

# The OCDSB Assessment and Evaluation Journey: Improving Student learning in Secondary Mathematics

*Submitted by: Robin McAteer, Instruction Coach Secondary Mathematics  
Lynn Pacarynuk, Instructional Coach Quality Assurance  
Ottawa Carleton District School Board*

## *“The primary role of assessment is to improve student learning”*

- *Ontario Mathematics Curriculum, Grade 9 and 10, Revised 2005*
- *Growing Success. Assessment, Evaluation, and Reporting in Ontario Schools, First Edition 2010*

This vignette is a pedagogical reflection on the challenges and opportunities associated with assessment in secondary mathematics. It provides an overview of the OCDSB's journey towards an understanding of the relationship between assessment and learning, through examples drawn from secondary mathematics. Two templates, the Assessment Plan and the Student Evidence Record, will be presented. These templates support teachers' practice around planning, designing tasks, collecting evidence, and determining grades.

The Ontario Curriculum has changed a lot over the last 15 years, and many of the changes have involved assessment. Starting in 1999 with Secondary School Reform, the curriculum underwent a significant organizational and philosophical shift. Some of the key changes were:

- a focus on student learning outcomes - called expectations
- the addition of seven key mathematical processes expectations for students to learn and apply to achieve the learning outcomes
- a shift from norm referenced to criterion referenced assessment, and the introduction of the achievement chart and levels of achievement to support this practice
- significant changes to the provincial report card, which included separating behaviour and learning and reporting on key learning skills
- repositioning the role of assessment as part of instruction - part of the learning process as well as the evaluation process

The OCDSB responded to these provincial changes in several ways, including the introduction of the subject specific Mark Weighting Guidelines in 2003, with revisions in 2005. These guidelines supported teachers by mapping curriculum expectations into the new achievement chart categories: Knowledge and Understanding, Communication, Application, and Thinking. We began thinking

about our courses as more than just content and we began to organize our assessment tasks and marks to reflect this change. Each category had a “weight”, and grades were calculated using a weighted average. The math community started to focus on student thinking in mathematics and to develop rich tasks to support student learning through mathematical processes such as reflecting, connecting, and representing. We began work as a community to develop rubrics and use levels of achievement to assess mathematical communication and mathematical thinking.

The assessment landscape continued to evolve. New research about the significant role of assessment FOR and AS learning had an impact on our practice. We started talking about multiple opportunities, feedback, self-assessment and differentiation. Our traditional grading paradigm of a one-size-fits-all weighted average didn’t fit with our new ideas about equity and learning for all.

In 2010, the Ontario Ministry of Education released Growing Success – Assessment, Evaluation and Reporting in Ontario Schools, grades 1 through 12. This document currently provides the framework for assessment in Ontario. Significant ideas in this document relate to evidence of achievement being recorded through the balance of observations, conversations and products, as well as the application of teachers’ professional judgment to personalize the teaching, learning and assessment process.

Building upon the ideas innovative teachers in our district, two templates were developed to replace the Mark Weighting Guidelines. The first template is the Assessment Plan. The Assessment Plan provides teachers with a planning tool to help anchor courses in the curriculum. The *curriculum*, not prescriptive mark weighting, provides the platform for alignment throughout instruction and assessment. Figure 1 shows an annotated sample of an Assessment Plan for grade 9 academic math.

The second template is the Student Evidence Record. There is a separate evidence record for each student, and students are encouraged to keep their own working copy. This template is a tool that organizes and displays evidence of learning in a visual way that reveals trends and patterns. This supports teacher responsiveness and students’ self-regulation. The Evidence record is based on the four levels of achievement outlined in the Ontario Curriculum, and supports teachers’ professional judgement in the determination of grades. The percentage grade that appears on the report card is a numerical representation

of an overall level of achievement. Figure 2 shows an annotated sample of an Evidence Record for a student in grade 9 academic math.

Teachers' practice is focused on helping students learn. This involves planning for instruction and assessment, designing tasks, and collecting evidence of student learning. This cycle repeats as teachers are responsive to students in an effort to help everyone learn. Periodically, teachers report out on the evidence of learning by determining grades. Grades communicate an estimate of student learning at that point in time.

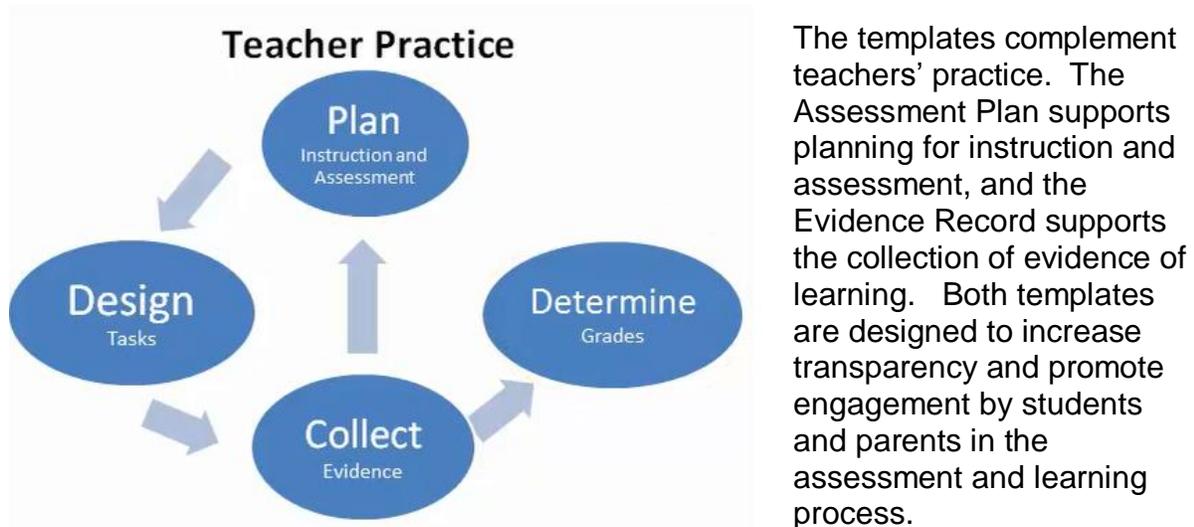


Figure 3 provides more detail about the connections to teachers' practice.

Taken together, the Assessment Plan and Evidence Record templates support student learning by focusing on expectations, empowering students as learners, supporting a responsive learning environment, and honouring teachers' professional judgment.

# Assessment Plan

Assessment Criteria are the Curriculum Performance Standards. They describe how the students will be assessed.

Overall Expectations are the Curriculum Content Standards. These are the outcomes that students are expected to demonstrate.

| Tasks                 | Overall Expectations  |   |  |   |   |  |   |  |   |  | Achievement Chart Criteria  |   |  |  |  |  |  |  |  |  |  |  |
|-----------------------|---|---|--|---|---|--|---|--|---|--|---|---|--|--|--|--|--|--|--|--|--|--|
|                       | Number Sense and Algebra  |   | Linear Relations   |   |   | Analytic Geometry  |   | Measurement and Geometry                       |   |  | K/U   |   | Thinking                               |  |  | Communication  |  |  | Application                                    |  |  |  |
|                       | NS1: Demonstrate an understanding of the exponent rules of multiplication and division and apply them to simplify expressions | NS2: Manipulate numerical and polynomial expressions, and solve first-degree equations. | LR1: Apply data-management techniques to investigate relationships between two variables | LR2: Demonstrate an understanding of the characteristics of a linear relation | LR3: Connect various representations of a linear relation | AG1: Determine the relationship between the form of an equation and the shape of its graph with respect to linearity and non-linearity | AG2: Determine, through investigation, the properties of the slope and y-intercept of a linear relation | AG3: Solve problems involving linear relations | MG1: Determine, through investigation, the optimal values of various measurements | MG2: Solve problems involving the measurements of two-dimensional shapes and the surface area and volumes of three-dimensional figures | MG3: Verify, through investigation facilitated by dynamic geometry software, geometric properties and relationships involving two-dimensional shapes, and apply the results to solving problems | Knowledge of content (facts, terms, procedures) | Understanding of mathematical concepts | Use of planning skills (understanding the problem, making a plan to solve the problem) | Use of processing skills (carrying out a plan, looking back at the solution, reasonableness, justifying, reflecting) | Use of critical / creative thinking processes (problem solving, inquiry) | Expression and organization of ideas and mathematical thinking | Communication for different audiences and purposes (present data, justify solution, math argument) in oral, visual, written forms. | Use of conventions, vocabulary and terminology | Application of knowledge and skills in familiar contexts | Transfer of knowledge and skills to new contexts | Making connections within and between various contexts |
| 1. Test 1             | x   | x   |  |   |   |  |   |  |   |  | x   | x   |  |  |  | x  |  | x  |  |  |  |  |
| 2. Paper Clips Task   |   | x   | x  | x   | x   |  |   | x  |   |  | x   | x   | x                                      | x  | x  | x  | x  |  |  | x  | x  |  |
| 3. Data Project       |   |   | x  | x   | x   |  |   | x  |   | x  | x   | x   | x                                      | x  | x  | x  | x  | x  |  | x  |  |  |
| 4. Test 2             | x   |   |  |   |   |  |   | x  |   |  | x   | x   |  | x  |  | x  | x  | x  | x  | x  | x  | x  |
| 5. Line Investigation |   |   |  |   |   |  |   | x  |   |  | x   | x   | x                                      | x  | x  | x  | x  |  |  |  |  | x  |
| 6. Test 3             |   |   |  |   |   |  |   | x  |   |  | x   | x   |  |  |  | x  | x  | x  | x  | x  | x  | x  |
| 7. Ramp Project       |   |   |  |   |   |  |   | x  | x   |  | x   | x   | x                                      | x  | x  | x  | x  | x  |  |  |  |  |
| 8. Test 4             |   |   |  |   |   |  |   | x  |   |  | x   | x   |  | x  |  | x  | x  | x  | x  | x  | x  | x  |
| 9. Sketchpad Invest.  |   |   |  |   |   |  |   |  | x   | x  | x   | x   | x                                      | x  | x  | x  | x  | x  |  |  |  |  |
| 10. Containers Task   |   |   |  |   |   |  |   |  |   | x  | x   | x   | x                                      | x  | x  | x  | x  | x  |  | x  | x  |  |
| 11. Test 5            |   | x   |  |   |   |  |   |  |   | x  | x   |   | x                                      |  |  | x  | x  | x  | x  | x  | x  | x  |
| 12. Summative Task    |   | x   | x  | x   | x   | x  |   |  |   | x  | x   | x   | x                                      | x  | x  | x  | x  | x  |  |  |  |  |
| 13. EQAO exam         | x   | x   | x  | x   | x   | x  |   | x  | x   | x  | x   | x   |  |  |  | x  | x  | x  | x  | x  | x  | x  |

Assessment tasks are planned with reference to curriculum content and performance standards

Figure 1: Assessment Plan Sample

| Term work                       | R Insufficient   |   | Level 1 Limited |      | Level 2 Some  |              | Level 3 Considerable |              | Level 4 Thorough |                              | Strand Summary                                   |
|---------------------------------|--|---|-----------------|------|---|--------------|----------------------|--------------|------------------|------------------------------|--|
|                                 | -  | + | -               | +    | -   | +            | -                    | +            | -                | +                            |  |
| <b>Number Sense and Algebra</b> |  |   |                 |      |   |              |                      |              |                  |                              |  |
| NS1                             |  |   |                 |      | This is Test 1 from the Assessment Plan.  |              | 1.T1                 | 4.T2         |                  |                              | 3+<br>Strength in NS2                            |
| NS2                             |  |   |                 |      | 1.T1  | 11.T5        | 2.PC                 | 6.T3         | 4.T2             |                              |  |
| <b>Linear Relations</b>         |  |   |                 |      |   |              |                      |              |                  |                              |  |
| LR1                             | Evidence of learning is organized by strand and overall expectation                    |   |                 |      | 2.PC  |              | 3.DP                 |              |                  |                              | 4-<br>Weakness in LR1<br>Strength in LR3         |
| LR2                             |  |   |                 |      | 5.LI<br>2.PC  |              | 3. DP                |              | 8.T4             |                              |  |
| LR3                             |  |   |                 |      | Code and colours are customized to indicate chronology and type of assessment. On this evidence record, tests are in red. |              |                      | 6.T3<br>2.PC | 4.T2             | 3.DP <sup>5.LI</sup><br>8.T4 |  |
| <b>Analytic Geometry</b>        |  |   |                 |      |   |              |                      |              |                  |                              |  |
| AG1                             |  |   |                 |      |   |              | 5.LI                 |              |                  |                              | 3<br>Tests weaker than projects                  |
| AG2                             |  |   |                 |      |   |              | 8.T4                 |              | 5.LI<br>7.RP     |                              |  |
| AG3                             |  |   |                 |      | 4.T2  | 2.PC<br>8.T4 | 5.LI<br>6.T3         | 3.DP         | 7.RP             |                              |  |
| <b>Measurement and Geometry</b> |  |   |                 |      |   |              |                      |              |                  |                              |  |
| MG1                             | Trends, patterns, and outliers are visible. Absence of evidence will also be apparent. |   |                 | 9.SI |   |              | 7.RP                 |              |                  |                              | 3<br>Poor performance on Sketchpad Investigation |
| MG2                             |  |   | 9.SI            | 3.DP |   | 10.CT        | 11.T5                |              |                  |                              |  |
| MG3                             |  |   | 9.SI            |      |   | 11.T5        | 10.CT                |              |                  |                              |  |
| <b>Summative</b>                |  |   |                 |      |   |              |                      |              |                  |                              |  |
|                                 |  |   |                 |      |   |              |                      |              |                  | 12.Task (4-)                 |  |
|                                 |  |   |                 |      |   |              |                      | 13.EQAO (3-) |                  |                              |  |

Figure 2: Sample Student Evidence Record



Assessment Plan

The Assessment Plan communicates curriculum expectations and the criteria for assessment, and connects them to the tasks that provide opportunities for students to demonstrate their learning.

| Number Sense and Algebra | Overall Expectations |                   |                          |   | Achievement Chart Criteria             |   |             |  |
|--------------------------|----------------------|-------------------|--------------------------|---|--|---|-------------|--|
|                          | Linear Relations     | Analytic Geometry | Measurement and Geometry | Knowledge of content (facts, terms, procedures) | Understanding of mathematical concepts | Communication and mathematical thinking | Application |  |
| NS1                      |                      |                   |                          |   |  |   |             |  |
| NS2                      |                      |                   |                          |   |  |   |             |  |
| LR1                      |                      |                   |                          |   |  |   |             |  |
| LR2                      |                      |                   |                          |   |  |   |             |  |
| LR3                      |                      |                   |                          |   |  |   |             |  |
| AG1                      |                      |                   |                          |   |  |   |             |  |
| AG2                      |                      |                   |                          |   |  |   |             |  |
| AG3                      |                      |                   |                          |   |  |   |             |  |
| MG1                      |                      |                   |                          |   |  |   |             |  |
| MG2                      |                      |                   |                          |   |  |   |             |  |
| MG3                      |                      |                   |                          |   |  |   |             |  |

The Evidence Record organizes evidence of student learning relative to the overall expectations of the course. It provides a visual representation of student progress that serves as a communication tool for teachers, students and parents.

Tasks are designed as opportunities for students to demonstrate achievement of the Overall Expectations

**MPM1D, Test 1**

| Overall Expectations  | Questions     | Level |
|---|---------------|-------|
| NS1: Demonstrate an understanding of the exponent rules of multiplication and division and apply them to simplify expressions | 1, 3, 4, 5, 6 | 3-    |
| NS2: Manipulate numerical and polynomial expressions, and solve first degree equations  | 3, 5, 6       | 2-    |

| Rubric   | R   | Level |   |   |   |
|--|-----|-------|---|---|---|
|  |     | 1     | 2 | 3 | 4 |
| Knowledge of content (facts, terms, procedures)                | 1-4 | 1     | 2 | 3 | 4 |
| Understanding of mathematical concepts                         | 1-4 | 1     | 2 | 3 | 4 |
| Expression and organization of ideas and mathematical thinking | 1-4 | 1     | 2 | 3 | 4 |
| Use of conventions, vocabulary and terminology                 | 1-4 | 1     | 2 | 3 | 4 |

*Rubrics contains criteria based on the Achievement Chart that are used to judge the quality of work*

**Test Questions**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Evidence Record

| Term work                       | R Insufficient | Level 1 Limited | Level 2 Some     | Level 3 Considerable | Level 4 Thorough | Strand Summary                              |
|---------------------------------|----------------|-----------------|------------------|----------------------|------------------|---|
| <b>Number Sense and Algebra</b> |                |                 |                  |                      |                  |   |
| NS1                             |                |                 | 1.T1, 1.T5       | 1.T1, 4.T2           |                  | 3+ Strength in NS2                          |
| NS2                             |                |                 |                  | 2.PC, 6.T3, 4.T2     |                  |   |
| <b>Linear Relations</b>         |                |                 |                  |                      |                  |   |
| LR1                             |                |                 | 2.PC             | 3.DP                 |                  |   |
| LR2                             |                |                 | 1.I1, 2.PC       | 3.DP                 | 6.T1             | 4- Weakness in LR3 Strength in LR2          |
| LR3                             |                |                 |                  | 5.T2, 5.TC, 4.T2     | 3.DP, 5.T1       |   |
| <b>Analytic Geometry</b>        |                |                 |                  |                      |                  |   |
| AG1                             |                |                 |                  | 5.I1                 |                  |   |
| AG2                             |                |                 |                  | 8.T4                 |                  |   |
| AG3                             |                |                 | 4.T2, 2.PC, 8.T4 | 5.I1, 5.DP, 6.T3     |                  | 3 Some weaker than projects                 |
| <b>Measurement and Geometry</b> |                |                 |                  |                      |                  |   |
| MG1                             |                |                 | 9.S1             | 7.PP                 |                  |   |
| MG2                             |                |                 | 9.S1             | 3.DP, 10.CC          |                  |   |
| MG3                             |                |                 | 9.S1             | 11.T5, 10.CT         |                  | 3 Poor performance on Student Investigation |
| <b>Summative</b>                |                |                 |                  |                      |                  |   |
|                                 |                |                 |                  |                      | 12.Task (4-)     |   |
|                                 |                |                 |                  |                      | 13.EQAO (3-)     |   |

*Evidence from tasks is recorded and organized by strand*

*Professional judgment is used to determine an overall level for each strand*

All strands are considered to determine a level for the term

|                          | Level      |
|--------------------------|------------|
| Number Sense and Algebra | 3+         |
| Linear Relations         | 4-         |
| Analytic Geometry        | 3          |
| Measurement and Geometry | 3          |
| <b>Overall Term</b>      | <b>3+</b>  |
| EQAO                     | 3-         |
| Task                     | 4-         |
| <b>Overall Summative</b> | <b>3</b>   |
| <b>Final Grade</b>       | <b>77%</b> |

*Levels are represented as percents for reporting purposes*

| Achievement Level | Percentage Marks | Achievement Level | Percentage Marks |
|-------------------|------------------|-------------------|------------------|
| 4+                | 95-100           | 2+                | 67-69            |
| 4                 | 87-94            | 2                 | 63-66            |
| 4-                | 80-86            | 2-                | 60-62            |
| 3+                | 77-79            | 1+                | 57-59            |
| 3                 | 73-76            | 1                 | 53-56            |
| 3-                | 70-72            | 1-                | 50-52            |

Figure 3: Teachers' Practice and the Templates