Teaching Core Content Embedded in a Functional Activity to Students with Moderate Intellectual Disability Using a Simultaneous Prompting Procedure

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Abstract: The purpose of this study was to investigate the effects of a simultaneous prompting procedure in teaching four secondary students with moderate intellectual disability to acquire and generalize core content embedded in a functional activity. Data gathered within the context of a multiple probe design revealed that all participants learned the following core content during a cooking activity: (a) reading - reading and defining age appropriate content, (b) math - computing percentages in an applied problem, and (c) science - applications of force. Practical implications are discussed for teaching academic core content within meaningful and functional activities for students with moderate intellectual disability.

Participation in large-scale accountability assessment by individuals with disabilities has been required for the past decade. The No Child Left Behind Act of 2001 (NCLB) and the Individuals with Disabilities Education Act 1997 (IDEA) were the impetus for the assessment of students with significant intellectual disability in that they mandated that "all students with disabilities were required to have access to the general curriculum and be included in state and district large-scale assessments" (Wakeman, Browder, Meir, & McColl, 2007, p. 143). With the authorization of NCLB, accountability assessment became standards-based, and states implemented an alternate form of assessment for students with significant disabilities to monitor their progress on grade-level standards. The U.S. Department of Education (2003) described alternate assessment as "an assessment designed for the small number of students with disabilities who are unable to participate in the regular state assessment, even with appropriate modifications" (p. 144). This assessment measures alternate achievement standards that although aligned to grade-level standards, differ in complexity and expectation (Wakeman et al.).

This legislation caused a shift in the curricular focus of special education for students with moderate and severe disabilities (MSD) from an emphasis on functional skill instruction to the current recommended practice of functional skill plus academic core content instruction (Browder, Spooner, & Meier, 2011). Beginning in the 1970s (Brown et al., 1979), the focus of the professional literature was on teaching functional skills to students with MSD. Research demonstrated that systematic instructional procedures such as constant time delay (CTD), system of least prompts (SLP), and simultaneous prompting (SP) were effective in teaching students with MSD this functional content, including both discrete and chained tasks across a variety of skills and age ranges from young children to adults (Collins, 2007; Wolery, Ault, & Doyle, 1992). For example, the CTD procedure has been used effectively to teach preschool children to respond to the lures of strangers (Gast, Collins, Wolery, & Jones, 1993), elementary and middle school aged children to...
shop for groceries (Morse & Schuster, 2000), and an adult to bowl (Zhang, Cote, Chen, & Liu, 2004).

The SLP procedure has been used effectively to teach elementary students to make telephone calls (Manley, Collins, Stenhoff, & Kleinert, 2008), middle school students with intellectual disability to use the next dollar strategy in making purchases (Colyer & Collins, 1996), and young adults to cook (Mechling, Gast, & Fields, 2008).

The SP procedure has been successful in teaching hand washing to elementary students (Parrott, Schuster, Collins, & Gassaway, 2000), community signs to elementary students (Singleton, Schuster, & Ault, 1995), opening a lock with a key to secondary school students (Fetko, Schuster, Harley, & Collins, 1999), and box assembly to adults at a vocational center (Maciag, Schuster, Collins, & Cooper, 2000).

Functional skill instruction across all domains remains an important curricular focus for students with MSD. This is especially true for those who are in secondary school and will soon need the skills to transition to adulthood with the goal of being independent enough to live in the least restrictive environment possible. Cooking is one such important skill for transition because it is needed in domestic settings and also can be used in vocational settings. As early as 1988, Schuster, Gast, Wolery, and Guiltinan found a CTD procedure to be effective when teaching cooking skills (i.e., making a sandwich, preparing a boil-in-a-bag item, and baking canned biscuits). More recently, Graves, Collins, Schuster, and Kleinert (2005) used CTD combined with video prompting to teach secondary students with MSD to prepare a food item on a stove, in the microwave, and on a counter top.

As researchers and teachers work to incorporate both core content and functional skill instruction in schools, some thought must be given to the setting where skills are taught. Although the research has shown that students with MSD can learn content presented in a general education environment (Collins, Evans, Creech-Galloway, Karl, & Miller, 2007), and that inclusive settings can be beneficial (e.g., provide opportunities for interactions with students without disabilities, Collins, 2007), some functional skills may best be taught in a resource room set up for life skill instruction. Zigmond (2003) reviewed the efficacy research on general education versus special education settings. She concluded that the research base does not support the setting where instruction occurs as a critical factor in students’ academic or social progress because the current research base is methodologically flawed and inconclusive. Additionally, she suggested that where students should receive instruction should be an individualized decision. Thus, the critical issue is the use of effective instructional strategies although the setting for instructional delivery (i.e., general or special education classroom) may vary from student to student and skill to skill.

Prior to IDEA (1997) and NCLB (2002), educators focused on inclusion in general education classrooms for students with MSD to establish peer relationships over the acquisition of core content (Wehmeyer, 2006). However, with the shift to a focus on core content instruction, it has become more difficult to justify time allotted to functional skill instruction, even in a resource room setting. One solution is to ensure that core content instruction is embedded within functional skill instruction. According to Browder, Wakeman, Flowers, Rickelman, and Pugalee (2007), real life functional skills and equipment may be used to further the acquisition of core content for students with significant disabilities, but the focus must be academic.

The authors conducted the present investigation because more research is needed in how to teach core content in a useful and meaningful way to secondary students with significant disabilities (Browder et al., 2003), thus ensuring that the students acquire the functional skills needed for successful transition. The research on combining functional and core content in instruction is just beginning to emerge with preliminary data indicating promising results (e.g., Collins et al., 2007; Collins, Hager, & Galloway, 2011; Jameson, McDonnell, Johnson, Riesen & Polychronis, 2007; Johnson, McDonnell, Holzworth, & Hunter, 2004). For example, Collins et al. (2007) taught functional and core content sight words to elementary, middle school, and high school students using “direct massed trial instruction in a special education resource room, direct distributed trial instruction in a...
general education classroom, and embedded distributed trials instruction in a general education classroom (p. 220). The results indicated that students learned both functional and core content sight words with only a small variance occurring in the rate of acquisition and maintenance regardless of the format used. Collins et al. (2011) found that students with moderate intellectual disability were able to acquire, generalize, and maintain both functional and core content information (i.e., language arts, math, science) when both types of information were provided within the same lesson. Johnson et al. (2004) taught general education teachers and paraprofessionals to embed instruction on both functional and core content information within the general education classroom. Students learned all skills and the teachers implemented the procedures with high levels of fidelity.

The purpose of the current study was to extend the literature on combining core content and functional skill instruction. The researchers used a SP procedure to teach core content within a functional activity to secondary students with moderate disabilities. Specifically, the purpose of this study was to answer the following questions: (a) Can students with moderate intellectual disability learn core content embedded in a functional cooking activity when taught with a SP procedure?, and (b) Will the students generalize the information across materials and settings? The functional group activity was cooking (i.e., baking a cake), and the core content included objectives aligned with the Kentucky Alternate Assessment Standards from reading, math, and science.

Method

Participants

Subjects. Three males and one female with MSD participated in the investigation. Each of the participants was enrolled in a secondary program for students with functional mental disabilities (the classification for serving students with MSD in Kentucky), and each was included in two general education classes. The participants’ ages ranged between 15 and 18 years, and each was identified as having a moderate intellectual disability, with IQ scores ranging from 41–55. All participants had goals that included reading (e.g., survival, job application, and employability words; core content passages) and math (e.g., repeated subtraction). The participants also had vocational transition goals (e.g., dusting, checking out books in the library, operating a cash register, sorting grocery items, sweeping). Three of the participants had personal finance goals (e.g., writing checks, balancing a checkbook, budgeting). Prior to the initiation of the study, the researchers determined that the participants met the following criterion for participation: (a) visual acuity to see the model prompts and materials; (b) auditory acuity to hear the verbal prompts, correction, and praise statements; and (c) ability to imitate a model. All participants had a learning history with the SP procedure.

Daniel was a 15-year old male student with Down syndrome and an IQ of 41 on the Intelligence Scale for Children IV (WISC-IV; Wechsler, 2003) who could identify 80% of targeted functional sight words and worked on functional math (e.g., next dollar strategy, coin combinations). He received speech therapy for 30 min per week and wore glasses to correct his vision. Kim was an 18-year old female student with an IQ of 48 on the WISC-IV who could identify and define 95% of targeted functional sight words and worked on personal finance skills. Terry was a 16-year old male student with an IQ of 55 on the WISC-IV who could read on a third grade reading level and worked on personal finance skills. Justin was a 15-year old male with an IQ of 48 on the WISC-IV who could identify and define 50% of targeted functional sight words and worked on personal finance skills.

Staff. With the exception of reliability data, the FMD classroom teacher (first author) collected all data daily during the investigation. She had 5 years of teaching experience and held a bachelor’s degree in MSD. At the time of the investigation, she was enrolled in a MSD master’s degree program. Her team teacher, who had a master’s degree in MSD and 9 years of teaching experience, collected reliability data. A graduate student with 5 years of teaching experience also collected reliability data. Each of these individuals had prior experience using the SP procedure to teach skills to students with MSD.
**Setting**

Sessions occurred daily in the FMD resource room of a public high school when all participants were present. (If a student was absent, instruction did not occur.) All sessions occurred during a block in which the teacher had planning time and the other students and staff were in general education classes. The classroom environment in which instruction took place was equipped for teaching functional skills. It included a laundry area with a washer and dryer and a kitchen with a stove, refrigerator, microwave, counter top, sink, and cabinets. Other kitchen equipment included measuring cups, plates, cups, kitchen utensils, and general groceries (e.g., oil, salt, pepper, flour, sugar). The room contained two small group tables and 12 desks that were used for both small group and 1:1 instruction. Probe and maintenance sessions occurred in a 1:1 instructional arrangement at a small table. Training sessions occurred in a small group format at a table or in the kitchen area.

**Materials/Equipment**

*Weekly cooking activity.* Cooking activity sessions were conducted on Fridays. During these sessions, the teacher used multiple exemplars to facilitate generalization. These included two brands of cake mixes (one name brand and one generic store brand). The students could choose to purchase a chocolate or yellow cake mix while on community based instruction (CBI) each week. Equipment for the cooking activity included a cake pan, oil, eggs, cooking spray, measuring cup, whisk, electric mixer, bowl, oven, and sink.

*Daily sessions.* During daily session instruction, conducted Monday through Thursday, the teacher used the following materials. For the reading standard, she presented directions found on cake mix boxes typed in Times New Roman, 14 point font, on 3 ½ × 5 inch index cards. For the math standard, she presented prices of groceries from newspaper ads, and the students used calculators with paper to record their answers. For the science standard, the teacher presented questions typed in picture text software on worksheets. Contingent on appropriate behavior, participants could choose an edible reinforcer from a basket of highly preferred items (i.e., mints, starburst, tootsie rolls) at the end of sessions in accordance with standard classroom procedure.

**Procedure**

Instruction consisted of the SP procedure presented in a small group format during a cooking activity as described in the following sections. (Note that a variation of the instructional procedures used in this investigation have been described by Collins, Karl, Riggs, Galloway, and Hager (2010) and Kleinert, Collins, Wickham, Riggs, and Hager (2010).

**General procedure.** The teacher taught three core content standards using the SP procedure in a small group format with a criterion of 100% accuracy on daily probes for three consecutive sessions across all participants. To determine the specific standards to be taught, the teacher screened the participants on a number of core content standards prior to the investigation and selected a math, science, and reading standard based on the screening results. The core content standards and corresponding functional applications taught during a cooking activity in this investigation are listed in Table 1. All of the core content standards came from the Kentucky Department of Education’s core content standards selected for alternate assessment. (http://www.education.ky.gov/KDE/Administrative+Resources/Testing+and+Reporting+/District+Support/Kentucky+Alternate+Assessment+Program.htm).

For the reading standard, the specialized phrases and definitions taught included the following: (a) lightly coat pan, (b) follow baking times below, (c) store loosely covered, (d) whisk by hand, and (e) cool cake completely. For the math standard, the teacher constructed a task analysis for computing the sale price of groceries needed to make a cake using percentage off as follows: (a) Enter price of total, (b) press “-,” (c) enter discount percentage amount, (d) press “%,” and (e) record sale price. For the science standard, the teacher constructed worksheets with questions and possible answers (written with picture-supported text software) about the principles of force that included the following:
1. An example of force is: (a) push, (b) balance, (c) motion.
2. True or false: Still cake batter in a bowl has balanced forces.
3. If I want to crack an egg against a bowl, I need to: (a) do nothing, (b) apply force, (c) apply opposing forces.
4. True or false: When an egg hits a bowl, the bowl is acting as an opposing force.
5. To apply force to something, I could: (a) kick, (b) push, (c) do all of the above.

Each week during daily training sessions, the teacher conducted a simulated cooking activity from Monday through Thursday and then culminated the week by actually baking a cake on Friday afternoon. During these activities, data were collected on the standards, but were not collected on the students’ ability to actually bake the cake.

The teacher conducted the investigation using a multiple probe design (conditions) across behaviors (i.e., core content standards) replicated across participants. The teacher conducted the study in the following sequence: (a) generalization pretest on all standards; (b) full probe sessions on the reading, math, and science standards; (c) daily probe trials followed by training trials on the reading standard until criterion was met; (d) full probe sessions on all standards; (e) daily probe trials followed by training trials on the math standard until criterion was met; (f) full probe sessions on all standards; (g) daily probe and training trials on the science standard until criterion was met; (h) final full probe session on all standards; and (i) maintenance and generalization probes on all standards.

**Full probe session procedure.** The teacher conducted three full probe sessions across standards prior to instruction and again after criterion was met for each standard. She conducted full probe sessions in the FMD resource room in a 1:1 format. At the beginning of full probe sessions, she secured the participant’s attention by asking the student to look at her and waited until the participant’s eyes were on her. During each full probe session, she provided verbal praise for attending, participating, and demonstrating appropriate behavior (e.g., sitting in seat with hands in lap) on a variable ratio of every third trial (VR3). During the full probe sessions, the reading, math, and science standards were assessed one after the other in the same session, in this order.

For the reading standard, the teacher presented target phrases from cake mix directions printed on flash cards and verbally gave the task direction, “What phrase and what does it mean?” She waited an interval of 5 s for the student to respond. If the participant responded correctly within 5 s (verbally stated the phrase and its definition), she placed a
“+” on the data sheet; if the participant responded incorrectly within 5 s (verbally stated either an incorrect phrase, definition, or both), she placed a “-” on the data sheet; and, if the participant did not respond within 5 s (did not say anything), she placed an “NR” on the data sheet. No praise or feedback were given for correct, incorrect, or no responses. After recording the data, she moved on to the next flashcard. The reading standard consisted of five phrases found on cake mix directions, and she assessed each phrase and the corresponding definition one time, for a total of five trials per session.

For the math standard, the teacher conducted one trial of the task analysis per session using a multiple opportunity probe (Brown & Snell, 2006). She began by presenting an advertisement with sale prices for groceries needed to make a cake, a calculator, paper, and pencil. The teacher and student worked together to find the items needed to make a cake and total the cost. The teacher then wrote on a piece of paper the percent off the student should use to calculate the final price. She provided the task direction, “Find the percentage off,” and waited 5 s for a response. If the participant initiated the first step of the task within 5 s, she allotted 30 s to complete the step. If the participant completed the response correctly, she provided a specific praise statement (e.g., “[Participant], I like the way you (description of step.”) and waited 5 s for a response. If the student made an error (i.e., the participant did not complete the step correctly, the next step in the sequence, or took too long), she interrupted the student and correctly completed the step out of view of the student while placing a “-” on the data sheet for the incorrect response and then waited 5 s for the student to initiate the next step. She followed the same procedure as for errors if the student failed to respond at all while placing a “NR” (no response) on the data sheet. She continued this process for each step of the task analysis.

For the science standard, the teacher asked the participant to complete a worksheet consisting of five multiple choice questions about force and motion. She assessed each question one time per session, using the worksheet as a permanent product. Each session consisted of the same questions; however, she presented the questions and answers in a randomized order across worksheets. The participant had 5 min to complete the worksheet. During this time, she read the questions and answers to the participant, who selected and circled the answers. At the end of 5 min, the teacher collected the worksheets (i.e., the permanent product) and recorded a correct response (“+”) for each correct response that was circled, an incorrect response (“-”) for each response in which something other than the correct answer was circled, and a no response (“NR”) if the student did not circle any response. No feedback was given for correct or incorrect responses as the students were completing the worksheets or when the teacher graded the worksheets.

**Daily probe trials.** As required in the SP procedure, the teacher conducted daily probe trials immediately prior to daily training trials to assess acquisition of content. She conducted daily probe trials in the same manner as full probe sessions except only the stimuli for the standard being taught at that time were assessed.

**Training trials.** The teacher conducted daily training sessions on one standard immediately following daily probe sessions in a small group setting. Each participant in the group was working on the same task. Regardless of whether the training trials involved simulation (Monday – Thursday) or baking an actual cake (Friday), the training session began with an overview of goals and expectations for the group (i.e., the classroom rules). The teacher then secured the attention of each participant by asking the students to look at her and waited until all eyes were on her. With attention of the group secured, she proceeded with embedding the core content within a functional activity related to baking a cake for each student by delivering training trials to each student in a round-robin format.

For all standards, the teacher, provided the task direction and then immediately provided the controlling prompt (i.e., verbal + model prompt) with a 0-s delay interval. Following delivery of the controlling prompt, she waited a 5-s interval for the student to respond. If the student responded correctly within the 5-s interval, she provided a descriptive verbal praise
statement. If the participant responded incorrectly or did not respond in the 5-s interval, she again provided the controlling prompt and waited for a response before moving on to the next trial or step. Student responses were not recorded during training trials because it was highly likely that a high percentage of correct student response would occur during training trials since a controlling prompt was provided immediately following the task direction. Criterion for mastery was based on responses recorded in daily probe sessions. Based on performance during daily probe sessions, she reinforced on a continuous reinforcement (CRF) schedule through 1 day at 100% accuracy (defined as to criterion) and then at the end of the session only for an additional 2 days at 100% accuracy (defined as through criterion).

Simulated training trials. When the reading standard was taught in the simulated training trials, the teacher pointed to the phrase on the box and showed the flashcard of the phrase while immediately saying the phrase followed by the definition. She then simulated the action of the phrase without actually using the consumable materials (e.g., held up a whisk and showed how to move it in a bowl, simulated breaking an egg). Students were then required to verbally repeat the phrase and the definition while performing the simulated action. Each student received 1 trial on each of the 5 phrases/definitions for a total of 20 trials for the group session.

When the math standard was taught in the simulated training trials, the teacher presented an advertisement with sale prices for groceries needed to make a cake, a calculator, paper, and pencil. The teacher and all students worked together to find the items needed to make a cake and total the cost. The teacher then wrote on a piece of paper the percent off the student should use to calculate the final price. For the first student she provided the task direction, “Find the percentage off,” and immediately modeled the first step of the task analysis on a separate sheet of paper. The student was required to repeat the first step on his or her piece of paper. The teacher then immediately modeled the second step of the task analysis and the student repeated. This sequence continued for all steps in the task analysis. Each student received one trial on the task analysis in the small group for a total of four training trials for the session.

When the science standard was taught in the simulated training trials, the teacher gave a verbal description of a law of motion while simulating it on items at the table. For example, the teacher said “An example of force is pushing something,” while she simulated pushing on the table. She then asked the student, “What is an example of force?” and the students were required to repeat her verbal model. Each student received 5 trials on an effects of force statement in round-robin fashion for a total of 20 trials in the group session.

Cake baking trials. The reading standard was taught the same way during the cake baking trials as during the simulated trials except rather than simulating the action, the students took turns actually performing the action with the real materials with teacher guidance.

On cake baking days the math standard was taught using the same procedures as the simulated trials except students calculated the price in the grocery store. Students selected the cake mix they would purchase while on CBI and then each student calculated the sale price of the grocery order before purchasing it.

The science standard was taught using similar procedures as the simulated trials except as the students were performing an action during the cake baking, the teacher verbally stated a law of motion and students repeated it (e.g., while breaking an egg the teacher said, “To break an egg we have to apply force. What do we have to do to break an egg?”).

Maintenance and generalization. The teacher assessed maintenance in the same manner as full probe sessions by conducting individual sessions with each student at 1, 3, and 5 weeks after all students met criterion. The end of the school year, however, prevented the teacher from obtaining maintenance data across all participants. The teacher assessed generalization across materials and settings for one session prior to and following intervention while the participants were participating in CBI trips. For the reading standard, she required each participant to read from different cake mix boxes while in the grocery store and define the phrase. For the
math standard, she required students to calculate the percent off a purchase while standing in the grocery store. For the science standard, she required students to verbally answer questions about laws of motion while participating in activities in the grocery store (e.g., “To apply force to this grocery cart, what must I do?”).

**Experimental Design**

The researchers used a multiple probe design (conditions) across behaviors replicated across participants to evaluate experimental control (Gast, 2010; Horner & Baer, 1978). Within this context, the teacher first conducted full probe sessions on all standards and then began intervention for the reading standard. After students met criterion in reading, she conducted full probe sessions on all standards and then began intervention on the math standard. After students met criterion in math, she conducted full probe sessions on all standards and then began training sessions on the science standard. After students met criterion in science, she concluded the investigation by conducting full probe sessions on all standards. To control for historical confounds, she asked parents and other staff not to teach the items targeted for instruction during the investigation.

**Reliability**

A team teacher in the resource room and a graduate student collected procedural (independent variable) and interobserver (dependent variable) reliability data at least one time per week per condition across full probe, daily probe, maintenance, and generalization sessions (33% of the sessions with Justin, 29% of the sessions with Daniel, 28% of the sessions with Kim, and 26% of the sessions with Terry). The observer did not collect reliability data during training sessions since the teacher did not record data on student responses during the simultaneous prompting trials used during training.

The researchers used the following formula to determine the dependent variable reliability: number of agreements divided by the number of agreements plus the number of disagreements, multiplied by 100 (Gast, 2010). The researchers used the following formula to determine the independent variable reliability: number of teacher behaviors observed divided by the number of behaviors planned, multiplied by 100 (Billingsley, White, & Munson, 1980). During all probe sessions (full probe, daily probe, maintenance sessions, and generalization sessions), the reliability observer recorded the student’s response and the teacher behaviors of: had materials and a data sheet ready, secured the student’s attention, gave the task direction, waited the correct interval for a response, and gave the correct consequence. During all probe sessions, dependent and independent reliability agreement was 100% across all participants.

**Results**

The purpose of this study was to evaluate if secondary students with moderate disabilities would learn core content embedded in a functional cooking activity when taught with a SP procedure and if they would generalize the information across materials and settings. The results indicated that the participants learned, generalized, and maintained the targeted core content standards.

**Effectiveness Data**

As shown in Figures 1–4, all participants had 0% levels of responding prior to intervention and learned each of the targeted standards in reading, math, and science to criterion when the intervention was introduced. Note that all participants continued to take part in the cooking activity until everyone in the group met criterion of 100% for 3 consecutive days; these additional sessions are not reflected in the graphed data since the teacher did not record core content data for students once they met criterion.

The average number of sessions to criterion across skills and participants was 11, and the average number of errors to criterion across skills and participants during probe sessions was 24 (28.4%). Individual instructional data for each participant on the number of sessions to and through criterion as well as the number and percent of errors to criterion (1
day at 100% correct responding) and through criterion (3 consecutive days at 100% correct responding) are presented in Table 2. Note that the data represent the number of the specific responses during daily probe sessions only.

**Maintenance Data**

Maintenance data were collected during full probe sessions for the reading standard during the third and fourth full probe sessions and for the math standard during the fourth
full probe sessions. All students’ full probe data indicated that they were maintaining for the first two standards over time. Additionally, with the exception of Daniel, the teacher collected maintenance data at 1, 3, and 5 weeks after criterion was met on the third and final standard (i.e., science standard). The 3 remaining participants reached 100% during all maintenance probe sessions.

Generalization Data

Generalization sessions occurred at a grocery store during CBI. The teacher conducted these sessions in the exact same manner as probe sessions; however, the materials were different. All participants demonstrated 100% accuracy in reading and defining words on novel cake mixes, in calculating the percent
off of their purchase, and in answering questions about force in regard to pushing the grocery cart.

Discussion
The purpose of this investigation was to teach academic core content skills to secondary aged students with moderate intellectual disability within the context of a functional activity. The current high-stakes state accountability systems require that teachers of students with MSD teach the core content standards to high levels as measured by alternate assessments. These same teachers are responsible for ensuring their students learn the func-

Figure 3. The percent of correct responses on full probe and daily probe trials for Terry. Closed circles indicate target response data, and open circles indicate generalization probe data.
tional skills they need to become as independent as possible in their future environments. Incorporating both of these aspects of students’ educational programs can be challenging as teachers have limited instructional time. We conducted this investigation to provide a demonstration of how teachers may provide instruction on core content standards in functional and meaningful ways. All students in this investigation successfully learned reading, math, and science content from their states’ alternate assessment standards. These results are similar to other investigations that successfully taught both functional and core content information to students with MSD (Collins et al., 2007; Collins et al, 2011; Johnson et al., 2004).

An abundance of research literature demonstrates the effectiveness of using systematic instruction with students with MSD (Brown & Snell, 2006). This study extends the literature in providing a demonstration of how the SP procedure was used effectively in teaching core content in a small group instructional format, whereas previous researchers have used the CTD procedure (Collins et al., 2007; Collins et al, 2011). In analyzing the data, the participants acquired the math standard in the fewest number of sessions. This may be because the math skill required memorizing

Figure 4. The percent of correct responses on full probe and daily probe trials for Daniel. Closed circles indicate target response data, and open circles indicate generalization probe data.
and following a five-step task analysis without understanding any depth of content. The science and reading standards appeared to be more difficult for some of the participants. Terry and Kim may have met criterion on these standards in fewer sessions because they were stronger readers than Justin and Daniel. The additional complexity of defining phrases in addition to reading them and of comprehending questions on a worksheet may have been related to the rate of progress for Justin and Daniel. During training, they demonstrated the ability to read the phrases but often were unable to define them or explain the meaning of abstract concepts; a skill that many students with intellectual disability find challenging (Hallahan, Kaufman, & Pullen, 2011).

One consideration in interpreting the data in this investigation is that the teacher required all participants in the group to be present during training sessions and that all students learned the same skill. Students did not move to the next learning standard until all students in the group met criterion. The teacher did this to simplify the procedures, but by conducting the group in this way, students may not have been able to progress at their own rate and the opportunity for observational learning (i.e., students learning new skills by watching others learn skills different from theirs) was removed (Collins, Gast, Ault, & Wolery, 1991). However, teaching one skill at a time through criterion, mirrors the format used in general education classes where it is standard practice to teach one unit at a time before proceeding to another.

One limitation of this study was that instruction occurred in a segregated, special education resource room setting. Although researchers have found benefits for students with and without disabilities who are educated in inclusive settings (Cole, Waldron, & Majd, 2004; McDonnell et al., 2003), teachers can be challenged to provide the intense level of instruction needed by students with MSD in general education settings. The teacher decided in this study to provide the instruction needed by students with MSD in a segregated setting because multiple sessions were needed to teach students to criterion, and the equipment resource setting also had the equipment needed to teach the functional application. In the future, teachers should consider other settings needed to teach the functional application.

### TABLE 2

<table>
<thead>
<tr>
<th>Student</th>
<th>Number of Training Sessions</th>
<th>To Criterion</th>
<th>Through Criterion</th>
<th>Number / Percent of Errors in Daily Probe Sessions</th>
</tr>
</thead>
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<tr>
<td></td>
<td>R</td>
<td>M</td>
<td>S</td>
<td>Mean</td>
</tr>
<tr>
<td>Kim</td>
<td>8</td>
<td>8</td>
<td>11</td>
<td>9.0</td>
</tr>
<tr>
<td>Justin</td>
<td>18</td>
<td>6</td>
<td>4</td>
<td>9.3</td>
</tr>
<tr>
<td>Terry</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>8.3</td>
</tr>
<tr>
<td>Daniel</td>
<td>21</td>
<td>10</td>
<td>25</td>
<td>18.0</td>
</tr>
</tbody>
</table>

*Note. R = reading standard; M = math standard; S = science standard.*
tings where instruction can occur in integrated settings. For example, this study could have been conducted in a consumer science class as students learned to plan and prepare meals with their peers without disabilities. Similar instruction could be extended into the community within the context of service learning. For example, a student with MSD could work with peers without disabilities to learn to read recipes in planning items to bake for a charitable bake sale, to calculate the percentage over cost to establish a price for bake sale items that will result in a profit, and to prepare the items with attention to healthy nutrients (e.g., make healthy choices based on calories and vitamins of ingredients).

Another limitation is that data were not collected on students’ ability to bake the cake independently. That is, although the core content information was taught in the context of the functional cake baking activity, data were not collected on how well students performed the cake baking. Other researchers have demonstrated students’ acquisition of both core and functional skill content (Collins et al., 2011), and future researchers should collect data on both skill types to provide evidence of the effectiveness and efficiency of this type of combined instruction.

Several benefits exist for teaching core content within a functional activity. First, in this investigation the teacher found the behavior of the participants during probe and training sessions to be appropriate. Participants appeared to look forward to participating in daily sessions and to enjoy the natural reinforcer of baking a cake on Fridays. It is possible that, if an activity is reinforcing to students, they may find the core content embedded within the activity to be more meaningful and readily applied to their lives. In other words, the functional activity may provide the motivation for learning new and sometimes difficult content. Second, in schools where instructional time is limited, teachers can maximize instruction time by incorporating both functional and core content instruction during the same sessions, thus increasing the efficiency of their instruction. Finally combining both types of content forces teachers to consider meaningful applications of standards instruction that can be shared in general education settings and taught to general education students.

Future research in core content instruction is both warranted and needed and might focus on additional instructional domains and variables. Researchers should consider instruction on other core content standards embedded in different functional activities. For example, in addition to the domestic cooking activity used in this study, core content could be embedded in vocational or recreation/leisure activities. For example, a student learning to work in a greenhouse could be taught to read directions on packets of seeds, to calculate the percentage of nutrients that need to be added to soil to increase fertility, and to learn the principles of photosynthesis while rotating plants to receive sunlight. In addition, researchers might examine the effects of peers with and without disabilities working together to learn the same core content during meaningful activities, and evaluate other systematic instructional strategies, such as CTD or SLP, when embedding core content in functional activities.

In summary, teaching core content within a functional activity can be a beneficial scenario for both students with MSD and their teachers. Teachers of students with MSD have several responsibilities and duties that include implementing behavioral support plans and teaching functional IEP goals as well as teaching a variety of required core content standards throughout the school year. It can be difficult to find the time to implement strategies to address all the needs of students. Embedding core content standards into functional IEP goals can “kill two birds with one stone.” Students and teachers can benefit from the minimal time it takes to teach the core content in functional activities. In addition, embedding core content in functional activities also can make the content more personally relevant and meaningful to the students, which can be motivating and possibly facilitate progress while decreasing inappropriate behaviors.

References


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