Intensive Intervention Practice Guide:

Using Visual Activity Schedules to Intensify Academic Interventions for Young Children With Autism Spectrum Disorder

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What Is It?

Students who are slow to respond to traditional instruction and intervention require intensified intervention. Visual Activity Schedules (VAS) are an evidence-based type of visual support that provide sequential organization of the steps for an activity or skill (Bryan & Gast, 2000; Knight, Sartini & Spriggs, 2015; Koyama & Wang, 2011; Spriggs, Mims, van Dijk, & Knight, 2017; Wong et al., 2014). VAS can be aligned with individual student needs, including behavioral support. VAS have strong evidence of effectiveness, provide many opportunities to respond, and can be used by teachers during a wide array of classroom activities. For students with Autism Spectrum Disorder (ASD), VAS can be an effective method of intensifying intervention to support students' understanding of, and participation in, multistep activities that pose difficulty.

For Whom Is It Intended?

Researchers have demonstrated that VAS can be used successfully to support students with ASD in acquiring academic skills (Banda, Grimmett, & Hart, 2009; Bryan & Gast, 2000). VAS are useful for students who are having difficulty completing the steps of a task or activity. These students may benefit from visual organization of the steps taught through systematic prompting, an approach which has been found to be beneficial for students with ASD (Hume & Odom, 2007; Waters, Lerman, & Hovanetz, 2009). VAS are particularly useful for students with ASD as they provide visual support to facilitate transitioning between steps of one or multiple activities. For example, Pierce, Spriggs, Gast, & Luscre (2013) used VAS for primary-aged students with ASD who were initially learning sequences within academic activities and tailored each VAS to specific students' needs. The researchers matched the activity, mode, and sequence with each student's abilities and all students acquired independence with their VAS (Pierce et al., 2013).

How Does It Work?

The focus of this guide is on using VAS to intensify academic interventions for students with ASD, including students who may be receiving intervention within Tier III of Multi-Tiered Systems of Support. Students with ASD have deficits in social-communication and exhibit restricted, repetitive patterns of behavior (DSM-V, 2013). VAS can provide support to students with these deficits to increase their success during academic activities (Betz, 2008; Bryan & Gast, 2000; Hume & Odom, 2007; Morrison, 2002; Pierce et al., 2013; Waters, Lerman, & Hovanetz, 2009). VAS work well for students with ASD due to common support needs related to processing, executive functioning, communication, sequencing, and organization (Dettmer, Simpson, Myles, & Ganz, 2000; Dunlap & Johnson, 1985; Hume & Odom, 2007; Mesibov, Shea, & Schopler, 2005). Unlike

verbal cues, visual cues can be displayed for ongoing periods of time and can thus serve to remind students of the steps of an activity (Mesibov et al., 2005).

Next, we describe how to use VAS as a method of intensifying academic interventions for young students (pre-kindergarten through elementary school) with ASD. In our example, we discuss how we would implement VAS using the data-based individualization (DBI) process (Lemons, Kearns & Davidson, 2014). DBI for VAS includes five steps: (a) determining the activity, (b) developing the VAS, (c) making the data collection plan, (d) teaching the use of VAS, and (e) evaluating student progress. For each step, we provide a description and an example.

Step 1. Selecting the activity

The activity selected should be one in which a student is not performing the expected steps independently. For example, the student may have the desired skills in his or her repertoire, but is unable to master the correct order of completion or is simply unable to perform the skills independently. After identifying the activity, the team should collect baseline data (Banda, Grimmett & Hart, 2009).

Example: Antonio is learning how to write a sentence. His data (see Figure 1) show that he is consistently performing the first step (choosing an idea to write about) independently. On the subsequent steps, however, he is often making errors because he is moving too quickly and misses steps (e.g., forgetting to write a verb or not including punctuation). When his teacher verbally reminds him or points to the "Word Wall" to help him select a verb, he is able to complete the steps. Because he needs many prompts to complete these steps, his team is selecting sentence-writing as the activity/skill in which they will use a VAS.

Step 2. Making the VAS

Completing a task analysis to determine the steps. Once the team has selected an activity and identified the student's performance within it, the team should task analyze the activity into steps that need to be completed in the correct sequence (for more on Task Analysis, see Task Analysis Step-by-Step Guide on AFIRM). The activity should have identified target steps (behaviors) to elicit within the activity in that sequence. Many factors should be considered when determining the sequence of the VAS, such as the student's motivating variables (i.e., What time of day is it? Has the student had access to a preferred activity recently?), the student's understanding of a sequence (i.e., Can the student understand a left-right sequence?), and the student's preferred reinforcement (i.e., Is there a way to embed a reinforcing step or activity within the VAS?). Following DBI guidance, the VAS will be individualized to this student's needs, so the number of steps for one student may differ from the number of steps identified for another student.

Example: Antonio's teacher selected sentence-writing as the activity. After reviewing the data she collected (Figure 1), she was able to determine that Antonio did not need support identifying a topic. Thus, she targeted the next five steps for his VAS.

Determining the mode. Various modes of activity schedules have been shown to be effective in the literature. These include the use of real objects, photographs or line drawings of objects, people, or places, and written words (Knight et al., 2015; Lequia, MacHalicek & Rispoli, 2012). Most important to the selection of the mode are the student's skills associated with receptive language, use of symbolic representations, and literacy. The team should individualize the selection of the mode to align with the student's independent receptive language level and reading ability. A student should be able to understand what each step of the VAS represents with little to no guidance (Banda et al., 2009). If the student is working on reading new words or understanding different modes of images, these should not be included in the VAS to ensure that the student can independently comprehend the visual steps.

Example: Antonio has sentence-level reading comprehension, but often needs pictures to support his understanding of sentences. He understands line drawings, so his teacher has selected a line-drawing with written directions for his VAS steps.

Determining the student's method of manipulation. Once the sequence and mode have been developed, the team should carefully consider the manner in which the student will physically manipulate the visual steps on their VAS by using data on the student's fine and gross motor skills. VAS can be structured by creating an object or image to represent each step. Often the objects or images are attached to or displayed upon a larger background item (e.g., large piece of cardstock, pocket chart). The objects or images can then be manipulated by the student. To support executive functioning and facilitate progression through the steps, it should be visually evident when a student has completed each step (Mesibov et al., 2005). Students frequently remove the object or image representing the step when it is completed. Alternatively, a VAS could be a checklist on which the student checks off a box after completing each step.

Example: Because Antonio rushes through and skips some steps of sentence-writing, his teacher wanted to ensure he had a way to stop and check that he has completed each step. She keeps Antonio's schedule on a clipboard next to him with a pencil and he checks off each step as he completes it to help him know which step he is on (see Figure 2).

Step 3. Developing a Data Collection Plan

DBI requires the team to have a data collection plan to support the team in identifying a goal, measuring the student's progress, and decision-making around adaptation as needed (Lemons at al., 2014). First, the team should set a goal for the student that is explicitly tied to the steps within the VAS. Often, the goal is that the student will complete each step of the schedule independently, by both manipulating the schedule (e.g., selecting the correct step and taking it off the schedule to put it in a "finished" pocket) and performing the skill the step dictates. Next, the team should make a progress-monitoring plan by considering what information is needed in order to evaluate the student's performance as well as when data will be collected and by whom. The measurement should be sensitive, such that no inference is required to see if the student is learning the skill and completing the steps of the VAS correctly with and without prompts.

Example: Antonio's goal is to independently select a topic and write a grammatically correct sentence with a subject, verb, appropriate capitalization, and appropriate punctuation. Antonio's teacher looks at his permanent product (i.e., each sentence he writes) and his schedule to see which steps he has checked off to collect her data. She is charting the data on a scatterplot datasheet to see his progress over time (see Figure 3).

Step 4. Teaching with the VAS

Systematic prompting should be used to cue the student to attend to the VAS, manipulate the visual steps, and perform each step within the activity. Teaching the independent use of the VAS requires idiographic information about each student. What are their likes and dislikes? What prompting procedure should be used to help the student become independent? Can the team reinforce the student's use of the VAS and appropriate step completion by including a preferred activity or step as the final step? Over time, a student should become independent in following the steps of the VAS. A variety of prompting procedures (e.g., system of least prompts, graduated guidance) exist to help teach students to independently complete the sequence included in the VAS (Bryan & Gast, 2000; Macduff et al., 2007; Pierce et al., 2013). To meet the needs of the student with ASD, a teacher draws the student's attention to the visual through the use of verbal, physical, or gestural prompts (National Professional Development Center on Autism Spectrum Disorder, 2015).

Example: Antonio's teacher presents his schedule to him at the beginning of the writing activity. She is using verbal and gestural prompts to promote his use of the VAS. She knows these prompts work well for him because he follows these prompts for other skills and the data show that he is making progress when prompts are used to cue his attention to the schedule. His team will collect data on whether prompts are needed for each step, and, if so the highest level of prompt they had to use.

Step 5. Evaluating Student Progress and Adapting as Needed

The data will show the team what type of adaptations may be needed. If, through progress-monitoring, the team has identified that a student is frequently making an error or is not progressing at an appropriate rate, they should consider adapting the VAS or the teaching procedures. Looking at the levels of prompting provided may show that the student often needs a very restrictive prompt (e.g., full physical prompting) to complete a step, which may indicate that they need more support in understanding the visual cue of that step of the VAS or that they need explicit instruction on that step (e.g., the student still needs instruction on how to do addition if they are making errors on their addition problems). In such cases, the team can adapt their teaching by using a more concrete visual cue or breaking that step down into multiple steps.

Example: After reviewing his data (Figure 3), Antonio's teacher determines that he has needed fewer prompts (both verbal and gestural) over time and is beginning to complete the correct steps independently. These data suggest that she should continue working with Antonio using his VAS to work toward achieving his goal of independently completing all the steps.

How Adequate Is the Research Knowledge Base?

The efficacy of VAS for students with ASD has been well-documented and evaluated through a number of individual studies and comprehensive reviews. After systematic reviews of peer-reviewed research in scientific journals, The National Professional Development Center on ASD (NPDC) and National Autism Center (NAC) identified VAS as an evidence-based practice (EBP) for children with ASD (Koyama & Wang, 2011; Spriggs et al., 2017; Wong et al., 2014). The NPDC includes VAS as part of the category of Visual Supports, while the NAC evaluated focused intervention practices and has listed VAS as an EBP on its own. To make these determinations, both organizations used rigorous inclusion criteria regarding the number of high-quality studies across varying types of research design and investigators, total number of participants with ASD across studies, and measurement of significant effects via statistical analyses for group designs or the number functional relations demonstrated within single-case design. The NPDC and NAC both establish VAS along with many other practices as EBPs for students with ASD.

Although numerous investigators have studied the use of VAS for individuals with ASD, Banda & Grimmet's (2008) initial review of the literature was the first comprehensive evaluation of the research literature documenting the effectiveness of VAS. The thirteen studies that Banda & Grimmet (2008) reviewed supported the use of VAS as an effective intervention strategy

for teaching various social, daily living, on-task, and transition behaviors and may decrease challenging behaviors during transitions for students with ASD. Lequia et al. (2012) examined the literature to identify effects of activity schedules on challenging behaviors for students with ASD across different variables (i.e., setting, type of visual schedule, purpose of the schedule, and participant characteristics). The eighteen studies identified by Lequia et al. (2012) provide support for the intervention's effectiveness in minimizing the perceived challenging behaviors presented within each case. Using research quality indicators from Horner et al. (2005), Knight expanded on the previous reviews and found sixteen out of thirty-one studies of acceptable quality, fourteen of which showed they were fairly to highly effective based on very low percent of non-overlapping data between phases, to support the establishment of VAS as an EBP for students with ASD. The results of this review suggest that VAS can be considered an evidence-based practice for individuals with ASD.

Though there is much evidence supporting the effectiveness of VAS, there are, however, gaps in the research. All of the studies on VAS for young children with ASD included in the NPDC review lacked information regarding the number of teaching episodes within each intervention session and the total duration of teaching required for the students to acquire the independent use of their VAS (Johnson, Fleury, Ford, Rudolph, & Young, 2018). In addition, Banda & Grimmet's (2008) review could not identify which components of the strategy were most effective including: types of pictures used, how the VAS was displayed to the student, and the size of the schedule. There were also limitations found within the specific studies included in this practice guide. For example, several studies do not provide a description of the decision-making process by which a particular mode of VAS (i.e., photograph, words, and line drawing) was chosen for participants (Bryan & Gast, 2000; Hume & Odom, 2007; Waters, Lerman, & Hovanetz et. al., 2009). While the research base for the use of VAS supports its use as an effective evidence-based instructional strategy, further research into frequency and duration of teaching sessions needed and the decision-making process needed to develop and teach the various components of VAS are still needed.

How Practical Is It?

The practicality of using a VAS is evidenced in a variety of ways. Teachers have successfully taught the use of VAS for many skills to children of varying ages and severities of ASD. Creating VAS can also be simple, teachers can use comic strips, drawings, photographs from the internet, or actual objects from their classroom, as steps on the schedule. The VAS can easily be contained in a notebook and carried from room to room, making the system very cost effective as well as practical. There are also a variety of teaching procedures that are available to teachers when using VAS to promote independent activity completion. Many of these procedures, such as

hierarchies of prompting and graduated guidance, are often already used by teachers and allow them to select the most appropriate procedure given the needs of their student.

The literature suggests that VAS can be feasible in a variety of settings, including general education classrooms, resource settings, self-contained classrooms, and homes, and by a variety of interventionists (Knight et al., 2015). Studies show that the use of VAS in the classroom increases productivity for individual students, teachers, and the classroom as a whole (Bryan & Gast, 2000; Hume & Odom, 2000) and that teachers can easily adapt the VAS to be used as a method of data collection (Bryan & Gast, 2000). Hume and Odom (2006) and Pierce et al. (2013) report that the interventionists in their studies considered VAS to be highly socially valid.

In addition to being a practical intervention for academic activities in classroom settings, a student's use of VAS can be generalized in a number of ways. Once a student has a general understanding of VAS, the teacher can expand its use to different settings or activity types. For example, a student can follow the visual cues for a different activity using the same structure and system that they've already used for a different academic activity. VAS can be used to teach a wide array of skills including academic, leisure, daily living, and vocational (Spriggs et al., 2017). Several studies have found that VAS were an effective intervention through which to increase social, functional, on-task, transitional, as well as challenging behaviors (Banda & Grimmett, 2008; Hume & Odom, 2006; Knight et al., 2015; Lequia, 2012).

How Effective Is It?

VAS have been shown to be effective and efficient at teaching young children with ASD to perform academic skills (Bryan & Gast, 2000; Dettmer, Simpson, Myles, & Ganz, 2000; Knight et al., 2015, Pierce et al., 2013). Hume and Odom (2006) taught three students with ASD to use VAS to address skills specific to each of their Individual Education Programs (IEPs). The three students mastered their VAS quickly (three to six training sessions) and maintained independent use at a one-month follow up. The effectiveness and efficiency of VAS were also exemplified in studies by Bryan and Gast (2000) and Pierce et al. (2013), in which participants were quickly able to grasp the mechanics of their systems through the systematic instruction from their teacher and were able to maintain independent and on-task behaviors.

What Questions Remain?

The current body of research surrounding VAS is geared towards addressing behaviors that support self-regulation, self-care, transition, and play for individuals with ASD. Given the effectiveness of VAS in these areas, it would be beneficial to further extend the research into the completion of academic activities within the classroom. Additional questions include:

- What is the utility of VAS for other populations of students working on academic skills?

- With VAS being typically included in studies that incorporate additional interventions, what is the extent that VAS on its own improves academic behaviors?

Where Can I Learn More?

- **autismpdc.fpg.unc.edu/evidence-based-practices**
  The Frank Porter Graham Center on Child Development at University of North Carolina at Chapel Hill has resources on all the practices they have identified as evidence-based practices for children with ASD. There are resources for service providers and parents. Information on VAS specifically can be found under "Visual Supports."

- **www.nationalautismcenter.org/national-standards-project/phase-2/**
  The National Autism Center has free reports for service providers that include more information on all the evidence-based practices they have identified.

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Figure 1. Antonio's Data for Writing a Sentence

Student: Antonio Behavior Observed: Writing a sentence Observer: T. Cher										
Writing a Sentence Steps	November									
	1	2	3	4	5	8	9	10	11	12
Chose an idea/topic to write about.	✗	V	V	G	G	■	■	■	■	■
Wrote a subject (person, place, or thing) for their sentence.	G	V	V	✗	G	✗	V	V	V	■
Wrote a verb for their subject to do.	V	V	✗	✗	✗	V	G	G	V	G
Used a capital letter at the beginning of the first word in their sentence.	V	✗	V	V	G	✗	V	✗	■	V
Used appropriate punctuation at the end of the sentence. (period, question mark, exclamation point)	✗	G	G	V	■	V	✗	V	✗	G

Did not display expected behavior	✗
Displaying expected behavior with verbal prompt	V
Displaying expected behavior with gestural prompt	G
Displaying expected behavior with partial physical prompt	P
Displaying expected behavior independently (no prompt needed)	■

Figure 2. Antonio's VAS for Sentence-Writing

person place thing		ABC	?.!
Sentence has a subject.	The subject is doing an action (verb).	Capital letter starts the sentence.	Sentence ends with punctuation.
✓	✓		

Figure 3. Monitoring Antonio's Progress with the VAS

Student: Antonio Behavior Observed: Writing a sentence Observer: T. Cher																	
Writing a Sentence Steps	November																
	Baseline								With Visual Activity Schedule								
	1	2	3	4	5	8	9	10	11	12	15	16	17	18	20	21	22
Chose an idea/topic to write about.	X	V	V	G	G	■	■	■	■	■	■	■	■	■	■	■	■
Wrote a subject for their sentence.	G	V	V	X	G	X	V	V	V	■	V	G	G	■	■	■	■
Wrote a verb for their subject to do.	V	V	X	X	X	V	G	G	V	G	G	G	■	V	G	■	■
Used a capital letter at the beginning of the first word.	V	X	V	V	G	X	V	X	■	V	G	■	■	G	■		
Used appropriate punctuation at the end of the sentence.	X	G	G	V	■	V	X	V	X	G	V	V	V	G	G		

Did not display expected behavior	X
Displaying expected behavior with verbal prompt	V
Displaying expected behavior with gestural prompt	G
Displaying expected behavior with partial physical prompt	P
Displaying expected behavior independently (no prompt needed)	■

Figure 4. Using DBI to Develop and Teach the Use of Visual Activity Schedules

Step 1. Determining the Activity	• Evaluate student performance on an activity • Collect baseline data
Step 2. Making the VAS	• Task analyze to determine the sequence • Determine the mode • Determine the student's method of manipulating the VAS
Step 3. Develop a Data Collection Plan	• Identify a goal (what the team will collect data on) • Select who will collect data and when they collect it • Develop a progress-monitoring plan
Step 4. Teach the use of VAS	• Select a prompting procedure • Select reinforcement
Step 5. Evaluate Student Progress and Adapt as Needed	• Evaluate the data on student performance • If needed, adapt the VAS and/or the teaching of steps in the activity • Continue to progress-monitor after adaptation
Ways to Expand the use VAS to be most effective for young students with ASD	
Collect Intervention Data	Keep collecting data! This will help you to evaluate the effectiveness of the VAS and the strategies you're using to teach its use.
Add New Pictures or Words	As the student becomes successful with the original form of the schedule, consider extending the use of the VAS to cover a longer period of time within the same setting or academic subject.
Fade Prompts	As the student becomes more independent, begin to reduce prompting.
Fade the Prominence of the VAS	As the student becomes more independent with their VAS, consider the many new opportunities they have to engage in different settings. Making the VAS portable and discrete can help the student use it in more settings.
Promote Generalization Across Settings and Activities	• Apply the use of the schedule to academic activities or transitions in as many settings as needed. • Consider adding steps for additional activities to increases the student's level of independence.

Adapted from Banda, D. R., Grimmett, E., & Hart, S. L. (2009). Activity schedules: Helping students with autism spectrum disorders in general education classrooms manage transition issues. *Teaching Exceptional Children, 41*(4), 16-21.

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