Virtuous cycles: Lectical® Assessments and adult learning

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The four virtuous cycles: *We're all learning here*.

From our perspective, learning is best thought of as a kind of *virtuous cycle*. We try something out with a goal in view, monitor our success, and try again, informed by what we have learned from each trial. We repeat this process until we reach our current goal, and then up the ante by setting a new goal and repeating the cycle at a new level of difficulty. We all learn best when this feedback loop is working well. In other words, optimal learning takes place in a *virtuous cycle, a* feedback loop that leads iteratively toward valued goals. Lectical Assessments are designed to support this kind of learning.

There are at least four related learning processes that occur when Lectical Assessments are used as intended. They involve the test taker, the educator, the institution, and the researcher. Test-takers learn from the process of taking the assessment, the personalized feedback embedded in their report, and engagement in targeted learning activities. The educator learns from the feedback in reports and DTS's growing knowledge base. Institutions learn from individual and group-level patterns of performance on Lectical Assessments and DTS's knowledge base. Finally, researchers at DTS learn about learning itself, as every Lectical Assessment contributes to the construction of rich and useful knowledge about the development of specific competencies and concepts. All four of these learning processes become virtuous cycles when testing is repeated, making it possible to track and *support* growth over time.

Below, we briefly outline the theory of learning that informs our approach to test design, and then discuss how the Lectical Assessments we build are best put to use.

Goal-action-feedback: The foundational "feedback loop" of life and learning

Most learning scientists—although they offer differing accounts—agree on a general model of learning that can be represented as a goal-action-feedback loop. This loop contains four essential variables: goal, action, feedback, and repeat. When integrated dynamically, they allow us to focus on the goal, choose an appropriate action, interpret the outcome, and decide how to correct or adjust the current available pool of actions and ideas to better reach a goal.

Behavioral learning scientists, evolutionary psychologists, and neuroscientists have repeatedly rediscovered this most basic mechanism of learning. For example, Piaget and Baldwin first characterized this feedback loop as an ongoing attempt to achieve balance between assimilation and accommodation. More recently, neuroscientists have observed that neurons in the neo cortex act in cohorts where repeated stimulation of the network in a variety of contexts fine-tunes the emergence of specific patterns. The evidence is clear. Whether viewing the human experience from the perspective of neurons or behavior, success depends on engaging in a virtuous cycle—the positive feedback loop of learning.

The same process is also thought to characterize organizational learning. Since the 1960s systems theorists, cyberneticists, and organizational psychologists have convincingly proposed that institutions should embed feedback-loops that enable goal monitoring and self-correction. A learning organization is one that can adjust its polices based on data about how well they work. This notion is even embedded in the guiding ideals of democratic societies, such as the idea that social policies should be implemented in an experimental mood and remain open to revision in a virtuous cycle that ensures we are continually learning about our schemes of social organization and their effectiveness.

And of course, science itself is a kind of virtuous cycle. Contemporary philosophers of science echo Bacon, Peirce, and Popper in arguing that the scientific method should be understood as an important type of learning process that involves testing a hypothesis against the world experimentally, reconsidering that hypothesis in light of what the experiment reveals, and then testing a new revised hypothesis, and so on. Shifts to new scientific paradigms can be conceived of as part of this ongoing cycle of conceptual revisions and experimentation.

All of these virtuous cycles, in addition to their iterative structure, have one thing in common—learning. They are virtuous cycles of learning.

Catalyzing learning using Lectical assessments

The developmental cycle

The learning sciences have provided evidence that useful learning requires time, practice, and the opportunity to make and learn from mistakes. When learners have an opportunity to participate in a virtuous cycle they learn in a way that prepares them to set and meet increasingly challenging goals. In other words, they are more likely to build the kind of understanding that is useful for meeting the challenges and changes of adult life.

A long lineage of theorists, such as James Mark Baldwin, Jean Piaget, and Kurt Fischer, have shown that improvement in cognitive performance reflects more than the incremental accumulation of information. Both knowledge and cognitive skills develop through a series of hierarchically organized levels. Each successive level is more complex and abstract than the level that preceded it. In other words, successive levels are more abstract, complex, and integrated. Development within a level manifests as an increasingly elaborate repertoire of knowledge and skills at that level. Moving from one level to the next occurs when the current level reaches a tipping point, the system reorganizes, and a new way of thinking emerges. This developmental model is a *natural* virtuous cycle of learning.

During the latter years of the 20th century, several researchers developed metrics based upon this developmental model, identifying 13 qualitatively distinct levels through which knowledge and cognitive skills develop. The most precise of these metrics—the Lectical® Assessment System (LAS)—can measure progress through these levels in ¼ level increments (called *phases)*. Twelve of these phases are regularly identified in adults.

Tests that help learners learn

Being able to measure learning along a scale informed by the natural learning cycle opens up new possibilities for assessment. For example, such a measure can be used like a ruler. We can line up a range of performances along this ruler and examine differences between them, building knowledge about how individuals learn specific skills and concepts over time. We can take what we have learned and use it to construct detailed learning sequences. In turn, these sequences can be used to tell us what any individual learner is most likely to benefit from learning next.

All of this suggests a new kind of assessment, one that supports the natural cycle of learning by gathering evidence about the level of a test taker's performance, then providing the test taker (and educator) with rich feedback that points to the specific concepts and skills that individual is most likely to benefit from learning next. This new form of assessment, the *Lectical® Assessment*, is designed specifically to be embedded in a cycle that mirrors the natural virtuous cycle of learning. In other words, Lectical Assessments engage learners in a virtuous cycle wherein their responses prompt immediate and useful feedback about where they are in their learning and how they might improve. This feedback sets the stage for further learning and, in time, another round of assessment, which in turn generates new feedback, and so on.

Tests that help educators teach

Lectical Assessments don't just help learners; they also help educators. Lectical Assessments (1) tell educators how well students understand and think with new ideas; (2) provide diagnostic information that aids instruction; and (3) show how close students are to achieving learning goals.

Lectical Assessments measure more than just what student know or don't know; they inform educators about the way students apply the material they are learning. Moreover, Lectical Assessments provide educators with a window into the learning process itself, allowing them to continually improve their grasp of how learning unfolds in their domain. With repeated use of Lectical Assessments as part of a reflective practice, educators, along with their students, engage in a virtuous cycle of learning.

Tests that help leaders understand and develop their organizations

Lectical Assessment can be used to help learners learn and to help teachers teach because they are formative assessments that provide insight into the learning process itself. Lectical Assessments are also standardized psychometrically, which means that scores are reliable enough to be used for a range of purposes, beyond their immediate usefulness as educational diagnostics. Standardized tests have been used for nearly a century by organizational leaders to help manage the allocation of human resources and to gain an overview of how their institutions are performing critical functions. Most contemporary educational reform efforts, for example, are built on the idea that standardized tests can be used to measure the effectiveness of new polices and practices. Likewise, large companies use standardized testing to determine how well their professional development practices have benefited employees.

But Lectical Assessments differ from most standardized tests in important ways. Because they measure the major transformations that occur during learning they provide a score that is meaningful as an index

of important learning events. This means that it is possible to truly track the learning of individuals and cohorts over time, providing a method for monitoring individual and cohort progress with specific ends in view, such as evaluating the effectiveness of curricula. A normal standardized test may be able to provide an overview of who is doing well and who is not, but this knowledge is divorced from any insight into the learning processes in question. Typical tests say nothing about the kinds of confusions that are common or about the range of conceptions and ideas held by different individuals or groups and how these are related to future prospects for learning. Lectical Assessments, on the other hand, provide this kind of information and more, providing an unprecedented degree of insight into the dynamics of the learning processes taking place in a wide variety of institutional contexts. Organizational leaders can use Lectical Assessments to institute virtuous cycles that will allow them to continually learn about how their policies and procedures are affecting the learning of the individuals in their organization.

Tests that help researchers build usable knowledge

Finally, all Lectcial Assessments play a role as data collection instruments. Eventually they yield large longitudinal databases that allow researchers to construct increasingly refined accounts of the pathways through which students learn important skills and concepts. Specifically, data compiled from Lectical Assessments are amenable to empirical methods that stem from an educationally oriented cognitive developmental perspective that stretches back to Baldwin and Piaget. This tradition is concerned with understanding: 1) the developmental pathways through which concepts typically and optimally develop; 2) the particular sub-concepts required to construct increasingly adequate understandings at each new developmental level; 3) the range of sub-concepts required for an optimal understanding of a given concept; and 4) effective methods for developing these concepts. These learning sequences are an important type of usable knowledge and can serve a variety of purposes—from informing curriculum development and training educators to setting empirically grounded benchmarks and standards.

Importantly, gaining an increasingly sophisticated understanding of these learning sequences can inform the (re)-design of more accurate and reliable assessments of conceptual development that can be employed by practitioners—that is, new and better Lectical Assessments. All Lectical Assessment are continually being improved in light of changes in our understanding about how learning works. So again, a virtuous cycle is enabled through the use of Lectical Assessments, this time involving research and development efforts that advance the new science of learning and its educational applications.

Building collaborations in which everyone is learning

Lectical Assessments are used to build relationships in which everyone is learning—the test taker, the educator, the institution, and the researcher. This unique and innovative approach to assessment places as much emphasis on supporting learning as it does on measuring it. The benefits and advantages of such an approach are wide ranging, as are its implications for the future of learning.

Of course, this document has only presented the vision behind Lectical Assessments in broad brushstrokes. For more detailed information on the ideas presented above please make use of the annotated list of resources provided below.

Resources:

Information on available Lectical Assessments

The links below will bring you to pages that contain information about each of the currently available Lectical Assessments. On these pages, you will find a brief overview of a given assessment and details about the test items and feedback reports. If you wish to see sample reports, please contact us.

Lectical Decision Making Assessment (the LDMA): http://devtestservice.org/about/assessldma.php

Lectical Leadership Reasoning Assessment (the LLRA): http://devtestservice.org/about/assessllra.php

Lectical Self-Understanding Assessment (the LSUA): http://devtestservice.org/about/assesslsua.php

Lectical Reflective judgment Assessment (the LRJA): http://devtestservice.org/about/assesslrja.php

Lectical Ethical Reasoning Assessment (the LERA): http://devtestservice.org/about/assesslera.php

Useful introductory texts and presentations

The papers and presentations listed below provide introductory overviews of some of the key facets of what goes into making Lectical assessments, how they work, and how they should be understood and used.

An introduction to the Lectical Assessment System, the "ruler" behind Lectical Assessments:
http://devtestservice.org/PDF/LAS.pdf

A brief look at the validity and reliability of the Lectical Assessment System:
http://devtestservice.org/PDF/LASvalidityreliability.pdf

A first pass at some basic issues in psychometrics and measurement:
http://devtestservice.org/about/measurement.html

An overview of our broad research methodology, *Developmental Maieutics*:
http://devtestservice.org/about/devmaieutics.html

An account of how we rationally reconstruct learning sequences:
http://devtestservice.org/PDF/LearningSequences.pdf

Instructions for taking Lectical Assessments:
http://devtestservice.org/assessments/takingassessments.php

A selection of our scholarly publications

The papers below provide a more rigorous look at some of the key ideas behind Lectical Assessments and how they are related to broader trends in cognitive developmental psychology and education over the past half century. Papers with blue titles are available at
http://devtestservice.org/about/articles.html .

Dawson, T. L. (2004). Assessing intellectual development: Three approaches, one sequence. *Journal of Adult Development, 11,* 71-85.

Dawson-Tunik, T. L. (2004). "A good education is…" The development of evaluative thought across the life-span. *Genetic, Social, and General Psychology Monographs, 130,* 4-112.

Dawson-Tunik, T. L., Commons, M., Wilson, M., & Fischer, K. (2005). The shape of development. *The European Journal of Developmental Psychology, 2,* 163-196.

Dawson-Tunik, T. L. (2006). The meaning and measurement of conceptual development in adulthood. In C. Hoare (Ed.), *The intersection of adult development and learning: A handbook of theory, research, and practice* (pp. 433-454). London: Oxford.

Dawson, T. L., & Fischer, K. W. (2006). Implications of assessment for learners. *Measurement, 4*(4).

Dawson, T., & Heikkinen, K. (2009). Identifying within-level differences in leadership decision making. *Integral Leadership Review, 9*(5).

Dawson, T. L., & Stein, Z. (in press). We are all learning here: Cycles of research and application in adult development. In C. Hoare (Ed.), *The oxford handbook of reciprocal adult development and learning.* New York: Oxford. [please contact us for a copy of this paper]

Stein, Z., Dawson, T. L., & Fischer, K. W. (2010). Redesigning testing: Operationalizing the new science of learning. In Khine & Saleh (Eds.) *New science of learning: Computers, cognition and collaboration in education.* Springer Academic.

Other related scholarly material

The papers and books listed below are good places to explore some of the broad ideas and intellectual traditions discussed above.

Apel, K. O. (1995). *Charles Sanders Peirce: From pragmatism to pragmaticism*. New York: Humanities Press.

Baldwin, J. M. (1911). *Thought and things: A study in the development of meaning and thought or genetic logic* (Vol. 1-4). New York: Macmillan Co.

Fischer, K. (1980). A theory of cognitive development: The control and construction of hierarchies of skills. *Psychological Review*, 87(6), 477-531.

Fischer, K., & Bidell, T. (2006). Dynamic development of psychological structures in action and thought. In W. Damon & R.M. Lerner (Eds.), *Handbook of child psychology: Theoretical models of human development* (6th ed. Vol. 1, pp. 313-399). New York: John Wiley & Sons.

Popper, K. (1966). *Of clocks and clouds*. St Louis: Washington University press.

Piaget, J. (1971). *The principles of genetic epistemology.* London: Routledge and Kegan Paul.

Senge, P. (2006). *The fifth discipline: the art and practice of the learning organization*. New York: Crown Business.