

# Explicit strategy instruction for teaching executive function strategies to students with special needs in an academic after-school program

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## RATIONALE

Executive function is a broad term used to describe the complex cognitive and behavioral processes that play a significant role in learning and academic achievement (ResearchILD, 2014). According to Dawson and Guare (2012), the term executive function emanated from the discourse of neuroscience and refers to the brain-based skills that are required for humans to perform a task or interact appropriately. They stated that there are two dimensions of executive function skills, involving cognition and behavior. For this study, the participating students received explicit strategy instruction utilizing an executive function curriculum, SMARTS Online Curriculum (ResearchILD, 2014).

## INTERVENTION

The Thomas Reynolds Center for Special Education and After-School Programs [The Center] collected data at its one after-school instructional site housed within the Thomas Reynolds Center for Special Education building. All participants received the proposed treatment. Project implementation occurred for 23 instructional weeks and involved nine 3rd graders. The project consisted of explicit strategy instruction using an evidence-based curriculum, SMARTS Online (ResearchILD, 2014) for teaching executive function strategies. SMARTS lessons are grouped by five executive function processes that affect learning: 1) goal setting, 2) cognitive flexibility, 3) organizing and prioritizing, 4) accessing working memory and 5) self-monitoring and checking. Participating students received strategy instruction adapted from the SMARTS Online curriculum by the Center's Graduate Assistants during the second hour of the after-school program four days a week. The second hour of the after-school program focused on academic instruction in either math or ELA. Center Graduate Assistants integrated executive function strategies from the SMARTS Online curriculum into their math and ELA lessons. At the end of each lesson or series of lessons, students completed a strategy reflection sheet, which is a component within the SMARTS curriculum. In addition, students completed periodic strategy use reflection sheets to determine whether the strategies they were taught were being used. The purpose of both types of reflections was primarily to promote student self-monitoring of strategy use, but they also allowed The Center to assess the efficacy of the strategy instruction within the after-school program. Each student was given a pre, mid and post-assessment using a modified version of the METACOG Student Survey called Motivation and Effort (ME), which is included in the SMARTS Online curriculum. In addition, general education teachers and special education teachers of participating students completed a modified version of the METACOG Teacher Survey called Teacher Perceptions of Student Effort (TPSE) (pre and post); parents also completed a modified version of the METACOG Parent Survey called Parent Perceptions of Student Effort (PPSE) (pre and post).

## REMEMBERING/ACCESSING WORKING MEMORY

According to ResearchILD (2014), working memory is the ability to hold information in one's mind and to mentally manipulate this information. Students who struggle with working memory have a hard time taking tests, cannot access and manipulate information easily, have difficulties completing multi-step directions and have high levels of inattentive and distractible behavior. (Holmes, 2012). According to unit 5 in the SMARTS curriculum, one strategy that assists students with working memory are mnemonics. Mnemonics serve as memory aid for our brain. For example, the letters ROYGBIV is a mnemonic to help remember the colors of the rainbow: red, orange, yellow, green, blue, indigo, and violet. Mnemonics can be used to remember facts and vocabulary words and more complex information, such as, a series of steps that must be completed in order. Students who use mnemonics successfully, practice the skill. Reading it once is not going to improve working memory. It must be read several times to be able to recall the information later. Mnemonics can be applied to different settings and subjects, such as step by step processes and functional skills. Mnemonics should also be personalized to students' interests. The student will more likely remember something if it is something they like.

## SELF-MONITORING & SELF-CHECKING

Cooper, Heron and Heward (2007) define self-monitoring as a procedure where an individual systematically observes his or her own behavior for constructing and retrieving behavior change. Students need to learn how to use strategies to regulate their behaviors and monitor progress. Students who have difficulty with self-monitoring skills have issues reflecting on their own behavior and need to be taught strategies to do so. Unit 6 within the SMARTS curriculum suggests daily checklists and reminders. Daily checklists could include completing homework assignments, bringing it to school and handing it in. Reminders could include color coding in the order of which is the most important; reminders can be paper or the use of a WatchMinder, a watch that vibrates in order for you to stay on task or reminds you to do something, such as study for an upcoming science test (Finn, Ramasamy, Dukes, Scott, 2014). By using these strategies for self-monitoring students will be able to be more independent and change their frustrated behaviors.

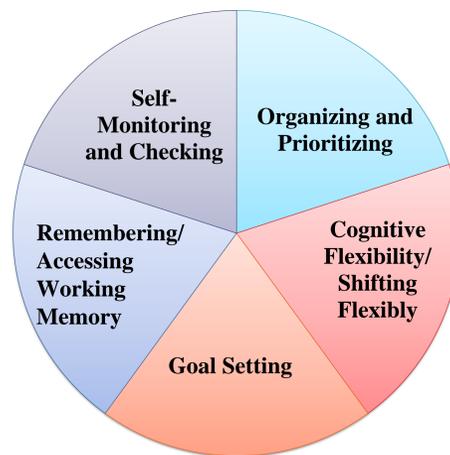
According to Van Boxtel (2016), self-checking is referred to as the ability to review ones work in order to ensure the assignment or test is free of errors. Students who understand the importance of self-checking their work on academic tasks are able to review their answers on a test, check their rubric, edit a writing assignment, etc. in order to ensure successful completion of the tasks. In lesson 6.3 of the SMARTS curriculum, the students learn The Top-3- Hits strategy, which helps students avoid the most common errors they make when completing an academic task. This strategy allows students to avoid making their most common mistakes during academic tasks, which makes self-checking much simpler. In lesson 6.4 of the SMARTS curriculum, students learn how to create checklists to help ensure that all necessary steps needed in order to finish a task successfully are complete. By creating a checklist, students are able to easily review their assignments to make sure they are free of errors. Van Boxtel (2016) suggests that students who are able to self-check their work have higher academic performance because they are able to take control of their actions and move towards independence as they are learning.



## SMARTS CURRICULUM

The SMARTS online executive function curriculum (ResearchILD, 2014) is an evidence-based curriculum for teaching students executive function strategies. SMARTS provides teachers with 30 lessons that can be used to teach students strategies for accessing important executive function processes. Designed for grades 6-12, seventeen (17) individual lessons were modified to fit the needs and understanding of 3<sup>rd</sup> graders, as well as integrated into math and ELA lessons. The project started with *Unit 1: Introduction of Executive Function Strategies*. During this unit, students were taught what metacognition is, what it means to have cognitive flexibility and what executive function is (Lessons 1.1, 1.2, 1.3, 1.4). In *Unit 2, Goal Setting: Understanding the Big Picture and Breaking it Down*, students learned how to identify CANDO (Clear, Appropriate, Numerical, Doable, and Obstacles) goals and think about their own individual goals (Lessons 2.1, 2.2). In *Unit 3, Cognitive Flexibility: Shifting and Flexible Thinking*, students learned the importance of shifting between multiple perspectives (Lesson 3.5). In *Unit 4, Part A: Organizing Materials and Prioritizing Time*, student learned how to organize their backpack and belonging and time management strategies (Lessons 4A.1, 4A.2). In *Unit 5, Remembering: Accessing Working Memory* was taught. During this unit, students learned about the different types of memory (short-term, long-term, and working), identified their own strengths and challenges in working memory, and learned new strategies to help with remembering information, such as cartoons and associations, using mnemonic devices, and stories (Lessons 5.1, 5.2, 5.3., 5.4). Lastly, *Unit 6: Self-monitoring and Self-Checking*, students learned the benefits of self-monitoring and strategies to help them self-monitor (Lessons 6.1, 6.2, 6.3, 6.5). This curriculum was used in an effort to help students generalize important strategies that will help improve their executive function, as well as to help the students identify which strategies work best for them based on earlier discovery of their own learner profiles.

## EXECUTIVE FUNCTION WHEEL



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## ORGANIZING & PRIORITIZING

According to Anderson, Caldarella, Conley, Munk, and Young (2008), organizing is defined as the skills that allow students to effectively manage their time and materials in the classroom. Students who have the ability to stay organized in school use notebooks for different subjects, keep a clean book bag, color code their supplies, and bring all necessary items to class. In lesson 4A.1 of the SMARTS curriculum, students learn the 4 C's strategy, which helps students maintain a clean book bag. The 4 C's stands for clean, categorize, customize, and continue. Students who are able to use this strategy when organizing their book bag are able to stay consistently organized and understand the importance of organization in school. According to Deshler, Hughes, Ruhl, and Schumaker (2002), students who are able to organize their academic materials have higher levels of school performance.

Willis (2016) suggests that prioritizing is defined as the cognitive process that takes place when the brain distinguishes main ideas from low-relevance details. Students use the executive function of prioritizing for every subject in school, such as, planning an essay, selecting which information to include in notes, and evaluating math word problems for the important information. When students are able to prioritize, they are able to plan the order in which they will complete a large task and which parts of the task should receive the most time and planning. According to ResearchILD (2014), students who do not prioritize their time find themselves overwhelmed when completing academic tasks because they do not have the skills necessary to manage their time. In lesson 4A.3 of the SMARTS curriculum, the students learn how to divide their tasks into obligations, aspirations, and negotiations. Within this lesson, students learn the importance of flexibly managing their time in order to accomplish their goals and complete tasks. According to Willis (2016), students who are able to prioritize academic tasks become more self directed learners who can successfully plan and achieve their long-term goals.

## COGNITIVE FLEXIBILITY

According to the SMARTS online curriculum, cognitive flexibility/shifting flexibly is the ability to think flexibly and to shift perspectives and approaches flexibly. This process is crucial for students' ability to learn new concepts. Cognitive flexibility allows students to combine ideas and concepts creatively and to integrate major themes with details (ResearchILD, 2014). In lesson 1.2 from the SMARTS curriculum, the main goal is for students to demonstrate cognitive flexibility by defining it and using it to solve math equations. The main goal of the lesson was for students to understand that they have to think of things in new or different ways. There is not always one correct way to do something. In addition, lesson 1.2 also had the students think flexibly in terms of ELA. For example, the students were given a sheet with four different phrases. Each phrase had multiple meanings. The students' job was to draw what they thought the phrase meant. Once all of the students were done they went through each phrase and they observed how some of the students drew different things for the same phrase. The students were able to think flexibly and reflect that there can be more than one meaning, and that not everyone thinks the same way.

Moran and Gardner (2007) state that students need to be able to take responsibility for their own learning in order to adapt to more diverse types of information and problem solving. Students who struggle with solving math problems can use cognitive flexibility by trying to answer the problem in more than one way. Lubin, Regrin, Boulch, Pacton, and Lancoe (2016), have also provided evidence as to how crucial being able to shift your mindset can be when it comes to a student's reading, writing, and math ability. In order to teach cognitive flexibility to students educators need to encourage growth mindsets and the ability to use their metacognitive strategies. Students need to be aware that there are multiple solutions to one problem (ResearchILD, 2014). Once students are well equipped with this knowledge they will be able to make cognitive flexibility one of their strengths.

## GOAL SETTING

According to Research ILD (2014), goal setting is defined as the ability to set realistic expectations in order to achieve a desired outcome. Students who are aware of their personal strengths and challenges, able to consider the "big picture", and understand the steps involved in the goal setting process are more likely to be successful in attaining their goals. Students who struggle with this executive function often have challenges developing a realistic goal because they do not have the skills necessary to make it specific and attainable. In lesson 2.1 of the SMARTS curriculum, students learn the strategy of setting a CANDO (Clear, Appropriate, Numerical, Doable, and Obstacle Considered) goal related to academics. The CANDO goal strategy allows students to learn how to create and set a goal that is realistic and specific to their academic lives. In lesson 2.2, the students evaluate the same academic goals and consider the specific steps they need to take in order to reach their goals. According to Lee, Palmer, and Wehmeyer (2009), students who understand how to set academic goals become more engaged in their education and as a result have a higher rate of performance in school.

## PRELIMINARY DATA ANALYSES

Preliminary analyses demonstrated that third-grade students in the study better understood what strategies were and were more self-reflective by mid-assessment. At the beginning of the program, students either didn't know what a strategy was or listed the following: trying your best, thinking, "simple," keeping hands to yourself, using noodles to count, or a game. These students listed math, happiness, cleaning your room, and art as strategies. One student described a strategy as "a way to do something" and was able to list actual math strategies (i.e., number bonds). By mid-assessment, six out of the nine students were able to capture that a strategy was a way to help or make work easier, and all students were able to list one or more strategies they had learned. Students who had previously answered "yes" to all questions had begun to reflect.

Students also became more critical of their efforts in relation to schoolwork. Although the same number of students saw themselves as hard workers who were able to do well in school, fewer students felt that they kept working even when work was boring or difficult. Fewer students also felt that they spent as much time as needed to get their work done at least sometimes, and fewer students acknowledged that they actually knew how they learned best. Finally, fewer students reported that they used ways (strategies) to help themselves do things that were hard and/or asked for help when needed.

Data also showed that strategies were being used by the students. Students self-reported using the following executive function strategies to help with classwork and/or homework by mid-assessment: ISEE a Strategy (for strategy identification) (n=2); CANDO goal-setting strategy (n=5); Shifty "try another way" strategy (n=6); 4C's organizational strategy (n=3); and Cartoons strategy for remembering (n=5). Further analyses in all of these areas will be done upon completion of the program.