Transforming Classrooms

PREPARING STUDENTS TO SUCCEED IN A COMPLEX WORLD

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> Education is the most powerful weapon
> which you can use to change the world.
> —Nelson Mandela

The Need

Today's learners are entering school facing unprecedented challenges, and educators are feeling enormous pressure from many different sources. With more learning objectives than ever, state-mandated standards now encompass a broad range of initiatives, which often leaves educators frustrated, feeling as though they are providing instruction in a mile-wide, inch-deep manner. In addition, learning objectives are becoming increasingly demanding and have been pushed down to earlier grades, leading to developmentally inappropriate expectations for young students. The pace of instruction has further accelerated due to the pervasive influence of social media and the recent rise of artificial intelligence (AI) in education. While these technological changes have enhanced access to information, they have also contributed to heightened stress and anxiety among students. The constant pressure to keep up with new information and shifting social trends, compounded by the fear of missing out (FOMO) and the need to perform at high levels, have contributed to a rise in mental health problems as students struggle to balance their academic, social, and personal lives. Moreover, learning loss from the COVID-19 pandemic, alongside other factors, have exacerbated disruptive behaviors, absenteeism, and increased school dropout rates (Donnelly & Patrinos, 2022; Jones, 2021; Santibañez & Guarino, 2021). These issues have been further

amplified by the growing number of students with adverse early childhood experiences (Shonkoff et al., 2021). As a result, educators are feeling overwhelmed, lamenting the limited time they have and the constant pressure to meet increasingly unrealistic expectations.

The solution that holds the potential to transform instructional practices lies in integrating executive function (EF) and emotional regulation strategies into existing curricula and teaching methods. By harnessing the combined power of metacognition, EF, and emotional regulation, educators can reduce students' anxiety and stress while simultaneously enhancing their motivation, engagement, resilience, and independent learning (Dunstan & Cole, 2018a, 2018b; Meltzer et al., 2018, 2021). This integrated approach provides a holistic framework for fostering students' well-being while promoting their engagement in school as well as their long-term success in school and in life.

Metacognition

Metacognition, or "thinking about thinking," has been a central focus of educational research since the 1970s (Flavell, 1979). Building on this foundation, researchers have highlighted the importance of students' "knowledge and control over their own thinking and learning activities" (Cross & Paris, 1988, p. 131), as well as their "awareness and management of their own thoughts" (Kuhn & Dean, 2004, p. 270). Other scholars have underscored the complexity of metacognitive processes, distinguishing between two key elements: *knowledge* of *cognition* and *regulation of cognition* (Brown et al., 1983). These researchers have noted that "metacognition is often confusing and is not only a monster of obscure parentage but also a many-headed monster at that" (Brown et al., 1983, p. 124), emphasizing the complexity of this concept.

Since the seminal work of Flavell and Brown, the educational landscape has shifted. More studies have differentiated metacognition from EF and have emphasized their interconnected roles in shaping engagement, focused effort, and independent learning (Denckla & Mahone, 2018; Diamond & Ling, 2016; Meltzer, 2010, 2018). Educators are increasingly recognizing that metacognition and EF are the building blocks of academic success, enabling students to set meaningful goals, think and problem-solve flexibly, and self-regulate (Meltzer, 2014; Meltzer & Basho, 2010; Meltzer et al., Chapter 2, this volume).

Executive Function

Executive function is a multifaceted construct or umbrella term for the complex cognitive processes that underlie flexible, goal-directed responses in novel

or difficult situations (Barkley, 2012; Denckla, 2007; Meltzer et al., 2018; Meltzer, 2014). Academic performance relies heavily on the core EF process of goal setting, organizing and prioritizing, cognitive flexibility, working memory, and self-monitoring (Denckla, 2007, 2018; Meltzer, 2007, 2010, 2014; Meltzer et al., 2015). These EF processes are defined briefly in Table 1.1 below and are elaborated in Meltzer et al. (Chapter 10, this volume).

All these EF processes are critically important for accomplishing everyday tasks, such as organizing daily schedules, planning activities, developing routines, following directions, and managing stress. EF processes also affect students' abilities to synthesize and integrate information for writing assignments, summarizing, taking notes, completing projects, studying, and submitting work on time (Barkley, 2010; Dawson & Guare, 2011; Denckla, 2007; Meltzer, 2010, 2018a, 2018b).

When classroom instruction promotes metacognitive awareness, students begin to understand their profiles of strengths and challenges and they are more

TABLE 1.1. EF Processes Defined

EF process	What is it?	Why is this important?
Goal setting and planning	The ability to set specific, realistic objectives that can be achieved within a defined period of time.	Enables students to analyze the task objectives, visualize the end product, and organize the time and resources needed to complete the task.
Flexible thinking and problem solving	The ability to abandon habitual approaches and to shift flexibly to alternative methods.	Critical in academic and social settings; affects students' ability to remain agile in the face of challenges and to manage their stress and anxiety.
Organizing and prioritizing	The ability to sort information based on the relative importance of different details.	Important for organizing time, materials, space, and ideas. Students may struggle with independent, open-ended tasks where they need to impose their own structure on information.
Working memory	The ability to mentally retain information for short time periods while manipulating the information mentally.	Essential for tasks requiring focus on multiple processes simultaneously, such as following directions, responding to oral questions, and mentally computing in math.
Self-monitoring and self-regulation	The ability to use cognitive and metacognitive processes to monitor their own feelings, appraise their performance, review progress, and adjust strategies as needed.	Helps students to check the effectiveness of their strategies, evaluate their use, and adjust their approach continuously based on task demands.

likely to generalize their use of EF strategies to broader contexts. Students also develop an understanding of which strategies complement their learning profiles so they can adapt specific EF strategies to the tasks at hand. For example, the EF strategies needed to study for a math test that emphasizes procedural knowledge will differ from the EF strategies needed to study for a Spanish test that emphasizes memorization of vocabulary.

Emotional Regulation

Emotional regulation refers to the ability to monitor, manage, and modify emotional responses in a way that is appropriate in a given situation. This involves recognizing emotions, understanding their impact, and using strategies to control impulses, reduce stress, and maintain emotional balance. Effective emotional regulation helps students to navigate social interactions, cope with challenges, and make thoughtful decisions rather than reacting impulsively (Greenberg & Kusché, 2006). This is a key component of self-management within the broader framework of what has been referred to as *social–emotional learning* (SEL). SEL describes the process whereby individuals develop and use personal and interpersonal skills, attitudes, habits, and behaviors that help support effective decision making, positive interactions, and overall success in school, work, and life (Brush et al., 2021; Collaborative for Academic, Social, and Emotional Learning [CASEL], n.d.; Durlak et al., 2022). Most programs address five core areas: self-awareness, self-management, social awareness, relationship skills, and responsible decision making (Lawson et al., 2019). These skills aim to foster supportive and respectful learning environments where students develop the skills necessary to become engaged learners. Achieving this goal supports positive outcomes and opportunities for success for all students.

Fostering Independent Learning through Metacognition, EF, and Emotional Regulation

Metacognition plays a key role in the development of both EF and emotional regulation processes by promoting self-awareness and self-understanding, thereby helping students to manage their thoughts, emotions, and actions. Research shows that EF processes, such as working memory and cognitive flexibility, often enhance students' emotional regulation skills (Riggs et al., 2006). At the same time, some mindfulness-based programs have a positive effect on both EF and emotional regulation (Diamond & Ling, 2016; Zelazo & Lyons, 2012).

These interconnections underscore the importance of a holistic approach in education. Teachers can support students more effectively by recognizing how

these areas strengthen each other, rather than treating them as separate processes to be developed in isolation. Addressing both EF and emotional regulation encourages a more integrated system that can help students to thrive academically as well as emotionally and socially. When structured approaches to fostering metacognition, EF, and emotional regulation are systematically integrated with the curriculum, we can promote more effective learning environments, ultimately nurturing resilient and self-directed students (see Dunstan et al., Chapter 12, this volume; Meltzer et al., Chapters 2 and 10, this volume).

Based on our extensive research and evidence-based practices, we propose a model that integrates metacognition, EF, and emotional regulation. As shown in Figure 1.1, these three elements work together, reinforcing one another to reduce anxiety and stress while cultivating effort, resilience, and independent learning. Each component is discussed in detail below.

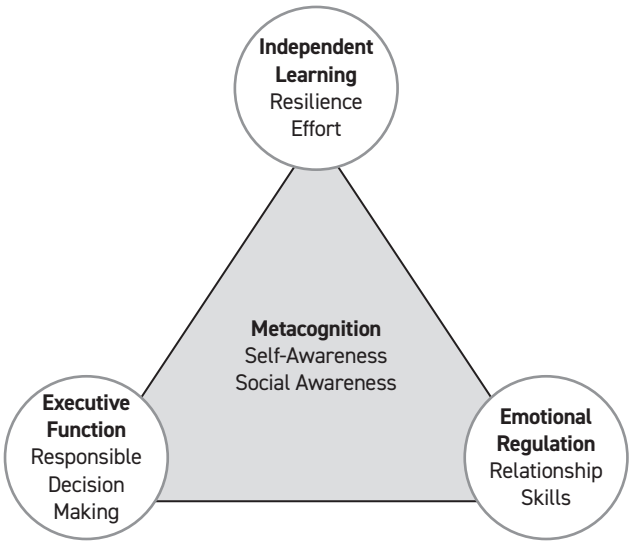

FIGURE 1.1. Integrating metacognition, executive function, and emotional regulation. Reprinted by permission. Copyright © 2025 ResearchILD.

Element 1: Metacognition and Self-Awareness

The integration of metacognition and self-awareness builds the foundation for academic and social development. Together, they form a powerful construct for fostering both intellectual and emotional growth as well as resilience and engagement. Metacognition empowers learners to understand how they learn best, enabling them to apply strategies more effectively and to stay actively engaged. Metacognition is a reflective process that allows students to better assess strategies that can

help them to overcome obstacles and to succeed. When students learn to analyze their challenges and implement effective strategies, they begin to recognize that they can influence their success and they are more engaged in the learning process.

Understanding their own thought processes also helps students to become socially aware and to regulate their emotions in academic and other settings. This metacognitive awareness enables students to understand the context for their frustration and anxiety, allowing them to adjust and persevere in the face of academic and social difficulties. Promoting these practices fosters flexible thinking and other EF processes, as well as emotional regulation.

Element 2: EF and Responsible Decision Making

When learners become more aware of the EF strategies that make academic tasks and social interactions easier, they become more adaptable, adjusting their approaches with greater flexibility. Cognitive flexibility, the ability to shift perspectives and adapt to new situations, enables students to use different strategies in relation to academic tasks such as reading long texts, writing essays and papers, as well as planning long-term projects. Cognitive flexibility is also essential for the development of responsible decision making in social interactions. Flexible thinking and decision making facilitate students' ability to consider the perspectives of others. Emotional regulation approaches extend flexible social skills further by focusing on empathy, perspective taking, and understanding others' emotions. If a particular approach is not working and students are able to shift flexibly, their stress levels drop and they can maintain their engagement and focused effort. Flexible problem solving also fosters emotional regulation in the face of adversity and ultimately helps students to adjust their behaviors and to develop appropriate social relationships.

Element 3: Emotional Regulation and Relationship Skills

The third element of this paradigm focuses on helping students intentionally manage their emotions, thoughts, and behaviors, especially in moments of stress or anxiety, so that they can maintain self-control and avoid behavioral outbursts in social situations. When students self-regulate, they can sustain their focus, resist distractions, and manage their emotions, thereby improving their social relationships. Students are also able to be proactive, making it easier to recover from challenges and to focus their attention and effort. Furthermore, students who are able to manage their emotions and thereby decrease reactivity are in a better position to listen, empathize, and understand the perspectives of others. For these reasons, emotional regulation helps students to sustain their engagement and resilience in academic and social situations.

Effort and Resilience

Spiraling upwards, these three foundational elements create a cycle of growth, helping students to manage stress and anxiety, adapt to setbacks, and invest the time and effort needed to use EF strategies in their daily lives. When learners are engaged in meaningful activities, they develop a sense of purpose, which can fuel their effort and their willingness to focus and to persevere through challenges. The problem solving and collaboration acquired through focused effort and engagement in learning can promote persistence and resilience in stressful situations. Focused effort and effective use of EF strategies also foster a sense of accomplishment, creating a psychological buffer that helps students navigate stress and setbacks. These positive emotions enhance resilience by fostering a mindset that sees challenges as opportunities for growth. In turn, resilience, the ability to adapt and recover from adversity, can enhance effort by helping students to stay committed and focused, even under challenging conditions. Resilience mitigates frustration, increases persistence, and deepens connections to tasks. By understanding and learning from their errors, managing stress, as well as maintaining balance, resilience protects students from burnout, allowing them to stay focused on their goals.

Independent Learning

Ultimately, the long-term outcome of this paradigm is to foster independent learning and emotional regulation so that students can manage their anxiety and stress without behavioral outbursts. Independent learners actively focus their mental energy on their goals and are driven by curiosity and their love of learning (Dunstan & Cole, 2018). They apply their effort to using EF strategies in novel contexts, especially when tasks are challenging. As students solve academic and interpersonal problems to reach their goals, they gain confidence and become increasingly motivated to act independently and to make their own choices. This is evidenced in their increased engagement and participation in class activities as well as their positive feelings about collaborating with their peers in the classroom. Therefore, students with resilient mindsets are more willing to invest the effort needed to use strategies and to persist so they can succeed in academic and social situations.

EF and Emotional Regulation Interventions

Over the past few years, a range of interventions have been developed to address EF processes in one domain and emotional regulation in another. However, intervention programs have not explicitly connected these two domains. Many

interventions have been siloed in schools and have been often implemented separately by special educators in study skills classes or by counselors in social groups. Additionally, the majority of EF interventions have not integrated EF strategies into classroom tasks and have not explicitly focused on helping students to transfer and generalize these strategies to academic and real-world tasks.

EF Programs

Programs that embed metacognition and EF strategies directly into learning activities provide students with essential tools for academic success. These strategies support fundamental tasks such as reading for meaning, writing papers, taking notes, completing projects, and preparing for tests (Best et al., 2011; Meltzer, 2018a, 2018b; Meltzer et al., 2021; Spiegel et al., 2021).

An increasing number of programs are being labeled as EF interventions, yet many of these initiatives tend to focus on improving EF processes in isolation. While these programs may strengthen certain cognitive functions, they often fail to explicitly connect EF strategies to the academic curriculum, which is essential for long-term success. Integrating EF strategies directly into the curriculum is crucial because it not only enhances cognitive development but also ensures that students can transfer and apply these strategies when they are required to write complex papers, take notes, study for tests, and summarize. When EF strategies are embedded throughout academic content, students are better equipped to understand themselves as learners, to think critically, and to engage more effectively with their learning, leading to long-term academic and personal success. This integration fosters a deeper, more lasting understanding of EF, helping students to build the foundation for academic and lifelong success.

The *SMARTS curriculum* (Meltzer, 2018a, 2018b; Meltzer et al., 2018, 2021) exemplifies a fully embedded approach by systematically teaching EF strategies—goal setting, organization, cognitive flexibility, self-regulation, and working memory—within core academic tasks such as reading, writing, summarizing, and test taking (*www.smarts-ef.org*). By integrating these strategies into everyday learning, SMARTS equips students with practical tools to enhance self-understanding, flexible thinking, and independent learning (see Meltzer at al., Chapters 2 and 10, this volume, for more details). Recently, SMARTS has also incorporated an emotional regulation component, providing students with strategies to understand their peers' perspectives and to manage the anxiety and stress associated with their academic workloads.

Early childhood education, programs such as *Pirates of Pondering* (Dunstan & Cole, 2018) and *Tools of the Mind* (Bodrova & Leong, 2007; Diamond et al., 2019) also embed EF development within the curriculum. These programs focus on fostering self-regulation and cognitive flexibility in preschool settings through

structured play and social interactions (see Dunstan et al., Chapter 12, this volume). Individualized strategy training programs, such as ExQ, provide systematic, personalized EF skill development for use on a one-on-one basis with students (see Kamath, Chapter 7, this volume, for more details). Overall, programs that integrate metacognition and EF strategies into learning activities equip students with crucial skills for academic achievement.

Programs That Build Social and Emotional Skills

Programs that address emotional regulation strategies are designed to promote prosocial attitudes, resilience, and emotional well-being, ultimately enhancing student engagement and academic performance (see Bond et al., Chapter 3, this volume). Targeted interventions provide structured individual and group activities that teach relaxation techniques, social skills, and problem-solving strategies. For example, *RULER* (Brackett, 2019), *Second Step* (Beland, n.d.), and *Responsive Classroom* (Charney & Clayton, n.d.) foster emotional intelligence, academic growth, and positive social relationships. Furthermore, Collaborative Problem-Solving (CPS) promotes equitable discipline practices and integrates naturally with systems of support and other SEL programs to reduce behavioral outbursts, strengthen relationships, and promote a positive school climate (see Ablon & Carpenter, Chapter 11, this volume). Additionally, mindfulness-based interventions such as *MindUP* (MindUP, n.d.) help students to improve emotional regulation and concentration through mindfulness and stress reduction. The success of these interventions largely depends on how effectively they are integrated into the school culture and the level of mentorship and support provided to educators (Gedikoglu, 2021; Ramirez et al., 2021). When educators are well supported and the interventions align with the values and practices of the school, their impact is significantly greater.

Bridging EF and Emotional Regulation

While the majority of EF programs have been developed and implemented separately, integrating these approaches more explicitly could provide a more comprehensive framework for student success while building students' tenacity and resilience (see Goldstein & Brooks, Chapter 4, this volume). A holistic approach that connects these domains can empower students with both the cognitive and emotional skills needed to navigate academic challenges, develop independence, and enhance overall well-being. Schools that integrate EF and emotional regulation strategies into daily instruction can create a more supportive and effective learning environment, leading to long-term gains in student engagement, self-confidence, and academic performance.

Systematic, Easy-to-Implement Strategies for the Classroom

Building on this integrated approach, applying EF and emotional regulation strategies within the classroom can have a transformative impact on student learning by boosting engagement, reducing stress, enhancing academic performance, and fostering independent learning. These benefits extend to all students but are particularly crucial for those with EF challenges, like André, whose difficulties are highlighted in the case vignette below.

CASE VIGNETTE: André

In elementary school, André thrived and his teachers often praised his enthusiasm and motivation. But middle school was a different story. He struggled with classroom transitions and had trouble adjusting to the requirements of multiple teachers. Managing his locker was a daily challenge, and he often forgot to hand in his homework to his different teachers. He could not adapt to the different writing assignments in English, science, and social studies. He also had difficulty shifting between subject areas and prioritizing as new tasks and projects were added to his workload. André felt overwhelmed by the mounting demands of middle school. Anxiety and stress took hold as he struggled to understand why school had become so difficult—and what he could do to improve. The compounding effects of his stress interfered with his ability to think clearly, reason through problems, complete papers, and hand in projects. He began to avoid his homework, he dreaded tests, and he told his parents that he hated school. His teachers and parents were puzzled by this "new frazzled André."

Educators are in a unique position to promote independent learning by infusing strategies into the curriculum so that they address EF and emotional regulation. The first step involved in working with students like André is to foster his *metacognition and self-awareness*. Self-assessment instruments and guided reflections can be used to develop André's metacognitive awareness and to promote EF and emotional regulation (see Meltzer et al., Chapter 2, this volume, for more suggestions). A few key ideas are mentioned below.

- Use metacognitive tools to understand André's perceptions of his own strengths and weaknesses (see Meltzer et al., Chapter 2, this volume).
- Provide opportunities for André to reflect on his strategy use and understand *where*, *when*, and *how* to use a particular strategy.
- Use surveys that help André to understand his motivation and effort, and

how these processes vary in different content areas (see Meltzer et al., Chapter 2, this volume).
- Encourage the use of metacognitive strategies by asking André to evaluate the approaches he uses to solve problems and to present alternate solutions.
- Use activities that help André to recognize and understand the impact of his own emotions such as the Mood-Meter from the RULER program developed at the Yale Center for Child Study (Brackett et al., 2019).

Transitioning to the second element of the paradigm, *EF and flexible social skills*, André now has a clearer understanding of his strengths and challenges as well as the goals he wants to attain. André is now more prepared to learn EF strategies that will help him navigate the demands of middle school, namely, strategies for setting realistic goals, organizing, prioritizing, and shifting flexibly. He also has the autonomy and agency to use these strategies to overcome his many challenges with school transitions and homework.

- Teach André how to set realistic and manageable goals and to break down each goal into manageable steps using EF strategies like the SMARTS *CANDO Goals* activity (see Meltzer et al., Chapter 10, this volume).
- Help André learn to organize and prioritize his schoolwork and after-school activities using EF strategies like the SMARTS "Have-to's versus Want-to's" task (see Meltzer et al., Chapter 10, this volume, for more details). This will help him to overcome the overwhelming demands of his schoolwork and homework, which will reduce his stress and increase his self-confidence.
- Address André's writing difficulties by teaching him strategies for differentiating main ideas and details, separating relevant from irrelevant details, and shifting flexibly from the major concepts to the supporting information using strategies such as SMARTS *Triple-Note-Tote and Skim and Scoop* (see Meltzer et al., Chapter 10, this volume).
- Require André to complete strategy reflection sheets at the end of selected classwork and homework assignments. Ask André to identify the strategy he has used for completing specific assignments and to explain *why* each strategy was helpful and what he might do differently next time (see Meltzer et al., Chapter 2, this volume).

Transitioning to the third element, *emotional regulation and relationship skills,* André would benefit from strategies to help him manage his cognitive load and emotions more effectively. For example, anecdotes from everyday life would help him to understand how people encounter challenges, reflect, and shift strategies to solve daily dilemmas. This approach will also help André to develop his own self-management schema.

- Implement RULER (Brackett, 2019) and help André to understand, label, express, and regulate his emotions.
- Instill relaxation techniques and mindfulness-based practices into daily classroom activities to help build André's emotional self-awareness, reduce his anxiety, and improve his emotional regulation (see Allen-Barrett et al., Chapter 5, this volume).
- Engage André and other students in interdisciplinary, cooperative themes that require them to work together to think critically and solve complex problems creatively (see Dunstan et al., Chapter 12, this volume).
- Implement peer mentoring and peer coaching programs for André and his classmates in order to extend and deepen the effects of teaching EF strategies while promoting responsible decision making and emotional regulation. The power of peer mentoring for students like André is reflected in the findings that students in positive peer mentoring relationships use EF strategies more consistently in their classwork, homework, and tests, and they also feel more confident in school (Meltzer, Basho, et al., 2015; Meltzer, Greschler, et al., 2015).

Conclusion

By fostering self-understanding and emotional regulation alongside EF strategies, educators can help students better manage their stress and enhance their engagement in the classroom. This approach cultivates resilience and a sense of agency as students learn to navigate challenges with confidence and adaptability. Moreover, integrating EF and emotional regulation reduces the barriers to success that arise from fragmented educational practices, ensuring that all learners—regardless of their backgrounds—are immersed in supportive and engaging school settings. This integration goes beyond academic outcomes and prepares students to thrive in a complex and interconnected world that is being shaped increasingly by the rapid changes fueled by AI. By augmenting both domains, educators and practitioners can design integrated learning experiences that reduce stress, boost student engagement, and ensure that students become independent learners who succeed in school and beyond.

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