Some Stimulating Examples to Inform Thinking About Learning Progressions

Brian Gong, Center for Assessment
Handouts to accompany presentation on "Developing learning progressions to inform formative assessment: Five areas to develop," a presentation at the CCSSO FAST SCASS Meeting, February 6, 2008, in Atlanta, GA.

References in PowerPoint

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Stimulating Examples - handout

I've chosen these six examples because I find them informative and provocative. Each illustrates the aspect of learning progressions headed in **bold**, but also has other rich characteristics. And each can be used to find other useful references.

Developmental Content Progressions – "Fractions and Rational Numbers." From Lamon, Susan (2005). Teaching fractions and ratios for understanding (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates. pp. 15-28.

Lamon's book illustrates how a mathematician thinks about proportional reasoning, and organizes it into a developmental sequence. Even more, Lamon's rich treatment shows what deep understanding is for each of the topics. She has a lot of activities/assessments, including some student work—and invites the reader to be willing to work the problems and learn and reflect on her/his own understanding. Proportional reasoning is one of the most studied areas in all of education in terms of student cognitive models, structure of the discipline, assessment probes, and instructional approaches.

Learning About Expertise – "An Analysis of Electronics Troubleshooting Expertise." From Lesgold, Alan & Lajoie, Susanne, "Complex problem-solving in electronics." In R. J. Sternberg & P. A. Frensch (Eds.), (2001), *Complex Problem Solving: Principles and mechanisms,* pp. 287-316.

How experts solve problems differently than novices, and how such expertise develops has been a focus of cognitive science from its inception. This excerpt from Alan Lesgold's work (from Bob Glaser's famous lab) is a good example of the methods and results of cognitive science research on expertise in a complex problem-solving area. Note particularly the attention to the relation of (the development of) expertise to content knowledge, knowledge representation, and other attributes. While such studies on the development of expertise have been done on some school subjects, they tend to be quite limited in number and in scope.

Learning Progression: A Curriculum View – "Our Approach to Science Curriculum." From SEPUP (The Science Education for Public Understanding Program), published by the Lawrence Hall of Science, University of California, Berkeley. http://sepuplhs.org/approach.html (retrieved 2/4/08).

SEPUP is an example of a carefully designed curriculum program. This description of SEPUP's approach to curriculum describes several components that are woven together in the curriculum—learning about scientific evidence, use of hands-on inquiry, spiraling of key concepts and skills, cooperative learning, connections to other disciplines. How these components are designed to be introduced, developed, and reinforced through the units makes this an interesting example of a set of curriculum-based "learning progressions." Whether one agrees with how SEPUP is designed, it can illustrate the issues involved in this approach to learning progressions.

Learning Progression: A Lesson View (and teacher process) – "Mathematics Learning Lesson Plan." From Fernandez Clea & Yoshida, Makoto. (2004). *Lesson Study:*

A Japanese approach to improving mathematics teaching and learning. Mahwah, NJ: Lawrence Erlbaum Associates, pp. 76-86.

Lesson Study is a widely used and respected approach to improving instruction and learning used in Japan. This excerpt is the actual plan for a single lesson, embedded in a unit and a larger multi-grade sequence of mathematics concepts and skills. The plan illustrates many aspects of learning progressions. The teachers' decision of how to handle the three main ways students at this age may approach a particular challenging subtraction concept is especially interesting. Lesson study is less about producing lesson plans and more about how the structured process helps teachers. As such this is an interesting example of the necessary teacher knowledge as well as how learning progressions and formative assessment/instruction might be implemented on a large scale.

Creating Learning Progressions: An Instructional Science Example – "Part-Task Sequencing of Learning Tasks." From van Merrienboer, J. J. G. & Kirschner, P. A. (2007). *Ten Steps to Complex Learning: A systematic approach to four-component instructional design.* Mahwah, NJ: Lawrence Erlbaum Publishers.

Instructional science/technology has devoted much energy to trying to explicate principles for learning in a developmental way. This example illustrates the detailed thinking about how an instructional sequence ("learning progression") might differ depending on the characteristics of the content/skill to be learned—in this case, different ways to learn components knowledge and/or skills of a overall complex task. Whether one agrees with this example or with the whole approach of instructional science/technology, I think it an important tradition to consider when thinking about resources for learning about learning progressions.

Supporting Standards-based Education with Learning Progressions and Associated Materials (State view) – "Victorian Essential Learning Standards Sitemap." From Victorian Essential Learning Standards website, published by the Victorian Curriculum and Assessment Authority, State Government of Victoria, Australia. http://vels.vcaa.vic.edu.au/sitemap.html (retrieved 2/4/08).

Learning progressions by themselves are not very useful, nor is formative assessment alone. This website hints at the resources available to support standards-based learning by the Victorian Curriculum and Assessment Authority (Australia). There are many interesting materials here. Especially relevant are the descriptions of the "Discipline-based Learning" that has statements of the "Structure of the Discipline" (I've included the statement for Mathematics); assessment maps, tasks, annotated work samples, and standards and "progression points" that provide indications of learning progressions within and across grades. The inclusion of this example is not an endorsement of the particular materials, but more an invitation to think about what a *state* might do to support formative assessment, and whom we might learn from.