# Understanding and Supporting Executive Function

## An Evidence-Informed Overview for Educators

## Introduction

Every day, educators ask students to arrive prepared, follow multi-step instructions, manage their time, shift between tasks, and regulate their emotions, often all before lunch. For many students, these demands are not simply about effort or attitude; they reflect the ongoing development of a set of cognitive skills known as executive functions. Yet executive function challenges are among the most frequently misunderstood in classroom settings, often misread as laziness, defiance, or lack of motivation rather than recognized as neurobiological realities that can be directly supported through thoughtful instructional design.

This article draws on current research to offer educators an evidence-informed overview of executive function and its relationship to learning. It is intended to support K–12 educators in understanding what executive functions are, how they develop, and how frameworks like Universal Design for Learning (UDL) can be used to reduce barriers and build capacity in everyday classroom practice. The goal is not to add to an already full plate but to offer a lens that makes the challenges many students face more visible and more actionable.

## Understanding Executive Functions

Executive functions are defined as a set of higher-order cognitive skills, which include (but are not limited to) planning and organizing, sustaining attention, working memory, and flexible thinking (Cristofori et al., 2019; D'Intino, 2023). A popular metaphor describes executive functions as the brain's air traffic control system (Center on the Developing Child at Harvard University, 2011). Just as air traffic controllers monitor the skies to determine which planes need attention and when, executive functions scan our internal and external environments to help us prioritize, focus, and respond effectively.

Executive functions work as a management system to help our mental processes work together, allowing us to learn, work, and manage the tasks of daily living. They are

necessary for humans to achieve goals, adapt to novel situations, and manage social interactions (D'Intino, 2023). Each day we use executive functions to take time to think before we act, to deal with unanticipated challenges, to resist temptations, and to stay focused. There is a strong correlation between executive function skill development and later cognitive flexibility, learning capacity, and self-control.

## Developmental Trajectory

The development of executive function skills begins in utero and continues well into an individual's mid-twenties, meaning that the brain's management system is a work in progress for much of an individual's life (D'Intino, 2023; Low et al., 2021). This longitudinal development window has significant implications for how educators understand behaviour, learning, and classroom supports. At each developmental stage, genetic predispositions, environment, and experiences shape executive function development, meaning that development varies across students. The table below (Table 1) outlines the emergence of executive function skills across the developmental trajectory.

> **Before Using the Developmental Table**
>
> When reviewing the developmental trajectory below, it can help to think of executive function skills as emerging unevenly, rather than as a checklist of what students should already be able to do.
>
> Before deciding on supports, consider:
>
> 1. What executive function demands are built into this task, routine, or expectation?
> 2. Where might students be using more cognitive energy than expected?
> 3. What could be made more predictable, visible, structured, or manageable?
> 4. What support could be offered now while still building independence over time?

**Table 1: Emergence of Executive Function Skills Across the Developmental Trajectory**

### Early Years (JK/SK)

Commonly emerging executive function skills may include:

- Basic inhibitory control, such as thinking before acting
- Simple working memory, such as following one-step directions
- Early cognitive flexibility, such as shifting between tasks and responding to rules

### Primary & Junior Years (Grades 1–6)

Commonly emerging executive function skills may include:

- Multi-step task completion
- Sustained attention over longer periods
- Emotional regulation in social settings

### Intermediate & Senior Years (Grades 7–12)

Commonly emerging executive function skills may include:

- Management of complex academic workloads and peer relationships
- Breaking down large tasks and prioritizing assignments
- Estimating how long tasks will take and getting started without excessive procrastination
- Meeting deadlines
- Managing information and space
- Following complex multi-step instructions while holding information in mind
- Managing frustration
- Thinking before speaking
- Shifting between contexts and environments

(Beck Wells, 2024; Blair, 2016; Bryson et al., 2025; Moody et al., 2022)

What Table 1 makes clear is that executive function development is highly variable; students at the same grade level will not all be at the same developmental stage, and classroom expectations can easily exceed a student's current executive function capacity without support in place. This ongoing development across childhood and

adolescence is coupled with increasing cognitive, social, and emotional demands; the frequent result is frustration born not out of defiance but of a developmental mismatch between what students are neurologically ready to do and what they are being asked to do (Bryson et al., 2025; Moody et al., 2022). When this mismatch is misread as laziness, opposition, or lack of motivation rather than as an expression of ongoing development, students can internalize lasting narratives of inadequacy that undermine agency, mental health, and self-regulation well into adulthood (Beck Wells, 2024). Recognizing the variable and context-dependent nature of executive function development is therefore a foundational step toward more responsive and equitable classroom practice.

## Executive Function & the Learning Context

Schools are full of executive function demands, from arriving to school prepared and on time to completing assignments and transitioning between classes. Executive function skills are necessary for success in school (D'Intino, 2023; Nyroos et al., 2018; Wijbenga et al., 2024). Because most executive function research occurs in laboratory settings, it fails to adequately mimic classroom environments; the unpredictability and complexity of the school environment mean that for children who experience challenges with executive function skills, the complexity can be overwhelming. Further, it is critical to recognize that executive functions do not operate in isolation; factors like stress, hunger, exhaustion, trauma, and anxiety directly impair executive function. Therefore, a child who looks inattentive or disorganized may not have a skill deficit; they could simply have already maxed out their cognitive resources.

## Learner Variability

Depending on the student's age and the classroom context, teachers may observe lagging executive function skills in a variety of ways. In the primary and junior years, patterns such as difficulty following multi-step directions, challenges transitioning between tasks, impulsive behaviour, emotional outbursts, or struggles beginning tasks without significant prompts can signal lagging executive function skills. As students enter the intermediate years, chronic disorganization, including the overstuffed locker or backpack many educators will recognize, missed deadlines, demand avoidance, sensitivity to perceived failure, or challenges shifting gears can be subtle signs of lagging executive function skills.

Executive function skills are not distributed evenly across your classroom community. For students with learning disabilities (LDs), attention-deficit/hyperactivity disorder

(ADHD), autism spectrum disorder (ASD), anxiety, and other exceptionalities, executive function challenges are often central to their experience of school (Khan & Lal, 2023; Lambek et al., 2011; Pardo-Salamanca et al., 2024). For students with LDs, the cognitive load that comes with decoding text may consume so much working memory that there is little space for comprehension. For individuals with ADHD, who often experience challenges with inhibitory control, working memory, and sustained attention, sitting through a long lesson and independently following multi-step instructions may be extremely difficult. While they may know exactly what they need to do, their neurobiology may limit their ability to independently initiate or sustain the task. Across populations, a common thread emerges: executive function challenges are frequently misread as behavioural or motivational problems, rather than neurobiological ones. This misreading leads to inappropriate responses, with students being treated as though they are misbehaving rather than needing support with executive function skills, and can result in damage to students' self-efficacy and relationships with adults.

## Building Capacity Through Instructional Design: Universal Design for Learning and Executive Functions

With its theoretical foundation in neuroscience, UDL is a powerful framework for supporting executive function in everyday classroom practice (CAST, 2024). Building on the principles of universal design in architecture, UDL recognizes that rather than retrofitting supports for individual students after problems arise, flexibility and accessibility should be built into learning design from the outset. Three core tenets anchor UDL: providing multiple means of engagement (the "why" of learning), multiple means of representation (the "what" of learning), and multiple means of action and expression (the "how" of learning). Each principle intersects directly with executive function skills.

Designing for **multiple means of engagement** links to executive function skills of initiation, motivation, and emotional regulation. When students have agency in how they engage with learning (through choice of format, topic, or pace), the cognitive and emotional costs of engagement decrease (CAST, 2024). For students who struggle with task initiation or sustaining effort, removing unnecessary barriers to entry is not accommodation; it is good teaching. Building in opportunities for students to set their own goals, monitor their progress, and reflect on their learning also explicitly develops metacognitive and self-regulatory executive function skills over time.

**Multiple means of representation** connect directly to the executive functions of working memory and cognitive load (CAST, 2024). When information is presented in multiple ways (verbally, visually, and through hands-on learning), students have the opportunity to access it through multiple cognitive channels. Providing written instructions alongside verbal ones, using graphic organizers to make abstract structures concrete, or breaking complex information into chunked, sequential steps all reduce the burden on working memory and support students who struggle to hold and manipulate information mentally.

Providing **multiple means of action and expression** supports planning, organization, and flexible thinking (CAST, 2024). Executive function demands are reduced when understanding can be demonstrated in a variety of ways; for a student who struggles to organize written language, they may be able to demonstrate sophisticated understanding in a podcast. Similarly, a student who struggles with open-ended tasks may thrive with clear scaffolding.

## Implications for Educators

Understanding executive functions conceptually is valuable, but educators need approaches that are realistic within the constraints of real classrooms. The following strategies are grounded in executive function research and UDL principles and are designed to be integrated into everyday practice without requiring extraordinary resources or preparation time.

### Designing with Executive Function in Mind

Executive function supports are often most effective when they are built into instruction from the beginning, rather than added only after a student is already struggling. Predictable routines, clear steps, and external scaffolds can reduce unnecessary cognitive load and help students access the learning task.

- **Design for Executive Function Instruction from the Start**
  Executive function supports should not be retrofitted after problems arise; they should be embedded into instructional design from the outset. Reducing cognitive load, offering structured choice, making thinking visible, and building in scaffolding are not accommodations reserved for individual students; they are features of well-designed instruction that benefit the full range of learners in any classroom. Bryson et al. (2025) highlight that integrating UDL principles with evidence-based practice provides an inclusive model for developing executive

function capacity across diverse learners, with direct implications for everyday lessons and unit design.

- **Routine**
  Routines are one of the most powerful executive function supports available to teachers. When students know what is expected of them (how the class begins, what assignments or tests look like, how transitions are signalled), their cognitive resources are freed up for learning new information, rather than navigating an uncertain situation (Buber, 2023). Simple instructional decisions like posting a daily agenda, using a consistent lesson structure (like a readers' workshop or a three-part math lesson), and providing notice of transitions can significantly reduce the executive function load. For students with lagging executive function skills, transitions (between activities, subjects, and environments) are disproportionately difficult. Advance warning (verbal or through visual timers) and allowing a moment to transition (such as a transition ritual) reduce the abruptness that can trigger dysregulation. Classroom routines and visuals are also supportive of working memory.

- **Chunking & Scaffolding**
  The original research on working memory suggested that people could hold 7, plus or minus 2, items in their working memory (Miller, 1956); however, the current research shows that most individuals can hold 4 chunks (Cowan, 2010). Further, we now know that working memory is limited by space and time. Generally, working memory improves with age; however, for some individuals, it does not (Heled & Levi, 2024). Working memory overload can be caused by too many instructions, too many choices, or too much technology. Large, multi-step tasks are among the most common executive function stumbling blocks for students at every age. Breaking tasks into clearly defined steps reduces the planning and organizational demands on students. Furthermore, checklists, graphic organizers, project planners, and exemplars all serve as external scaffolds for executive function skills that are still developing. One useful strategy, "Get Ready-Do-Done," uses backwards planning to visualize the end result of a task (Ward & Jacobsen, 2014). This strategy can be powerful in helping individuals plan, manage time, and overcome task avoidance.

## Creating Supportive Classroom Conditions

Students are better able to use executive function skills when classroom relationships, routines, and responses reduce stress, shame, and overwhelm. These strategies focus on creating the emotional and relational conditions students need in order to regulate, engage, and learn.

- **Reframe the Behaviour**
  The most important shift an executive function-informed educator can make is interpretive. When a student with a learning disability is avoidant, disruptive, or emotionally reactive, the instinct to respond with a behavioural consequence is understandable, but it is frequently misaligned with what is actually happening neurologically. As noted throughout this article, executive function challenges are routinely misread as motivational or behavioural problems. For students with learning disabilities in particular, this misreading carries real costs: damaged self-efficacy, strained relationships with teachers, and internalized narratives of failure that can persist well into adulthood. Reframing means pausing before responding and asking, "*What executive function skill might be lagging here, and what does this student need?"* This shift from judgment to curiosity is not merely philosophical; it is a practical and evidence-informed response to the neurobiological realities of how learning disabilities intersect with executive function.

- **The Classroom Environment**
  Above all else, an emotionally stable and secure classroom environment is a prerequisite for school success. When students are in a state of stress, shame, or overwhelm, their prefrontal cortex can quite literally go offline (Arnsten, 2009). Environments where mistakes are normalized, effort is valued, and safe struggle is embedded set the stage for learning (Narciss & Alemdag, 2024). Teacher-student relationships are central to this. Every unnecessary cognitive demand in a learning task competes with the demands of the actual learning objective.

- **Co-Regulation and Emotionally Safe Learning Conditions**
  Check-ins, co-regulation as a direct instructional strategy, and explicit acknowledgment of effort can create emotional conditions for executive function to be used. These relational supports help create emotionally safe learning conditions. In the primary and junior years, educators can model self-regulation aloud, making visible their self-regulatory processes. Furthermore, scaffolding

the development of these skills when students are calm and regulated makes them easier for students to access when dysregulated.

## Making Executive Processes Visible

Executive function skills such as planning, monitoring, flexible thinking, and evaluating are often invisible to students. These strategies make those processes more explicit so students can observe, practise, and gradually internalize them.

- **Make Thinking Visible**
  Many executive function skills (like planning, monitoring, and evaluating) are invisible mental processes. Making them visible and explicit supports students who have not yet internalized them. Read-alouds offer opportunities to model perspective-taking, which can foster cognitive flexibility. Strategies such as See-Think-Wonder develop observation and curiosity skills by asking students to make connections or inferences. Other strategies such as KWL charts, RAN charts, or “I used to think… now I think” invite students to demonstrate their learning.

- **Reflection Prompts and Metacognitive Strategies**
  Metacognition supports learning by making the learner aware of their own knowledge, experiences, and emotions through examining and questioning their cognitive and emotional processes (Merkebu et al., 2024). Building opportunities into our classroom routines for check-ins and exit tickets with immediate feedback allows students to self-monitor and reflect on the learning process. Structured reflection prompts such as *"What's my first step?"* or *"What do I do if I get stuck?*" or "*Did my plan work?"* help students develop the metacognitive habits that underpin self-regulated learning.

- **Planning, Monitoring, and Problem-Solving Strategies**
  Think-alouds, where teachers narrate their own planning and problem-solving process, model what executive function skills look like in action. Think-alouds are powerful instructional tools, particularly in the primary and junior years, and can also be helpful in secondary classrooms. Structures like Project Zero’s thinking routines help to make thinking visible for students (Project Zero, n.d.).

## Building Independence Over Time

The goal of executive function support is not dependence on adult prompting, but gradual movement toward independence. Students benefit when supports are scaffolded, practised, and released over time.

- **Gradual Release of Responsibility**
  Gradually releasing responsibility to students over time is important to their future independence (Hall et al., 2021). In the classroom, we can support working memory by pairing oral instructions with visuals, colour-coding, visualizations, linking new information to familiar cues, teaching rehearsal strategies (i.e., mnemonics), and creating drop zones. When teaching new or complex content, minimize extraneous demands on working memory: limit the amount of information presented at once, use visual supports alongside verbal instruction, and allow students to refer back to examples or anchor charts rather than relying entirely on recall. This is not simplifying content; it is designing instruction so that cognitive resources are directed toward understanding, not management.

- **Offer Meaningful Choice**
  Choice is a powerful lever for engagement and executive function development simultaneously (Carlson, 2023). When students have input into how they demonstrate learning, how they organize their time, or which aspects of a topic they explore, they practice goal-setting, planning, and self-monitoring in authentic contexts. Choice does not mean unlimited freedom; structured choice within clear parameters is often more effective, particularly for students who find open-ended tasks dysregulating. Choice boards are one way to offer freedom within boundaries (Tucker, 2021). When content allows, a choice board is a menu of tasks that allows students to decide how they will demonstrate their learning or a skill. Not only does this enhance engagement, but it also allows the teacher to confer with groups or individuals.

- **Goal-Setting, Self-Monitoring, and Reflection**
  Research indicates that goal-setting supports academic and behavioural growth in students, building skills such as self-awareness, social awareness, self-management, relationship skills, and responsible decision-making (Sanders et al., 2023). In the primary years, students can set a goal, such as ignoring distractions during independent work time, and self-monitor their progress towards that goal. Teachers can support this with frequent check-ins. In the intermediate and senior years, guided reflection, planning, and revision

processes support self-efficacy and progress towards learning outcomes (Chung et al., 2021).

## Conclusion

Executive function is developmental, variable, and shaped by context. Students in every classroom are at different points along this trajectory, and many, including students with learning disabilities, ADHD, ASD, and anxiety, face genuine neurobiological barriers that are routinely mistaken for motivational or behaviour concerns. Educators do not need to “fix” students; rather, they can design learning environments that reduce unnecessary barriers, make expectations and processes visible, and progressively support student independence over time.

The strategies outlined in this article, rooted in executive function research and grounded in UDL, are not extraordinary interventions. They are features of thoughtful, responsive instruction that benefits all learners. When routines provide predictability, when cognitive load is managed, when behaviour is interpreted through a neurobiological lens, and when students are offered structured choice and agency, the classroom becomes a place where executive function capacity can genuinely grow. Supporting executive function effectively is not a destination; it is a practice. An executive function-informed educator is not one who has mastered a fixed set of strategies; it is one who approaches their practice with the same curiosity, flexibility, and self-regulation they are working to cultivate in their students.

## Author Bio

Dr. Terri Jackson is an assistant professor at the University of Prince Edward Island. Terri has over two decades of experience in education, much of which is in the field of inclusive education. Her research interests include inclusive education, neurodiversity, teacher education, and capacity-building.

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