CHAPTER 1

Introductory Issues

On the first day of school in any given academic year, children bring with them a set of psychological characteristics that affect how much they will learn that year. To be sure, the content presented by teachers and how this information is presented matters as well, but there is ample evidence that student characteristics such as their existing knowledge, ability to attend, memory ability, natural aptitudes, and motivation all play a strong role in how much they will learn in the classroom (Byrnes, Miller-Cotto, & Wang, 2019). Researchers sometimes refer to these learning-related characteristics as *propensities* because they make students prone to or apt to benefit from the instruction they receive (Byrnes, 2020; Byrnes, Wang, & Miller-Cotto, 2019; Corno et al., 2002).

A second key finding of the literature besides the fact that propensities are highly determinative of learning is that all of the propensities improve with age (see Chapters 3 through 14), so it would be expected that older children and adolescents would be likely to get more than younger children do out of the same learning opportunities. A related prediction would be that older students could handle learning more information because their more advanced propensities make them more efficient processors of information and enable them to engage more with the material, even when it is difficult and abstract. Given these two sets of findings, it is important that preservice and inservice teachers learn about these propensities and discover ways to promote their development. That is the primary overall goal of this book.

The specific goal of the present chapter is to provide an overview of the rest of the book as well as describe the benefits of taking a developmental

approach to studying these propensities. In the next two sections, this overview and a description of a developmental approach are provided.

OVERVIEW OF THE BOOK

The chapters in this book are organized into four logically sequenced parts. Part I includes two chapters on introductory or foundational matters: the present overview chapter and Chapter 2 that focuses on developmental neuroscience (mind–brain connections and brain development). Part II includes six chapters that focus on domain-general theories of learning (Chapter 3), the nature and development of memory (Chapter 4), the nature and development of motivation (Chapter 5), executive function and self-regulation (Chapter 6), intelligence, aptitude, and expertise (Chapter 7), and spoken language competence (Chapter 8). The information in Chapters 3–8 is relevant to the learning of any subject area, so regardless of whether children are about to learn key concepts in math, science, or history, these chapters help teachers answer questions such as "Why do children fail to understand this topic?" and "Why do students forget information between one year and the next?"

Because this book is specifically geared toward teachers, the chapters in Part III might be considered the core chapters. Unlike the theories in Part II that are applicable to any subject area (i.e., they are "domain-general"), the theories and findings in Part III are more domain-specific and focus on the subject areas and skills taught in most elementary, middle, and high schools. In particular, the subject areas include reading (Chapters 9 and 10), writing (Chapter 11), math (Chapter 12), scientific reasoning (Chapter 13), and history (Chapter 14).

Another way to think of the information presented in Chapters 3–14 is to consider the fact that if (1) we were trying to predict which students will show the highest level of achievement in some subject area (e.g., math) at the end of the school year, (2) had measures of the constructs in the domain-general chapters in Part II (e.g., working memory), and (3) had measures of student's initial skill level in the subjects presented in Chapters 9–14, we would be able to predict each student's end-of-year achievement level in each subject area with a great deal of accuracy. However, it is also the case that other factors besides the factors presented in Chapters 3–14 are determinative of achievement.

The final part of the book is the last chapter in Part IV (Chapter 15). To have a more refined understanding of who learns in school and why, we also need to consider socioeconomic differences in achievement and cross-cultural differences in achievement and motivation. Chapter 15 includes a discussion of sociocultural factors that provides a more complete understanding of school-related learning trajectories than if this discussion were omitted and it also introduces the opportunity–propensity model

of achievement. Although it is not essential that the chapters be read in sequence, there is a logic to reading about domain-general issues first, specific subject areas second, and sociocultural issues third.

THE BENEFITS OF TAKING A DEVELOPMENTAL PERSPECTIVE

A central premise of scholars in fields such as developmental psychology and human development is that important insights into people can be gained by viewing them in a developmental perspective. In contrast to cataloging the skills, dispositions, and social relationships that adults have at a particular time and linking these characteristics to current levels of functioning, developmental scientists try to situate the current state of propensities within a developmental trajectory that also specifies where a person "has been" and where they "seem to be going" next. Teachers of a particular grade level can appreciate this perspective because they are the ones who inherit a cohort of students from a prior grade and think about what they need to do to get these students ready for the next grade. When a current cohort, as a group, seems to have a particular problem understanding a key concept that should have been initially covered and mastered in a previous grade, it is natural to wonder how they were taught in that grade (or if the prerequisites for that concept had been covered at all). Similarly, if cohort after cohort seems to be particularly anxious about learning skills in a particular domain (e.g., science), it is natural to wonder if they had unpleasant experiences when they learned that subject in prior grades. So, knowing where students "have been" can provide useful insights into their current state.

But knowing where they are going next in the curriculum is also important. Most curricula are sequenced for a reason. Some topics are foundational for later topics. Some topics are easier for children to understand than others because they are more familiar or less abstract. If we arrange a set of skills into a developmental sequence (fewer skills to more skills, lower- level skills to higher-level skills, less proficiency to more proficiency), and chart this sequence as a graph, we can view the progression as a *developmental trajectory*. When children are getting better and better at some ability (e.g., writing, playing the piano), this is typically what we mean by *development*. However, research shows that individual children experience a range of trajectories, some more positive than others. Teachers need to know what the more positive trajectories look like, so they can help get children on these trajectories as opposed to getting them off-track or slowing down their progress.

Developmental scientists are particularly prone to thinking of any skill or disposition as being on a trajectory. Skills and disposition often change over time, often for the better but sometimes for the worse. Developmental

scientists also like to zoom in on parts of the trajectory and take "snapshots" or *developmental states* of the skill or disposition at particular points in time. For example, they might assess the level of some skill at ages 5, 7, and 9. These snapshots or developmental states (expressed as scores on some test) can then be plotted on a graph that represents the average trajectory of the skill between ages 5 and 9.

Developmental scientists are not only concerned with describing the development of skills and dispositions in terms of a sequence of developmental states, but also interested in explaining how and why one state (e.g., skill level at age 5) gets transformed into the next state in the sequence (e.g., skill level at age 7). In other words, they develop theories that explain changes or the sequence of states over time. These theories posit so-called *developmental mechanisms* that explain how and why skills or dispositions change over time in the manner that they do (Klahr & MacWhinney, 1998). Particularly useful theories explain why skills change more rapidly in some children than others, or why some trajectories have a positive slope (things get better) while others have a negative slope (things get worse). One example of a developmental mechanism that could explain increases in skill is practice. As will be discussed in Chapter 7, people who attain the highest levels of expertise in some domain (e.g., chess playing, sports, music) practice an average of 3.5 hours per day. People who practice less attain lower levels of proficiency. So, if one were to take a snapshot of the average skill level at Time 1 for a group of learners, then take another snapshot at Time 2, and finally measure the amount of practice each student engaged in, we could explain why some showed a steeper learning curve (i.e., learned faster) than others using the developmental mechanism of practice.

It is in this way that a developmental perspective not only provides the snapshots of skill development so that teachers can see where students have been and where they are going, but also provides insight into developmental mechanisms that explain how to create the more optimal trajectories. Instruction should be designed to take advantage of, or harness, developmental mechanisms that have been identified in developmental theories, if doing so is possible. Teachers can create opportunities for practice and thereby harness that developmental mechanism, but other developmental mechanisms happen somewhat independently of a teacher's actions. For example, some developmental scientists argue that brain maturation is a developmental mechanism that explains why certain abilities improve over time (e.g., Steinberg, 2008). Teachers obviously cannot control or harness brain maturation. That said, as we will learn in Chapter 2, experience can affect brain development.

Another important way that a developmental perspective should frame considerations of student learning and classroom instruction is that, for about the last 20 years, there has been a tendency among faculty in colleges of education and psychology departments to counteract earlier arguments

that younger children are often not "ready" to understand a topic. At one time, many teacher educators assumed that waiting to teach something until children were ready was a major implication of Piaget's theory (see Chapter 3). At the same time, there was also a long-standing "reading readiness" view about waiting to teach anything about reading until children were about 6.5 years old (see Chapter 9, on beginning reading skills). Critics of Piaget's theory argued that he underestimated children's skills, and teachers unnecessarily taught children basic skills first (e.g., sounding out letters) before they taught them higher order skills (e.g., comprehension). The argument became that we should instead examine how skilled performers in some discipline (e.g., adult readers, practicing mathematicians, practicing scientists, practicing historians) carry out their work or perform tasks, and teach children to emulate them. The problem with the latter view is that novices do not really understand what experts are doing. Education faculty and psychologists soon discovered that perhaps you do want to have children, for example, understand whole numbers before you get them to understand rational numbers, negative integers, or algebra (see Chapter 12, on mathematics learning). Now there is a clear emphasis on creating *developmental progressions* that lay out precursor concepts and skills and all the subsequent skills that build on these precursor or foundational skills (Lehrer & Schauble, 2015). Doing so is consistent with a developmental perspective.

In Chapters 3–14, the goal is to not only chart the development domain-specific and domain-general propensities (listing the sequence of developmental states) but also describe theories that posit developmental mechanisms that explain how and why skills and dispositions change over time in both positive and negative ways. These mechanisms will be directly linked to teaching strategies when they are in fact under the control of teachers.

It is important to note how different it is to think of teachers as "facilitators of development" as opposed to "information providers." When teachers think of their job as merely covering the content in the required curriculum and think of students as receptacles into which this information can be "poured," they are not apt to promote development as described in this chapter. There would be no effort to understand what students know at the beginning of the year so that they can adjust up or down what they are about to present. Rather, they would just cover the same content regardless of what students know. Similarly, they might be puzzled as to why some students struggle. In addition, they might likewise cover content (because it should be covered) rather than understand where students are in the developmental sequence for some skill and where they should be going next to keep progressing in the appropriate manner.

It is further worth noting that the mandated curriculum of a school district may take into account the idea of an optimal developmental

progression for some skill, but it may not. It is often the case that scholars in academia challenge the prevailing wisdom of what should be taught in school and how. Over the past 20 years, scholars in multiple fields have argued that the endpoint of instruction should be the acquisition of the skills and dispositions of highly skilled individuals or professionals in a given field such as reading, mathematics, science, or history. What kinds of skills and attitudes do these individuals have? We will see regularly in this book that the ideal set of skills in each of the fields of reading, math, and so on are rarely mastered by students by the time they reach the end of high school. A final goal of this book is to foster a different understanding of the endpoint of development than what seems to be fostered in standard curricula.

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