

The Learning Record Assessment System™ Mathematics Component

The Learning Record Assessment System™ provides a systematic and moderated way of using multiple sources of evidence, including student work and teacher observation notes, to monitor and improve student learning in K-12 classrooms and schools. Adapted from the British *Primary Language Record*, it was developed for assessing reading and writing by the Center for Language in Learning (CLL) during the early 1990s. A grant from the Bureau of Indian Affairs (BIA) has helped support the development and piloting of a mathematics component.

The Learning Record Assessment System™, involves several elements.

1. Collection and analysis of student work. During the year, samples of student work, periodic in-depth assessments, and teacher observation notes are collected in individual portfolios. At the end of the school year, each student's portfolio is analyzed and summarized collaboratively by the student and the teacher. The Learning Record uses standardized record forms, but does not require prescribed or common tasks to be included in students' portfolios.
2. Placement of students on a standardized performance scale. Near the end of the school year, using evidence in the portfolios, the teacher places each student at a level on the Learning Record scale. For mathematics, there are two scales: (1) Mathematical Understanding and (2) Mathematical Disposition (for students in grades 3 and above). The scales consist of performance descriptors identifying important benchmarks or characteristics of student work at various levels. For ease of use, the Mathematical Understanding Scale is broken down by grade spans: K-2, 3-5, 6-8, and high school level courses.
3. Systematic and sustained staff development. For participating schools, the Learning Record is phased in over a three-year period under the leadership of a CLL coach. Teachers participate in seminars while they begin to collect, share and analyze student work. They also discuss the implications of using the Learning Record on classroom practices.
4. On-site and cross-site moderations. Moderations ensure that records from one classroom or school are comparable with records from other classrooms and schools. After teachers place their students on the Learning Record scales, samples of students' portfolios (with names of students and teachers masked) are reviewed, first at the local school and then later at an inter-site moderation. Reviewers, reading in pairs, examine evidence in the portfolio and place the student on the

Scales. A third reading is done if two of the three scores (teacher, site, and inter-site placements) do not match.

Dimensions of Learning

Five Dimension of Learning are integral to the LR and serve as a framework to view student progress.

- Confidence and Independence. Are students willing to risk error? Are they increasingly able to volunteer information and possible solutions to problems, to ask questions and to initiate topics for discussion and study? Are they willing to persevere in the face of complexity?
- Experience. Are student using their prior knowledge to make sense of their current tasks and projects? Is there evidence to show that they have broadened and deepened their experience in specific curricular areas? Can they apply their school experience to a range of authentic purposes?
- Skills and Strategies. Are students using the skills and strategies of the subject to solve problems and construct projects and products? Do they demonstrate they can use mathematics to solve a variety of problems across different mathematics strands? Can they communicate their strategies and findings clearly?
- Knowledge and Understanding. Are students increasingly able to show what they have come to know and understand? What evidence is there that they are adding to their personal knowledge and understanding? What evidence is there that their understanding helps them make connections among mathematical ideas and across other content areas?
- Ability to Reflect. Are students increasingly able to describe how and what they are learning to do and to understand? Can they provide criteria for assessing their own work? Are they developing the ability to judge the quality of their own work? Do they know what to do to improve it?

A Student's Learning Record

Evidence of each student's progress is collected in the student's Learning Record (portfolio). Documentation is recorded on a standardized Data Collection Form and supported with samples of student work. The standardized recording form includes the following:

- Documenting Prior Experience. This is usually completed during the first quarter of the year and features personal data about each student including the parents' or caregivers' description of the student as a learner and the student's own description of his or her accomplishments and goals.

- Collecting Evidence of Student Learning. Throughout the year, teachers and students collect evidence about what and how the student is learning. Data about student learning is recorded on two forms: Observation Notes and (2) Analysis of Mathematics Work. Samples of student work related to the each recording are included in the portfolio.
 - (1) *Observation Notes*. During the year short comments (perhaps using sticky notes or mailing labels) are recorded when the teacher observes something significant about a student's mathematical learning. The observation may be made during class time or when the teacher is reviewing the student's work. Any student work related to the observation note is included in the portfolio. (The matrix at the top of the page is there as a convenience to jot down the date of an observation and to possibly help direct a teacher's observations to a variety of situations.)
 - (2) *Analysis of Mathematics Work*. Three times during the year, the teacher and/or the student does a more-in-depth analysis of student work. This work should directly relate to some of the criteria included in the mathematics scale. The work may include interviews, a classroom assignment or project, a unit assessment, or standardized tools, such as a district assessment.
- Summarizing Student's Mathematics Learning. Near the end of the third quarter, the teacher writes a summary of the student's achievements using the evidence accumulated in the student's Learning Record. The teacher uses the descriptions in the Mathematical Understanding and Mathematical Disposition Scales as criteria against which to assess the nature and extent of progress.
- Reflecting on the Year's Work. At the end of the year, the teacher and student review and update the student's achievements and provide suggestions for the student's continuing development.

Learning Record Mathematics Scales

The Learning Record scales are used at the end of each year to indicate each student's level in mathematics. In addition, the scale descriptors are intended to help students, parents, and teachers understand what is necessary to become truly accomplished in mathematics and to identify what students might work on to improve their learning.

There are two Learning Record mathematics scales. The Mathematical Understanding Scale (for grades K through high school) identifies the important mathematics that students should learn and understand. It is divided into thirteen levels, grouped into five levels per grade span, K-2, 3-5, 6-8, and high school level courses. The Mathematical Disposition Scale (for grades 3 to high school) describes other important characteristics for students to achieve to be successful at learning mathematics. It

incorporates the LR five dimensions of learning and is used in conjunction with the Mathematical Understanding Scale to indicate student progress.

Grade Level Expectations of the Scales

- *Mathematical Understanding, Grades K-8.* Given a good mathematics program, the end-of-year expectation is for students in grades 1-8 to be performing two levels higher on the Mathematical Understanding Scale than their grade placement. For example, the expectation is that 4th grade students who meet (or exceed) grade level standards will be at Level 6 of the Learning Record Mathematical Understanding Scale. The expectation for kindergarten students is level 2.
- *Mathematical Understanding, High School Level Courses.* The last grouping of the scale is for students enrolled in courses that have been considered high school level "college prep" (i.e., courses that go beyond traditional middle school level math). Some students may begin these courses in grades 8 (or lower) and other students may wait till later. While it is recognized that the title, structure, and content of courses will vary across schools (Algebra 1, Integrated Math 1, etc.), the descriptors for each level include content from all mathematics strands. By the end of three years of challenging high school level mathematics courses, the expectation is for students to be performing at level 12. (The content of AP courses is not included in the scale, although the expectation is that students enrolled in these courses would be at level 12 or 13.)
- *Mathematical Disposition Scale, Grades 3-12.* While there will be correlation between students' mathematical understanding and disposition, students who seem to be at the same level of mathematical knowledge will often vary in their degree of confidence, willingness to use and understand different approaches, and their ability to reflect on their work. For example, two fifth grade students may be at level 7 on the understanding scale, but one may be at a level 2 on the disposition scale and the other at level 4. (However, it would be impossible for a student whose mathematical understanding is far below grade level expectations to be performing on a high level of the disposition scale.)

Assumptions Underlying the Mathematics Scales

There were a number of assumptions underlying the development of the mathematics scales.

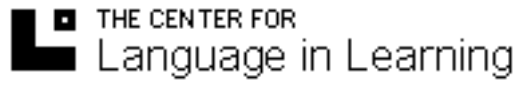
- Mathematical understanding is critical. Developing student understanding of mathematics was the foundation for the development of the scales – students need to understand and make sense of the mathematics they learn. It is not sufficient that students can do procedures by rote. Students must know when and how to use mathematics, and they must think critically when solving problems. Problem solving is embedded throughout the scales at all levels.
- Important mathematical ideas must be apparent. In general, mathematics content is identified in these four areas or strands: (1) number sense, (2) patterns, functions, and algebra, (3) geometry and measurement, and (4) data analysis, statistics, and probability. At each level of the scale, emphasis was placed on

describing the important mathematical ideas for that level. However, since the scales are compressed, not all the important mathematical learnings for each level is specified. Students will have many classroom experiences with content not mentioned at a particular scale level. Emphasis was placed on describing the key indicators that reveal that a student is developing mathematical understanding.

- The scales are developmentally-based. Each school year, students' learning of mathematics grows and builds on what they know, understand, and can use. At each level of the scales, emphasis was placed on describing the critical mathematical ideas and benchmarks so that teachers/students can distinguish among the levels and have some notions of what constitutes progress. Moreover, each level of a scale identifies a broad range of mathematical ideas that require time and many experiences for students to develop and deepen their understandings. Therefore, students may be working at a level for a long period of time – possibly more than a year. This does not necessarily mean that a student is not progressing.
- Expectations are high, but realistic. The scales were written with the assumption that ALL students can learn mathematics provided they participate in a quality mathematics program with teachers who understand mathematics and teach in ways that help students develop understanding and competence. Documents such as the National Council of Teachers of Mathematics (NCTM) Standards and state/local standards and frameworks were used as references in the development of the scales. The developers of the scales also drew upon their many years of working with students to describe levels they believe are realistic but obtainable.
- Holistic judgments will be used for student placement. Although each level of the scales describes a number of different learnings in mathematics, an overall judgment, based on multiple pieces of evidence in a student's portfolio, is used to place a student at a level. The description of each level is not intended to be a "check-list" with a requirement that the student must have mastered each criterion mentioned. Generally, the description of a level should "feel" that it corresponds to the level where a student is performing.

Piloting

During the 1998-99 school year, more than fifty teachers in California and BIA schools participated in the first year pilot. They submitted fifty records of K-8 students for a pilot cross-site moderation. Teachers who pilot are asked to keep Learning Records for one to five students during the year. Teachers and schools interested in knowing more about the Learning Record and/or participating in this year's pilot should contact Joan



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