



Center for  
K–12 Assessment  
& Performance Management

*An independent catalyst and resource for the improvement of measurement and data systems to enhance student achievement.*

**Exploratory Seminar:**  
Measurement Challenges Within  
the Race to the Top Agenda  
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## **THE DESIGN OF AN ASSESSMENT SYSTEM FOR THE RACE TO THE TOP: A LEARNING SCIENCES PERSPECTIVE ON ISSUES OF GROWTH AND MEASUREMENT**

**This policy brief is based on a presentation by James W. Pellegrino (University of Illinois at Chicago) at the Exploratory Seminar: Measurement Challenges Within the Race to the Top Agenda, December 2009. Download a copy of the final paper written by Dr. Pellegrino, as well as the other papers presented at the seminar, at <http://www.k12center.org/publications.html>.**

*In recent years, the learning sciences have made great strides in understanding the nature of learning and knowing, in ways that can inform the development of assessments and models for measuring growth. Learning progressions are an example of how the research base can be used to shape perspectives on the assessment of student learning, from contexts of application that span classrooms to state and national policymaking.*

Assessment should never be the tail that wags the educational dog. Rather, it should be integrated with curriculum and instruction, with all three guided by theories and research on the nature of learning and knowing. The assessment system should use approaches aligned to the scientific knowledge base and be appropriately designed for particular levels of use, with real clarity about the functions served and information needs of users at each level. Unlike current naïve views, assessments are not valid for a range of different purposes. They are valid for the purpose and the conditions of use for which they were originally designed.

### **Fundamental Assumptions**

Before considering the scientific foundations of growth measurement, we need to revisit some fundamental assumptions about the assessment of student knowledge:

- Assessment is really a process of reasoning from evidence—we can never really know what someone knows.
- We need to understand that reasoning process in terms of its three core elements: cognition, observation, and interpretation.

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- The cognition component should drive the design of assessments and assessment systems because design should flow from theories or models of how students represent knowledge and develop competence in a given academic domain.
- The cognition vertex should therefore help define the observations; our assumptions about what aspects of knowledge and thinking are tapped when students tackle a task should influence the types of tasks we design and, thus, the evidence of learning that we are likely to obtain from observations of student performance.
- The interpretation vertex, which includes the contributions of measurement and statistical modeling, informs us about how to make sense of the observations we have made.

Research-based perspectives on the development of knowledge and skill are critical to this enterprise because they highlight the most important aspects of knowledge and understanding that we should be assessing. Such perspectives give us strong clues as to how critical aspects of knowledge can be assessed and they can lead to assessments that yield more instructionally useful information. They can also guide the development of systems of assessments designed to work across contexts, ranging from the classroom to state and national testing programs.

The field of psychology has long known that changes in knowledge and competence are nonlinear. Conceptual models of what changes as a person learns through repeated engagement with information and intellectual tasks are seldom simple. Often, complex changes are occurring; research in the learning sciences is shedding light on such complexities, including how to use this knowledge for the design and integration of curriculum, instruction, and assessment. One example of applying a learning sciences perspective to the challenge of mapping and measuring student growth is research on the nature of learning progressions.

## **Learning Progressions**

Learning progressions are descriptions of the successively more sophisticated ways in which students come to think about key disciplinary concepts and practices as they move across multiple grades. Their characteristics include the following:

- They are domain-specific and empirically based.
- They are structured around big ideas and key practices in an intellectual domain.
- At the upper anchor are societal expectations of what students should know, based on an analysis of the academic discipline. At the lower anchor is what students typically bring to the instructional process.
- They model how learning develops, including the intermediate steps and benchmark performances on the path towards expertise.

- They vary in the amount of detail they provide, and there is debate about what constitutes a good learning progression, but most are grounded in empirical research.
- They are not instruction-neutral and can be used to guide the design of instruction through the specification of intended learning performances.
- They connect assessment to the instructional process through the development of tasks that allow us to observe and infer students' levels of competence for monitoring and improvement purposes.

## **Measurement Model Issues**

Measuring student performance and growth is not a simple matter. A variety of sophisticated statistical and analytic models are available but their choice and appropriateness will vary with three factors: (a) the time scale over which learning has occurred, (b) the grain size and details of what was to be learned, and (c) the intended purpose and use of the inferences we wish to make. A single metric of growth may not be feasible, sensible, nor attainable for many cases of educational practice, and a multivariate measurement model may be what we need.

## **Linking With Policy and Practice**

Finally, there are challenges in meshing knowledge from the sciences of learning and measurement with the demands of policy and practice. The policy world wants immediate and definitive answers to questions and design problems that the sciences of learning and measurement have only begun to explore. Ultimately, we have to meet in the middle and put in place assessment design processes that start with the most defensible approaches to obtaining the evidence we seek about student learning, rather than the data we can easily collect.

## **For More Information**

For more information on this subject, please see the paper by Dr. Pellegrino:

Pellegrino, J. W. (2010). *The design of an assessment system for the race to the top: A learning sciences perspective on issues of growth and measurement*. Retrieved from <http://www.k12center.org/publications.html>.