

# Research and Policy on Disability: Linking Special Education to Developmental Science

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## Abstract

Bridging special education (SE) and developmental science recognizes their shared focus on individual adaptation, growth, and outcomes. Adaptation continuously aligns the proclivities of students and the opportunities of their contexts. Considerations for the adaptation of students with disabilities include developmental malleability, problem behavior, intervention supports, and SE services. Policy implications center on the need to focus on the individual in context in both research and intervention, merge data from the implementation of intensive interventions and person-oriented analysis to establish comprehensive frameworks that include a focus on neurophysiological processes, and train the next generation of SE leaders in intensive interventions and applied developmental science.

## Keywords

special education, developmental science, policy, adaptation

## Tweet

Special education shares developmental science insights on students with disabilities to aid and understand their adaptation in context.

## Key Points

- Special education (SE) and developmental science both focus on individual adaptation, yet without much cross-talk. But SE illustrates applied developmental science.
- Person-oriented analysis identifies subgroups of youth who share common characteristics (e.g., learning disabilities, emotional and behavioral disorders, intellectual disabilities) and determines differences in their educational needs.
- A systems view of development is reflected in individualized educational plans that focus on the specific child and her or his ecology; the corresponding service provision that spans domains of functioning leverages these correlated constraints.
- Special educators reflect systems reorganization when they recognize a student adapting in atypical ways, and they build on such adaptations to foster the student's development.
- Individualized approaches adapt interventions, strengthened by incorporating a correlated constraints perspective and identifying neurophysiological, cognitive, contextual, and ecological factors that may moderate or contribute to their effectiveness.

## Introduction

Federal policy plays a critical role in the education and development of youth with disabilities. From the early years, the interplay between policy, research, and advances in services for students with disabilities has shaped special education (SE). Three policies are key to understanding the background of current SE practices: Public Law 88-164 (1963) initiated legislation to establish research on the development and treatment of disabilities and to create training programs for teachers to support the academic and social success of students with disabilities; the Education for All Handicapped Children Act (PL 94-142, 1975) established that all children are entitled to a free and appropriate public education in the least restrictive setting; and the 1997 reauthorization of the Individuals with Disabilities Education Act (PL 105-17) included provisions to develop individualized education programs focused on (a) improving educational results through the general curriculum, (b) educating students with disabilities among non-SE peers, and (c) requiring schools to provide positive supports and individualized interventions to promote students' productive behavior and life skills.

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Current priorities in SE can benefit from advances in developmental science. An integrated science of development and disability can build on the shared focus on human adaptation, common to SE and developmental science. We discuss key issues in SE from this perspective. To conclude, we consider policy implications and next steps.

## The Need for an Integrated Science of Development and Disability

### *Disability, SE, and Adaptation*

The concept of disability refers to an impairment that substantially limits functioning in one or more major life activities (Americans With Disabilities Act, 2008). For the purposes of SE research and services, the United States Department of Education stipulates in the Individuals With Disabilities Education Improvement Act (PL 108-446, 2004) that a student with disability (a) must have one or more *specific disabilities* (i.e., intellectual disabilities, speech or language impairments, hearing impairments, visual impairments, autism, orthopedic impairments, serious emotional disturbance, traumatic brain injury, specific learning disabilities, or other health impairments) and (b) must also require SE and related services.

SE can be distinguished from general education in terms of scope and aims. General education focuses on academic instruction based on the learning needs of youth at a particular grade level and is designed to promote a set of skills and knowledge thought to be common for a specific age. With the focus on the general curriculum in PL 105-17, SE includes an emphasis on the acquisition of skills and knowledge common to all youth. But SE law recognizes that students with disabilities differ from non-SE peers in one or more domains of human functioning and adaptation. The focus of SE is to go beyond common educational processes and meet the adaptive needs of students with disabilities. The concept of adaptation refers to the continuous alignment between the capacities and proclivities of the student and the opportunities, resources, and demands/expectations of the various ecologies in which he or she is embedded.

Since the passage of PL 88-164 and reflected in subsequent SE legislation, a focus on adaptation, in three distinct but related ways, distinguishes SE from general education. First, with the concept of individualized education programs, the law recognizes it is necessary to adapt instruction/contexts and provide supports to reduce the impact of the disability and ensure learning is accessible to the particular student. Second, with the focus on *life skills* and related services, legislation acknowledges that the purview of SE goes beyond academic learning and includes helping students develop adaptive behaviors and functional competencies related to the general activities of living that are impeded by the disability. Third, beginning with PL 88-164, there is a strong recognition that SE occurs at the *intersection of learning and development*.

This means that one responsibility of the field involves facilitating the developmental opportunities of youth with disabilities in a manner that ameliorates the impact of their disabilities and promotes their adaptive functioning.

### *Developmental Science*

Developmental science is a unified framework that transcends traditional disciplinary boundaries (e.g., psychology, sociology, neurobiology, genetics, education) to understand human development as the product of a system of influences (Magnusson & Cairns, 1996). From this view, development is a dynamic process that involves “on one hand, individual human beings as active, holistically functioning biopsychological organisms and, on the other hand, the equally dynamic multi-level environmental systems in which they live their lives” (Bronfenbrenner, 1996, p. xvii). This means the development and functioning of youth involves a continual synthesis of biological, psychological, and social-ecological subsystems (Cairns & Cairns, 1994), which all impact the success of SE.

Three concepts of developmental science are particularly germane to crafting policy: *correlated constraints*, developmental adaptation, and person-oriented analyses. Building on development as a process of individuals and contexts adapting to each other, these three concepts usefully frame how the brain and behavior operate together to contribute to adaptation (Magnusson & Cairns, 1996). Furthermore, these concepts clarify how developmental processes can be leveraged to support the school adjustment and adaptation of students with disabilities (Farmer, Sutherland, Talbott, Eber, & Norwalk, in press).

**Correlated constraints.** Because development reflects the interplay of human subsystems both internal (i.e., biological, psychological) and external (i.e., behavioral, ecological, sociological) to the individual, growth and adaptation come from a dynamic system (Magnusson & Cairns, 1996). As network components, developmental subsystems continually align, stabilize each other, and promote continuity in individuals’ functioning. Yet, because these subsystems connect, major changes in one prompt changes in others (Cairns & Cairns, 1994). The term correlated constraints suggests that the same developmental processes that promote change can also foster conservation (Magnusson & Cairns, 1996). This means, for example, that educational interventions cannot be confined to just one aspect of the student.

**Systems organization and developmental adaptation.** Correlated constraints describe developmental subsystems as impacting each other. While these subsystems stabilize each other, they also continually align, with behavior operating as a leading edge in adaptation (Gariépy, 1996). Behavior changes rapidly in response to others subsystem changes, and momentary behavior change prompts adaptation in other

subsystems and reorganization of the developmental system (Cairns & Cairns, 1994). In turn, systems reorganization may realign developmental trajectories. The concept of correlated constraints suggests that, although development tends to conserve existing adaptations, malleability remains open, so major shifts in functioning may occur across the life-course. The practical implication is that change is always possible, especially starting with behavior and spreading from there.

*Person-oriented approaches.* In developmental science, the person (rather than the isolated variable) reflects human growth (Bergman & Vargha, 2013). Variables coalesce within individuals, and “packages of variables” contribute to adaptation (Magnusson & Cairns, 1996). Person-oriented analyses identify youth who reflect coordinated academic, behavioral, and social-ecological patterns. Distinct adjustment configurations in elementary and secondary school predict school engagement and achievement, high school completion, and postsecondary educational attainment (Cairns & Cairns, 1994; Roeser & Peck, 2003).

### *SE as Applied Developmental Science*

SE and developmental science both focus on individual adaptation. Yet, these fields have had little cross-talk. Three aspects of SE illustrate applied developmental science. First, identifying subgroups of youth who share common learning, behavioral, and social characteristics (e.g., students with learning disabilities, students with emotional and behavioral disorders, students with intellectual disabilities), and determining differences in their educational needs is, in effect, person-oriented analysis. Second, a systems view of development is reflected in individualized educational plans that focus on the specific characteristics, strengths, and needs of the child and her or his ecology; the corresponding provision of services that span multiple domains of functioning leverages correlated constraints in the intervention process. Third, special educators reflect systems reorganization when they recognize the natural propensity of a student to adapt in atypical ways, and they build on such adaptations to foster the student’s development of new competencies, supports, and pathways to productive outcomes.

## **Key Issues in SE**

### *Understanding Developmental Malleability in Terms of Brain and Behavior*

Advances in studying brain and behavior development suggest that youth who experience school adjustment problems and learning difficulties tend to differ from non-SE peers on some neurophysiological structures and processes. Fully understanding these differences varies across disabilities, but neurophysiological researchers seek mechanisms that may remediate factors that contribute to disability.

Neurophysiological education science has extensively studied language and literacy. A range of brain regions relate to individual differences in the component skills that contribute to reading ability (Noble & McCandliss, 2005). Differences in neural processing precede the manifestation of academic deficiencies. Much of this work points to the importance of early auditory processing, particularly phoneme discrimination, as a foundation for learning to read (White-Schwoch et al., 2015). Differences in auditory processing as early as 5 months old, when language development begins, predict difficulties in writing in early elementary school (Schaadt et al., 2015). Although differences in brain function can appear before evident impairment in academic function, this does not necessarily indicate an immutable deficit. Brain functions change after participation in targeted interventions (e.g., Horowitz-Kraus et al., 2014; Shaywitz et al., 2004), with evidence of improved brain phoneme discrimination evident after as few as 3 hr of training (Lovio, Halttunen, Lyytinen, Naatanen, & Kujala, 2012).

In addition to informing treatments to remediate disability, identifying neural mechanisms related to school performance illustrates how disability arises from correlated constraints between a child’s developing brain and resources within the developmental environment (Noble, Wolmetz, Ochs, Farah, & McCandliss, 2006). Brain development is experience dependent, and deficits in neural function associated with literacy skills may reflect early experiences. Socioeconomic factors link with ecological supports for language development, such as fewer enrichment resources, less exposure to books and reading, and greater exposure to background noise, which interfere with infants discriminating speech phonemes. Exposure to low-resource environments is associated with less efficient brain activation during basic auditory perception in adolescence (Skoe, Krizman, & Kraus, 2013). In contrast, pre-school-aged children who are read to more often at home show greater brain activation related to semantic processing when listening to a story (Hutton et al., 2015). Quality and consistency of early exposure to developmentally appropriate language experiences influences developing neural systems that support literacy once children reach school. Acquiring literacy itself further contributes to reorganizing brain structure and function (Dehaene, Cohen, Morais, & Kolinsky, 2015).

Given literacy as a defining academic skill, neuroscience research in education has focused on brain mechanisms related to language and learning. However, emotion regulation also influences children’s ability to succeed in school (Blair, 2002). Academic success is predicated on a child’s ability to meet basic behavioral expectations in the classroom, which include being able not only to focus attention and follow direction but also to engage in socially appropriate ways with peers and adults (Blair & Diamond, 2008). Although acquiring self-regulation skills is a developmental milestone for school success, basic neuroscience research on self-regulation integrating with school-based behavioral

support programs is just beginning. Programs to incorporate socio-emotional learning in the classroom indicate effectiveness on average (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011). Yet, these programs do not focus on students who receive SE services, and they rarely incorporate neurobiological theory in the intervention evaluation, which could elucidate what contributes to treatment response. By examining how neural systems that contribute to affective arousal and inhibitory control differ between children with and without behavior problems, research can offer insight into which children are more or less likely to respond to universal socio-emotional curricula, and which may need additional intervention support.

Thus, research on brain processes may clarify problems, facilitate intervention development, and contribute to assessing treatment effectiveness. Synergy between basic-science inquiry into neural mechanisms of learning and clinical-science research in classroom applications may facilitate best practices in SE. SE researchers and practitioners should build on this knowledge to leverage understanding of what can and cannot change in students' neurophysiological functioning and use this knowledge of developmental processes to support the adaptation of students who experience significant learning and adjustment problems in school (Pavlakakis, Noble, Pavlakakis, Ali, & Frank, 2015).

### *Problem Behavior and Intervention Supports for Students With Disabilities*

The challenges students with disabilities experience in school are not limited to learning and instruction; they also center on social and behavioral development. Relative to non-SE peers, youth with disabilities tend to have higher rates of problem behavior, experience peer rejection, affiliate with classmates who support their social difficulties, and be involved in peer victimization (Chen, Hamm, Farmer, Lambert, & Mehtaji, 2015; Rose, Swearer, & Espelage, 2012). When students with disabilities have social difficulties, they also risk exclusionary discipline (i.e., suspension; Duran, Zhou, Frew, Kwok, & Benz, 2013). More experience with suspensions and expulsions is in turn linked to increased criminality and incarceration for students with disabilities (Nelson, 2014).

To address problem behavior and school discipline issues of students with disabilities, the Individuals With Disabilities Education Act of 1997 (IDEA; PL 105-17) and subsequent reauthorizations require positive behavioral interventions and supports (PBIS), as well as functional behavioral assessments (FBAs), to promote students' productive engagement in school. In response to these requirements, the Office of Special Education Programs of the United States Department of Education established a Technical Assistance Center on Positive Behavioral Interventions and Supports in 1998. As a result, a national network of PBIS programs builds from principles of applied behavior analysis, multi-tiered models of prevention, universal screening, and integrating behavioral

and education practices to create a framework and intervention approaches schools can use to promote positive behavior in all students (Horner, Sugai, & Anderson, 2010). This approach involves primary (Tier 1) approaches to create systematic rules and strategies to address the behavior supports needed of all children, secondary (Tier 2) approaches that involve small groups of youth who are not responsive to primary strategies and who need more individualized supports, and tertiary (Tier 3) interventions that occur when students are not responsive to Tier 1 and Tier 2 strategies, and intensive interventions that are individualized to the student and his or her contexts.

FBAs are likely to be a part of Tier 3 interventions. FBA describes systematic procedures to determine antecedent variables that evoke and consequences that maintain problem behavior (Farmer, Lane, Lee, Hamm, & Lambert, 2012; Ingram, Lewis-Palmer, & Sugai, 2005). The function of behavior breaks down into behaviors used to obtain desired stimuli (e.g., attention, tangibles) or escape undesirable events (e.g., non-preferred assignments, people). Having hypothesized a problem behavior's function, an intervention is developed to replace the problem behavior with a functionally equivalent appropriate behavior. For example, if a student consistently hits others to gain teacher attention, that student could be taught a more appropriate (and efficient) way to gain teacher attention. Similarly, antecedent events that trigger problem behavior can be modified to promote positive-proactive behaviors. FBAs can make interventions more efficient (Ingram et al., 2005; Miller & Lee, 2013).

IDEA addresses the educational support needs of students with a variety of disabilities, and as such, FBAs apply to all children who receive SE. Yet, potential difficulties challenge applying research, developed primarily from individuals with intellectual disabilities, across other disabilities (Sasso, Conroy, Peck Stichter, & Fox, 2001). Students with high-incidence disabilities experience more socially complex environments that contribute to their behavior problems (Shores & Wehby, 1999). Accurately identifying relevant variables and arranging associated interventions in classroom settings, with classroom personnel, can be difficult. Emerging work on the social functions of problem behavior (Farmer et al., 2012) and the management of classroom social dynamics (Farmer, Reinke, & Brooks, 2014) may help. However, going beyond classroom management and considering how other correlated constraints (e.g., family/community factors, students' social cognitions, neurophysiology, self-regulatory processes) sustain students' problem behaviors is needed to inform coordinated strategies that span school, mental health, and related service agencies (Farmer et al., in press).

### *The Delivery of SE Services*

Since the 1990s, situating SE within general education has been focal. In 1997, the reauthorization of IDEA (PL 105-17)

mandated that students with disabilities have access to the general-education curriculum. Hence, students with disabilities are increasingly educated in general-education settings, and their instruction involves non-categorical approaches that do not link services to a disability classification (e.g., learning disability, intellectual disabilities, emotional/behavioral disorders), but to specific instructional and related learning support needs. Accordingly, a response-to-intervention (RTI) framework addresses the learning needs of struggling students using the same three-tiered model. The core feature of RTI is that intervention centers on students' performance in response to specific instructional or behavioral strategies (Fuchs, Fuchs, & Stecker, 2010). As the 2004 reauthorization of IDEA states, "In determining whether a child has a specific learning disability, a local education agency may use a process that determines if [he or she] responds to scientific, research-based intervention as part of the evaluation process" (20 U.S.C. §1414[b][6]).

By definition, students who require Tier 3 interventions or who receive SE are not responsive to evidence-based practices. Such students learn differently from their non-SE peers and need instructional or behavioral supports that cannot be adequately addressed solely by modifying universal or secondary strategies (Farmer et al., in press; Fuchs & Fuchs, 2015). This does not mean abandoning data in the intervention process. It does mean that a general-education or a special-education teacher trained as generalist cannot simply pull an evidence-based practice off the shelf, to meet the needs of students who require Tier 3 interventions. Furthermore, special educators with relevant expertise should individualize and intensify interventions for students with disabilities (Danielson & Rosenquist, 2014). The emerging field of intensive intervention science addresses this need by developing strategies, delivery frameworks, and training to guide data-based intervention approaches responsive to individualized learning and support needs of students who have significant learning and behavioral difficulties (Farmer et al., in press; Fuchs, Fuchs, & Vaughn, 2014; Kern & Wehby, 2014). Although this work centers on individualized approaches to adapt interventions, these efforts may be enhanced by incorporating a correlated constraints perspective and identifying neurophysiological, cognitive, contextual, and ecological factors that may moderate or contribute to the effectiveness of the intensification process.

## Policy Implications and Considerations for the Future

Many policy implications result from bridging SE and developmental science and from leveraging current research in brain and behavior to address the growth and outcomes of youth with disabilities. Three implications come to the forefront: (a) reinvesting in the original special-education emphasis on individual adaptation, by focusing on developmental pathways and realignment in the life-course; (b)

including both developmental and RTI data in the dynamic delivery of services to students with disabilities; and (c) bringing SE and developmental science together in training both practitioners and researchers to address the growth and adaptation of youth with disabilities.

## *Focusing on the Individual in Developmental Context*

The strength of SE and what makes it special is the individualized education plan. Starting with PL 88-164 (1963) and elaborated in PL 94-142 (1975), the core of SE identifies the strengths, resources, and needs of the individual and adapts both interventions and relevant contexts to support the development of specific skills and capacities. As policy has moved forward with the Americans with Disabilities Act and subsequent amendments to the Individuals with Disabilities Education Act, awareness has grown that adaptation is not simply what is happening in the present. Rather, as increasingly understood, SE should also provide youth with developmental opportunities that prepare them for the future.

With universal programs, evidence-based practices, and tiered models of support, current efforts in SE seem to be shifting away from the individual and increasingly center on standardized interventions. Establishing a comprehensive collection of intervention strategies grounded in evidence from rigorous research advances the field and increases our capacity to support a broader range of students (Vaughn & Swanson, 2015). We must be careful this is not done at the cost of individualized interventions that promote the long-term growth and adaptation of the student. We cannot expect any teacher to haphazardly select an evidence-based practice and produce desired, sustainable student outcomes just by implementing the intervention with fidelity. We must also question whether short-term, politically valued markers of student success, such as standardized test scores or reductions in discipline referrals, should be intervention targets, if they do not link to key developmental processes and long-term outcomes. The field of SE cannot afford to let educational practices and indicators based on general population statistics guide the education of individual students with disabilities, if such practices and indicators do not align with the student's adaptive needs or long-term goals and desired outcomes.

This is not an either/or proposition. Efforts to create a science of the intensification and individualization of interventions will enhance our capacity to modify evidence-based practices to meet the needs of specific students with disabilities (Danielson & Rosenquist, 2014; Fuchs & Fuchs, 2015). As these efforts move forward, the focus must not only be simply the adaptation of interventions but also the developmental adaptation of students. To support more tailored and effective interventions, policies need to support basic person-oriented research to identify developmental factors, including brain and behavior malleability, which can be

leveraged in interventions for distinct subtypes of students with disabilities.

### ***Merging Intensive Intervention and Developmental Assessment Data***

Accordingly, bringing together distinct types of data will help guide the intervention process. Special educators should understand how data on students' performance on specific evidence-based interventions can generate modifications to the intervention, guide a different intervention, or promote additional data collection or a series of intervention and data collection to tailor specific approaches (Danielson & Rosenquist, 2014; Fuchs et al., 2014). This emerging area of inquiry and policies needs to support more research on implementing evidence-based practices, adapting such practices, and collecting data to drive in-stream modifications of specific strategies (The Council for Exceptional Children's Interdivisional Research Group, 2014; Kern & Wehby, 2014).

Beyond how to tailor evidence-based practices for students who are unresponsive to specific interventions, another series of questions remain: What works for whom? When it is likely to have a sustained effect? When do we need to shift interventions? And how do we know whether intervention impacts are related to desired long-term outcomes? Person-oriented information about students who reflect specific configurations of a range of school adjustment and developmental variables comes into play. Information from person-oriented research can combine with RTI data to provide greater precision in the individualization and intensification of interventions. By merging data-based individualization with person-oriented data on potential pathways and leverage points for systems reorganization, a comprehensive assessment and individualized intervention framework can pinpoint the positive realignment of developmental trajectories and corresponding productive outcomes of youth subtypes at high risk for chronic educational failure. New policies need to directly support research to integrate person-oriented and intensive intervention perspectives in both the assessment and intervention delivery processes.

### ***Focusing on Applied Developmental Science in SE Training***

About six and a half million (13%) public school students receive services under IDEA across 13 SE classifications (National Center for Education Statistics, 2015). The characteristics, development, educational, and service support needs vary both across and within different SE classifications depending on the severity of the disability. Generating a one-size-fits-all approach to meeting the needs of students within a particular disability category—much less across the entire field of SE—is not feasible or productive.

With the focus on inclusion and social acceptance of human differences, disability has sometimes been reduced to a diversity topic and, with RTI, the special educator's role has become that of a generalist. Students with disabilities differ markedly from non-SE peers in their learning and development, and generalists implementing standard evidence-based practices cannot easily address their needs (Farmer et al., in press; Fuchs & Fuchs, 2015). If these differential needs are not effectively addressed and supported during childhood and adolescence, youth with disabilities are not likely to experience adaptive pathways and develop the functional skills necessary to achieve their developmental potential. To promote their adaptation and productive adult outcomes, students with disabilities, by law, have the right to receive the services of specialists who understand their specific learning and developmental needs and who have the knowledge, skills, and resources to address them.

Recent advances in brain and behavior research, developmental science, RTI, and intervention intensification converge to put SE in a position to prepare professionals who can provide students with disabilities the cutting-edge interventions individualized to their specific developmental needs. The Office of Special Education Programs has taken an important step forward by establishing the National Center on Leadership in Intensive Interventions—a consortium of seven universities preparing doctoral candidates to be the next generation of SE researchers developing new approaches in data-based individualization. Moreover, these graduate students are learning how to train the next generation of special educators—intervention specialists who can adapt interventions to the specific needs of students and their developmental contexts.

Complementary research in developmental science can merge with work on intensifying interventions. Person-oriented research on the developmental pathways of subtypes of students with disabilities can identify developmental constraints and leverage points specific to these subtypes, and establish assessment and intervention approaches utilizing this information in the education and treatment process. To do this, policies should establish research in applied developmental science specifically designed to address SE. Correspondingly, knowledge about developmental science should infuse the training of special-education researchers, and training programs in developmental science should be established for special educators. As we learn more about how brain and behavior processes operate together to contribute to the adaptation of students with disabilities, we need policies to support the advanced training of highly experienced special educators to serve as intervention specialists who understand these developmental processes and can use this knowledge to individualize instructional and behavioral support practices that meet students' immediate and long-term adaptive developmental needs. Furthermore, we need to understand that such individuals are highly trained professionals, and they should receive

commensurate levels of pay and resources to support them in the performance of their jobs.

In conclusion, the half century since the passage of PL 88-164 (1963) has seen tremendous advances in SE that reflect the interplay between policy, research, and training to establish new models of service delivery and supports to address the learning and developmental needs of youth with disabilities. Merging intensive interventions and developmental science will create service delivery frameworks that focus on what works for whom, when, and under what circumstances. Linking the fields of SE and developmental science should identify services and intervention support pathways that not only promote the productive development and positive outcomes of students with disabilities but also provide insights into human learning and adaptation that can benefit all children.

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