

# Table of Contents

<b>About the Authors</b> . . . . .	<b>vii</b>
<b>Introduction</b> . . . . .	<b>1</b>
What We Know About Learning. . . . .	2
Differentiation in a Brain-Friendly Classroom . . . . .	3
What You'll Find in This Book . . . . .	6
<b>1 Using Educational Neuroscience to Differentiate Instruction</b> . . . . .	<b>9</b>
Differentiation in the General Education Classroom . . . . .	9
Brain-Compatible Classrooms. . . . .	12
Seven Common Brain Principles for Educators . . . . .	15
21st Century Brains . . . . .	19
Finding the Learner's Sweet Spot . . . . .	21
So What About Learning Styles? . . . . .	23
Gardner's Multiple Intelligences Theory . . . . .	24
Teacher Mindsets . . . . .	26
Think Big, Start Small. . . . .	28
Chapter Review . . . . .	29
<b>2 Creating a Brain-Compatible Environment</b> . . . . .	<b>31</b>
Physical Environment. . . . .	32
Basic Needs . . . . .	34
Systems and Patterns . . . . .	37
Stress Management . . . . .	41
Social Connections . . . . .	43

	Welcoming Digital Natives . . . . .	45
	Chapter Review . . . . .	47
<b>3</b>	<b>Engaging, Exciting, and Energizing the Learner . . . .</b>	<b>49</b>
	Novelty and Humor . . . . .	51
	Mini-Challenges and Competitions . . . . .	54
	Activating Prior Knowledge and Building Curiosity. . . . .	56
	Choice Opportunities . . . . .	58
	Digital Hooks . . . . .	62
	Chapter Review . . . . .	65
<b>4</b>	<b>Exploring the Learning . . . . .</b>	<b>67</b>
	Rote and Elaborative Rehearsal . . . . .	67
	Best Practices for Active Processing . . . . .	68
	Long-Term Memory. . . . .	71
	Cooperative Group Learning . . . . .	72
	Social Skills for Student Success . . . . .	78
	Note Taking and Summarizing . . . . .	80
	Projects. . . . .	83
	Chapter Review . . . . .	86
	<i>Here is . . . Where is?</i> . . . . .	88
	<i>Note-Taking Template</i> . . . . .	89
<b>5</b>	<b>Extending and Expanding Learning for Every Student</b>	<b>91</b>
	Tiered Lessons . . . . .	91
	Adaptations, Accommodations, and Modifications. . . . .	96
	Jump-Starts . . . . .	98
	Organizing Student Tasks by Interest and Learning Preference. . .	99
	Lateral Enrichment and Expansion . . . . .	102
	Chapter Review . . . . .	112
<b>6</b>	<b>Evaluating the Learning. . . . .</b>	<b>115</b>

Guidelines for Assessment of Contents. . . . .	116
Getting to Know Your Students . . . . .	117
Preassessments. . . . .	117
Formative Assessments . . . . .	119
Feedback Is the Breakfast of Champions. . . . .	120
An Adjustable Moment. . . . .	122
The Power of Do-Overs . . . . .	124
Summative Assessments . . . . .	125
Chapter Review . . . . .	127
<b>7 Think Big, Start Small. . . . .</b>	<b>129</b>
Planning Guide . . . . .	130
The Art of Differentiation Is Greater Than the Sum of Its Parts. . . . .	135
Chapter Review . . . . .	136
<i>Planning Template for Differentiated Instruction . . . . .</i>	<i>137</i>
<i>Teacher Self-Assessment: Differentiated Curriculum     and Instructional Practices. . . . .</i>	<i>138</i>
<b>References and Resources. . . . .</b>	<b>141</b>
<b>Index . . . . .</b>	<b>151</b>



# Using Educational Neuroscience to Differentiate Instruction

The argument can be made that schools are again in a time of transition—a period in which it again seems evident that one-size-fits-all approaches to curriculum and instruction are a misfit for too many students, a period in which teachers are once more trying to understand what it means to calibrate instruction based on the varying needs of an increasingly diverse student population.

—Carol Ann Tomlinson

For centuries, teachers have been challenged to address the diverse needs of all learners. As educational neuroscience becomes available to us, we can begin to understand how our students' unique brains are developing. We can use the emerging information about how learning and memory take place to inform our instructional practices on a daily basis in the classroom. Differentiation and educational neuroscience go hand in hand!

## Differentiation in the General Education Classroom

Today's classrooms are filled with diverse learners with social, cultural, economic, language, and learning differences. Some students have immigrated from places far away; other students have not gone farther than a mile from their homes. Students with special needs are instructed in classrooms alongside gifted learners. Many students have been working with technology since they were toddlers; others have never used a mouse. Each student's brain has been uniquely wired. An individual's life experiences create an intricate web of memories and shape the way new learning is received.

Teachers need to welcome this diversity and seek out ways to address each student's unique needs. A traditional one-size-fits-all approach will work for a few but will likely

leave many unsuccessful learners. In the past, many teachers conducted schooling in a cycle of “teach, test, and hope for the best.” Many believed that if students didn’t get it, it was not the teacher’s fault; rather, it was due to the students’ lack of effort and/or abilities. Differentiation is basically providing the opportunity for every student to succeed and reach his or her potential.

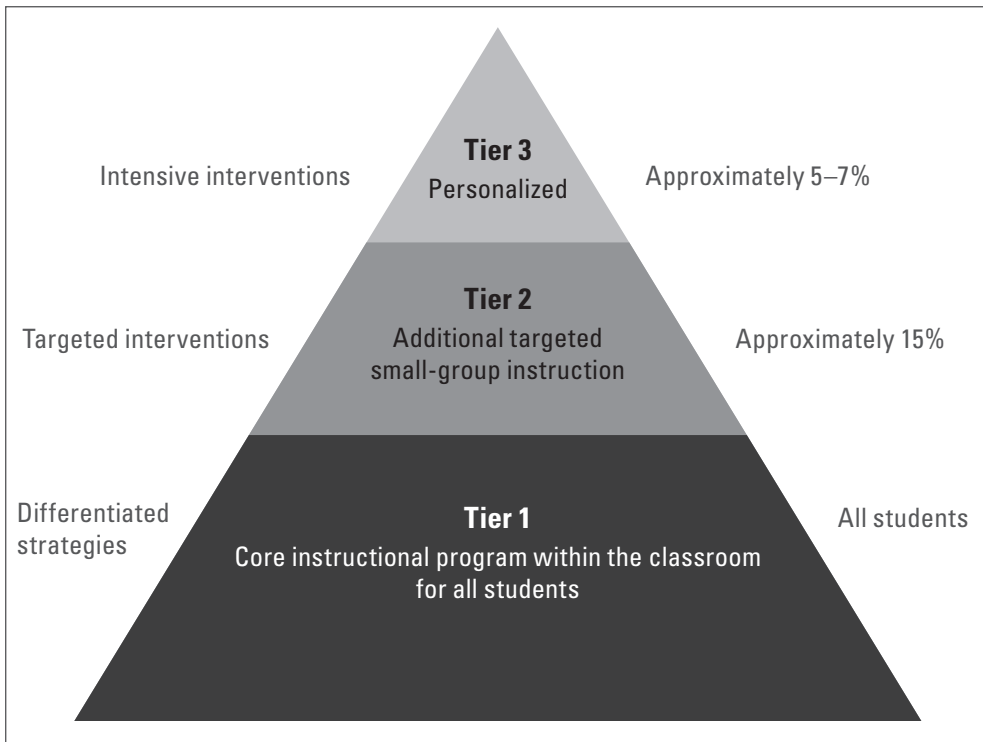
Today, we are on a quest to leave no child behind, but to achieve that end, educators must plan strategically, using all the knowledge and skills at their disposal. The process of response to intervention (RTI) has been mandated in many schools to ensure all learners have opportunities to be successful and to help educators reach students who are at risk. In the RTI model, differentiated instruction is a primary level of intervention (Bender & Shores, 2007). It is not only for those students who are struggling but also for students working at grade level and the more able, ready, and gifted students. Differentiation is necessary to meet each learner where he or she is and move him or her toward targeted standards or expectations.

## ***Overview of RTI***

In 2004, the reauthorization of the Individuals with Disabilities Education Act (IDEA) encouraged states to use the RTI process to identify and meet student learning needs. RTI is a comprehensive early detection and prevention strategy that identifies struggling students and assists them *before* they fall behind. RTI systems combine universal screening, preassessments, and high-quality instruction for all students with specific interventions targeted at struggling students. RTI involves “targeting specific areas on which students are struggling and applying increasingly intensive research-proven interventions until the threat to learning is alleviated” (Bender, 2009, p. 1). This encourages schools to provide classroom support before considering special education referrals and placements. Special education referrals are considered only for students who fail to respond to evidence-based interventions and highly effective best practices.

In RTI, the levels of interventions are referred to as “tiers.” (These tiers are not to be confused with tiered lessons, a common differentiation strategy; see chapter 5.) RTI is typically thought of as having three tiers (see fig. 1.1). Tier 1 encompasses the core general education classroom instruction using high-quality, research-based best practices. Tier 2 targeted interventions are provided only to students who continue to demonstrate learning challenges and show weak progress from general education classroom instruction. Tier 2 students usually receive supplemental, small-group instruction three to five times per week aimed at building targeted skills. Tier 3 intensive interventions are provided to students who do not progress after a reasonable amount of time with Tier 2 interventions and require more personalized assistance.

In Tier 1, general education teachers differentiate instruction—including varying time, content, process, and degree of support and scaffolding—based on students’ assessed skills. Helping students explore the content and skills in a variety of ways is considered



**Figure 1.1: Pyramid of interventions.**

the primary level of intervention and is the universal core program that all students will receive. A teacher’s repertoire of differentiated strategies is key to providing opportunities for success for all students.

### ***Quality Differentiation***

As mentioned previously, the concept of differentiation can be compared to the story of the elephant and the blind men. Each man touched a different part of the elephant and described the elephant based on what he touched—as a rope, fan, snake, wall, spear, or tree—each with an accurate definition based on his understanding and exposure to the elephant. There are many facets to differentiated instruction, and if you just touch one part, you are missing others. Some glom on to the idea of choice boards or tic-tac-toe charts, and others emphasize flexible grouping. Those who zero in on one of these differentiated strategies may be missing the big picture; the whole is sometimes not quite clear or consolidated. And then, of course, there are others who think, “Differentiation? Oh yes, we’ve done that already!”

Differentiation is not just a set of strategies, although you certainly need an instructional repertoire in order to differentiate. Differentiation encompasses many things but basically evolves from a core philosophy or mindset that all students have potential and can



# Creating a Brain-Compatible Environment

One thing that brain research tells us—loud and clear—is that the way we raise and teach our children not only helps shape their brains, but can also influence or even alter the way genes play out their roles. This promising news also means, however, that we have a serious obligation to attend to factors over which we have some control—namely, most things that happen to children at home and at school throughout their growing-up years.

—Jane M. Healy

To effectively implement differentiation strategies, teachers must design and orchestrate a brain-compatible environment. We believe that educators can interpret and apply some basic tenets from neuroscience research to create classrooms that are in line with how natural learning occurs. In this chapter, we offer a variety of simple suggestions that can help transform any classroom into a place where students feel safe, secure, challenged, motivated, successful, included, and independent. As previously discussed, it will be important to determine each student's sweet spot related to a learning environment that is perfect for him or her. For instance, some learners have seating preferences; other students have lighting or sound preferences. Our challenge as educators is to provide the general ambiance with options/nuances to better satisfy each learner's needs.

The basic categories to consider when designing a brain-compatible classroom are:

- ◆ Physical environment—lights, noise, air
- ◆ Basic needs—hunger, thirst, fatigue, exercise
- ◆ Systems and patterns—agendas, procedures, self-help strategies for independence

- ◆ Stress management—managing emotions, breaks, coping skills
- ◆ Social connections—inclusion, tribes, partners

## Physical Environment

Many students may be sensitive to physical aspects of the classroom. Lack of natural light, ambient noise from air systems and technology, and air temperature and quality may all cause learners' brains to be distracted from learning and engagement. Classrooms that lack a comfortable climate and environment may have elements that are perceived as threats or act as annoyances to the learner. There are a number of simple solutions for creating a brain-compatible and body-compatible classroom.

### *Let the Sun Shine In*

Consider how you are using natural light in the classroom. The sun provides a full spectrum of light and can enhance general health (Hathaway, Hargreaves, Thompson, & Novitsky, 1992). For students who are able to spend a lot of time out of doors, the quality of indoor lighting may not be a critical factor. But as more children are spending a majority of time indoors, more frequent exposure to natural light could make a difference.

According to Geake (2009), "Another possibility for a school of the future involves changes to the physical classroom environment, particularly with lighting. . . . This suggests that the current widespread use of overhead neon strip lighting in school classrooms might need to be re-assessed" (p. 187). The following list of suggestions might be useful in making changes in the classroom:

- ◆ Make sure classroom windows are free of unnecessary curtains, blinds, or decorations.
- ◆ Poll students to find out which ones believe they actually learn better when sitting near the natural light. Some choice of where students sit can be taken into consideration.
- ◆ Rotate seating arrangements and ask students if they notice a difference in their ability to focus, stay awake, and read text.
- ◆ When appropriate and convenient, consider conducting part of the instruction in an outdoor setting.

### *Adaptations for Institutional Lighting*

Traditional classrooms may not have been designed with natural lighting in mind. To reduce heating and cooling costs, some rooms may not even have any windows. Standard fluorescent light fixtures are common in many of today's classrooms. Some use ballasts and baffles to deflect and enhance the lighting, but many broadcast the limited spectrum of light directly. Flashing, blinking, vibrating, and buzzing often accompany the fluorescent light fixtures, and students may not even be aware of how these effects influence their learning. To lessen the effects of harsh lighting, consider the following: