

Snacks and Skills: Teaching Children Functional Counting Skills

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- Brandon is a 7-year-old with fetal alcohol syndrome; he has been classified as having severe mental retardation. He does not speak, but uses some signs and pictures for verbal communication.
- Megan is a 7-year-old girl with Down syndrome; she is classified as having moderate mental retardation. She has limited verbal ability and uses some pictures/symbols to communicate. Megan's parents want her to learn academic skills, including basic math and reading, so that she will develop the skills needed to participate in general education.

Both children are learning counting skills on ordered objects—snacks for their classroom. This article shows how we taught these children functional skills using real-life objects and settings (see box, "What Does the Literature Say?").

Our experience indicates that to effectively teach children with severe disabilities how to count requires the use of both pointing and gesturing. In addition, we use pointing to teach children how to recognize items, such as milk containers, and the numbers that represent the total of containers. We use gestures as prompts to remind children of each step when counting.



Counting real objects helps children with disabilities learn math skills.

Using Real-Life Counting Experiences

According to Westling and Fox (2000), using real materials in their natural context during teaching helps children learn how to carry out an activity as they will do in their daily lives and assists them in mastering the desired skill. In a natural environment, the skill learned can be practiced in school, at home, or in communities. To provide students with severe disabilities an opportunity to practice the skills that have been introduced in school, we considered a number of routine activities and decided to include these students in a snack delivery activity.

The snack delivery enables students to walk out of their classroom and become involved in something that they like. Most important is that they can learn and practice counting skills in a functional and meaningful way. The following are the steps in our snack delivery activity.

Step 1: Completing the Task

Teaching Brandon and Megan to complete the school routine to deliver snacks and practice counting involves teacher guidance to prompt them to remember how to complete the task. Task analysis outlines the steps (see Figure 1). These steps are practiced

The snack-delivery system lets students learn and practice counting skills in a functional and meaningful way.

every day. A teacher or teacher assistant accompanies both children and provides prompts when necessary.

Step 2: Using Pictures to Represent Objects and Numbers

The delivery list supplied by the school's main office is printed on one sheet of paper. The list includes each preschool teacher's name and the number of cartons of each type of milk that each has ordered. To help the children recognize different kinds of milk, photos of the milk cartons are used.

When the children arrive at the cafeteria, they look at or point to the appropriate photo to determine what type of milk has been ordered. Next, they look at or point to the number of cartons.

Figure 1. Steps When Delivering Snacks

1. Take the wagon in class
2. Walk to the main office (leave the wagon outside)
3. Ask for the snack list from Ms. Gogan (secretary in the main office)
4. Pull the wagon to milk fridge in cafeteria
5. Count out containers of chocolate/white milk/juice and put in the wagon
6. Return with filled wagon to classroom for jackets*
7. Deliver filled wagon to preschool
8. Count out milk/juice and distribute to classroom baskets
9. Return the wagon to storage spot in Room 9

* Students need to wear their jackets to go out of the building where the preschool is located.

What Does the Literature Say About Functional Skills?

What Are Functional Skills? Functional skills are “useful” for students with severe disabilities (Snell & Brown, 2000). The outcomes of a student's academic performance should include the achievement of such skills—skills that will allow the student to enjoy a greater degree of participation in an enjoyable lifestyle (Ford et al., 1989). For some students, the mastery of key functional academic skills can increase their independence and self-direction at home, in school, and in the community. Functional skills can be *pivotal* in enabling students with severe disabilities to access or actively participate in services, to indicate choices, and to become independent (Snell & Brown). The pivotal skills in mathematics include number recognition, counting, computation, money handling and time management (Ford et al.).

Why Is Counting an Important Functional Skill? Counting objects to obtain a total number is a basic skill that is a prerequisite to understanding the meaning of numbers, and this ability also serves as a predictor of children's abilities to use numbers across a variety of contexts (Gelman & Gallistel, 1978). Competence in basic arithmetic reasoning (e.g., sequencing and equivalence) and the ability to add and subtract have been shown to develop from proficiency in counting (McEvoy & McConkey, 1991). Counting also has the potential to contribute to the development of increased social independence and is the reason why counting is taught early in the sequence of skills included in the mathematics curriculum (Resnick, Wang, & Kaplan, 1973). An ability to count and identify numbers is indicated as one of the instructional standards in the Core Curriculum Content Standards for Students with Severe Disabilities (CCCSSSD, New Jersey Department of Education, 2000). These standards are a selected set from the general Core Curriculum Content Standards (CCCS, New Jersey Department of Education, 1996) of the state. The cumulative progress indicators for this set of standards are modified from the general education standards. The CCCSSSD were developed to expand the range of knowledge and skills addressed in the CCCS to ensure that general standards meet the needs of all students, including those with severe disabilities. The CCCSSSD were also designed to assist the individualized education program (IEP) teams in developing goals and objectives that are relevant to these special education students. The curriculum and instruction are required to align with the standards and the individual needs of students. The relevant indicators reported herein are to be able to identify numbers and to be able to count groups of objects within the context of everyday tasks (Standard 4.6, Indicator 1 & 2).

Counting Principles. Related to counting skills, Gelman and Meck (1986) outlined five principles: (a) one-to-one correspondence, (b) stable order principle, (c) cardinal principle, (d) item identification, and (e) order-indifference principle. Of these five principles, the first three are related to “how to count.” To teach rote counting using numbers from 1 to 5, is the first skill to be developed followed by learning to count to 10, and so on, until counting by rote up to 100 is mastered (Gelman & Gallistel, 1978). Pointing is a common method used by teachers to establish one-to-one correspondence between numbers and items to be counted. Gestures are also employed to mediate an accurate count, or simply support learners in referring numbers to objects (McEvoy & McConkey, 1991).

They then count the real milk containers, up to the number ordered, and place them in the wagon. We used a traditional least-to-most prompting hierarchy (see Figure 2), and we provided verbal praise to reinforce the student's correct responses.

Step 3: Self-Monitoring to Increase Student Independence

To reduce the amount of teacher prompting and to increase the likelihood that the children will learn to count independently, we used a self-monitoring strategy. This strategy prepares children to prompt or monitor

Figure 2. Steps When Counting Milk Containers

1. Look at or point to the first photo and number in list
2. Count out milk cartons
3. Place milk cartons into wagon
4. Turn over the photo after finishing
5. Look at or point to the next photo and number in list
6. Repeat Steps 2 to 4
7. Look at or point to the next photo and number in list
8. Repeat Steps 2 to 4

their own behavior and to help promote independent performance (Argen, 1997). According to Copeland and Hughes (2000), a picture prompt strategy could be used to increase the independence of high-school age students with severe disabilities.

During the snack-delivery activity, we implemented self-monitoring using photo prompts. First, the delivery list is modified and each picture is stapled to the corner of a sheet of paper. When one type of milk is totally counted out and placed in the wagon, the children turn over the picture to indicate they have completed the task. We taught the strategy over a period of 1 week, followed by practice managed by the teacher. Throughout this period, self-initiation skills are imbedded by using indirect verbal prompts, such as, "What do you do first? What is next?" Subsequently, we used a gesture of pointing to the pictures to prompt the children.

Functional skills can be pivotal in enabling students with severe disabilities to access or actively participate in services, to indicate choices, and to become independent.

Figure 3. Record of Skill Performance of One Student

| Skill Observation Form | | | |
|-----------------------------------------------------------|--------------|---------------------------|-------------|
| Student Name: Brandon | | | |
| Observer: | | Session: Follow-up | |
| Counting Steps | Dates | | |
| | 5/8 | 5/9 | 5/10 |
| 1. Look at or point to the first photo and number in list | 3 | 3 | 4 |
| 2. Count out milk cartons | 3 | 3 | 3 |
| 3. Move milk containers into wagon | 3 | 4 | 4 |
| 4. Turn over the photo after finishing | 3 | 3 | 4 |
| 5. Look at or point to the next photo and number in list | 3 | 3 | 3 |
| 6. Count out milk containers | 3 | 3 | 3 |
| 7. Turn over the photo after finishing | 3 | 3 | 4 |
| 8. Look at or point to the next photo and number in list | 3 | 3 | 4 |
| 9. Count out milk containers | 3 | 3 | 3 |
| 10. Turn over the photo after finishing | 3 | 4 | 5 |

Key: Scores: 0 = full physical, 1 = partial physical, 2 = model, 3 = verbal, 4 = gesture, 5 = independent.

Step 4: Evaluation of the Skills Learned

We conducted the snack delivery program during an entire semester. In our observation of Ms. Pam's class (see box, "Snacks R Us!"), we recorded the use of training prompts to teach task performance and self-monitoring (see Figures 3 and 4). In addition, we developed an alternative assessment procedure that took into account the state's Core Curriculum Content Standards for Students with Severe Disabilities to evaluate students' skill performance and outcomes. We used this assessment

to monitor Brandon and Megan's ongoing progress toward achieving the standards of counting skills and to provide information for teachers to assist with educational planning.

Figure 5 shows the counting skills rubric we developed to evaluate children's performance in learning basic arithmetic skills. The rubric describes the requirements of the core curriculum standards in arithmetic and includes levels of performance indicators rated from 1 to 4, with 4 indicating the proficiency level. In addition to rating the children's performance using the rubric,

Snacks R Us!

To deliver snacks from the cafeteria to classrooms has been an activity for students at different grades to learn taking responsibilities in the school community. This activity would offer students with severe disabilities an opportunity to develop skills, such as counting items, one-to-one correspondence between the number and the item, and thus to learn to recognize numbers in a real context.

Ms. Pam, a special education teacher of 5 students with multiple disabilities, requested that her students become involved in delivering the snacks. She discussed this possibility with the general education first grade teacher, Ms. Gin, for her students to participate in a useful school activity that would support learning the prerequisite skills required in Ms. Gin's classroom. Each day, Ms. Pam assigned two children to obtain a delivery list from the school's main office. They then used a small wagon to carry cartons of milk to each preschool classroom. When getting the cartons of milk from the cafeteria, each child was instructed to point to the number of the milk cartons included in the list, then to count the number of cartons and to place the correct number of cartons into the wagon. This activity became a daily routine included in the class schedule for the students to practice counting skills.

Figure 4. Baseline Data of Skill Performance of One Student

| Student Name: Brandon | | | |
|-----------------------------------------------------------|--------------------------|-------------|-------------|
| Observer: Session: | Session: Baseline | | |
| Counting Steps | Dates | | |
| | 2/13 | 2/14 | 2/15 |
| 1. Look at or point to the first photo and number in list | 2* | 2 | 2 |
| 2. Count out milk cartons | 1* | 1 | 1 |
| 3. Move milk containers into wagon | 2 | 2 | 2 |
| 4. Turn over the photo after finishing | 1 | 1 | 1 |
| 5. Look at or point to the next photo and number in list | 2 | 2 | 2 |
| 6. Count out milk containers | 1 | 1 | 1 |
| 7. Turn over the photo after finishing | 1 | 1 | 1 |
| 8. Look at or point to the next photo and number in list | 2 | 2 | 2 |
| 9. Count out milk containers | 1 | 1 | 1 |
| 10. Turn over the photo after finishing | 1 | 1 | 1 |

Key: Scores: 0 = full physical, 1 = partial physical, 2 = model, 3 = verbal, 4 = gesture, 5 = independent.

* Direct verbal prompts were used when modeling and providing physical assistance.

we observed their behavior during completion of the task in each session of the snack delivery activity using the form depicted in Figure 3. Scores from 1 to 5 were used to evaluate the student's performance, with 5 indicating independence and 0 indicating full physical assistance. A score of 1 indicated partial physical assistance, 2 indicated modeling, 3 indicated verbal prompts, and 4 indicated gestures.

Student Performance

The teacher and teacher assistant observed the children each day carrying



out the snack delivery tasks. During the initial training to introduce the picture prompts and self-management, the teacher provided direct verbal prompts, as well as physical prompts, for both children, to help them count the number of milk containers.

Figure 4 shows baseline data. During baseline, the teacher modeled the procedure, gave direct verbal prompts, and provided partial physical assistance at times. The average score for Brandon was 1.4 out of 5, and 1.6 out of 5 for Megan. In follow-up practice sessions, the teacher reduced her use of physical and direct verbal prompts. Instead, the

Figure 5. Rubrics for Arithmetic Counting Skills

| Skills/Performance | 4 | 3 | 2 | 1 |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Counting concrete Objects # _____ | <ul style="list-style-type: none"> • Able to count _____ objects accurately in all situations. • Able to apply counting skills to problem-solve in all situations. | <ul style="list-style-type: none"> • Able to count _____ objects accurately most of the time. • Able to apply counting skills to problem-solve with some mistakes. | <ul style="list-style-type: none"> • Unable to count _____ objects consistently. • Able to apply some counting skills to problem-solve with many mistakes. | <ul style="list-style-type: none"> • Unable to count _____ objects. • Unable to apply counting skills to problem-solve. |
| Counting by Rote to _____ | <ul style="list-style-type: none"> • Able to rote count to _____ accurately in all situations. • Able to rote count to problem-solve in all situations. | <ul style="list-style-type: none"> • Able to rote count to _____ accurately most of the time. • Able to rote count to problem-solve with some mistakes. | <ul style="list-style-type: none"> • Unable to rote count to _____ consistently. • Able to rote count to problem-solve with many mistakes. | <ul style="list-style-type: none"> • Unable to rote count to _____. • Unable to apply rote counting skills to problem-solve. |
| Counting by Fives to _____ | <ul style="list-style-type: none"> • Able to skip count to _____ accurately in all situations. • Able to skip count to problem-solve in all situations. | <ul style="list-style-type: none"> • Able to skip count to _____ accurately most of the time. • Able to skip count to problem-solve with some mistakes. | <ul style="list-style-type: none"> • Unable to skip count to _____ consistently. • Able to skip count to problem-solve with many mistakes. | <ul style="list-style-type: none"> • Unable to skip count to _____. • Unable to apply skip counting skills to problem-solve. |
| Counting by Tens to _____ | <ul style="list-style-type: none"> • Able to skip count to _____ accurately in all situations. • Able to skip count to problem-solve in all situations. | <ul style="list-style-type: none"> • Able to skip count to _____ accurately most of the time. • Able to skip count to problem-solve with some mistakes. | <ul style="list-style-type: none"> • Unable to skip count to _____ consistently. • Able to skip count to problem-solve with many mistakes. | <ul style="list-style-type: none"> • Unable to skip count to _____. • Unable to apply skip counting skills to problem-solve. |

Note: The rubrics were developed according to New Jersey’s General Education Core Curriculum Content Standards: 4.6; and Core Curriculum Content Standards for Students with Severe Disabilities: 4.6; indicators: 1, 2.

teacher used only indirect verbal prompts in the form of questions such as, “What is next?” “What is this number?” and “How many . . . ?”; the teacher also used gestures of pointing to the pictures to remind students of the steps to follow.

By the end of the semester, Megan could complete 80% of the steps independently, with average scores of 4 out of 5, using the self-management strategy. Brandon could complete 70% of the steps with average scores of 3.3 out of 5. The average gain scores were about 2, indicating that both children made

progress in learning counting skills and completing the task.

Final Thoughts

As a result of the teachers’ efforts, both children are now enrolled in a first grade general education classroom. They both requested to continue to deliver snacks to preschool classrooms because they enjoyed this activity and saw it as a service to their school. The skills they learned and the self-confidence they developed assisted them to transfer from a special education to a general education classroom. Teaching

counting skills to students with severe disabilities through the use of real and meaningful activities enhances content acquisition and skill reinforcement.

**Self-monitoring strategies
prepare children to prompt
or monitor their own
behavior and to help
promote independent
performance.**

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