Human Development

Article

Human Development 2025;69:158–169
DOI: 10.1159/000545251

Received: November 5, 2024
Accepted: March 7, 2025
Published online: March 18, 2025

Developmental Imagination: Teaching Students to Think Like a Developmentalist

Kendra Thomas[a] Kathleen Stassen Berger[b]

[a]Hope College, Holland, MI, USA; [b]Bronx Community College, City University of New York, New York, NY, USA

Keywords
Critical thinking · Developmental psychology · Lifespan course · Interleaving · Relational developmental systems

Abstract
The purpose of the undergraduate lifespan course (often required for psychology, education, and nursing majors) might be to teach students to think like a developmentalist. Students often fail to transfer the vast curriculum to their multiple professional domains. Moreover, students frequently maintain mechanistic assumptions, not grasping the essence of developmental science. Lifespan courses should be taught from a relational developmental systems metatheory to reflect current developmental science. This article explains that need and offers a pedagogical strategy to build critical thinking and inquiry skills. The goal was to equip students to transfer and apply this knowledge to their diverse professional domains and future lives. Advancing the teaching of developmental science is key to advancing the field. We propose five thinking maxims specific to human development that can be explicitly interwoven in the lifespan curriculum to help students learn to think like a developmentalist. These are sensitivities vary; combinations differ; risks and protections interact; effects lag and cascade; and context matters. These maxims are supported by developmental science and can be easily infused in the course (e.g., through lecture slides, assignments) to help students complete the course with a pocket guide to lifespan development that they will carry lifelong.

Developmental Imagination: Teaching Students to Think Like a Developmentalist

Most psychology, nursing, and education majors require students to take a lifespan developmental psychology course. This course typically goes from conception to death, glimpsing the breadth of developmental science. The course is where preservice teachers learn about the adolescent brain and puberty. It might be the only class future nurses have grief in the dying process or about how different ages and cultures confront death. This course is the main venue in the college curriculum to debunk myths about the brain, or attachment, or aging, which everyone, no matter what their future professional or family situation, needs to know.

But, as two professionals who have taught human development for decades, we know that some of our students do not carry their learning from this class forward. Here, we describe a scaffold that might allow their developmental imagination to endure.

karger@karger.com
www.karger.com/hde

Correspondence to:
Kendra Thomas, thomas@hope.edu

Research shows that college students may not develop critical thinking tools to consider new problems (Abrami et al., 2015) and may fail to transfer principles outside the classroom (Fries et al., 2021; van Peppen et al., 2021). For example, students in an undergraduate lifespan course learn about epigenetics, the gut microbiome, and gene-environment interactions. Students may pass the course but fail to identify the fallacy of a genetic reductionist news headline the very next day, much less comprehend the implications of a political debate years hence.

Human development is context-specific and contexts change quickly. Current students will not be raising children, treating patients, or educating students in the same context in which they grew up. College students will be leaders in professions that do not yet exist. Students need organized, transferable thinking strategies based on developmental science to solve new problems with little scientific data (Halpern & Dunn, 2021). That will prepare them to analyze issues that do not yet have scientific consensus. For example, we will never have sufficient longitudinal data on the effects of newest technologies or viruses. Future professionals need a broad foundational knowledge that brings intellectual structure to the uncertainty and diversity of human experience.

In this article, we propose that the purpose of the undergraduate lifespan course is to teach students to think like developmentalists: nurturing the developmental imagination. We outline the scientific assumptions in which the developmental imagination might be rooted. We believe that advancing the teaching of human development is crucial for advancing the field.

Second, we share a pedagogical strategy developed by one of us (Thomas) and welcomed and honed by the other (Berger), both with many years of teaching experience. This strategy is specific enough to be applied in every classroom, yet broad enough to be tailored by each educator. We invite others to engage, build upon, and improve this approach to advance the scholarship of human development.

Developmental Imagination

In 1959, sociologist C. Wright Mills wrote about the *sociological imagination* (Mills, 1959). He proposed a framework for understanding the influence of broad social structures. Introductory sociology textbooks often reference this concept to teach students how to consider the historical contexts and forces that affect our social lives.

Inspired by Mills, we tell our students about the "developmental imagination." The study of human development involves a level of uncertainty that should be embraced, not avoided (Van Geert & de Ruiter, 2022). Thus, one of the central learning goals of a lifespan development course should be to teach students to think like developmentalists and imagine the expansive dynamics that contribute to individual development. A person lacking developmental imagination might lead to catastrophizing every hardship ("their lives are ruined") or glossing over human suffering ("they'll be fine"). Students do not enroll in an undergraduate lifespan development class as empty slates. Beyond their personal experiences, they have heard of many "studies" or "theories" (trustworthy or illegitimate) that have guided their assumptions of human development. For example, psychological research is often trivialized in the news. Reductionist headlines in blogs, social media reels, and even reputable news sources often undermine critical thinking. College students are coming of age at a time of social polarization, where many influencers try to convince them that their way is the best. Parenting influencers showcase the "fail-proof" potty training method or their "parenting hack" for tweens. These trends are built on a sense of superiority or outrage, often undermining wisdom passed down within families or communities. The developmental psychology classroom can equip students not to be at the mercy of click-bait headlines when they raise children, make consumer decisions, or implement best business practices.

Students must learn to identify what is not being discussed. For example, when every podcast on ADHD is focused on testing scores and biased diagnoses, students should ask about longitudinal data and contextual differences. When every news article about immigrants and ethnic minorities focuses on adversity and risk factors, students should identify the community's assets and protective factors. When every blog is talking about the teenage mental health crisis, developmental science students should ask about differential susceptibility and compounding risk factors. Thus, students need a shorthanded way of remembering key concepts of developmental science so they can brainstorm beyond their newsfeeds. A developmental imagination can scaffold students to ask good questions and identify logical fallacies.

An undergraduate lifespan course will not equip any college student with the skill to diagnose an attachment disorder, design an educational intervention, or counsel families in crisis. But it could make them more curious and compassionate, building their capacity to imagine

others' lives and problem-solve. We seek to educate for wisdom, not just information (Baltes & Staudinger, 2000; Ferrari & Kim, 2019).

(Re)Building Developmental Science Assumptions

A "developmental imagination" has to be guided by solid scientific assumptions. Much past scientific research in the biological and social sciences is rooted in a substance-oriented ontology – a philosophical framework that considers entities or objects as distinct from an individual essence. For example, intelligence as innate, personality as inborn, or mind as separate from body – all common misconceptions.

However, life is dynamic, unpredictable, and uncertain. Every phenomenon is a complex fusion of many contributing forces. Thus, in contrast with a substance-oriented ontology, a relational ontology frames the self as shaped by the relations between many dynamic entities, mutually influencing each other. For example, DNA is not separate from the environment ("nature × nurture"). Instead, the epigenome orchestrates how fragments of DNA are encoded into proteins based on countless environmental cues (Immordino-Yang et al., 2019). Some scientists have argued that the replication crisis in psychology happened because of a substance-oriented ontology, assuming the stability of people and undermining the dynamic and contextual nature of human behavior and development (Van Geert & de Ruiter, 2022).

Developmental science has increasingly embraced relational developmental systems metatheory (Lerner & Lerner, 2019; Overton, 2013; Witherington et al., 2018), emphasizing life's multidirectional plasticity (Baltes et al., 1999). Most things are multi-caused, multi-maintained, and part of a dynamic system. By this metatheory, faculty should not present students with false dichotomies such as mind versus body, nature versus nurture, stability versus instability, or emotion versus reason (Overton, 2013). Intelligence, personality, morality, and relationships cannot be reduced to lists of causes or traits. Humans build their environments, which in turn shape the people they become. Humans are biologically cultural (Rogoff, 2003; 2024). Human development is inherently active, self-organizing, nonlinear, and adaptive (Lerner & Lerner, 2019; Osher et al., 2021). Genes cannot be conceptually separate from the environment because the former is regulated by the latter (Immordino-Yang et al., 2019; Lerner & Overton, 2017).

Although relational developmental systems metatheory is widely accepted among researchers of human development, it has not been well disseminated among practitioners (Budwig & Alendander, 2021; Witherington, 2021). For dissemination, faculty should be understood as practitioners in the field (Budwig & Alexander, 2021). Thus, advancing the teaching of human development is progress to the whole field.

A substance-oriented ontology is rarely explicitly addressed or taught in the developmental psychology course. Thus, its assumptions evade critique and silently influence generations of professionals. The discipline of human development should seek ways to advance education, taking the same constructivist approach to the classroom and acknowledging the learner as a whole person (Budwig & Alexander, 2021). Education should help students identify patterns, transfer their skills to real-life settings, and remember content years later in the clinic, classroom, or office. A relational-ontological pedagogy should make knowledge applicable and long-lasting.

The lifespan development course should help students unlearn a reductionist, mechanistic view of people. Developmental science has moved beyond theories that compare humans to machines (Narvaez et al., 2022), such as Freud's steam engine metaphor of aggression (Sturmey, 2022) or the photographic computer file of memory (Bongard & Levine, 2021), or the static blueprints of genes (Reynolds, 2022). The metaphors served a purpose, but science outgrew them. Yet, students' lay theories about human development often have ill-fitting assumptions from physics and computer science.

There is no way to know a newborn baby's future self. If you know her culture and family history, you can presume something about her genetic makeup, language, and context. Yet, there will be new technologies, relationships, viruses, and life-saving treatments beyond our understanding. There are environmental exposures that will influence her genomic expression through epigenetics, accentuating her uniqueness even if she is a monozygotic twin. Human plasticity is an essential outcome of the evolutionary process (Narvaez et al., 2022) and one's potential cannot be known in advance (Cantor et al., 2021). The vastness lends itself to the idea of a developmental imagination, inviting students to gaze at uncertainty with creativity, not paralysis.

Education and nursing majors (who take lifespan development courses in college) will face challenging classrooms, irrational bureaucrats, and defiant students and patients. To support wise decision-making, professionals must view the whole person with curiosity, care, and strong but flexible view of developmental

science. Professionals' developmental imagination can guide the questions they ask during triage or assessment.

Infusing a Developmental Imagination in the Classroom

One of APA's goals in psychology education is scientific inquiry and critical thinking (Mueller et al., 2020). Syllabi often claim these goals. Most teachers think their classes promote critical thinking skills, but they report that their strategies are implicit and insufficient (Bellaera et al., 2021). Even when professors model critical thinking, students struggle to reproduce these skills independently and novices especially struggle with inquiry.

Thinking strategies should be taught for knowledge transfer and long-term retention (Fries et al., 2021). Most college courses lack a systematic design to prepare students to think critically (Tiruneh et al., 2018). Teaching students to inquire is difficult and goes beyond learning to "list" or "define." Professors expect students to ask meaningful questions, but few are equipped with discipline-specific strategies on how to inquire in their discipline (Budwig & Alexander, 2020). To close the gap between classroom practice and professional knowledge, professors need to infuse critical thinking and inquiry strategies into course content. Critical thinking can be both general and content-specific (Abrami et al., 2015).

One effective way to implement critical thinking is by using the infusion method (Abrami et al., 2008; Tiruneh et al., 2018). Thus, students learn discipline-specific thinking strategies through course content, and then practice it continuously in assignments, discussions, and lectures (Edwards, 2023). Courses in research methods teach maxims like "correlation is not causation." That memorable phrase is interleaved throughout the course, helping students understand confounding variables, external validity, and regression analyses.

"Correlation is not causation" is easily transferable outside the classroom. Students consider alternative explanations and think like a scientist. Similarly, we propose to infuse developmental science heuristics to foster critical thinking and transfer beyond the classroom.

The students who take the undergraduate course, lifespan development, have many majors and a wide variety of professional aspirations. That makes it hard for faculty to address all the professional applications of developmental science. Moreover, some nursing and education curriculums are shifting away from requiring the course, motivated to reduce reliance on other departments or streamline the courses to increase graduation rates. Thus, developmental science (and its education) should seriously reflect on and advocate for its value for these professions. Students need tools to reason in various everyday contexts. Teaching students from various majors how to think like a developmentalist could better infuse the advancements of our discipline into practice. We propose teaching five cognitive strategies that could guide student inquiry and scaffold students going into diverse fields.

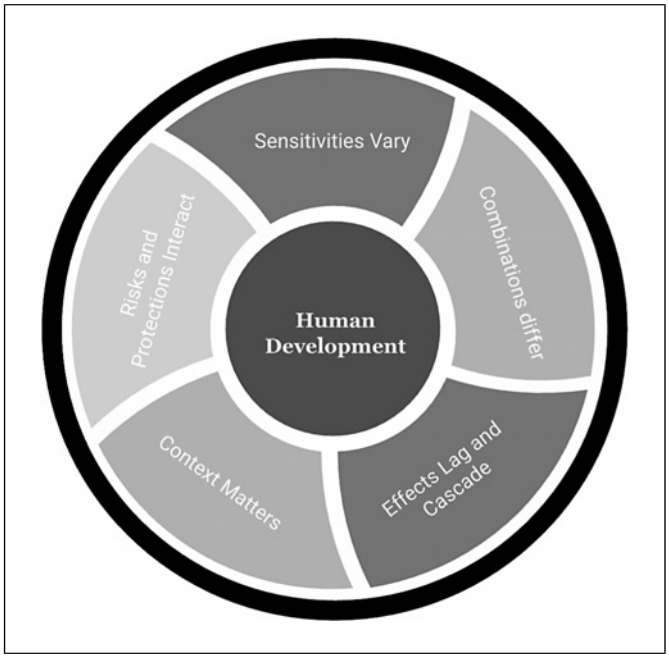

Fig. 1. Five thinking strategies to infuse in the teaching of developmental science.

Fries and colleagues suggest that the best way to teach for transfer is to have students practice connecting new knowledge to a deep knowledge base (Fries et al., 2021). Lifespan development courses can continuously connect weekly lectures and assignments to these five strategies. Interleaved practice is one of the best strategies to retain and transfer knowledge (Taylor & Rohrer, 2010; van Peppen et al., 2021). The five developmental science maxims proposed advance content-specific critical thinking and inquiry by providing an underlying memorable structure to the course. These five are interdependent and can converge on the same phenomenon, like five photographic angles. See Figure 1.

These five are easily infused in the curriculum, allowing a structure for students to organize patterns between topics and connectivity to their knowledge base.

Attachment, executive function, media, sexuality, and life satisfaction are topics in the lifespan curriculum that all connect to the five strategies. By infusing and interleaving these five memorable phrases in the course, we can teach students to transfer the underlying principles within the discipline: developmental science and learning science walking hand-in-hand.

Our five strategies to teach students to think like a developmentalist have been developed in the classroom, informed by our research and experience, a focus group, and many conversations with colleagues who also teach lifespan development (see Acknowledgments). These five strategies are as follows:

1. Sensitivities Vary (between People and across Time)

Students easily understand that people are unique. However, they need guidelines for how people differ. This maxim concerns the principles of plasticity and differential susceptibility. Plasticity can also be misunderstood or be used to gloss over developmental hazards. For example, most students have heard (or said) "children are resilient." But research shows that some life seasons are more vulnerable than others (sensitive periods), and some children are more sensitive than others (differential susceptibility).

One of the big themes of developmental science is that lifespan timing matters. For example, days 20–36 post-conception are critical for fetal limb growth – as was evident in the tragedy of thalidomide prescriptions (Vargesson, 2015). The first years of life are sensitive for language learning (Zhao & Kuhl, 2022). Adolescence is a sensitive period for brain development (Choudhury et al., 2023) and spiritual development (Riveros & Immordino-Yang, 2021). Late adulthood is often a time to reflect on life purpose and legacy transmission (Anderson et al., 2022). Developmental neuroscience reveals that each network and region of the brain has a distinct schedule for synaptogenesis and synaptic pruning. The visual cortex develops early but is dependent on sensory visual stimulation (Pedersini et al., 2023). Fast mapping vocabulary occurs in early childhood with the rapid strengthening of synapses related to language (Constant et al., 2023). *Sensitivities vary* reminds students about the developmental sensitivities and importance of order and timing.

Differential susceptibility is often explained in the lifespan development curriculum by noting that some people are like orchids (context and care-sensitive, but lovely in the right conditions) and others like dandelions (growing in almost any situation; Ellis & Boyce, 2008; Laurent, 2014). The "sensitivities vary" heuristic goes beyond orchids and dandelions. Some individuals are more sensitive to some things at sometimes (Zhang et al., 2023). The strategy echoes the specificity principle (Bornstein 2017). Sensitivities are person-specific and timing-specific, reminding students not to underestimate the heterogeneity of responses. This maxim helps students understand why a move to a new city, parental divorce, or exposure to a carcinogen might disproportionately harm one child in a family. In the lifespan course, "sensitivities vary" can be revisited throughout the semester and used in course discussions (see Table 1, for example).

2. Combinations Differ

Combinations differ are like the composition of piano keys forming new songs. The notes are unique constructed combinations with transformational (not additive) value. Students should become skeptical of single-variable explanations. Genes, parents, and contexts cannot be dissected to explain intelligence, personality, or morality. For most topics in a lifespan development course, variables are multi-caused and multi-maintained. In human development, causality is a fusion of genes, behavior, environment, and brain development (Gottlieb & Halpern, 2002). Thus, students should learn to look for significant combinations in developmental pathways. Human development is not the sum of all its parts. Life is dynamic. Developmental scientists have suggested moving toward verbs like fusion and merge (Lerner & Overton, 2017). The heuristic "combinations differ" is meant to help students get past a two-dimensional understanding of variables because different combinations lead to different outcomes. Students learn about epigenetics, gene-environment interactions, and gene-gene interactions (thousands of genes and environmental cues). Some genes only influence psychological functioning in the presence of other genes (Garvert et al., 2022). The child of tall parents will grow tall only when paired with adequate nutrition in early childhood.

An example of this *combinations differ* that can be used in the classroom is Chawner and Filippetti's (2024) developmental model of emotional eating. They posit that the different combinations of variables (food availability, stress, structure, routine, family eating habits, temperament, genetics, emotion regulation) lead to under-eating or overeating or different subtypes of malnutrition, with lifelong consequences for brain development and health.

Another example is teaching theory of mind, a staple of the contemporary developmental psychology curriculum. Telling lies in early childhood is sometimes framed as a developmental milestone because it requires the ability to consider others' thoughts. One study found that cognitive

Table 1. Thinking strategies in action

Thinking strategies	Application to the social media – mental health connection
Sensitivities vary	The averaged effect can mask individual and developmental sensitivities. Many people benefit or are only mildly affected by social media, but sensitivities vary across time and between people. Adolescent girls are particularly sensitive to harm from social media. For that subgroup, the effect sizes are larger. Broad statements in the media gloss over known differences.
Combinations differ	Most phenomena in human development are multi-caused and multi-maintained. To avoid a reductionist view of any single cause, students considered these combinations. An eating disorder might be multi-caused by the combination of a social media algorithm that emphasizes physical appearance combined with a highly controlled home eating environment. An adolescent gambling addiction might emerge from the fusion of a genetic predisposition combined with a lot of free time at an empty home and access to gambling sites.
Risks and protections interact	Scientists debate the use of the word "cause" connecting social media and adolescent mental health. In previous class discussions, that word pushed students into yes/no thinking, often generating paralysis or highlighting disagreements between peers. For this discussion, students broke down the phenomena by risks and protections. Several hours of social media (risk) before bed (risk) interferes with sleep (risk). But free play (protective factor) outside (protective factor) with friends (protective factor) safeguards healthy development.
Effects lag and cascade	Some scientists are concerned that young adult's mental health is worst among those who got smartphones earlier. Other researchers have investigated if the youth mental health crisis of today is a delayed effect of lack of unstructured play and outdoor time in early childhood.
Context matters	In the Covid-19 pandemic was a specific historical/global health context. Social media was the only way some adolescents could connect and was a lifeline of well-being for adolescents that were isolated from friends. Different social media platforms are different contexts. TikTok is not the same context as Facebook or Instagram.

development predicted lying behavior when parents were harsh. But, when parents were warm and supportive, their children were less likely to lie even when they had advanced theory of mind. Different parenting practices and cognitive maturation combinations meant different outcomes in child behavior (Ding et al., 2023). This scaffold allows students to take a multidimensional perspective of developmental milestones and teach students the underlying structure of inquiry in the discipline.

3. Risks and Protections Interact

The lifespan curriculum discusses risk factors in every chapter: socioeconomic status, adverse child events (ACEs), disease, genetic predisposition, peer substance abuse, neighborhood violence, environmental toxins, and loneliness. Students often struggle to understand the complexity of causality in human development, not differentiating between necessary, sufficient, or contributing causes. Moreover, they often fail to see causes as continuous variables and instead think of them as nominal variables. For example, alcohol consumption during pregnancy causes fetal alcohol syndrome. Yet a student might think of someone they know who drank during pregnancy, and the child was at the top of their class. Students sometimes grab anecdotal examples and dismiss scientific evidence.

When social scientists investigate causal claims, they quantify risk and measure specific outcomes – when, how much, and which variables? Students are better served by learning to quantify risk and leverage protections. For critical thinking, students should learn to evaluate the degree of risk (Facione 2011). For example, sugar is a well-established cause of caries in childhood, which has long-lasting whole-body health implications (Cherian et al., 2023). However, researchers conceptualize sugar as a risk factor that can be quantified. Moreover, the effect of sugar is counteracted by protective factors and preventative measures.

If we equip students to see only risks and setbacks, we are not serving them well. Students must learn to identify developmental assets. Relationships are crucial for human development (Osher et al., 2021). One of the most

consistent findings in longitudinal research on child resilience is the significance of having supportive relationships (Hopper & Cosco, 2023; Lerner et al., 2023). Margaret Beale Spencer (2024) discusses the inescapable vulnerability of human development. She considers the "net vulnerability" of each individual, which balances risk factors and protective factors – both of which are linked to context and culture. Families, schools, and faith institutions often serve as sources of support and protection. A trusted adult can mitigate the negative effects of ACEs (Ashton et al., 2021). For instance, a study involving nearly 2,000 Ghanaian kindergarteners quantified the cumulative risks and protective factors, revealing that high-quality teacher interactions were significant even amid numerous cumulative risks (Ibejwe-Okafor & Wolf, 2021).

As Spencer has repeatedly stressed in her scholarship, the discipline of human development has disproportionately focused on risk and negative outcomes, especially in communities of color. The memorable maxim, risks, and protections interact, helps student develop a cognitive habit of considering both. Cultural assets should be salient in the lifespan classroom, showcasing the best of human development. For example, critical consciousness emerges through the self-awareness of socioeconomic position (Freire, 1970). When parents wisely prepare their children of color for discrimination, they can equip them with the critical consciousness needed to effect positive social change (Anderson et al., 2022; Bañales et al., 2021). Youth civic engagement can be a protective coping response to discrimination and racism (Hope & Spencer, 2017). No hardship should be romanticized or pitied; instead, every caring adult, close friend, and supportive network should be highlighted.

4. Effects Lag and Cascade

In our experience, students are accustomed to noticing and contemplating immediate effects. Noting the quick and obvious outcomes of a medication, intervention, or toxin is easy. It is hard to connect the dots when the outcomes are far in the future. For example, consider a prenatal viral infection that decreases mathematical ability in elementary school, or early radiation exposure that causes cancer decades later (Navarrete-Meneses et al., 2024). The 1919 flu affected the employment of exposed babies when they were in mid-life.

Teaching students in developmental science classes to consider the long term is crucial. Yet, determining lagged outcomes requires expensive and time-consuming longitudinal research. The research must be based on diverse enough samples to generalize to others and measure enough variables to rule out alternative explanations for the outcomes measured. For instance, the lifespan curriculum often highlights the importance of early childhood education and debates on its long-lasting outcomes (Burchinal et al., 2024; Durkin et al., 2022; Gray-Lobe et al., 2023). One study shows that preschool and Head Start programs are linked with higher education enrollment decades later (Gormley et al., 2023). Some developmental scientists posit the current mental health crisis can be traced to a generational parenting shift that changed child play and cascaded into youth well-being (Gray et al., 2023). The long-term effects of Covid-19 for students who were in high school are now being studied.

Some of today's college students will become superintendents who make decisions about elementary school recess schedules thinking about high school academic outcomes. Or they may be policymakers who will make funding decisions on scientific research. The developmental imagination will remind them that some benefits or harms only emerge in the long term.

Sometimes, effects appear dormant, but other times, the long-lasting effects are because of a cascade of events that can be traced back decades, constructing a positive or negative chain of events. In a prospective longitudinal study, researchers found that ACEs predicted health biomarkers assessed in mid-life (Bourassa et al., 2023) and gray matter (Gehred et al., 2021). Researchers concluded this was a biological embedding of ACEs that cascaded throughout their lives.

The maxim "effects lag and cascade" can be interleaved throughout the curriculum when showcasing the continuity of infant attachment, the anti-phobic effects of childhood play, the connection between adolescent nutrition and mid-life osteoporosis, and the neurological build-up and cascade of Alzheimer's disease. Lifespan textbooks and courses have multiple examples of long-lasting outcomes, but the short phrase "effects lag and cascade" reminds students to be wary of premature scientific conclusions. Students can hypothesize that an industrial chemical or a virus can have unnoticed effects for decades, as with the water in Flint Michigan or military deployment in World War II. Students will not be surprised to learn that early childhood education and infant nutrition have lasting societal benefits. To think like a developmentalist, students learn to take the long view without jumping to conclusions.

5. Context Matters

"Knowledge disembodied from the context is not basic knowledge" (Lerner et al., 2000 p. 25). This heuristic echoes Bornstein's specificity principle (Bornstein 2017;

Lerner & Bornstein, 2021), Bronfenbrenner's bioecological systems theory (Bronfenbrenner & Morris, 2007), and Vygotsky's sociocultural theory (Vygotsky, 1997). Barbara Rogoff extended Vygotsky's work and explained that children are inherently connected to their context. Rogoff (2024) explains that we are biologically cultural; learning is mutually constituted between person and context.

Baltes and Staudinger (2000) believed that identifying the dynamic role of context throughout the lifespan is one of the main metacognitive components of wisdom. People develop within specific historical, cultural, and developmental contexts. For example, physical environments drive how toddlers learn words (Breitfeld & Saffran, 2024). The word context includes everything from the direct physical environment to sociocultural values. William Greenough's work (1987) on experience-expectant and experience-dependent development is another example in the lifespan curriculum. Timing and order of development are shaped through context and experience.

Many college students need help identifying the pervasive nature of cultural context. The lifespan course helps students go beyond seeing culture as a series of curiosities about other people in diverse locations. The culture permeates every microsystem interaction (Coll et al., 1996; García-Coll, 2020; Velez & Spencer, 2018). Some researchers have termed this the "m(ai)crosystem" (Rogers et al., 2021). For example, how parents talked to their children about the civil rights protests in 2020 depended on the number of demonstrations in their area, their political affiliation, and their ethnic identity (Rogers et al., 2021). The world is increasingly multicultural. Thus, students must learn to identify how culture is ingrained in all processes of human development (Jensen, 2012).

Psychology and education majors enter lifespan development classes with many myths, such as "intelligence is inherited and not changeable by the environment" (Novak-Geiger, 2023). When teaching about the polygenic correlation with IQ scores, instructors can point out that this correlation is context-specific. Poorly funded schools, lack of books at home, malnutrition, and poor healthcare bring the correlation of genes and IQ down to zero (Bates et al., 2013; Turkheimer et al., 2003). The Flynn effect (often mentioned in lifespan textbooks) highlights the historical changes in the environment (healthcare, education) impact generational IQ scores, increasing the most in countries that have drastic quality-of-life improvements (Rodgers & O'Keefe, 2023). Moreover, the definition of intelligence is culturally grounded. What is considered intelligent in one culture may not be intelligent in another (Serpel, 2000; Sternberg, 2024).

Developmental science has historically decontextualized the competencies of racial and ethnic minorities (Coll et al., 1996; Spencer, 2024) and obfuscated the "complex systems of marginalization" (Velez & Spencer, 2018). For example, dementia risk is tied to one's neighborhood, even though the genetic risk for dementia is not (Reuben et al., 2024). Thus, high rates of dementia in a neighborhood are not the effects of selective migration. This "context matters" strategy can help correct this historic decontextualization of human development. Throughout the course, students can be scaffolded to realize how nature is nurtured (Immordino-Yang et al., 2019) and how development is embedded in a community, place, and moment in history.

Thinking Strategies in Action

These five maxims are intended to teach students habits of inquiry in developmental science, providing a scaffold to ask questions and interact with the uncertainty of outcomes and origins. In our experience, explicitly integrating these five phrases into the course helps us avoid being too theoretical (disconnected from the realities of temper tantrums and chronic pain) or narrowly prescriptive (reinforcing specific cultural practices). By being explicit of some patterns of human development, students have a path to comprehend their personal experiences through the structure of developmental science. Now, I describe how I (Thomas) have infused these into my course in lectures, discussions, and assignments. These strategies are presented as ideas to be freely adapted by any instructor.

I have a slide that shows all five (see Fig. 1), which I display intermittently throughout the semester. For example, for one lecture focused on preventative measures to promote healthy aging, I showed the slide and highlighted the "risks and protections interact." The figure shows the five strategies converging on human development. All five apply to healthy aging, but students practice its application by picking one (while showing all). The repetitive slides serve as interleaved practice (Taylor & Rohrer, 2010), connecting the curriculum to a broad, flexible cognitive structure (Fries et al., 2021).

In annotated bibliography assignments or short-answer essays, I have asked students to connect the findings to a strategy (increasing the depth of processing and making it more challenging for AI tools to replicate).

This tool can be an entry point for students of diverse backgrounds to connect their experiences (often not reflected in the curriculum) to class discussion. The explicit themes provide a structure to welcome diversity.

If students learn to think like a developmentalist, they will learn higher order strategies to digest multidimensional problems. To illustrate this, I used these five strategies (which students had already been taught) as a prompt to get students to consider adolescent mental health and social media without reductionism or catastrophizing. Many thoughtful scholars are collecting data and debating this issue; it is a ripe topic for academic discussion. Students have read some empirical articles on the subject. I asked students to consider each maxim, discuss with their peers, and practice their developmental imagination. See Table 1, for a summary.

Limitations

Any phenomenon or research finding could be framed using multiple thinking strategies. Consider this example: a genetic predisposition for a disease is activated by an environmental toxin. This phenomenon could be used to explain how: sensitivities vary (one person is more vulnerable to that toxin than the other); combinations differ (a specific gene-environment combination); risks and protections interact (preventative healthcare); effects lag and cascade (a disease may emerge slowly); and context matters (neighborhood exposure and national policies).

Given the assumptions of relational developmental systems metatheory, it is unlikely that any list of maxims of developmental science would be disconnected from each other. The goal is not to have completely distinct thinking strategies. In short, these maxims offer an educational scaffold for praxis, especially useful for novices in a developmental science course. Any valuable idea should improve and evolve. We do not propose that these five heuristics are exhaustive, distinct, or final. We offer these (imperfect) mantras to invite others to strategize and implement developmental science into the classroom.

Conclusion

A developmental imagination could attune professionals to an individual's specific needs and vulnerabilities and the context in which they live. Teachers, nurses, caregivers, social workers, and mental health professionals must assess and mitigate risks with strong relationships and preventative strategies. The developmental imagination will help students consider the long-term impact of today's choices without succumbing to determinism or assuming the worst. Lastly, the developmental imagination needs to consider the specifics of the context, knowing that development is embedded in many simultaneous systems. By interleaving the thinking strategies in the curriculum, students can graduate from the course with a pocket guide to human development. Interleaving the five statements builds a transferable multidimensional cognitive structure: A developmental imagination.

Acknowledgments

We acknowledge those who participated in the focus group discussions and collaborated with us as we sought feedback on the thinking strategies. In alphabetical order: Guadalupe Espinoza, Kimberly Glackin, Sam Hardy, Sydney Johnson, Carmen Kho, Raymond Kidulf, Tom Ludwig, Winnie Mucherah, Jenny Padilla, Vaishali Raval, Hannah Schacter, Bryce Van Vleet, Gabriel Velez, Yuan Zhang, and Siman Zhao.

Statement of Ethics

There were no human subject participants in this research.

Conflict of Interest Statement

There are no conflicts of interest to report.

Funding Sources

There are no funding sources to report.

Author Contributions

Kendra Thomas devised the concept of a developmental imagination with five mantras to weave throughout the curriculum and she taught with these. She and Kathleen Berger developed the five thinking strategies collaboratively. Kendra Thomas did the majority of the writing; Kathleen Berger participated in editing.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

References

Abrami, P. C., Bernard, R. M., Borokhovski, E., Wade, A., Surkes, M. A., Tamim, R., & Zhang, D. (2008). Instructional interventions affecting critical thinking skills and dispositions: A stage 1 meta-analysis. *Review of Educational Research*, *78*(4), 1102–1134. https://doi.org/10.3102/0034654308326084

Abrami, P. C., Bernard, R. M., Borokhovski, E., Waddington, D. I., Wade, C. A., & Persson, T. (2015). Strategies for teaching students to think critically: A meta-analysis. *Review of Educational Research*, *85*(2), 275–314. https://doi.org/10.3102/0034654314551063

Anderson, K. A., Fields, N. L., Cassidy, J., & Peters-Beumer, L. (2022). Purpose in life: A reconceptualization for very late life. *Journal of Happiness Studies*, *23*(5), 2337–2348. https://doi.org/10.1007/s10902-022-00512-7

Anderson, L. A., Caughy, M. O., & Owen, M. T. (2022). "The Talk" and parenting while Black in America: Centering race, resistance, and refuge. *Journal of Black Psychology*, *48*(3-4), 475–506. https://doi.org/10.1177/00957984211034294

Ashton, K., Davies, A.R., Hughes, K., Ford, C., Cotter-Roberts, A., & Bellis, M. A. (2021). Adult support during childhood: a retrospective study of trusted adult relationships, sources of personal adult support and their association with childhood resilience resources. *BMC Psychology*, *9*(1), 101. https://doi.org/10.1186/s40359-021-00601-x

Baltes, P. B., & Staudinger, U. M. (2000). Wisdom: A metaheuristic (pragmatic) to orchestrate mind and virtue toward excellence. *American Psychologist*, *55*(1), 122–136. https://doi.org/10.1037//0003-066x.55.1.122

Baltes, P. B., Staudinger, U. M., & Lindenberger, U. (1999). Lifespan psychology: Theory and application to intellectual functioning. *Annual Review of Psychology*, *50*(1), 471–507. https://doi.org/10.1146/annurev.psych.50.1.471

Bañales, J., Hope, E. C., Rowley, S. J., & Cryer-Coupet, Q. R. (2021). Raising justice-minded youth: Parental ethnic-racial and political socialization and Black youth's critical consciousness. *Journal of Social Issues*, *77*(4), 964–986. https://doi.org/10.1111/josi.12486

Bates, T. C., Lewis, G. J., & Weiss, A. (2013). Childhood socioeconomic status amplifies genetic effects on adult intelligence. *Psychological Science*, *24*(10), 2111–2116. https://doi.org/10.1177/0956797613488394

Bellaera, L., Weinstein-Jones, Y., Ilie, S., & Baker, S. T. (2021). Critical thinking in practice: The priorities and practices of instructors teaching in higher education. *Thinking Skills and Creativity*, *41*, 100856. https://doi.org/10.1016/j.tsc.2021.100856

Bongard, J., & Levin, M. (2021). Living things are not (20th century) machines: updating mechanism metaphors in light of the modern science of machine behavior. *Frontiers in Ecology and Evolution*, *9*, 650726. https://doi.org/10.3389/fevo.2021.650726

Bornstein, M. H. (2017). The specificity principle in acculturation science. *Perspectives on Psychological Science*, *12*(1), 3–45. https://doi.org/10.1177/1745691616655997

Bourassa, K. J., Moffitt, T. E., Harrington, H., Houts, R., Poulton, R., Ramrakha, S., Rasmussen, L. J. H., Wertz, J., & Caspi, A. (2023). Childhood adversity and midlife health: Shining a light on the black box of psychosocial mechanisms. *Prevention Science*, *24*(5), 817–828. https://doi.org/10.1007/s11121-022-01431-y

Breitfeld, E., & Saffran, J. R. (2024). Early word learning is influenced by physical environments. *Child Development*, *95*(3), 962–971. https://doi.org/10.1111/cdev.14046

Bronfenbrenner, U., & Morris, P. A. (2007). The bioecological model of human development. *Handbook of Child Psychology*, *1*.

Budwig, N., & Alexander, A. (2020). A transdisciplinary approach to student learning and development in university settings. *Frontiers in Psychology*, *11*, 576250, https://doi.org/10.3389/fpsyg.2020.576250

Budwig, N., & Alexander, A. J. (2021). Exploring the conceptual frameworks guiding developmental research and practice in higher education: Some challenges for transdisciplinary work. *Human Development*, *65*(1), 1–18. https://doi.org/10.1159/000514553

Burchinal, M., Whitaker, A., Jenkins, J., Bailey, D., Watts, T., Duncan, G., & Hart, E. (2024). Unsettled science on longer-run effects of early education. *Science*, *384*(6695), 506–508. https://doi.org/10.1126/science.adn2141

Cantor, P., Lerner, R. M., Pittman, K. J., Chase, P. A., & Gomperts, N. (2021). *Whole-child development, learning, and thriving: A dynamic systems approach*. Cambridge University Press. https://doi.org/10.1017/9781108954600

Chawner, L. R., & Filippetti, M. L. (2024). A developmental model of emotional eating. *Developmental Review*, *72*, 101133. https://doi.org/10.1016/j.dr.2024.101133

Cherian, J. M., Kurian, N., Varghese, K. G., & Thomas, H. A. (2023). World Health Organization's global oral health status report: Paediatric dentistry in the spotlight. *Journal of Paediatrics and Child Health*, *59*(7), 925–926. https://doi.org/10.1111/jpc.16427

Choudhury, S., Piera Pi-Sunyer, B., & Blakemore, S. J. (2023). A neuroecosocial perspective on adolescent development. *Annual Review of Developmental Psychology*, *5*(1), 285–307. https://doi.org/10.1146/annurev-devpsych-120321-011511

Coll, C. G., Crnic, K., Lamberty, G., Wasik, B. H., Jenkins, R., Garcia, H. V., & McAdoo, H. P. (1996). An integrative model for the study of developmental competencies in minority children. *Child Development*, *67*(5), 1891–1914. https://doi.org/10.2307/1131600

Constant, M., Pulvermüller, F., & Tomasello, R. (2023). Brain-constrained neural modeling explains fast mapping of words to meaning. *Cerebral Cortex*, *33*(11), 6872–6890. https://doi.org/10.1093/cercor/bhad007

Ding, X. P., Tay, C., Goh, S. J., & Hong, R. Y. (2023). Parental warmth moderates the relation between children's lying and theory-of-mind. *International Journal of Behavioral Development*, *47*(4), 306–316. https://doi.org/10.1177/01650254231175835

Durkin, K., Lipsey, M. W., Farran, D. C., & Wiesen, S. E. (2022). Effects of a statewide pre-kindergarten program on children's achievement and behavior through sixth grade. *Developmental Psychology*, *58*(3), 470–484. https://doi.org/10.1037/dev0001301

Edwards, L. (2023). In their own words: What scholars and teachers want you to know about why and how to apply the science of learning in your academic setting. In C. E. Overson, C. M. Hakala, L. L. Kordonowy, & V. A. Benassi (Eds), *Society for the Teaching of Psychology* (pp. 511–520). https://teachpsych.org/ebooks/itow

Ellis, B. J., & Boyce, W. T. (2008). Biological sensitivity to context. *Current Directions in Psychological Science*, *17*(3), 183–187. https://doi.org/10.1111/j.1467-8721.2008.00571.x

Facione, P. A. (2011). Critical thinking: What it is and why it counts. *Insight Assessment*, *1*(1), 1–23.

Ferrari, M., & Kim, J. (2019). Educating for wisdom. In R. J. Sternberg, & J. Glück (Eds), *The Cambridge Handbook of Wisdom* (pp. 347–371). Cambridge University Press. https://doi.org/10.1017/9781108568272.017

Freire, P. (1970). Pedagogy of the oppressed. *Continuum*.

Fries, L., Son, J.Y., Givvin, K.B., & Stigler, J. W. (2021). Practicing connections: A framework to guide instructional design for developing understanding in complex domains. *Educational Psychology Review*, *33*(2), 739–762. https://doi.org/10.1007/s10648-020-09561-x

García Coll, C. (2020). Globalization, culture, and development: Are we ready for a paradigm shift?. *Human Development*, *64*(4-6), 245–249. https://doi.org/10.1159/000512903

Garvert, L., Kirchner, K., Grabe, H. J., & Van der Auwera, S. (2022). Genome-wide gene-gene interaction of the 5-HTTLPR promoter polymorphism emphasizes the important role of neuroplasticity in depression. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *119*, 110614. https://doi.org/10.1016/j.pnpbp.2022.110614

Gehred, M. Z., Knodt, A. R., Ambler, A., Bourassa, K. J., Danese, A., Elliott, M. L., Hogan, S., Ireland, D., Poulton, R., Ramrakha, S., Reuben, A., Sison, M. L., Moffitt, T. E., Hariri, A. R., & Caspi, A. (2021). Long-term neural embedding of childhood adversity in a population-representative birth cohort followed for 5 decades. *Biological Psychiatry*, *90*(3), 182–193. https://doi.org/10.1016/j.biopsych.2021.02.971

Gormley, W. T., Amadon, S., Magnuson, K., Claessens, A., & Hummel-Price, D. (2023). Universal pre-K and college enrollment: Is there a link?. *AERA Open*, *9*. https://doi.org/10.1177/23328584221147893

Gottlieb, G., & Halpern, C. T. (2002). A relational view of causality in normal and abnormal development. *Development and Psychopathology*, *14*(3), 421–435. https://doi.org/10.1017/s0954579402003024

Gray-Lobe, G., Pathak, P. A., & Walters, C. R. (2023). The long-term effects of universal preschool in Boston. *Quarterly Journal of Economics*, *138*(1), 363–411. https://doi.org/10.1093/qje/qjac036

Gray, P., Lancy, D. F., & Bjorklund, D. F. (2023). Decline in independent activity as a cause of decline in children's mental well-being: summary of the evidence. *The Journal of Pediatrics*, *260*, 113352. https://doi.org/10.1016/j.jpeds.2023.02.004

Halpern, D. F., & Dunn, D.S. (2021). Critical Thinking: A model of intelligence for solving real-world problems. *Journal of Intelligence*, *9*(2), 22. https://doi.org/10.3390/jintelligence9020022

Hope, E. C., & Spencer, M. B. (2017). Civic engagement as an adaptive coping response to conditions of inequality: An application of Phenomenological Variant of Ecological Systems Theory (PVEST). In N. J. Cabrera, & B. Leyendecker (Eds), *Handbook on Positive Development of Minority Children and Youth* (pp. 421–435). https://doi.org/10.1007/978-3-319-43645-6_25

Hopper, S., & Cosco, T. D. (2023). What can we learn about resilience from large-scale longitudinal studies? *Handbook of Resilience in Children* (pp. 85–102). Springer International Publishing.

Ibekwe-Okafor, N., & Wolf, S. (2021). Applying a cumulative risk and protective framework to assess early learning in Ghana. *Early Years*, *43*(1), 104–122. https://doi.org/10.1080/09575146.2021.1913101

Immordino-Yang, M. H., Darling-Hammond, L., & Krone, C. R. (2019). Nurturing nature: How brain development is inherently social and emotional, and what this means for education. *Educational Psychologist*, *54*(3), 185–204. https://doi.org/10.1080/00461520.2019.1633924

Jensen, L. A. (2012). Bridging universal and cultural perspectives: A vision for developmental psychology in a global world. *Child Development Perspectives*, *6*(1), 98–104. https://doi.org/10.1111/j.1750-8606.2011.00213.x

Laurent, H. K. (2014). Clarifying the contours of emotion regulation: Insights from parent–child stress research. *Child Development Perspectives*, *8*(1), 30–3. https://doi.org/10.1111/cdep.12058

Lerner, R. M., & Bornstein, M. H. (2021). Contributions of the specificity principle to theory, research, and application in the study of human development: A view of the issues. *Journal of Applied Developmental Psychology*, *75*, 101294. https://doi.org/10.1016/j.appdev.2021.101294

Lerner, R. M., & Lerner, J. V. (2019). The development of a person: A relational–developmental systems perspective.

Lerner, R. M., & Overton, W. F. (2017). Reduction to absurdity: Why epigenetics invalidates all models involving genetic reduction. *Human Development*, *60*(2-3), 107–123. https://doi.org/10.1159/000477995

Lerner, R. M., Chase, P. A., Dowling, E. M., Tirrell, J. M., Buckingham, M. H., Yu, D., Park Y, Gonçalves, C, Gansert, P, & Lerner, J. V. (2023). Resilience and positive youth development: a dynamic, relational developmental systems-based perspective. *Handbook of Resilience in Children* (pp. 337–349). Springer International Publishing. https://doi.org/10.1007/978-3-031-14728-9_18

Lerner, R. M., Fisher, C. B., & Weinberg, R. A. (2000). Applying developmental science in the 21st century: International scholarship for our times. *International Journal of Behavioral Development*, *24*(1), 24–29. https://doi.org/10.1080/016502500383430

Mills, C. W. (1959). *The sociological imagination*. Oxford University Press.

Mueller, J. F., Taylor, H. K., Brakke, K., Drysdale, M., Kelly, K., Levine, G. M., & Ronquillo-Adachi, J. (2020). Assessment of scientific inquiry and critical thinking: Measuring APA goal 2 student learning outcomes. *Teaching of Psychology*, *47*(4), 274–284. https://doi.org/10.1177/0098628320945114

Narvaez, D., Moore, D. S., Witherington, D. C., Vandiver, T. I., & Lickliter, R. (2022). Evolving evolutionary psychology. *American Psychologist*, *77*(3), 424–438. https://doi.org/10.1037/amp0000849

Navarrete-Meneses, MP, Salas-Labadía, C, Gómez-Chávez, F, & Pérez-Vera, P (2024). Environmental pollution and risk of childhood aancer: A scoping review of evidence from the last decade. *International Journal of Molecular Sciences*, *25*(6), 3284. https://doi.org/10.3390/ijms25063284

Novak-Geiger, V. (2023). Prevalence of neuromyths among psychology students: small differences to pre-service teachers. *Frontiers in Psychology*, *14*, 1139911. https://doi.org/10.3389/fpsyg.2023.1139911

Osher, D., Cantor, P., Berg, J., Steyer, L., & Rose, T. (2021). Drivers of human development: How relationships and context shape learning and development 1. *The Science of Learning and Development* (pp. 55–104). Routledge.

Overton, W. F. (2013). A new paradigm for developmental science: Relationism and relational-developmental systems. *Applied Developmental Science*, *17*(2), 94–107. https://doi.org/10.1080/10888691.2013.778717

Pedersini, C., Miller, N. P., Gandhi, T. K., Gilad-Gutnick, S., Mahajan, V., Sinha, P., & Rokers, B. (2023). White matter plasticity following cataract surgery in congenitally blind patients. *PNAS*, *120*(19), e2207025120. https://doi.org/10.1073/pnas.2207025120

Reuben, A., Richmond-Rakerd, L. S., Milne, B., Shah, D., Pearson, A., Hogan, S., Ireland, D., Keenan, R., Knodt, A. R., Melzer, T., Poulton, R., Ramrakha, S., Whitman, E. T., Hariri, A. R., Moffitt, T. E., & Caspi, A. (2024). Dementia, dementia's risk factors and premorbid brain structure are concentrated in disadvantaged areas: National register and birth-cohort geographic analyses. *Alzheimer's and Dementia*, *20*(5), 3167–3178. https://doi.org/10.1002/alz.13727

Reynolds, A. S. (2022). *Understanding metaphors in the life sciences*. Cambridge University Press.

Riveros, R., & Immordino-Yang, M.H. (2021). Toward a neuropsychology of spiritual development in adolescence. *Adolescent Research Review*, *6*(3), 323–332. https://doi.org/10.1007/s40894-021-00158-1

Rodgers, J. L., & O'Keefe, P. (2023). A synthetic theory to integrate and explain the causes of the Flynn effect: The parental executive model. *Intelligence*, *98*, 1–14. https://doi.org/10.1016/j.intell.2023.101740

Rogers, L. O., Niwa, E. Y., Chung, K., Yip, T., & Chae, D. (2021). M (ai) cro: Centering the macrosystem in human development. *Human Development*, *65*(5-6), 270–292. https://doi.org/10.1159/000519630

Rogoff, B. (2003). *The cultural nature of human development*. Oxford University Press.

Rogoff, B. (2024). Mutually consituting, fractal: Individual and cultural aspects of holistic process. *Review of Research in Education*, *47*(1), 60–83. https://doi.org/10.3102/0091732X231224666

Serpell, R. (2000). Intelligence and culture. *Handbook of Intelligence*, 549–578. https://doi.org/10.1017/cbo9780511807947.026

Spencer, M. B. (2024). Contributions to inclusive and impactful development and psychopathology science: interrogating ecology-linked vulnerability and resilience opportunities. *Development and Psychopathology*, *36*(5), 2075–2090. https://doi.org/10.1017/S0954579424000579

Sternberg, R. J. (2024). What is intelligence, really? The futile search for a Holy Grail. *Learning and Individual Differences*, *116*, 102568. https://doi.org/10.1016/j.lindif.2024.102568

Sturmey, P. (2022). Psychological and sociological theories of violence and aggression. In *Violence and aggression advances in preventing and treating violence and aggression*. Springer. https://doi.org/10.1007/978-3-031-04386-4_9

Taylor, K., & Rohrer, D. (2010). The effects of interleaved practice. *Applied Cognitive Psychology*, *24*(6), 837–848. https://doi.org/10.1002/acp.1598

Tiruneh, D.T., De Cock, M., & Elen, J. (2018). Designing learning environments for critical thinking: Examining effective instructional approaches. *International Journal of Science and Mathematics Education*, *16*(6), 1065–1089. https://doi.org/10.1007/s10763-017-9829-z

Turkheimer, E., Haley, A., Waldron, M., D'Onofrio, B., & Gottesman, I. I. (2003). Socioeconomic status modifies heritability of IQ in young children. *Psychological Science*, *14*(6), 623–628. https://doi.org/10.1046/j.0956-7976.2003.psci_1475.x

Van Geert, P., & de Ruiter, N. (2022). *Toward a process approach in psychology: Stepping into Heraclitus' river*. Cambridge University Press.

van Peppen, L. M., Verkoeijen, P. P., Kolenbrander, S. V., Heijltjes, A. E., Janssen, E. M., & van Gog, T. (2021). Learning to avoid biased reasoning: Effects of interleaved practice and worked examples. *Journal of Cognitive Psychology*, *33*(3), 304–326. https://doi.org/10.1080/20445911.2021.1890092

Vargesson, N. (2015). Thalidomide-Induced Teratogenesis: History and Mechanisms. *Birth Defects Research (Part C)*, *105*(2), 140–156. https://doi.org/10.1002/bdrc.21096

Velez, G., & Spencer, M. B. (2018). Phenomenology and intersectionality: Using PVEST as a frame for adolescent identity formation amid intersecting ecological systems of inequality. *New Directions for Child and Adolescent Development*, *2018*(161), 75–90. https://doi.org/10.1002/cad.20247

Vygotsky, L. S. (1997). *The collected works of LS Vygotsky: Problems of the theory and history of psychology* (*Vol. 3*). Springer Science & Business Media.

Witherington, D. C. (2021). Enacting the spirit of transdisciplinarity within developmental science. *Human Development*, *65*(1), 19–22. https://doi.org/10.1159/000514586

Witherington, D. C., Overton W., Lickliter R., Marshall P., & Narvaez D. (2018). Metatheory and the primacy of conceptual analysis in developmental science. *Human Development*, *61*(3),181–198, https://doi.org/10.1159/000490160

Zhang, Y., Ye, T., Yu, P., Xu, R., Chen, G., Yu, W., Song, J., Guo, Y., & Li, S. (2023). Preterm birth and term low birth weight associated with wildfire-specific PM2. 5: A cohort study in New South Wales, Australia during 2016–2019. *Environment International*, *174*, 107879. https://doi.org/10.1016/j.envint.2023.107879

Zhao, T. C., & Kuhl, P. K. (2022). Development of infants' neural speech processing and its relation to later language skills: A MEG study. *NeuroImage*, *256*, 119242. https://doi.org/10.1016/j.neuroimage.2022.119242