WHAT YOUR COLLEAGUES ARE SAYING . . .

"This book is a gem and deserves to be on every K–3 teacher's desk. Weathers and Oberle identify the developmental skills, structures and strategies that lead to success for all. When the authors discuss what is needed to support executive functions, rather than turning to the latest shiny object or program, they recommend that teachers focus instruction on 'modifying how you present learning and keep students engaged, an area completely within your sphere of influence.' Best yet, Weathers and Oberle provide examples, diagrams, anecdotes, and explanations that take us from insight to action at every step of the way."

Patrice M. Bain, teacher and author of *Powerful Teaching* and *Powerful Classrooms*

"Simply put, this book belongs in the hands of every elementary school teacher. The information and lessons presented are so valuable for growing student's abilities to learn successfully. There is no other book which so eloquently and effectively discusses the topic of executive functioning in our youngest learners. What a goldmine for elementary teachers to have this succinct text to help them better understand and assist their students."

Blake Harvard, teacher and author of *Do I Have Your Attention?*

"It is rare to find learning-science books focused on primary students. Rarer still is to find learning-science books that are highly practical and fun to read. Weathers and Oberle have hit the trifecta with this work. This book should be on the shelf of every teacher who works with younger children (and, dare I say, every parent with younger children)."

Jared Cooney Horvath, director of LME Global

"This book is absolutely brilliant, an instant modern classic in the field of education. Simply one of the best books I've read to support teachers in the classroom, focusing on a subject that is relevant to all and explained with clarity and concrete examples. Sarah and Mitch are the perfect pairing, each bringing their own experiences and expertise to each page. I can confidently recommend this book to educators regardless of the stage of their career they find themselves, as there truly will be sage advice and practical takeaways for every educator."

Kate Jones, senior associate for teaching and learning of evidence based education

"Of all the books I've read on the science of reading and the science of learning over the past five years, *Executive Functions for Every K–3 Classroom: Supporting Self-Regulation for a Strong Start* truly rises above the rest! Teachers hear the term *executive functions* often, yet few resources explain so clearly what it means for students, how it impacts learning, and, most importantly, how to support learners who struggle in this area. Whether you're a classroom teacher, a special education teacher, or a school administrator, this book will be an invaluable addition to your professional learning library."

Kim Lockhart, classroom and special education teacher at Ontario Public Education

"This text is the long-overdue breath of fresh air teachers didn't realize they were waiting for. The authors draw on their own classroom experiences to respectfully tap into teachers' prior implicit knowledge about working memory, inhibition, and cognitive flexibility. They then provide helpful frameworks to understand, anticipate, and respond to executive function challenges in the classroom context. Teachers will not need to make big conceptual leaps from the pages of this book to their own classrooms. The authors 'talk the talk and walk the walk,' marrying theory and practice in ways that will be transformative for teachers at all stages of their careers."

Pamela Snow, professor of cognitive psychology at School of Education, La Trobe University

"This book provides an accessible and critical resource for teachers. It showcases the importance of executive functions (EF) as the capacities that orchestrate successful learning. Mitch Weathers and Sarah Oberle's book skillfully integrates cognitive science principles, focusing on structuring routines, instruction, and environments to preserve your students' precious cognitive load. If you are a K–3 educator, use this book to effectively reduce 'interference' and increase 'automaticity' in your classroom!"

Nathaniel Swain, author of *Harnessing the Science of Learning*

"How can insights into core executive functions—working memory, inhibition, and cognitive flexibility—help teachers support every student's learning and self-regulation? Oberle and Weathers blend research, classroom experience, and spot-on anecdotes to clarify this crucial but misunderstood dimension of K–3 teaching."

Andrew Watson, president and founder of Translate the Brain

executive functions

FOR EVERY K–3 CLASSROOM

executive functions

FOR EVERY K–3 CLASSROOM

PROMOTING
SELF-REGULATION
FOR A STRONG START

Mitch Weathers • Sarah Oberle

Foreword by Zach Groshell

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Foreword

by Zach Groshell

When I first started teaching, I spent several months in the role of *the fireman*. A behavior would flare up on one side of the room, and I'd come rushing to the rescue, ready to put out the flames. But as I focused on extinguishing one blaze, another problem would ignite behind me. Around and around that classroom I went—reacting, redirecting, reprimanding. In typical first-year-teacher fashion, I waited for sparks to fly before ever thinking about the kindling.

On one of those early days, I was invited to observe the classroom down the hall—Ms. Candice's room. She had all the markers of a master teacher: high expectations, crystal-clear instructions, and that steady presence of someone who loves her subject and knows exactly where her students are headed.

But what struck me most wasn't her wait time or her withitness. It was that her students could . . . student!

Those kids were the same age as mine, with the same odds stacked against them, and yet unlike my own, they tackled content like a gaggle of Hermione Grangers. It was executive function in motion—attention, memory, and self-control working together like clockwork; the invisible architecture of what the authors of the book in your hands call *studentness*.

That's when it hit me: Ms. Candice wasn't just managing behavior and teaching math or reading. She was teaching the hidden curriculum—the implicit expectations of how to be a student *alongside* the content. She had built what I hadn't: a system that shaped students' habits through explicit teaching and integrated routines—a classroom where fires weren't just prevented but where the learning practically ran itself.

This is the book I wish I'd had back then. It doesn't just name the problem—it maps it. It shows that executive functions aren't mysterious traits some kids luck into and others don't. They're built through the routines we teach, the thinking we demonstrate, and the independence we scaffold until those moves become who students are.

And what makes the work of the authors of this book exceptional is its precision about how to help. They remind us that executive function grows not from exhortation but from design—from teaching that honors the human cognitive architecture and builds routines that support independence. Their approach turns compassion into structure: minimizing interference, increasing automaticity, and arranging learning so success is the default, not the exception.

The result isn't just calmer classrooms—it's students who can think clearly because the clutter has been cleared away. When self-regulation becomes automatic, working memory is freed for reasoning, problem-solving, and creativity. Teaching well means designing those conditions—helping students manage their minds and materials so learning itself becomes the focus.

The equitable approach isn't to reserve success for the few who arrive already equipped to succeed, leaving others to discovery-learn it on their own. It's our work to make the route explicit—and give every child a fair chance to travel it.

Whether your classroom feels like mine once did or you're simply refining your craft to reach every learner, this book is your oxygen mask. But even more than that, it's your blueprint for building a classroom that runs not on chance and adrenaline but on design.

—Zach Groshell, PhD, Author of *Just Tell Them: The Power of Explanations and Explicit Teaching*

Preface

As the first educators children encounter in their formal school experience, we are, in many ways, already quite familiar with fostering executive functions (EFs) for our students. We do it because we have to, but most of us learn how to do it incidentally, over time, through experience and observation. It often feels like one long, informal discovery learning project, an exhausting process for teachers and a costly loss of academic time for students.

This book is designed to take the guesswork out of that process. It aims to provide lower-grade teachers with insights and strategies that often take years to develop or even notice. Teachers in older grades may take for granted many of the foundational behaviors and skills their students have already learned—skills that don't typically develop on their own. In the early grades, it's our job to guide students through the ins and outs of how to "do" school. This is the hidden curriculum: the unspoken yet essential expectations and behaviors required to navigate school and achieve academic success (La Lopa & Hollich, 2014). Successfully managing this hidden curriculum relies on a degree of self-regulated behavior. When we are mindful of EFs, we can better support students in developing the self-regulation they need to thrive in school.

Yet, despite its importance, we as teachers receive very little guidance or preparation to support these EFs. We may be taught the value of establishing basic routines, but there's rarely a comprehensive look at how, why, or what to teach in order to systematically support EF development for *all* students.

This book seeks to fill that gap.

EFs are the essential capacities that enable children to function effectively as students—what we call developing a sense of "studentness." Studentness encompasses the ability to pay attention, regulate impulses, plan, organize, remember instructions, and manage time and materials—abilities that are critical for academic and lifelong success. Without those abilities, students may experience difficulty learning or demonstrating their learning, completing tasks correctly, maintaining supplies, and following behavior expectations.

These factors take time to develop, and while some students are fortunate enough to pick them up independently, many do not. Rather than leaving this to chance, why not be proactive and ensure *all* students are supported before they fall behind? We can achieve this by understanding EFs and the resulting skills or behaviors necessary for school success. Once we are knowledgeable, we can thoughtfully evaluate and plan to structure our learning environments in a way that reduces unnecessary cognitive load to support the development of executive functions (Yan et al., 2024).

The best part? All of this can be embedded in what you are already doing.

In Mitch's first book, *Executive Functions for Every Classroom: Creating Safe and Predictable Learning Environments for Grades 3–12*, he focuses largely on developing students' higher order EFs (reasoning, problem-solving, planning) as they gain independence traveling through the upper grades. This second book was born out of the demand from lower-grade teachers after the release of the first book and the acknowledgement that our youngest students have their own unique set of contexts and needs. To honor those differences, Mitch and Sarah decided to write a new book just for these very special beginning learners. After all, their educators are the ones who lay the foundation for the remainder of children's academic careers!

Sarah recalls hearing Mitch on a podcast about EFs. Until then, she had only seen EFs discussed in special education, but as a general education teacher, she knew these abilities impacted every student. Mitch was the first person she'd heard frame EFs as a necessary support for *all* students. Intrigued, she reached out. When she learned he was writing a book, but for upper grades, she insisted, "We need this in the primary grades." The two stayed in touch, often joking about teaming up. So when Mitch later asked if she would cowrite a version for younger students, Sarah immediately agreed.

Mitch remembers the first email he ever received from Sarah because it still makes him laugh to this day. Sarah had heard Mitch on a podcast and was trying to reach him via social media. Mitch, a known social media luddite, had not seen her multiple attempts to make contact. They eventually were connected.

Fast forward two years later, and Mitch is in a presentation Sarah is giving at a ResearchED conference. The focus of Sarah's talk was working memory. Mitch had never heard nor seen such a succinct and clear explanation of the impact cognitive load has on our youngest learners' working memory capacity.

Since the publication of Mitch's first book, he has received consistent feedback from teachers of our youngest students about the need to address EF in the primary years. It was at that moment, in Sarah's workshop, that Mitch had what he refers to as an epiphany: Sarah and Mitch needed to coauthor a book to translate the work Mitch had established for Grades 3–12, for the primary classroom.

Initially, the two planned to mirror Mitch's first book but cater the content for kindergarten through third-grade classrooms. It quickly became clear that these lower grades were much different than what Mitch had experienced during his secondary career, and thus the book would need to be much different from the first book because your grades *are* so completely dissimilar. There are plenty of times that kindergarten through twelfth grade get wrongly clumped together, but this won't be one of those instances. Third grade is included in both versions because we kept in mind that third graders can lean toward the younger or older side and wanted third-grade teachers to have the option. Additionally, third grade tends to be an inflection point when expectations for independence significantly increase.

Without further ado, we thank you for investing your precious time in learning about how to support EFs for your young students and wish you a fruitful reading experience.

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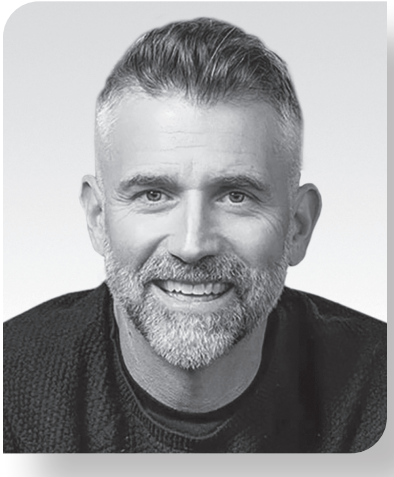


Mitch Weathers is a teacher, founder of Organized Binder, Inc., and author of the bestselling book, *Executive Functions for Every Classroom: Creating Safe and Predictable Learning Environments—Grades 3–12*. Together with the Organized Binder team, Mitch works with K–12 schools and colleges in the United States and internationally to equip students with executive functioning skills. When he is not working with schools, you can find him running trails training for his next ultramarathon. He lives with his wife and two daughters in Northern California.

Dr. Sarah Oberle is a seasoned educator with extensive experience in primary education. She holds a doctorate in Educational Leadership with a specialization in Cognitive Science, bringing together deep expertise in both teaching and learning. Passionate about bridging research and practice, Dr. Oberle focuses on translating insights from the science of learning into accessible, practical strategies that enhance classroom instruction and student success.

An active member of several educational boards and committees, she works alongside educators and policymakers to promote evidence-informed decision-making and meaningful, sustainable improvement in education. Beyond her classroom experience, Dr. Oberle has designed and led professional learning programs that empower teachers to apply knowledge of how learning happens to their own practice.

She lives in Chester County, Pennsylvania, with her husband and two daughters.

Introduction

▶ You've just finished your lesson, and students are back at their seats to begin an independent activity. Except, you notice one student still sitting on the carpet, unaware that his classmates have returned to their seats. While many are busy getting started on their work, two students are chatting, and another cannot find a pencil. Suddenly your observation is interrupted by a student calling out, "What do I do?" Naturally, you've explained the directions and checked for understanding already. As you quietly gesture direction reminders to this child, another classmate skips into the room from a pull-out session, yelling, "What are we doing?" Those students who were getting started on their work are fully distracted now by this disruptive entrance. To top it all off, you notice a fast-finisher has completed the activity entirely incorrectly.

Sound familiar? Despite our best efforts to scaffold content and directions, early years teachers often have to repeat themselves and seem to be battling never-ending distractions. At first glance (or read), you might assume that this classroom is poorly managed. Or perhaps you're thinking this is a notably challenging group. While both *can* be true, much of the problematic behaviors in this scenario are indicative of each child's varied executive function development. Paying attention, remembering directions, avoiding distractions to stay on task, and managing materials are all dependent on the successful employment of executive functions (EFs). Even within the lower grades, there is a huge variation and growth of these cognitive abilities. The important idea to understand is that we are working with children who are still growing and strengthening their EFs. Problems enacting working memory, inhibition, and cognitive flexibility do *not necessarily* reflect a deficit or concern. As a teacher, there are things you can understand and intentionally do to maximize your students' abilities and potential—actions that will lead to more self-regulated behavior in your classroom.

Let's unpack **self-regulation** a bit. We need our students to pay attention to the learning and ignore anything else they may want to think about, including the toy in their pocket, the lunch they can't wait to eat, or chatting with the friend next to them. We also expect them to avoid acting on impulses like yelling out or grabbing something (or someone!). That's some serious demand on their ability to inhibit their reactions. We *also* need them to think about the content, whether during instruction or an activity, and manipulate that content to begin learning, which engages working memory. Then, if a routine changes or something is lost, teachers expect, knowingly or unknowingly, students to quickly decide how to solve that problem or situation. In other words, students need to be cognitively flexible to find an alternate way of proceeding.

If you are a lower-grade teacher, so much of what you do day to day for your young learners is directly impacted by EFs. The problem is, outside of special education, no one really talks about exactly what EFs are, or how they affect your students. We think you deserve to understand the why and how behind an aspect of your work that has such a critical impact on your students' ability to be successful at school.

In this book, we intend to present information, together with practical strategies, that will not only improve your learning environment but also increase your students' success. While the topic of EFs can be quite technical, this book is for you: educators who work with our youngest students. The knowledge you gain from this book will be scientifically accurate but also relevant to your practice.

THE BASICS: WHAT ARE EXECUTIVE FUNCTIONS?

Executive functions are a set of interactive cognitive abilities that, when working successfully, orchestrates the self-regulation required to accomplish goals (Hofmann et al., 2012). There are core EFs and **higher order executive functions**. To keep this book as relevant and practical as possible, we have chosen to focus solely on the three core EFs: working memory, inhibition, and cognitive flexibility. Executive functioning, particularly in the early grades, primarily consists of the behaviors associated with self-regulation. Because you work with the youngest students, these three EFs are central to the skills and behaviors we aim to nurture in children as they begin their school journeys. Interestingly, the three core EFs are what make higher order executive functioning (reasoning, problem-solving, and planning) possible in the older grades (Collins & Koechlin, 2012). This is why it is so important that students in the primary years have teachers who understand executive function limitations and can structure their learning experiences and environments accordingly.

We will reference the core EFs throughout this book and take a deep dive in Chapter 1, but to be sure we are on the same page, they can be defined as follows:

- Working Memory: The mental workspace that functions to simultaneously hold and manipulate information
- Inhibition: The ability to manage impulses and filter out irrelevant information
- Cognitive Flexibility: A mindset that allows for perspective-taking, switching, and adapting to new tasks or situations

When supporting our youngest students in developing core EFs, cognitive load is a crucial consideration. Though cognitive load is not considered an executive function, it is inherently connected to EFs, which is why we are including the concept here with the three core EFs. Thus, throughout this book, we will examine our approaches through the lens of EFs in service of preserving cognitive load to ensure that we are optimizing learning rather than unintentionally hindering it.

Cognitive load refers to the amount of cognitive demand a person is experiencing. You can think of it like a box your students carry—what you put in that box determines how heavy or manageable it is. If it's filled with too much information or overly complex tasks, it can quickly become overwhelming and difficult to carry. A lack of inhibition or cognitive flexibility can also contribute to undue demand on cognitive load.

When cognitive load exceeds what a child can manage, the mind diverts its energy to coping with the overload rather than engaging in learning. This underscores why it's essential to be mindful of how much information and how many tasks we ask of students at any one time. Effective strategies reduce unnecessary demands and distractions, allowing our students' capacity to be harnessed for learning (Sweller, 2011). With that said, cognitive load is essential for learning and should be engaged. The goal is for teachers to deliberately enact cognitive load in ways that enhance learning and engagement—such as introducing an appropriate level of challenge—while avoiding unnecessary complexities or distractions that overwhelm working memory (Bannert, 2002).

The goal is for teachers to deliberately enact cognitive load in ways that enhance learning and engagement—such as introducing an appropriate level of challenge—while avoiding unnecessary complexities or distractions that overwhelm working memory (Bannert, 2002).

Imagine asking second graders to solve two-digit subtraction equations with regrouping, explain their thinking in writing, and make a proof drawing, all while classmates around them are chatting. That's a lot to juggle. It's not that we don't want students to think hard. We do. But we want their effort focused on the learning goal, not spent managing distractions, unclear directions, or too many simultaneous demands. When cognitive load is managed well, students are stretched in the right places where it counts.

> ***When cognitive load is managed well, students are stretched in the right places where it counts.***

WHY SHOULD EVERY K–3 EDUCATOR KNOW ABOUT EXECUTIVE FUNCTIONS?

▶ Mitch will never forget his first few years in the classroom. He was fresh out of graduate school, armed with teaching credentials and a master's degree in cross-cultural pedagogy, eager to change the world. He knew the content of his class and the standards he was tasked with teaching. But those first few years, no matter how hard he tried, his students experienced minimal to average success. He certainly did not feel like he was *changing* the world.

Like the experience of a lesson not going as anticipated, he had a nagging feeling that something was missing. There was something he needed to bring into his instruction to help his students succeed, but what? Then one day, while in class, it occurred to him: Many of his students, especially those who struggled, did not know how to "do" school. But in the same moment that this realization came to him, he was flooded with questions he did not know the answer to: How do you "do" school? Can "doing" school be taught? Should it be taught? If so, where can teachers find the time to fit it in? Where should I begin?

If you have had these same feelings and asked yourself the same questions, then we are glad you are here. This book is written for you! As mentioned previously, there is a particular set of core executive functioning processes that manage students' ability to succeed. The resulting self-regulation strengthens their potential to confidently "do" school in the younger years

(Heemskerk & Roebers, 2023). This is why every teacher should know about executive functioning.

When we structure the learning environment in a manner that minimizes demand on learners' core executive functioning abilities, we are proactively shielding them from potential learning threats, while simultaneously supporting their ability to develop productive learning behaviors. We preserve their ability to self-regulate by creating an environment where working memory, inhibition, and cognitive flexibility are more likely to function properly. Then we can reinforce the habits needed to be successful at school. As a result, our young learners improve their ability to pay attention, learn, understand, remember, control impulses, and remain organized—all the skills our children desperately need to build a sturdy foundation for school and beyond (Diamond, 2013). Moreover, supporting a child's executive functioning addresses the development of the whole child, underscoring the gravity of this work. Supporting EFs not only improves academic outcomes, astonishingly, strong EFs improve mental and physical health, overall quality of life, job success, and even public safety (La Lopa & Hollich, 2014).

Supporting the development of the whole child is truly noble work. It is likely the spark, the initial call to action, you experienced that drew you into the profession. Teachers want to change the world. We know that was why we became teachers. We wanted to leave those small imprints on young lives that become inflection points, most of which we only notice when we look back on our lived experience, but are the moments that changed their lives forever. The academic and life outcomes associated with developing EFs in the early years can be truly transformative.

Read this next paragraph as a call to action:

Research has clearly shown that supporting the three core EFs in our youngest students improves learning and overall performance. When students learn more easily and effectively, it often leads to increased effort and greater motivation. In fact, EFs are often a better predictor of academic success than IQ and even show a greater likelihood of high school and college completion. EFs are positively related to improved reading and math outcomes (Serpell & Esposito, 2016). Supporting EFs in the early years has been shown to close the achievement gap between students of lower vs. higher socioeconomic backgrounds. This is significant, given the well-established link between lower socioeconomic status and reduced executive functioning skills. But there is more. Research indicates that strong executive functioning skills serve as a protective factor against the academic risks associated with extreme poverty. Students experiencing homelessness, for example, are more likely to demonstrate resilience in school when they possess strong EFs (Sankalaite et al., 2021).

PLANNING WITH EXECUTIVE FUNCTIONS CREATES MORE EQUITABLE AND ACCESSIBLE LEARNING OPPORTUNITIES

Regardless of the grade, subject, tier, or intervention you teach, and whether your students are in general education, special education, or are language learners, this knowledge—and the decisions it guides—applies to you. Designing our routines, instruction, and learning environment with EFs in mind ensures that *all* students have improved access to meaningful learning.

Think of learning like a race: Students with naturally strong executive function skills start at the front of the starting line, equipped with the tools they need to focus, remember instructions, and manage their behavior. Meanwhile, students with underdeveloped EFs are lining up much farther back, already at a disadvantage before the race even begins. Without intentional planning, we inadvertently leave these students behind, making it harder for them to catch up. But when we design instruction that supports executive function, we move the starting line forward for everyone and give all students a fairer chance to run the race successfully. In doing so, we create more equitable learning conditions and open the door for every learner to thrive.

For example, some of our students don't arrive to us with the same preparedness for school as many of their peers. They haven't learned the implicit expectations of school. When we understand how executive function development affects a learner's ability to notice and adapt to the often unspoken rituals of school, we can begin to explicitly name and teach those expectations, reducing cognitive load for students who haven't already internalized that background knowledge.

Keeping EFs in mind while teaching means being thoughtful about attention demands, providing opportunities for students to offload ideas, and chunking instructions. These considerations and subsequent strategies increase the likelihood of success for all learners, regardless of their working memory, inhibition, or cognitive flexibility capacities. In Chapters 4, 5, and 6, you'll explore practical strategies that help bring these ideas to life in your own classroom context.

TWO KEYS FOR SUPPORTING EXECUTIVE FUNCTIONS IN THE PRIMARY YEARS

When we ask our students to "pay attention," "stay on task," "get organized," or "clean up," for example, we have to remind ourselves that they don't automatically know what we mean by those requests. We need to frequently and explicitly show our learners *what* we mean and *how* to be successful.

In the following chapters, you'll gain insights relevant to your role as an education professional, along with practical suggestions for applying this

knowledge in your setting. These suggestions generally fall into one of two categories: decrease **interference** (like distractions and temptations or increase **automaticity** (building fluency with both foundational knowledge and classroom procedures) to reduce cognitive load and ultimately maximize our students' finite working memory, ensuring it is used effectively for learning. We can reduce interference and increase automaticity in the classroom by establishing supportive conditions and habits that empower students to focus on learning, rather than being derailed by challenges with self-regulation. We aim to make the often invisible skills of successful learners, sometimes called the "hidden curriculum," visible to you so you can make them visible and attainable for your own learners.

> ***We can reduce interference and increase automaticity in the classroom by establishing supportive conditions and habits that empower students to focus on learning, rather than being derailed by challenges with self-regulation.***

What does that mean? Well, we will explain how the physical environment affects our students and suggest strategies to mitigate the common pitfalls of classroom settings. There are tools you can equip your students with, too, which can serve to offset some of the unavoidable school or classroom conditions. You will learn instructional hacks as well as ideas for developing and mastering routines to promote self-regulation. Gaining a new lens for applying your professional judgment can help you recognize, respond to, and support students who are struggling due to executive functioning challenges.

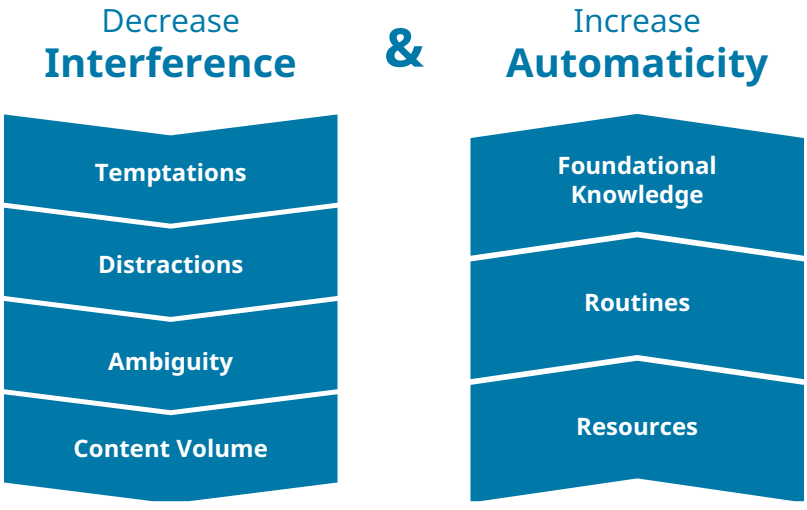
CONCLUSION

Many teachers, especially in general education settings, have limited or unclear knowledge about EFs. This gap in knowledge isn't the fault of teachers—EFs are rarely covered in depth during teacher preparation programs or professional development. We believe understanding EFs is essential because it can sharpen your professional judgment and directly support your students' success. As the authors, we aim to share scientifically accurate information while remaining clear, relevant, and free of unnecessarily technical research.

In this book, we'll focus on three core EFs: working memory, inhibition, and cognitive flexibility. Our two main goals are to equip you with foundational knowledge about the core EFs and to offer practical strategies for designing your classroom environment, instruction, and routines with executive functioning in mind. In particular, we aim to unpack strategies that will reduce

interference and increase student automaticity, helping you create a classroom environment that supports and strengthens self-regulated behavior (highlighted in Figure I.1).

FIGURE I.1 Interference vs. Automaticity



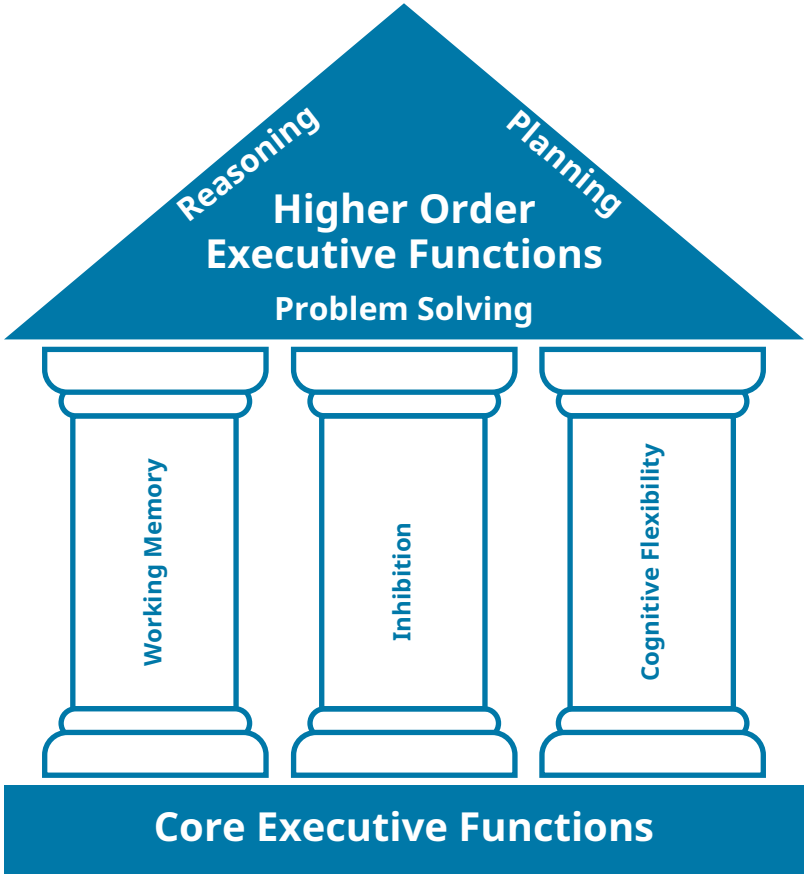
CHAPTER 1

Understanding Executive Functions

As we discussed in the Introduction, executive functions (EFs) are a set of cognitive processes that, taken together, support goal-oriented behavior (Diamond, 2013). A goal could be as simple as unpacking a backpack or as complicated as completing a challenging assignment. They function like the mind's control center, guiding our thoughts and actions, as needed. The strength and development of executive functions vary between individuals and can also fluctuate within the same individual depending on the demands of a situation (Siregar, 2023).

There are several dimensions to executive functions, which can be split into two categories: core EFs and higher-order EFs (see Figure 1.1). For the purpose of this book, we will focus on the three **core executive functions: working memory**, **inhibition**, and **cognitive flexibility**. Higher-level executive functions, such as reasoning, problem-solving, and planning, emerge from the three core executive functions (Diamond, 2013). While the higher-order functions may apply to younger learners, they are not as immediately relevant as the core three, which form the foundation for developing learning behaviors essential to future academic success. We understand that in the early grades, your executive function-related challenges center more around elements of self-regulation like paying **attention**, completing routine tasks, and getting along with others.

FIGURE 1.1 Core and Higher Order Executive Functions



FOUNDATIONS FIRST: UNDERSTANDING THE CORE THREE + COGNITIVE LOAD

Throughout this book, we'll consistently refer to the three core executive functions: working memory, inhibition, and cognitive flexibility. Before moving on, let's solidify your understanding of these foundational cognitive processes to ensure you're equipped for what comes next.

Working Memory

Working memory is the mental workspace where your current thoughts occupy your mind's spotlight. It not only maintains the information you're actively focusing on at any given moment but also manages any connecting, calculating, sequencing, or updating of the information as well. If you're paying attention to what you are reading at this moment and working to comprehend and relate it to your own work, you are engaging your working memory right now!

Because its capacity and duration are limited, working memory can manage only small amounts of information for brief periods of time. The amount of information and the duration for which it's held vary from person to person and even moment to moment. However, as a general reference for perspective, we will approximate that working memory can hold approximately four items for roughly 30 seconds, at any given time. Though working memory capacity and duration improve as we age, typically leveling off in early adulthood, this estimate can still serve as a useful guideline for both adults and children.

Unlike short-term memory, working memory is a busy mental workspace. You're not just holding information in mind (like short-term memory), you're engaging with it: processing, calculating, sequencing, and manipulating ideas in real time. Learning depends on information passing through working memory, making its role essential to academic success. Beyond that, we rely on working memory to carry out everyday tasks, making it critical to "studentness"—the self-regulation required to follow directions, manage materials, and stay organized. In fact, working memory has been shown to be a better predictor of academic success than measures of IQ (La Lopa & Hollich, 2014).

Imagine you're driving in an unfamiliar area, searching for a specific address. As you scan the roads, you need to keep that address in mind, constantly juggling it with the changing scenery around you. Whether it's passengers talking to you or the radio playing, don't you feel the need for silence in that moment? When your working memory is so focused and consumed with the task at hand, even background voices can drain some of the mental bandwidth needed to stay on track. As a result, you crave quiet to remain focused and ease the mental strain.

As we will unpack in the coming chapters, this same intentional conservation of cognitive bandwidth by teachers is absolutely critical and necessary for students' learning and academic success.

Inhibition

Inhibition refers to our ability to filter out interference. Interference denotes anything that can potentially distract students, like irrelevant stimuli (external) or our own unrelated thoughts (internal). It's our defense mechanism against being distracted by any and everything. Inhibition also serves to prevent us from acting on impulses. As an executive function, inhibition plays a massive role in not only learning but also navigating various school scenarios. Paying attention, for example, is dependent on our need to focus while ignoring anything that deters us from maintaining attention. This ability to ignore or suppress is driven by **inhibitory processes** (Wang et al., 2024).

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Returning to our driving example, it's your inhibitory processes that are fighting to ignore the voices from passengers or the radio. Your working memory depends on the success of that inhibition to keep that goal, in this case, finding an address, at the center of your thoughts. Sometimes, like in this example, inhibition's job becomes too overwhelming, and either we need to eliminate the distractor, or we succumb to the distractor. The decision to reduce noise in the car serves to decrease the need for inhibition, freeing up mental space for working memory. Thus, working memory relies heavily on our ability to inhibit.

Cognitive Flexibility

Cognitive flexibility encompasses our ability to update expectations, consider alternate perspectives, and adjust to new situations. This core EF allows us to shift between tasks, regulate our emotions when things don't go as expected, and consider different perspectives, whether related to people or tasks. It allows us to adapt academically, socially, and emotionally. Cognitive flexibility begins developing early in life and continues throughout childhood and into early adulthood, with rapid development during the ages targeted in this book (Buttelmann & Karbach, 2017; Huizinga et al., 2014)! In school, students rely on cognitive flexibility to navigate transitions, adapt to change, and interact productively with others. They also need it to shift attention, tackle a variety of tasks, and demonstrate comprehension of texts, especially when it requires thinking beyond their initial habits or preferences.

Thinking again about our driving analogy, after eliminating the distracting background noise to reduce the demand on your working memory and inhibition, you've successfully made it 3 minutes from your destination, only to find a road blocked due to construction. Your cognitive flexibility will determine how you respond to this unforeseen challenge. Will you pull over, frustrated and concerned about how you will find the address? Will you just keep driving and let your GPS reroute you, not phased at all about the redirection? Will you turn around and go home?

Cognitive Load

As previously noted in the introduction, we cannot discuss how EFs manifest in the classroom without considering cognitive load. Cognitive load refers to the amount of cognitive demand a person is experiencing. As educators,

our choices can either support and maximize students' cognitive capacity by focusing it on essential learning, or unintentionally hinder it by overloading students with extraneous demands (unnecessary mental tasks unrelated to learning) that sap the mental resources needed for success. Cognitive load can be influenced by both internal and external factors, which is why it's essential for us to be knowledgeable about it and intentional in how we design and manage our classrooms. In general, we can't control the internal factors that affect our students' cognitive load, but we *can* be strategic in how we design learning experiences and classroom environments to reduce unnecessary strain and support their success. We will explore these strategies at length in Chapters 3 through 6.

Just as we need calm and quiet to concentrate, like the driver in the previous example, our students also benefit from these conditions. The more they can access knowledge automatically, and the quieter and less distracting their environment is, the better equipped and more at ease they are to focus on tasks that require deeper thinking. Unfortunately, not only are students often unaware of the conditions that help them focus, but even when they do know, they are typically powerless to make those changes within a classroom setting. It is up to us as educators to create optimal learning conditions that support their success.

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SELF-REGULATION

If lower-grade teachers were granted a wish, how many would ask for their students to be self-regulated? This is such an all-encompassing term that packs a punch for every aspect of success at school, particularly for our young students. Can you think of anything you facilitate in your classroom that doesn't require self-regulation on the part of your students? The fact is, self-regulation depends on successful enactment of all three of the core EFs we discuss in this book (Hofmann et al., 2012). That is why, just like "paying attention," self-regulation is no simple task and requires a significant amount of a student's mental bandwidth. It encompasses the behaviors we refer to as "studentness." Therefore, one way to gauge the development of core executive functions is the manifestation of self-regulation in the classroom.

IN REAL LIFE

Now that you have a foundation in the core EFs, let's look at a real-world classroom example for context. We'll analyze the scenario through the lens of working memory, inhibition, and cognitive flexibility, maintaining our focus on managing cognitive load.

Kindergarten Student

Maria's class is learning about shapes and their defining characteristics. She just sat down to complete an activity where the directions instruct students to put an X on every shape that is *not* a square. As Maria begins, she notices her teacher setting up supplies for an upcoming class celebration. The teacher is lining up toppings for an ice cream sundae party, and Maria is mesmerized. She watches with excitement, imagining the different flavors of ice cream and how many toppings she might try.

When she returns her attention to the task, Maria rushes through the activity and mistakenly puts an X on all the squares instead of the other shapes. As she walks to turn in her paper, she sees an adult enter the room and quietly inform the teacher that the ice cream delivery has been delayed until tomorrow. Hearing this, Maria becomes visibly upset. She crumples up her paper and throws it to the floor. The teacher calmly tells Maria to pick up her paper and head over to the carpet for a quick chat.

Using the lenses of working memory, inhibition, cognitive flexibility, and cognitive load, let's unpack what was really going on in Maria's kindergarten scenario.

Maria's working memory is responsible for holding the activity directions in mind as she examines each shape and completes her work. However, she struggles to inhibit her desire to watch her teacher prepare for the upcoming ice cream celebration. Once her attention shifts, her cognitive load becomes compromised, and she can no longer think about the party while holding the shape directions in mind. The directions fade from her working memory, and as a result, she completes the assignment incorrectly. When Maria hears that the ice cream party won't happen today as she expected, she experiences immediate feelings of disappointment and frustration. Maria struggles to reframe her expectations in light of the new information—a challenge tied to cognitive flexibility—and ultimately loses control of her behavior.

Third-Grade Student

John's class is working on multistep word problems during math. The directions on the board say, "First, underline the important numbers. Then, write an equation. Finally, solve and explain your thinking in a complete sentence." John reads the word problem and starts by underlining the numbers. Halfway through writing his equation, a classmate next to him whispers, "Did you see

the new game on the tablet cart?" John smiles but turns back to focus on his work, resisting the urge to respond.

He glances at his paper and tries to remember what step he was on. He restarts the equation, but this time skips writing it altogether and just solves the problem. Then John notices he didn't underline the right numbers and gets frustrated. Just as he's about to erase everything, his teacher announces that the steps are still on the board and reminds students to check their work. John takes a deep breath, rereads the directions, and starts again—this time carefully.

Leveraging knowledge about working memory, inhibition, cognitive flexibility, and cognitive load, let's consider the story of third-grade student, John.

As John works on a multistep word problem, his working memory helps him follow the instructions, but he loses track when distracted by a classmate's whisper. He successfully inhibits the impulse to respond and shifts his attention back to his work. After glancing at his paper, John loses his place and skips a step, which causes frustration. With a reminder from his teacher to check the steps on the board, John taps into his cognitive flexibility, rereads the directions, and begins again carefully, not letting the setback discourage him. John's ability to protect his cognitive load by disengaging from his friend and using the reminder on the board to refresh his working memory before the information faded allows him to succeed despite the potential threats to his performance.

While these scenarios are simplified because core EFs are quite interconnected, they are intended to provide a more nuanced and contextual understanding of the three core functions without becoming overly technical. We hope these examples have shown the contrast in how EFs can work for or against students, depending on their development and their ability to use them effectively.

CONCLUSION

The three core executive functions, working memory, inhibition, and cognitive flexibility, are deeply interconnected and play a central role in your learners' abilities to self-regulate. They are responsible for everything from paying attention and completing tasks to remembering where things are and getting along with others. When educators understand these essential cognitive processes, they are better equipped to anticipate challenges and reduce the impact of EF demands, ultimately safeguarding cognitive load for learning in the classroom. Additionally, becoming knowledgeable about these mental capacities can help you interpret students' struggles more accurately, enabling more effective and timely intervention. In the chapters ahead, we'll explore how to recognize signs of EF strain and strategies to ease the pressure points that contribute to it.

FROM INSIGHT TO ACTION

- What misconceptions, if any, did this chapter clarify for you?
- Can you think of times when your EFs helped you succeed and times when they slipped or were overwhelmed?
- When in your classroom, do students need to hold multiple pieces of information in mind?
- What kinds of distractions most commonly derail your students' attention or behavior?
- What classroom tasks or transitions seem to demand the most flexibility from your students?