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A Systematic Perspective on Student Learning and Assessment

By Amy Reilly

WHITE PAPER

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Abstract

Pearson understands that successful design, development, and use of assessment requires understanding assessment as part of a larger system of education components that, when working individually and together well, improves outcomes for learners. We refer to this system as The System for Learning and Assessment.

In this paper, we briefly describe this system, focusing on the five major components that have critical roles to play:

- **Theory of Learning**
- **Professional Learning**
- **Curriculum**
- **Instruction**
- **Assessment**

Paying special attention to the role of assessment, we focus on how assessment is influenced by—and how assessment, in turn, influences—the other components.

Assessment is part of a larger system of education components that must work well together and individually to improve student learning.

Forward

By Gay Klassen, Classroom Teacher

In my 12 years of teaching, I have had the opportunity to use many different sets of curricula, assessments, teaching methodologies, and classroom management strategies. We usually receive some professional learning for implementation and then off we go with this new solution that will solve all of our problems. For a few different reasons, at first it's a challenge, and maybe even a little (or a lot) awkward, as we work to fit this new thing into our daily habits and ways of teaching. First, like with anything, it takes time and effort to learn something new, especially when it is complex, like a change in our school's curriculum. This is in an environment where time is already in short supply, so it is difficult to set aside the amount needed to really internalize whatever is new and consider how to put it into practice.

It's also challenging because we are usually plugging this one discrete part into what we already have in place and it takes effort to make that puzzle piece really fit. That is, this new piece is often developed and used, at least in the beginning, in isolation of our other materials, tools, and practices. Teaching and learning and all that goes with that process, however, is like cooking a meal. Sometimes I don't follow a recipe, but I always think of my ingredients in terms of the effect they will have on the meal and make adjustments accordingly. As teachers, we must consider the broader ecosystem and coordinate the various parts.

In the summer, for example, we often revisit our scope and sequence against what we know are our priority skills and concepts. We make adjustments based on previous years' assessment data and lessons learned. To do so without consideration of assessments we've already created and are planning to use would result in a lack of cohesion among what we're teaching and trying to learn about our students. Further, if we don't consider the curriculum we are using, we will have misalignment with our teaching materials, planning, and goals.

Everything in my classroom is part of a larger system of learning and management. It's not always easy, but I have to coordinate the various parts for things to work effectively. In the same way I can't isolate a student's math score on a test from knowing he's been absent lately, I can't view my curriculum or instructional strategies separate from the assessments I plan to use, my own professional learning needs, or even what resources are available to me. Thinking of the different parts of the system as interconnected is what helps facilitate alignment and coherence in my classroom.

> "As teachers, we must consider the broader ecosystem and coordinate the various parts."

Introduction

All too often educational products, such as a formative assessment item bank or a new professional learning offering, are created and implemented in isolation. Commercial organizations tend to focus on the components of teaching and learning in which they have expertise or opportunities for increased market share. Even within state and district offices of education, curriculum, professional learning, and assessment divisions are often separate from each other and, in some cases, even in different buildings.

What makes this a particular challenge in the field of education is that high-achieving teachers leverage the natural process of instruct, assess, re-teach, with support by professional learning and curriculum, as very much part of a fluid process or system. However, if assessments, instructional strategies, curriculum, and professional learning are all created as separate, unconnected parts, we create discord in the teaching process. This requires teachers and school and district leaders to make the connections among the different components so each makes sense in the context of the other. Many other industries have solved this problem by taking more of a systems-thinking approach. In this paper, we define a system and systems thinking, as well as the different components of a learning and assessment system.

What is a System?

A system is a set of components that interact with each other to function as a whole with the goal to improve student learning.

A number of definitions of a system have been offered from people working in the field of systems thinking. For an introduction to systems thinking, Bertalanffy (1968) or Weinberg (1975) provide deep explanations. Kauffman (1980) defines a system as "a collection of parts which interact with each other to function as a whole" (p. 4).

Our definition of a system builds on these definitions to emphasize the goal of improving student learning. We define a system as a set of components that interact with each other to function as a whole with the intention of improving student learning. This definition implies a system perspective, or the adoption of systems thinking.

Systems Thinking

Systems thinking means being able to see the underlying web of ongoing, reciprocal relationships that cycle to produce patterns of behavior. It is understanding the interactions and influences of the various components.

A number of obstacles impede systems thinking. First, people may find it difficult to break from their personal frame of reference. This frame of reference includes assumptions about causes and effects, and about what is more and less important. People find it difficult to step back from their own stand of trees and see the larger forest.

Second, people tend to focus on objects and activities, like tests, materials, and training sessions. But the core of systems thinking is identifying the web of relationships among objects and activities. Systems thinking requires making these relationships explicit.

Third, people are prone to define boundaries around areas of expertise and authority. But systems thinking cuts across disciplinary and organizational boundaries. Systems thinking asks how the web of interdependent relationships across boundaries is creating the patterns of system behavior. It can create "turf issues" by challenging the boundaries defining expertise and authority.

System Coherence

The *complexity* of a system around learning and assessment presents a challenge to meeting the intended outcomes, such as improving student learning. Success requires that all of the components work together, but often various components are created or implemented without consideration of one another. For example, interim assessments are often used to monitor student performance throughout the year. However, a recent Pearson survey—conducted by Penn Schoen Berland (2017)—of teachers, principals, district instructional coaches, and assessment directors, revealed that misalignment with curriculum is seen to make the assessment unfair and restrict teachers' instructional freedom. As a result of this kind of incoherence among assessment and curriculum, the success of teachers improving practices to personalize student instruction is reduced.

According to the National Research Council (2012), the literature on education policy often uses the term "coherence" interchangeably with "alignment." However, the authors treat coherence as the broader concept and alignment as only one of its dimensions. They point out that a system for student learning can be coherent in the following ways:

- **Horizontally coherent**, in the sense that the curriculum-, instruction-, and assessment-related policies and practices are all aligned with set standards, target the same goals for learning, and work together to support students' development of knowledge, skills, and abilities.

- **Vertically coherent**, in the sense that there is a shared understanding at all levels of the system (classroom, school, school district, state, and national) of the learning goals (and for the curriculum) that underlie the standard.

- **Developmentally coherent**, in the sense that there is a shared understanding across time of what ideas are important to teach and of how children's understanding of these ideas should develop across time, e.g., the school year.
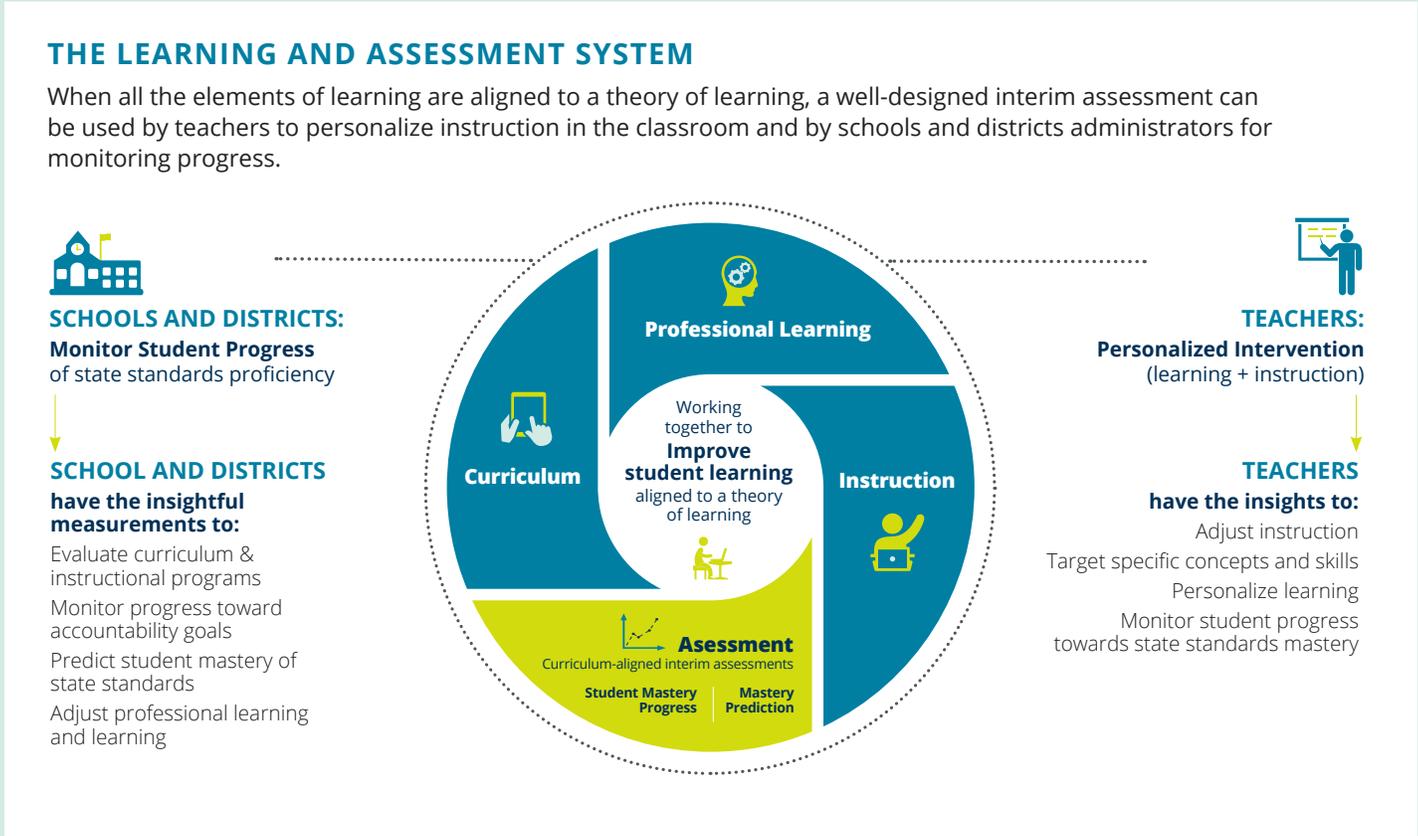
Our current research focuses on horizontal coherence with assessment, asking, "How can we design and develop assessments in a way that improves its alignment with curriculum, instruction and professional learning?" Horizontal coherence is improved is by creating classroom-formative and interim assessments that are tightly aligned to local standards and curriculum maps.

By improving this coherence, educators are able to better measure student learning as it is happening and provide relevant information back to teachers in order to adjust instruction.

What Are the System Components?

The key components of The Learning and Assessment System, shown below, are theory of learning, professional learning, curriculum, instruction, and assessment. No component should be considered by itself. The five components interact with each other to function as a whole.

THE LEARNING AND ASSESSMENT SYSTEM

When all the elements of learning are aligned to a theory of learning, a well-designed interim assessment can be used by teachers to personalize instruction in the classroom and by schools and districts administrators for monitoring progress.

SCHOOLS AND DISTRICTS:
Monitor Student Progress
of state standards proficiency

SCHOOL AND DISTRICTS
have the insightful measurements to:
Evaluate curriculum & instructional programs
Monitor progress toward accountability goals
Predict student mastery of state standards
Adjust professional learning and learning

Professional Learning

Working together to **Improve student learning** aligned to a theory of learning

Curriculum

Instruction

Asessment
Curriculum-aligned interim assessments
Student Mastery Progress | **Mastery Prediction**

TEACHERS:
Personalized Intervention
(learning + instruction)

TEACHERS
have the insights to:
Adjust instruction
Target specific concepts and skills
Personalize learning
Monitor student progress towards state standards mastery

Theory of Learning

The *theory of learning* corresponds to the understanding of student thinking and learning at the grain size that is the focus of instruction and the curriculum. A number of approaches to student thinking and learning are contenders for the theory of learning. Two widely known approaches are learning progressions and misconceptions. Learning progressions represent a set of mental models that are ordered from less sophisticated models to more sophisticated models. Student learning is represented as developing along this sequence until students attain the target conception. A set of misconceptions offers a second approach. Misconceptions may be flawed mental models or procedures. Here, student learning is represented as starting from their current misunderstanding and directly acquiring the target conception without any intervening stages.

The theory of learning influences the other components in the system through its description of how students think and how thinking changes as students learn. Ideally, professional learning, curriculum, instruction, and assessment would reflect a shared theory of learning. A shared approach to student learning creates coherence so that all the components are working together to support students' development of knowledge, skills, and abilities.

Professional Learning

Another component of The Learning and Assessment System is *professional learning*. Research has shown that continuing professional learning with teachers is one of the keys to improving student learning (Borko & Putnam, 1995; Desimone, 2009). During professional learning, teachers can learn new insights into how students think and learn, better understand assessment results, and acquire additional approaches to gauge what students know and support further student learning.

Professional learning can act as a catalyst along with the other components of the system to change classroom practice. Research shows that professional learning paired with the other components has a greater impact on classroom practice than changes in the one component alone. For example, Cohen & Hill (2000) found that receiving professional learning in conjunction with a new curriculum enhanced innovation in teachers' instructional practice over just introducing new curriculum materials.

Curriculum

In this system, *curriculum* consists of the knowledge and skills in subject areas that teachers are expected to teach and students are expected to learn. The curriculum generally encompasses a scope or breadth of content in a given subject area and a sequence for learning. It is often communicated through the organization of a textbook or other instructional materials.

Different approaches to curriculum cohere with different approaches to the theory of learning. A common approach for current curricula is a flatly organized "catalogue of desirable outcomes" (Black, Wilson, & Yao, 2011). A subject or content area is presented as a set of discrete knowledge and skills. An understanding of these component knowledge and skills is wholly correct or entirely wrong with no intermediate stages of learning.

A second, more recently popular approach, presents the knowledge and skills in a subject area as an ordered sequence from less to more sophisticated understanding. These knowledge and skills are described as interdependent and overlapping and are used together in context. This kind of an approach coheres closely with a learning progression.

Classroom or interim assessment should measure the knowledge and skills covered in curriculum units. The curriculum should also dictate the timing of the assessment of knowledge and skills so that the assessment is relevant to student acquisition of learning. In addition to providing information to teachers and students about mastery of the content, this information allows for school and district leaders to monitor student progress and identify areas where the curriculum may not be implemented with fidelity. It also aids in evaluating the effectiveness of the curriculum.

Instruction

Instruction refers to methods of teaching and the learning activities used to help students learn the content and objectives specified by a curriculum. Instruction encompasses the activities of both teachers and students. It can be carried out by a variety of methods, sequences of activities, and topic orders.

Instruction occurs when the teacher interacts with the student. These interactions are important in determining whether students learn successfully. Instruction is influenced by every other component described in this system. Consequently, poor coherence between instruction and other components, such as the effective use of assessment results to influence instruction, directly impacts student learning. For other stakeholders, such as school and district leaders, the assessment results may also be used to learn more about successful teaching strategies that can be leveraged and shared.

Assessment

Assessment is the means used to measure student achievement and may also include an indication of the progress in student learning made over time. As mentioned previously, this paper focuses primarily on the assessment component of The Learning and Assessment System. An assessment program often includes a range of assessment types for various purposes and uses throughout the school year. A comprehensive assessment system typically consists of the following:

· **Formative assessment** processes and tools through teacher observations, questioning, or other informal measures influence teacher instruction on a frequent and informal basis. Formative assessment "serves a relatively narrow audience—students, teachers, and parents—and has the strictly *instructional* purpose of helping the teacher tailor activities to facilitate learning" (Troy, 2011).

· **Interim or benchmark assessments** measure "students periodically throughout the year or course to determine how much learning has taken place up to a particular point in time and to track progress toward meeting curriculum goals and objectives" (NCDPI, 2008). The information from interim assessments is used by multiple stakeholders. Teachers use the information to make instructional decisions. School and district leaders may use this information to predict summative assessment results, to evaluate curriculum and professional learning needs, or as part of response to intervention efforts.

· **Large-scale summative measures** typically provide an end-of-year snapshot of student proficiency relative to the state standards. Because of timing and the grain size of information typically provided back, this information may be of limited instructional value, but used by leadership at all levels for accountability purposes, including the school improvement needs, as well as by parents and the community.

Through the assessment component, principled assessment design approaches connect to the other components of The Learning and Assessment System such as the theory of learning. The first activity in a principled design approach is to develop a deep understanding of what is being assessed and, as part of our system, what students should learn. Understanding what is being assessed—the knowledge, skills, and abilities—as well as how to communicate useful information for the intended audience drives most of the assessment design and development decisions.

Assessment is the measurement of student achievement.

Principled assessment design approaches connect to the other components of The Learning and Assessment System.

Several other ideas from such principled design approaches are especially important for The Learning and Assessment System. One important idea is the concept of evidence, or "how do you know what you are assessing when you see it?" For The Learning and Assessment System, the assessments must be designed and developed in a way that provides evidence of the knowledge, skills, and abilities that is in harmony with the other components. Examples demonstrating the importance of this coherence include:

- If the theory of learning is a learning progression, the assessment should provide evidence of students' stage in a sequence of increasingly sophisticated mental models.

- If the theory of learning concerns misconceptions, the assessment should provide evidence that students have adopted a particular misconception or the target conception.

Incoherence is created and student learning is impaired when the evidence from assessment is based on one theory of learning but the curriculum, assessment, and professional learning is based on another theory of learning.

Incoherence is created and student learning is impaired when the evidence from assessment is based on one theory of learning but the curriculum, assessment, and professional learning is based on another theory of learning. A common example is when the assessment is based on an approach where evidence is provided in terms of number correct or some similar score for standards and sub-standards. In contrast, the curriculum is organized around a progression of increasingly sophisticated mental models and teachers have learned instructional methods that encourage students to build on current understanding and develop a more sophisticated mental model.

Incoherence is created when assessment results are presented in ways that teachers don't readily understand or can connect with available instructional approaches and progress through the curriculum.

A second important idea for creating assessments is the concept of communication, or "how do you talk to people about what you are assessing?" An example is when assessment results are intended to be used formatively to make instructional decisions and improve student learning. As Nichols, Meyers, and Burling (2009) point out, there is no such thing as a formative assessment, only a formative system of assessment, curriculum, instruction, and professional learning. For The Learning and Assessment System, assessment results must be communicated to teachers in a way that allows them to use the results to make informed instructional decisions. When assessment results are presented in ways that teachers don't readily understand, and when they can't connect those results with available instructional approaches to progress through curriculum, incoherence is created.

Conclusion

Systems thinking in the context of learning and assessment allows for connections to be made across the different materials, tools, and strategies used in the classroom. It creates opportunities for close alignment between assessment and curriculum so that better, more valid measures are created, reducing the opportunity for students to take tests not worth taking. It connects beliefs about how students learn with meaningful professional learning and instructional strategies. It considers the type of claims made about what students know and can do in terms of not only assessment design, but also results design, and what teachers or other stakeholders are expected to do based on those claims.

Thinking of all the components as part of an integrated system allows us to see and implement a more coherent process of teaching and learning.

By considering how each of these different parts of the system relate to one another, we can start to identify areas of particular strength and needs for improvement. Only when assessment is aligned with the curriculum, for example, can we evaluate how well the curriculum is being implemented. Without being tied directly to the units of instruction being taught, we would not know if the results were confounded by poor implementation, timing of the assessment relative to instruction of concepts, or the introduction of construct irrelevance. Likewise, if the assessment is not tied to the theory of learning to reveal student misconceptions, the likelihood of selecting appropriate instructional strategies as next steps is compromised. Thinking of all the components as part of an integrated system allows us to see and implement a more coherent process of teaching and learning.

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