.31 her average score was zero % . For \$2.79 her average score was zero % . For \$5.00 her average score was 67 % . For \$10.00 her average score was 33 % , and \$20.00 her average score was 67 % . After the intervention, her average score for \$11.00 improved to 100 % . For \$1.00 her average score was 67 % . For \$25.31 her average score was 67 % . For \$2.79 her average score was 100 % . For \$5.00, \$10.00, and \$20.00 her average score was 100 % .

During baseline Participant 3 had an average score of 78 % for 1 cent, 67 % for 5 cents, 78 % for 10 cents, 67 % for 25 cents, 78 % for \$1.00, 89 % for \$5.00. 78 % for \$10.00, and 78 % for \$20.00. During the use of Direct Instruction Model, Lead, Test the participants scores improved for most of the denominations. For 1 cent his average increased to 89 % . For 5 cents his average increased to 78 % . For 10 cents his average decreased to 67 % . For 25 cents his average decreased to 45 % . For \$1.00 his average increased to 100 % . For \$5.00 his average increased to 100 % . For \$10.00 his average increased to 100 % . For \$20.00 his average increased to 100 % .

Because Participant 4 showed mastery of phase one, two, and three during intervention with 100 % accuracy, her target skill was changed she was taught to read a menu, calculate sales tax, and state the final price of the item. In baseline she got all the values incorrect because she had no concept of how rounding worked. Single values were presented first. During the use of Direct Instruction Model, Lead, Test the participants scores improved for all the items on the menu. For milkshake she had an average of 89 %. For French fries she had an average of 56 %. For candy bar she had an average of 67 %. For hot dog, soup, and salad she had an average of 100 %. The next phase included adding multiple items on a menu to find the tax and final price. In baseline she mastered all values that rounded neatly. For milkshake and hot dog, and milkshake hotdog and french fries her average was 100 %. For French fires and salad her average was 67 %. For French fries and soup her average was 67 %. For candy and hot dog she had an average of 67 %. For soup and salad she had an average of zero %. After intervention her ability to factor and add tax using rounding increased to an average of 100 % with the exception of soup and salad that had an average of about 17 %.

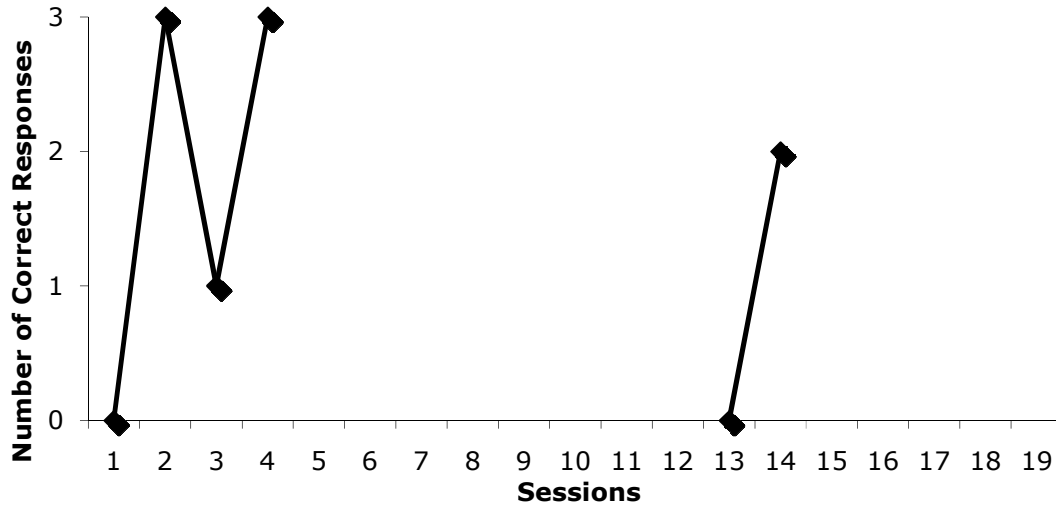


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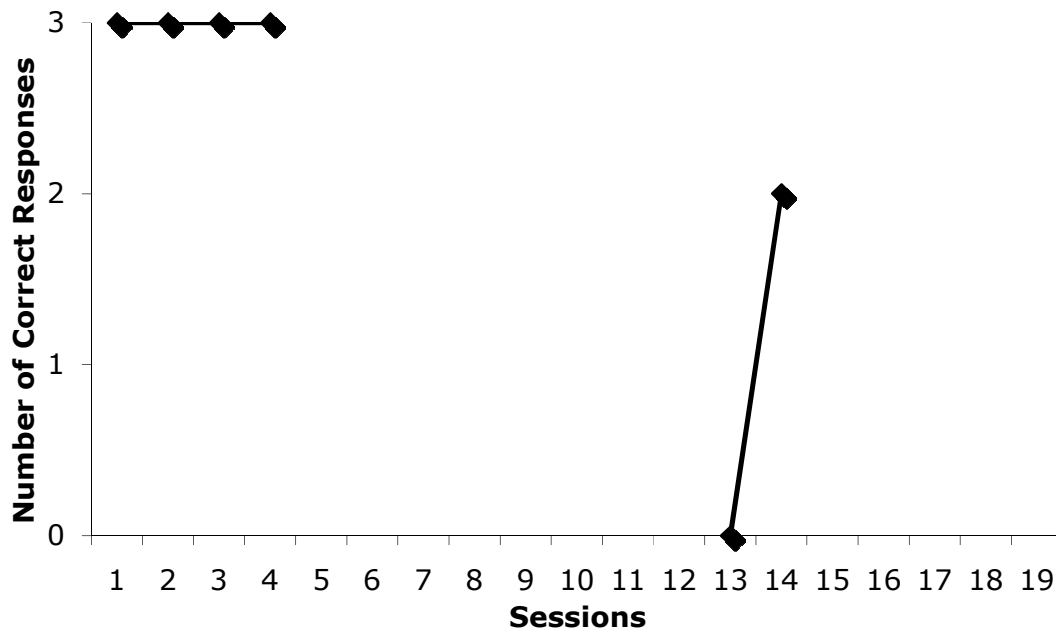


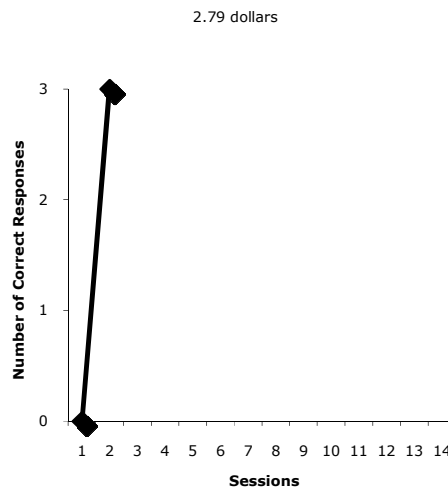
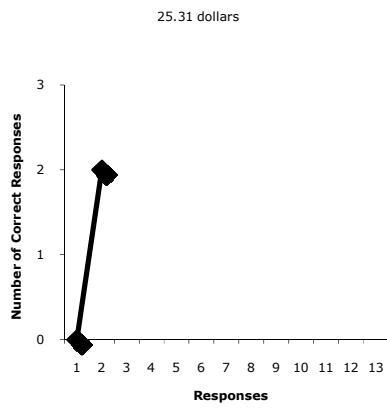
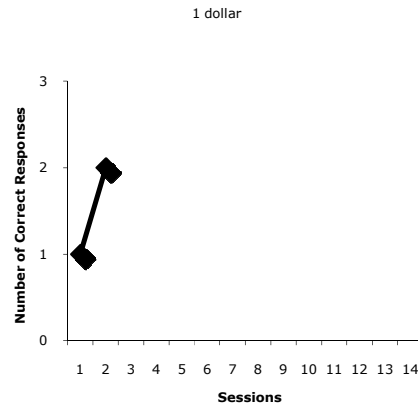
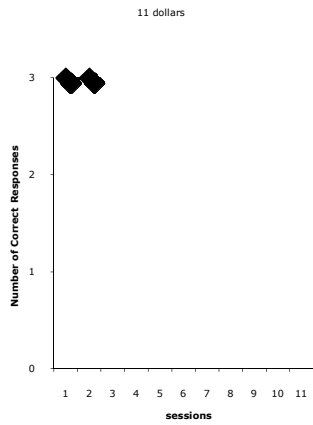


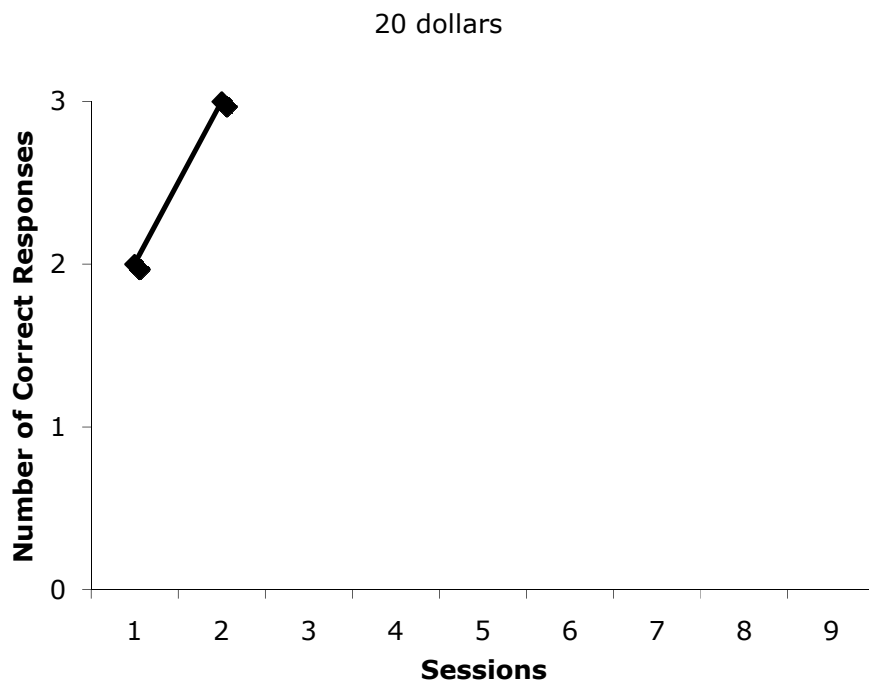
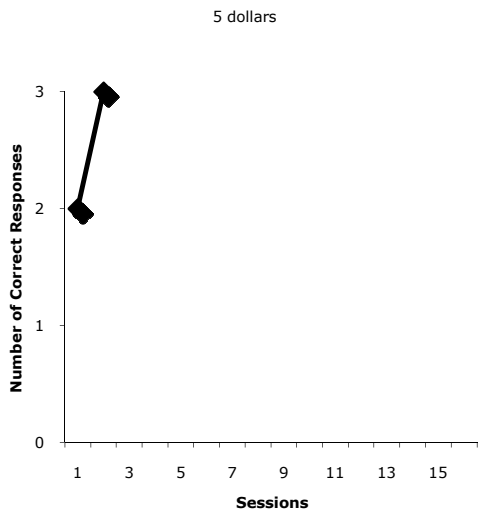
Cany bar

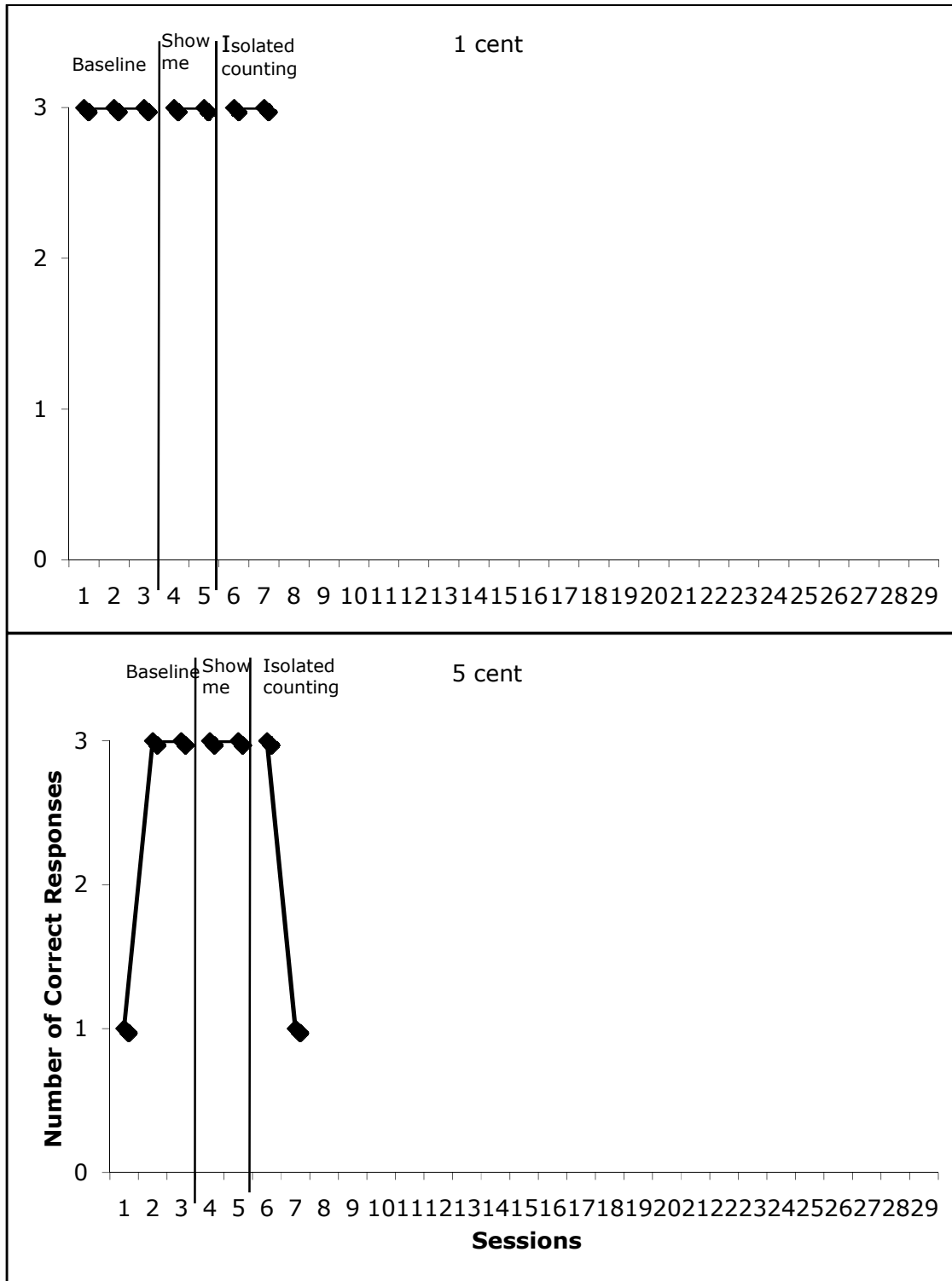


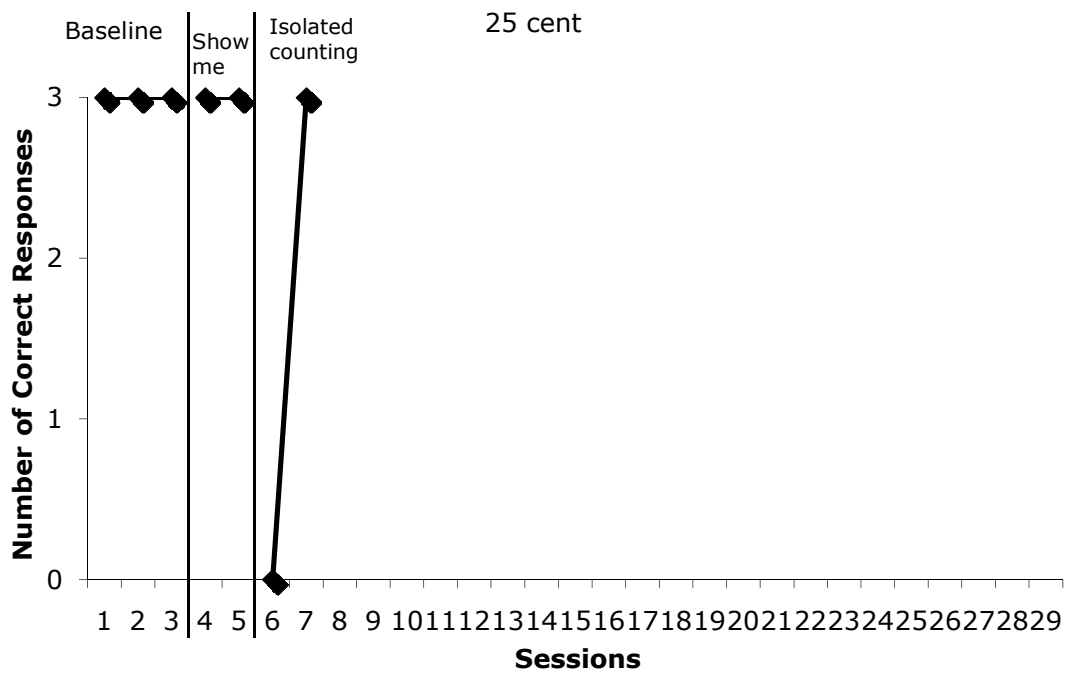
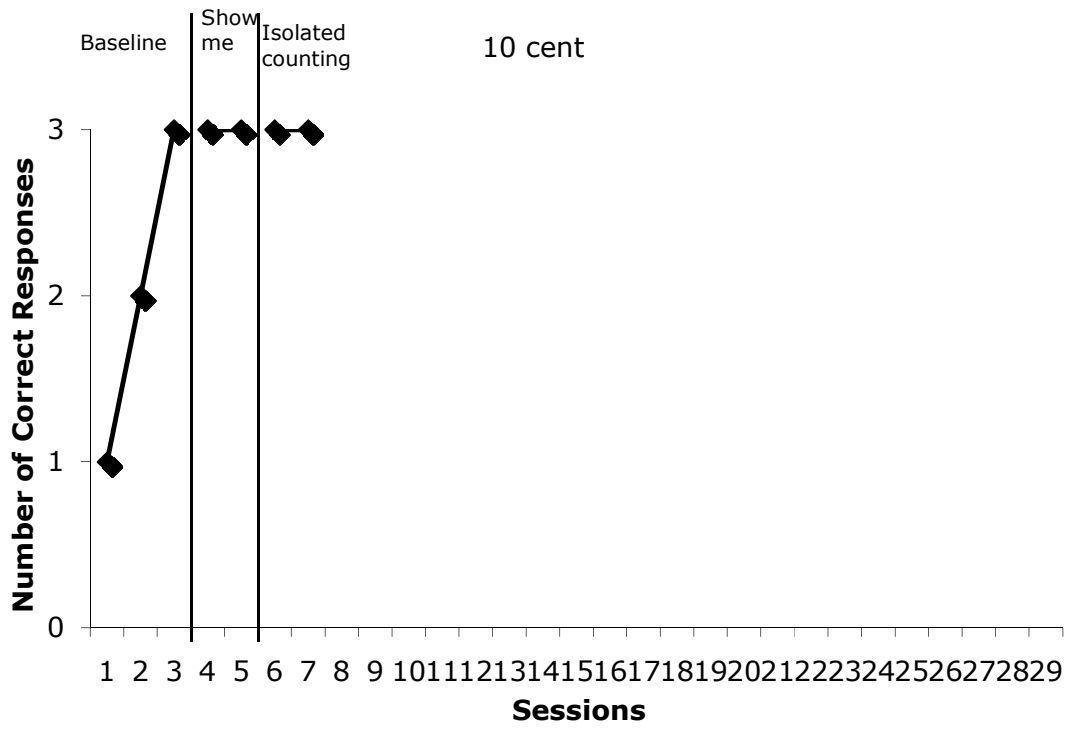
Hot dog

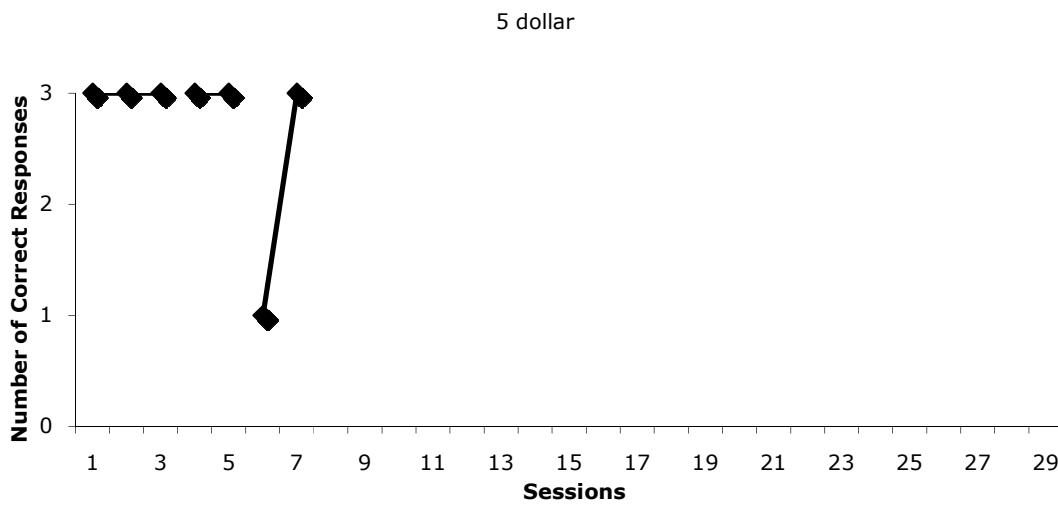
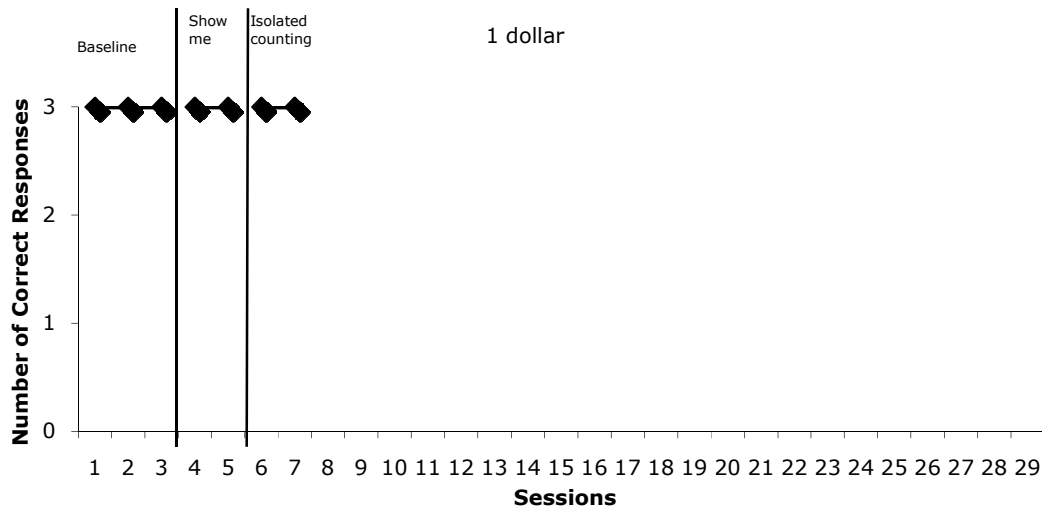


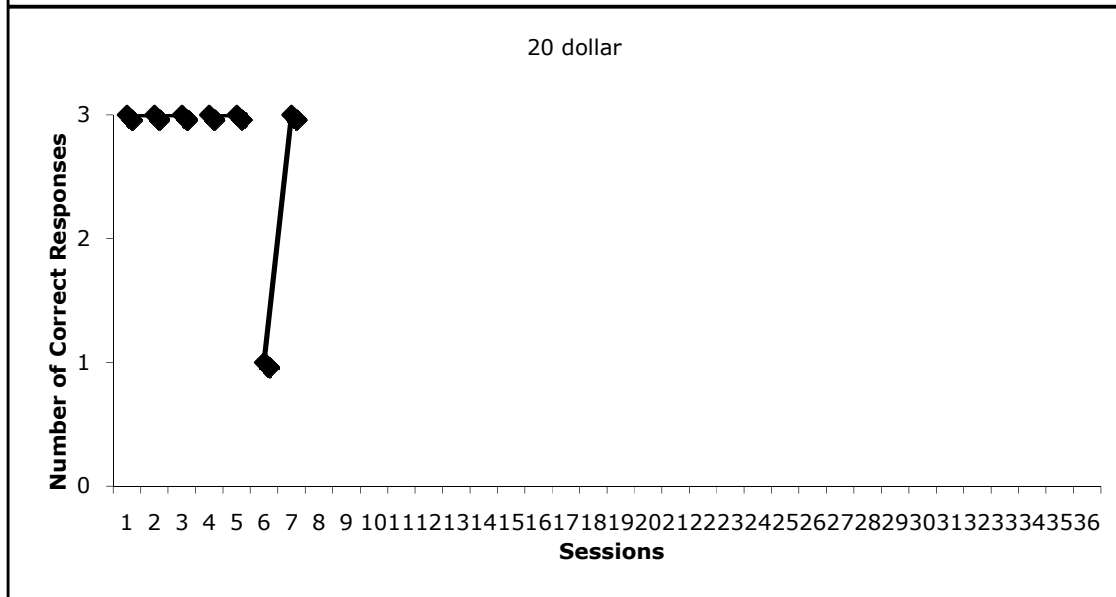
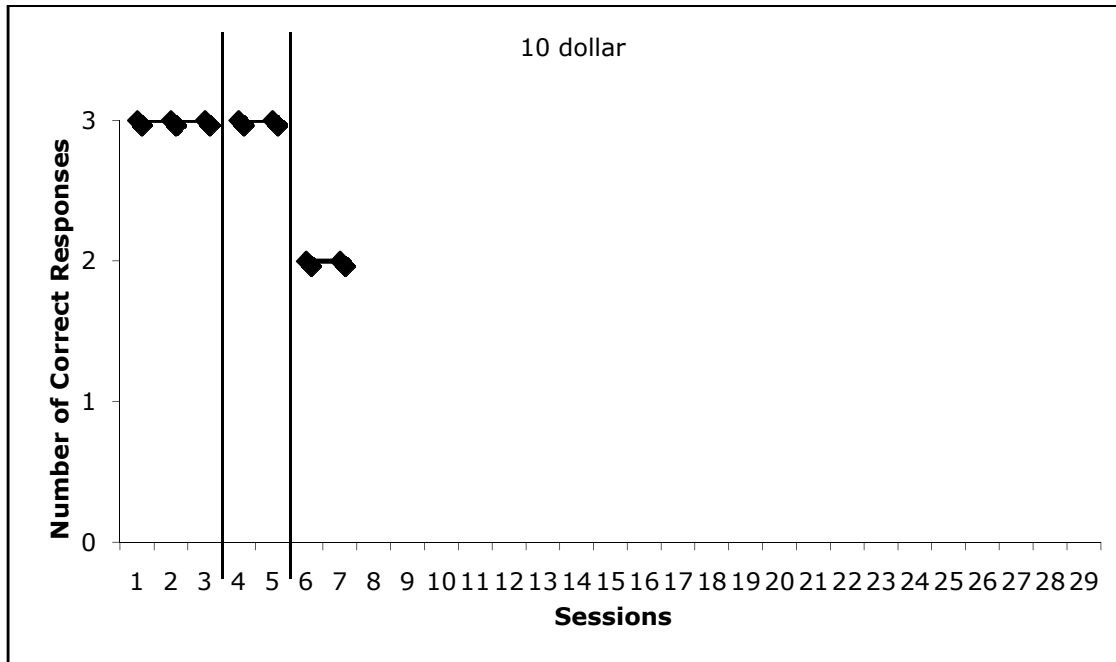


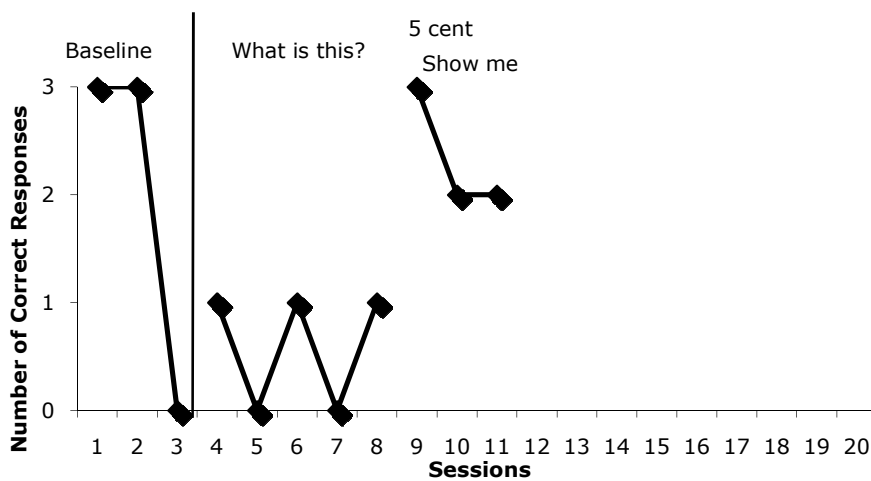
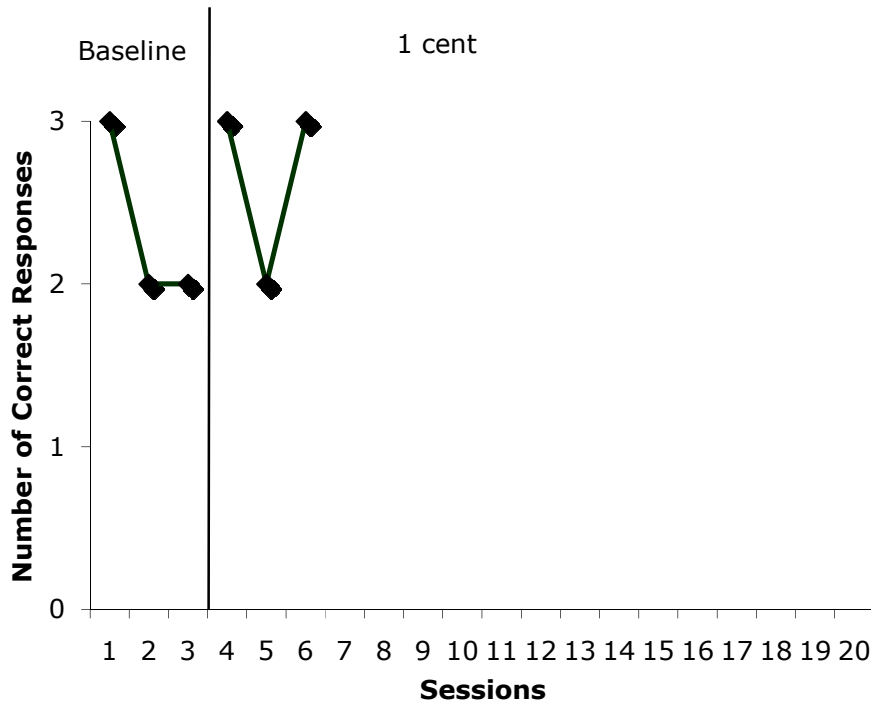












**Conclusion**

Overall results show Direct Instruction model, lead, test increased the four participants ability to identify and discriminate coins and dollars, count money, give the proper amounts as seen on a menu, and give change. This replicates some of our previous research (Hastings, Raymond, & McLaughlin, (1989 teaching money skills to high school with developmental disabilities and also young adults (Watanabe, McLaughlin, Weber, & Shank, 2013).



### Suggestions and Recommendations

Some of the strengths of this study were that it allowed the participants to work at their own pace and did not move them to the next phase of intervention until they had reached mastery in their current phase. Also it allowed for students to focus on one key component at a time which allowed student frustration remain low. The mastery of new skills gave the participants confidence to move onto more complex skills. The participants were excited to work on more complex skills, which made it easier and more enjoyable to move through the phases of instruction.

There was no cost associated with conducting this study and the effort was minimal on the part of the researcher to implement and gather the data. The participants were there every day the data sessions took place. The research felt Direct Instruction was an ideal method to help students with disabilities acquire new money skills.

There were several limitations in the present research. First, due to time restraints with the two participants who were learning the more complex skills, it required them more time to work through the problems they were asked to do. This made it difficult to get numerous data sessions completed. This has been a common finding across a wide range of our research completed by both graduate and undergraduate students (McLaughlin et al., 1999; B. Williams, McLaughlin, Williams, R. & Howard, 1995).

Additional research is needed to further document that Direct Instruction, with the use of money, is appropriate for all students with varying disabilities. This study has clearly shown that students with a range of disabilities were able to increase their money skills using Direct Instruction model, lead, and test methodology.

### Acknowledgement

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