MetaCOG Online

SMARTS and the Metacognitive Awareness Survey System

Part I

The SMARTS Executive Function Curriculum

Since its launch in 2015, SMARTS has proven to be a versatile tool used by thousands of teachers around the world. There are SMARTS strategies for every student, every classroom, at any time of the year. As part of special education, general education, one-to-one tutorials, and district-wide implementation, SMARTS can help you empower your students with the executive function strategies they need to succeed.

SMARTS is a yearly licensed subscription curriculum designed for either Elementary or Middle/High School level students, with Professional Development and Coaching options. SMARTS provides teachers with the tools necessary to teach executive function strategies. Each unit addresses an area of executive function crucial for success in school and life:

- Unit 1: Introduction to Executive Function Strategies
- Unit 2: Goal Setting
- Unit 3: Thinking Flexibly
- Unit 4: Organizing and Prioritizing Materials and Time
- Unit 5: Organizing and Prioritizing Information
- Unit 6: Remembering: Accessing Working Memory
- Unit 7: Self-Monitoring and Self-Checking

Since 2015, the SMARTS Executive Function Curriculum has been used by thousands of teachers across the US and in 25 countries around the world. The SMARTS curriculum includes 30 lesson plans, 30 PowerPoints, hundreds of activity handouts, as well as strategy reflection sheets. SMARTS Secondary users also have access to the MetaCOG Survey system, a series of surveys to help students and their teachers understand students' unique executive function strengths and challenges, their motivation and effort, and which strategies are most uniquely suited for each student.

The Metacognitive Awareness Survey System (MetaCOG-R)

The MetaCOG surveys (see Table 1), included partially in the SMARTS Online Executive Function Curriculum, were developed by ResearchILD in 2003 (Meltzer et al., 2004a, 2004b, 2004c). These research-based surveys help teachers to understand students' views of their own effort, strategy use and academic performance. The MetaCOG also helps teachers to understand their own perceptions of students' performance. Research has shown that students' perceptions of their own effort and strategy use are often very different from their parents' and teachers' perceptions (Meltzer et al., 2004a, 2004b, 2004c). When teachers can compare their own views

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with their students' self-perceptions, they can more readily reach all students, teaching them to "learn how to learn" over the course of the school year.

TABLE 1. Metacognitive Awareness System, Revised (MetaCOG-R)

Student questionnaires
- ME-R—Motivation and Effort Survey
- STRATUS-R—Strategy Use Survey
- MAQ-R—Metacognitive Awareness Questionnaire

Teacher questionnaires
- TPSE-R—Teacher Perceptions of Student Effort
- TIQ-R—Teacher Information Questionnaire

Parent questionnaires
- PPSE-R—Parent Perceptions of Student Effort

Note. Five-point rating for all surveys.

Please note that **these surveys are not diagnostic measures**. They are process measures that provide valuable information about students' use of executive function strategies as well as students' self-concepts, perceived effort, and persistence.

In 2021, ResearchILD developed an online and interactive version of the Strategy Use Survey (STRATUS-R), one key survey in the MetaCOG (see Table 2). The new MetaCOG Online features customized graphics and data displays for teachers and their students. These profiles allow teachers to understand their students' EF profiles and select from recommended SMARTS lessons to meet students' unique needs. In addition, students learn more about their EF strengths and challenges and how to use this knowledge to select and refine their own strategies.

The MetaCOG-R surveys for students and teachers include:

- Strategy Use Survey (STRATUS-R)—Assesses students' perceptions of their executive function strategy use. This is now online and called MetaCOG Online.
- Motivation and Effort Survey (ME-R)—Measures students' ratings of their own effort, persistence, and motivation. This will be available online in the second phase of MetaCOG Online.
- Teacher Perceptions of Student Effort (TPSE-R)—Assesses teachers' ratings of students' effort in different academic domains. This will be available online in the second phase of MetaCOG Online.

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TABLE 2. Sample Items from the MetaCOG STRATUS-R Strategy Use Survey

- I have trouble breaking down my homework into smaller, more manageable parts.
- I have trouble organizing my thoughts before I write.
- When I read or write, I struggle to figure out the main ideas.
- When I am learning something new, I connect it to something I already know.
- When I do my work, I ask if my answers make sense.
- If the method I am using to solve a problem is not working, I use another way of solving it.

Note. The STRATUS comprises 30 items. Students rate themselves on a 5-point scale for each item. Items from Meltzer, Reddy, & Sayer (2014).

Development of the MetaCOG Survey System

Promoting students' metacognitive awareness begins with building a classroom culture that helps students to understand their learning profiles as well as the importance of using strategies for their academic work. Formal and informal assessment methods can help teachers understand each student's self-perceptions and use of executive function strategies. One practical approach that is teacher-friendly and easy to implement is the MetaCOG Survey System-R (Revised). The MetaCOG-R, which can be used with students from 9 to 18 years of age, is a criterion-referenced assessment system that compares students', teachers', and parents' perceptions of students' effort, strategy use, and academic performance (Meltzer, 2014; Meltzer et al., 2004a, 2004b, 2004c; see also Meltzer, 2010, available at www.researchild.org and smarts-ef.org).

These strategy ratings focus on academic areas that depend heavily on executive function processes—for example, reading comprehension, written language, homework, and studying (Meltzer et al., 2001; Miller et al., 2001). Completion of the three MetaCOG-R surveys helps students to develop an understanding of their own learning profiles. This self-understanding is the foundation for building students' metacognitive awareness and their use of EF strategies. The MetaCOG-R can be used for a variety of purposes over the course of the school year:

a. To understand students' views of their own effort, use of strategies, and academic performance.
b. To help educators and clinicians to compare their own judgments with their students' self-perceptions as well as parents' perceptions.
c. To develop a system for teaching strategies to help students plan, organize, prioritize, shift flexibly, memorize, and check their work.
d. To track students' understanding and implementation of these strategies over time.

The Strategy Use Survey - Revised (STRATUS-R) consists of 30 items that assess students' self-reported strategy use in reading, writing, spelling, math, studying, and test taking (α = .945)* (Meltzer et al., 2004c). The original version of the STRATUS was a 31-item questionnaire; one question with low internal consistency was removed in the 2019 revision. The STRATUS survey was

administered to 900 students from five school districts across the socioeconomic spectrum for the purpose of identifying reliability and validity.

The Motivation and Effort Survey - Revised (ME-R) consists of 30 items that assess students' self-ratings of their effort and performance on different academic tasks that depend on executive function processes (α = .91)* (Meltzer et al., 2004). The ME survey was administered to 900 students from five school districts across the socioeconomic spectrum for the purpose of identifying reliability and validity.

The MetaCOG surveys were also used in a study by Meltzer et al. (2019) that focused on the extent to which students' use of EF strategies was associated with their effort and academic performance in school. 543 students in grades six through eight were taught SMARTS EF strategies such as CANDO goals, STAR strategy, and Triple Note Tote. After students were taught SMARTS EF strategies, they completed the MetaCOG surveys. Our findings indicated that students who reported using EF strategies more often also reported stronger academic performance, as well as stronger effort on homework, studying, and long-term projects. They also showed stronger effort on complex reading and writing tasks.

Note: The MetaCOG was administered to 900 students for the purpose of identifying reliability and validity. For the MetaCOG questionnaires, all reliability values were calculated using baseline data for the samples. Cronbach's alpha was used to measure the internal consistency (reliability) of the MetaCOG questionnaires based on the agreement and correlation between items. An alpha value of .70 and higher is generally viewed as acceptable in social science research.

Part II

MetaCOG Online Pilot Overview

In January 2021, ResearchILD launched a pilot program to test the MetaCOG Online system. We partnered with five schools and learning centers. Thirteen teachers and their 150 students completed surveys about their experiences and feedback, which helped us to refine our online survey system and the accompanying resources.

Online Survey
During the first phase of the development of the MetaCOG Online system, we focused on the STRATUS-R, a 30-item survey that helps students to assess their perceptions of the extent to which they use executive function strategies. Once students complete the online STRATUS-R survey, their personalized Executive Function (EF) profiles are generated which can be downloaded and saved as a PDF.

The next phases of MetaCOG Online will include the online version of the Motivation and Effort Survey (ME-R) and Teacher Perceptions of Student Effort (TPSE-R).

Student EF Profile
Students receive personalized profiles that begin with a visual presentation of their EF areas of strength. They also receive a description of the impact of these executive function processes on their academic work as well as sports, the arts, and social-emotional behavior. Next, students see a visual presentation of their EF challenges accompanied by a description of skills that their EF challenges may affect. Students are then provided with suggestions for building on their strengths and improving their areas of challenge. These suggestions focus on practical strategies that students can begin to implement immediately. The last portion of the student profile includes a list of priority SMARTS lessons based on students' areas of challenge. The lessons offer teachers strategies for helping students to build on their strengths so that they can improve.

Class Summary
Once all students have completed the survey, each teacher can generate and download a summary of the findings for their entire class. This includes an overview of each student's strengths and challenges and the overall strengths and challenges for the class. A ranking of suggested SMARTS lessons is also included.

Student Reflection Sheets
The EF Profile Reflection Sheets offer students a chance to reflect on their areas of strength and challenge, make connections to their daily activities, and brainstorm ways they can leverage their strengths to improve.

MetaCOG Online Development

Using the extensive research from the paper version of the MetaCOG, formulae for calculating each student's strengths and challenges were developed in late 2020. These formulae were tested for ecological validity and alignment with teacher and student reports. As was discussed above, thirteen teachers and 150 students from five schools and learning centers completed surveys about their experiences as part of the MetaCOG Online pilot.

The focus of phase 1 of the development ofMetaCOG Online has been to develop an online version of the STRATUS-R. The next phases of the MetaCOG Online program will focus on developing online versions of the Motivation and Effort Survey (ME-R) and Teacher Perceptions of Student Effort Survey (TPSE-R). The MetaCOG Interpretation Guide provides a detailed description of the specific questions that are mapped to the five EF areas. In addition, each question has been mapped to the three or four most relevant SMARTS lessons. When students answered a question with "never" or "rarely" (or a reverse-coded question with "usually" or "always"), this indicated that a specific EF area was a challenge for students and related SMARTS EF lessons were recommended.

After students (n=150) completed the online STRATUS-R survey and reviewed their EF profiles, they completed the Post-MetaCOG Reflection (n=122). This feedback survey tapped into students' experiences with the survey and covered the ease of navigating the survey, what students learned about themselves, how they would use the strategies suggested, and more. ResearchILD also interviewed the teachers involved in the pilot study who offered feedback about their experiences as they administered the survey and reviewed their students' EF profiles as well as the EF summaries for their classes.

MetaCOG Online Pilot teachers provided ample feedback about how they were using or planned on using the data from the MetaCOG Online. Since each student received a list of recommended SMARTS lessons based on their individual responses to the survey, and teachers received a ranked list of priority lessons for their class overall, some teachers used the MetaCOG Online to customize instruction. Some pilot teachers were interested in administering the MetaCOG Online at different times in the school year to track student growth. The detailed information that the MetaCOG Online provides (students' EF strengths, EF challenges, and responses to individual questions) can demonstrate if students are using strategies and setting goals for themselves. Teachers can compare students' responses and EF strengths and challenges from multiple times throughout the school year. This data is helpful not only for teachers to customize instruction and track student growth, but it can also spark class discussions about executive function, strategy use, motivation, and more.

MetaCOG Online Components

Whether students take the MetaCOG Online multiple times a year or only once, the data from the MetaCOG Online can enable teachers and students to engage in conversations about executive function, strategy use, motivation, and more.

Students begin by completing the MetaCOG Online survey. Once they have answered all thirty questions, they instantaneously receive a personalized profile with their EF strengths and challenges, strategy recommendations, and a list of suggested SMARTS lessons.

Students are encouraged to review their personalized EF profiles so they can understand their own strengths and challenges. Teachers are also provided with reflection sheets and guided questions they can use to spark discussion with their students. The EF Profile Reflection Sheet can be used to extend students' learning from the MetaCOG survey, to promote self-understanding, and to help them find their personalized pathways to success.

Teachers receive a class summary that includes the strengths and challenges for each student and for the class overall. Teachers also receive an action plan framework that includes the top suggested SMARTS lessons based on class data. Teachers have the option to view survey results and survey question responses by individual students or overall classes.

MetaCOG Online Pilot Study

Teachers' Goals:

During our 2021 pilot program, teachers reported multiple reasons for wanting the MetaCOG Online survey to become available. Teachers viewed the MetaCOG Online survey as a tool to **map out both individual and class-wide areas of EF strengths and challenges**. With this information, teachers felt they would be better equipped to engage students in conversations about building on their EF strengths and improving their areas of EF challenge.

All teachers in the MetaCOG Pilot Study reported that the EF Profiles **sparked invaluable discussions** between teachers and students. Some teachers met one-on-one or in small groups with students, and others met as a whole class or grade. These discussions covered topics ranging from what EF means, to what it means to have a strength or challenge in each EF area, to strategies students could use to support their learning and personal growth. Teachers reported that these conversations helped their students **gain self-awareness and self-understanding about their learning profiles.**

Some teachers reported that having an understanding of students' EF strengths and challenges provided more context for understanding why students were struggling. This made it possible for teachers to **provide the support and strategies** that students needed to succeed.

Teachers also liked the fact that they could use MetaCOG Online to help **customize instruction.** Each student received a list of recommended SMARTS lessons based on their individual responses to the survey, and teachers received a ranked list of priority lessons for their overall class. Teachers were able to use the data from MetaCOG Online to create customized sequences of SMARTS strategies to meet the needs of their students. Teachers were excited about the prospect of administering MetaCOG Online at the beginning of the school year to

begin planning which SMARTS lessons to teach and to help students understand their EF strengths and challenges.

Pilot teachers were motivated by the prospect of using MetaCOG Online to **track student growth.** They were also excited about the prospect of using MetaCOG Online at different points in the school year to monitor changes in students' overall strengths and challenges. This detailed information can demonstrate if students are using more strategies and setting goals for themselves.

## Summary of Students' Responses to the Post-MetaCOG Reflection

Ease of Use

94 of 102 students (over 92%) reported that taking MetaCOG Online was an easy process.

**How easy was it to do the MetaCOG survey?**
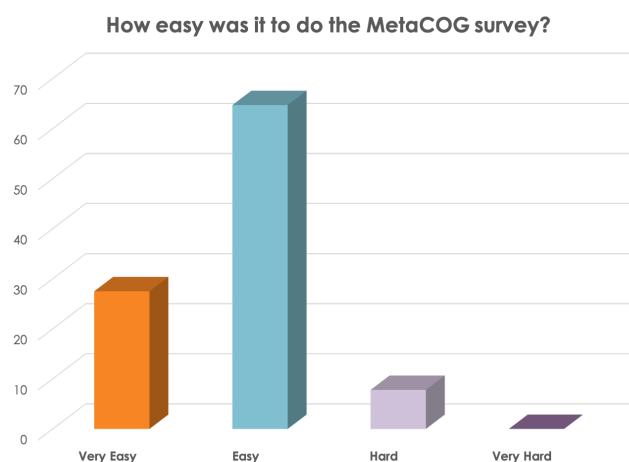
Accuracy of Strengths and Challenges

Over 85% of student participants (83 of 97 students) felt that the description of the strengths and challenges in their EF Profiles "definitely" or "somewhat" described their experiences as students.
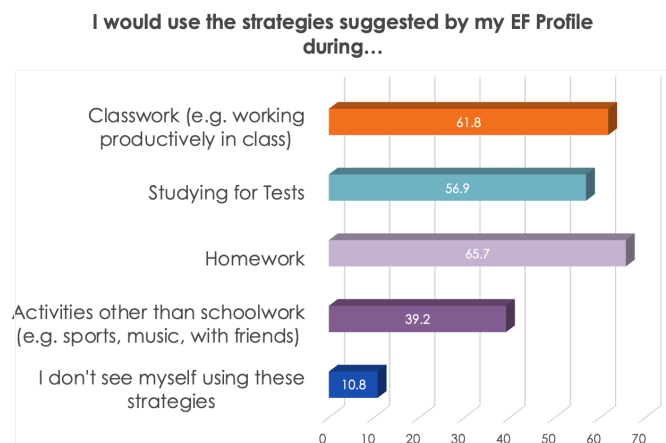
Does the description of your strength and challenge describe your experience as a student?
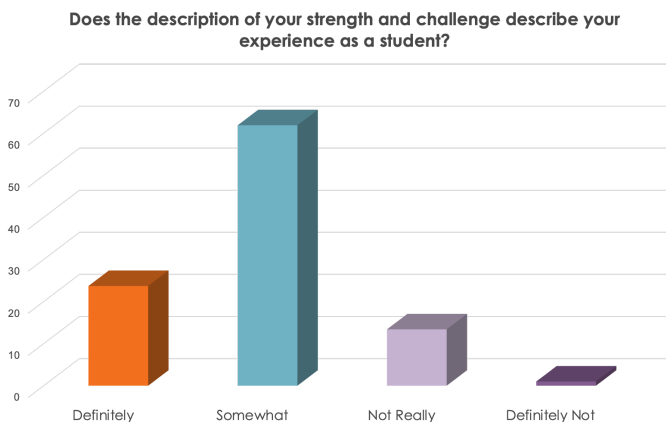
Strategies for Improving

77 of 97 students (over 79%) reported that they would use the recommended strategies in the future.

**Are the "next steps" things you could see yourself doing?**
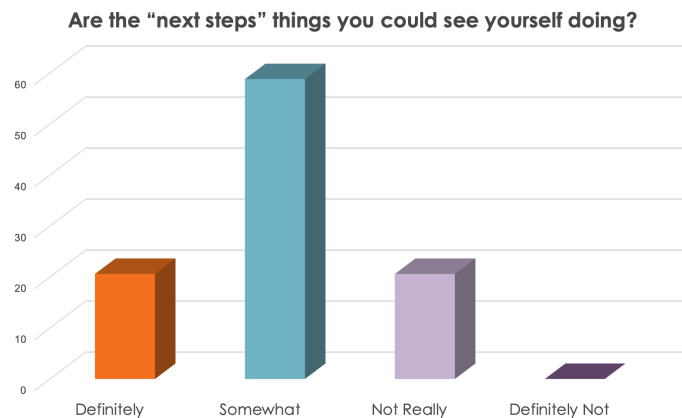
Applying Strategies

- 61.8% of students said they would use their recommended EF strategies while doing classwork
- 65.7% of students reported that they would use these EF strategies while doing homework
- 56.9% of students felt that the EF strategies would be useful while preparing for tests.
- 39.2% of students reported they would use their recommended EF strategies for activities other than schoolwork (sports, music, and with their friends).

I would use the strategies suggested by my EF Profile during...

Classwork (e.g. working productively in class)	61.8
Studying for Tests	56.9
Homework	65.7
Activities other than schoolwork (e.g. sports, music, with friends)	39.2
I don't see myself using these strategies	10.8

Information on EF Profile

82.4% of students felt that their EF Profiles displayed "just the right amount of information."

How much information do you feel your EF Profile displayed?
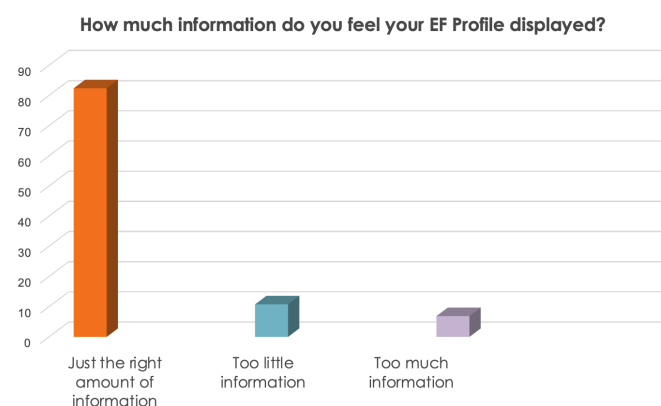
Student Takeaways

After reviewing their EF Profiles, students were asked to report one thing they had learned. Below are a number of examples:

- "I learned that I need to strengthen my ability to set goals." -6th grade student

- "I need to work on my memory for things such as assignments to help me get better grades in classes and not miss assignments." -6th grade student

- "I can get smarter." -6th grade student

- "I learned some flaws about myself and how to fix them." -6th grade student

- "...I set a lot of goals for myself even though I don't realize it." -6th grade student

- "I would like to say thank you for helping me fix my challenges." -6th grade student

- "I learned that I'm good at completing tasks and fixing mistakes…" -6th grade student

- "To make goals for the future on things I have to improve on." -8th grade student

- "Stay in an environment that keeps you motivated." -9th grade student

- "I have the capacity to revise what I do to become a better learner!" -10th grade student

Key Themes from the MetaCOG Pilot Study

Teachers reported that the survey was easy to administer. The link could be placed in Google Classroom, emailed to students, or made available through a school's learning management system.

- *The survey "was an easy, quick thing that I could post very easily to the Google Classroom. And it was very accessible for the students since everything's very technology-based now." -9th grade teacher*

Teachers reported that the recommended SMARTS lessons helped them customize instruction for their classes. Some teachers reported that a list of top five lessons was what they preferred. Others noted that having a ranked list of all SMARTS lessons provided them with many paths forward for their students.

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- ○ *"The more SMARTS lessons the better, because what might work for one student might not work for another student."* -9th grade teacher

Teachers described many reasons for giving their students MetaCOG Online at the beginning of the school year (e.g. for lesson planning purposes, to help students understand themselves better as learners) and also expressed interest in re-administering MetaCOG Online to students throughout the school year to track their responses to individual questions and to determine how students' strengths and challenges had changed.

- ○ *"I would love to incorporate this on a regular basis. I would envision doing this at the beginning and end of each quarter."* -6th grade teacher

All teachers agreed that the MetaCOG Online survey and EF Profiles provided rich material for one-on-one and group discussions. These discussions helped students think about their perceptions of their areas of strength and challenge, how they developed certain strengths, and strategies they could use to improve.

- ○ *"...we put them into groups based on their strengths, and then put them into different groups based on their challenges and facilitated a discussion about their strengths and their challenges. Because I think it needs to be more of a conversation than having students reading through the reports."* -8th grade teacher

Teachers reported that the EF Profiles helped students understand themselves better as learners.

- ○ *"It also allows students, even if they have not had the SMARTS curriculum, to get a better sense of who they are as learners."* -6th grade teacher

100% of teachers reported wanting to use MetaCOG Online again. Many teachers described their plans to administer MetaCOG Online to students in the fall of 2021.

- ○ *"This was truly a helpful process and I really hope you continue this next year. I would really like to do a pre- and post-survey of my classes next year to see if there is growth over the semester."* -6th grade teacher

Conclusions

Data-driven instruction matters, and the STRATUS-R Online, which is the first phase of the MetaCOG Online, offers valuable information about students' strategy use and EF strengths and challenges. All pilot participants reported that MetaCOG Online and the resulting EF Profiles helped students to reflect on their learning profiles and understand themselves better as learners. Teachers reported that students began to self-reflect and think strategically. MetaCOG Online is an important first step for helping students to learn HOW to learn.

Resources

Interested in more information? We look forward to connecting with you!

ResearchILD: https://www.researchild.org/
SMARTS Online: https://smarts-ef.org/
The Institute for Learning and Development: https://www.ildlex.org/
SMARTS YouTube: https://www.youtube.com/SMARTSExecutiveFunction
SMARTS Twitter: @SMARTSOnline
ResearchILD Twitter: @ResearchILDorg
ResearchILD Facebook: https://www.facebook.com/ResearchILD/

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Appendix
MetaCOG Studies – Specific Findings

The MetaCOG Online was developed using the extensive research from the paper version of the MetaCOG. Formulae for the MetaCOG online were developed by ResearchILD in late 2020, and the first phase of the MetaCOG Online pilot focused on testing the formulae for ecological validity and alignment with teacher and student reports.

For the MetaCOG questionnaires, all reliability values were calculated using baseline data for the samples. Cronbach's alpha was used to measure the internal consistency (reliability) of the MetaCOG questionnaires. On surveys with multiple Likert-scale items, internal consistency refers to the agreement and correlation between items. Cronbach's alpha measures the extent to which items are a consistent measure of a concept. Cronbach's alpha is expressed as a number between 0 and 1, and higher values represent greater internal consistency. An alpha of .70 and higher is generally viewed as acceptable in social science research.

The Strategy Use Survey - Revised (STRATUS-R) consists of 30 items that assess students' self-reported strategy use in reading, writing, spelling, math, studying, and test taking (α = .945)* (Meltzer et al., 2004c). The STRATUS was originally a 31-item questionnaire; one question was removed in the 2019 revision due to low internal consistency. The STRATUS was tested with 900 students from five school districts.

The Motivation and Effort Survey - Revised (ME-R) consists of 30 items that assess students' self-ratings of their effort and performance on different academic tasks that depend on executive function processes (α = .91)* (Meltzer et al., 2004c). The ME was also tested with 900 students from five school districts across the socioeconomic spectrum.

The MetaCOG surveys were also used in a study by Meltzer et al. (2019) that focused on the following research questions:

Do students who use SMARTS EF strategies more frequently also show stronger self-ratings of their:
- Effort in school?
- Overall academic performance?
- Effort on homework, studying, and long-term projects?
- Effort on complex reading and writing tasks?
- Resilience?

543 students (409 typically achieving students and 134 students receiving special education services) completed the MetaCOG surveys before and after a SMARTS intervention. Structural equation modeling (SEM) was performed with five latent factors. Structural equation modeling (SEM) is a methodology frequently utilized in social and behavioral sciences that involves the construction of a model to theorize the relatedness of certain variables. This comprehensive statistical approach was used to investigate relationships between five latent factors: students'

effort on reading and writing; students' effort on homework, tests, and projects; students' use of EF strategies; students' persistence; and students' resilience.

Each of the factors was modeled twice, once for pre-intervention and once for post-intervention. 6th through 8th grade teachers were trained to use the SMARTS EF curriculum, and students were taught SMARTS EF strategies such as CANDO goals, STAR strategy, and Triple Note Tote. After students were taught SMARTS EF strategies, they completed the MetaCOG surveys. Those who reported more frequent use of EF strategies also reported:
- Stronger academic performance
- Increased effort on complex reading and writing tasks
- Increased effort on homework, studying, and long-term projects

The findings showed that students who demonstrated higher levels of resilience and persistence after the intervention also reported greater effort. Students' persistence was a good predictor of their self-reported academic performance.

These findings have many implications for the classroom. As students begin to use executive function strategies in their schoolwork, they value these learning strategies and they feel empowered to work harder. Strategic learning builds effort, flexible thinking, and persistence in students as well as a recognition that they can master their difficulties and can succeed.