Resetting the Stage: Introducing a Special Section About Learning Sequences and Developmental Theory

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I have taken on the task of editing special sections on Learning Sequences and Development for *Mind, Brain, and Education* with the intention of displaying the wide variety and continuing relevance of current developmental research and theory. Hopefully, over the coming years, these special sections can serve as an outlet for researchers with diverse backgrounds, using different types of methods and offering models of variable scope and complexity. In general, I am looking to cast the net broadly and bring as many developmental approaches as I can to the table, in the interest of disseminating knowledge about development and stimulating dialogue within the discipline and between the discipline and educators.

There is not—and never has been—just one way of framing research and theory about human development. Contemporary approaches run the gamut: from neural network modeling (Mareschal et al., 2007; Spitzer, 1999) and dynamic systems theory (Fischer & Bidell, 2006; van der Maas & Molenaar, 1992; Van Geert, 1994) to broad clinically useful models of the life course (Kegan, 1994) and from overarching metatheoretical accounts of development as a bio-psycho-social process (Overton, 2007; Wilber, 1999) to empirically grounded explanatory frameworks with wide applicability (Fischer & Bidell, 2006). Some researchers take the generation of usable knowledge as a major focus (Dawson & Stein, 2008), while others keep classic philosophical issues firmly in view (Smith & Voneche, 2006). Of course, a full characterization of the field as it stands is beyond the scope of this introduction, which aims only to frame the general goals of future special sections and highlight the articles featured in this issue.

Despite the diversity of broad orientations to development alluded to above, there are some common themes—aside from the fact that they are all concerned with change over time, that is, development. One key common theme will occupy us over the next few special sections that will focus on theory, research, and practice involving *learning sequences*. The term *learning sequence* refers to an important type of usable knowledge in *Mind, Brain, and Education*. A learning sequence, also known as a developmental pathway or learning progression, is an empirically grounded reconstruction of the steps or stages in the acquisition of a concept, skill, or capability.

Researchers have been working for decades using a variety of methods to build learning sequences in different important areas. To name a famous few: Baldwin (1906) outlined a set of learning sequences about the self and world, detailing levels in the development of basic epistemological concepts. Piaget (1977) researched and theorized roughly a dozen key capabilities and concepts appearing in infancy, childhood, and adolescence and detailed learning sequences of various scope. Kohlberg (1981, 1984) rationally reconstructed a broad learning sequence about moral reasoning. Kitchener and King (1990) built a sequence about reflective judgment. Fowler (1981) built one about faith. Siegler (1981) described one about mathematics. This list could be extended. The unifying element across these diverse efforts is that they are all attempts at outlining stage-like changes in the development of capabilities, knowledge, or skill, which are empirically grounded and offered in light of broader theoretical models and explanatory frameworks about human development.

Well-conceived learning sequences can be used to improve our understanding of human development, craft curricula, inform assessment, and characterize education and learning at all levels. For several decades, researchers from various camps have been building learning sequences using different methods based on different theoretical assumptions. Recently, these

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efforts have begun to dovetail in part as a result of empirical progress and in part as a result of the trajectory of international educational reforms calling for curricula that promote deeper conceptual understanding, especially in the areas of science, critical thinking, social skills, and citizenship.

This issue contains two articles, both presenting learning sequences that are of direct relevance to educators. In the first article, Sharon Griffin discusses some of the most important and well-established research about learning sequences for basic mathematical competencies. Griffin explains how her research group used knowledge about these sequences to construct a powerful pedagogical approach and a variety of popular curricular materials. Then, she further explains a crucial next step wherein the group conducted more research to prove the efficacy of their research-based educational efforts. The work of the late Robbie Case figures prominently in this discussion, and it is appropriate that we feature his work in this inaugural special section about the continuing relevance of developmental reach and theory. As explained in Griffin's article, Case offered one of only a handful of comprehensive and empirically grounded Neo-Piagetian models of cognitive development. Moreover, along with Griffin and others, Robbie Case worked to make this theory and research relevant to educators, and the Number Worlds mathematics curriculum stands as powerful testament to his ingenuity and acumen.

In the second article, we find a very different kind of developmental theory and research. King, Magolda, Barber, Brown, and Lindsay offer an exploratory study of how the effectiveness of educational interventions varies as a function of the developmental level of the students, focusing on colleges' attempts at fostering life skills and critical thinking through specific learning experiences. By employing a set of developmental methods and models focusing on broad shifts in students' self-understandings, the authors discuss the need for reforming these kinds of college programs, arguing for developmentally effective interventions and curricula.

These two articles represent the tip of an iceberg; there are many developmental approaches that can be used to generate knowledge about learning sequences. However, these articles are a particularly good place to start, because they clearly demonstrate two ways that learning sequences can be used to address educational questions. Future special sections will continue to feature a wide variety of developmental approaches to various educationally relevant topics, including articles about moral development, emotional development, science education, and more.

REFERENCES

Baldwin, J. M. (1906). *Thought and things: A study in the development of meaning and thought or genetic logic* (Vols. 1–3). New York: Macmillan Co.

Dawson, T. L., & Stein, Z. (2008). Cycles of research and application in science education. *Mind, Brain, and Education*, 90–103.

Fischer, K., & Bidell, T. (2006). Dynamic development of psychological structures in action and thought. In W. Damon & R. M. Learner (Eds.), *Handbook of child psychology: Theoretical models of human development* (Vol. 1, pp. 1–62). New York: Wiley.

Fowler, J. (1981). *Stages of faith: The psychology of human development and the quest for meaning*. San Francisco: Harper and Row.

Kegan, R. (1994). *In over our heads: The mental demands of modern life*. Cambridge, MA: Harvard University Press.

Kitchener, K. S., & King, P. M. (1990). The reflective judgment model: Ten years of research. In M. L. Commons, C. Armon, L. Kohlberg, F. A. Richards, T. A. Grotzer & J. D. Sinnott (Eds.), *Adult development* (Vol. 2, pp. 62–78). New York: Praeger.

Kohlberg, L. (1981). *The philosophy of moral development: Moral stages and the idea of justice* (Vol. 1). San Francisco: Harper & Row.

Kohlberg, L. (1984). *The psychology of moral development: The nature and validity of moral stages* (Vol. 2). San Francisco: Jossey Bass.

Mareschal, D., Johnson, M., Sirois, S., Spratling, M., Thomas, M., & Westermann, G. (2007). *Neuroconstructivism* (Vols. i–ii). Oxford, UK: Oxford University Press.

Overton, W. F. (2007). A coherent metatheory for dynamic systems: Relational organicism-contextualism. *Human Development*, 50, 154–159.

Piaget, J. (1977). In H. E. Gruber & J. J. Voneche (Eds.), *The essential piaget: An interpretive reference guide*. New York: Basic Books.

Siegler, R. S. (1981). Developmental sequences within and between concepts. *Monographs of the Society for Research in Child Development*, 46, 84.

Smith, L., & Vonèche, J. J. (Eds.). (2006). *Norms in human development*. New York: Cambridge University Press.

Spitzer, M. (1999). *The mind within the net: Models of learning, thinking, and acting*. Cambridge, MA: MIT Press.

van der Maas, H. L., & Molenaar, P. C. (1992). Stagewise cognitive development: An application of catastrophe theory. *Psychological Review*, 99, 395–417.

Van Geert, P. (1994). *Dynamic systems of development: Change between complexity and chaos*. New York: Harvester Wheatsheaf.

Wilber, K. (1999). *Integral psychology*. Boston: Shambhala.