What's the Point of Points?

Rethinking the Assessment of Student Mathematics Work

#NCTM100
Hello!

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Quick Survey. . .
What’s your role?

Quick Survey. . .
Hybrid, Virtual, Full return?
Background
How Did I Get Here?
Traditional Paradigm
CCSS Performance Standards

• Make sense of problems and persevere in solving them.
• Reason abstractly and quantitatively.
• Construct viable arguments and critique the reasoning of others.
• Model with mathematics.
• Use appropriate tools strategically.
• Attend to precision.
• Look for and make use of structure.
• Look for and express regularity in repeated reasoning.
IB learners strive to be:

- Inquirers
- Knowledgeable
- Thinkers
- Communicators
- Principled
- Open-Minded
- Caring
- Risk-takers
- Balanced
- Reflective
Collaborative Culture
What Has to Change?

**Delivery**
Direct instruction gives way to student exploration.

**Activities**
Less time rehearsing algorithms, more time solving problems.

**Assessment***
Measure extent to which students meet expectations (a.k.a. Standards)
“... (grading) practices are not the result of careful thought or sound evidence, ... rather, they are used because teachers experienced these practices as students and, having little training or experience with other options, continue their use.”

**No Judgement**

Why Abandon Tradition? What’s Wrong With Points?

- Assessments crafted to ensure enough students meet arbitrary targets. (Remove Challenges.)
- If a test is “too hard”, scores may be inflated. . . or “curved”.
- Cut scores are arbitrary.
What Is “Excellence”?

<table>
<thead>
<tr>
<th>% Score</th>
<th>Rating</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>5.00</td>
<td>A+</td>
</tr>
<tr>
<td>95%</td>
<td>4.75</td>
<td>A+</td>
</tr>
<tr>
<td>90%</td>
<td>4.50</td>
<td>A</td>
</tr>
<tr>
<td>85%</td>
<td>4.25</td>
<td>A-</td>
</tr>
<tr>
<td>80%</td>
<td>4.00</td>
<td>B+</td>
</tr>
<tr>
<td>75%</td>
<td>3.75</td>
<td>B</td>
</tr>
<tr>
<td>70%</td>
<td>3.50</td>
<td>B-</td>
</tr>
<tr>
<td>65%</td>
<td>3.25</td>
<td>C+</td>
</tr>
<tr>
<td>60%</td>
<td>3.00</td>
<td>C</td>
</tr>
<tr>
<td>55%</td>
<td>2.75</td>
<td>C-</td>
</tr>
<tr>
<td>50%</td>
<td>2.50</td>
<td>D+</td>
</tr>
<tr>
<td>45%</td>
<td>2.25</td>
<td>D</td>
</tr>
<tr>
<td>40%</td>
<td>2.00</td>
<td>D-</td>
</tr>
<tr>
<td>&lt;40%</td>
<td>&lt;2.00</td>
<td>F</td>
</tr>
</tbody>
</table>
What Is “Excellence”?

<table>
<thead>
<tr>
<th>Grading Scale</th>
</tr>
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<tbody>
<tr>
<td>A = 100-93</td>
</tr>
<tr>
<td>A- = 92-90</td>
</tr>
<tr>
<td>B+ = 89-87</td>
</tr>
<tr>
<td>B = 86-83</td>
</tr>
<tr>
<td>B- = 82-80</td>
</tr>
<tr>
<td>C+ = 79-77</td>
</tr>
<tr>
<td>C = 76-73</td>
</tr>
<tr>
<td>C- = 72-70</td>
</tr>
<tr>
<td>D+ = 69-67</td>
</tr>
<tr>
<td>D = 66-63</td>
</tr>
<tr>
<td>D- = 62-60</td>
</tr>
<tr>
<td>F = Below 60</td>
</tr>
</tbody>
</table>
What Is “Excellence”?

A Much Higher Standard of Excellence?

Quick Survey . . .
Does your school/you use points/percents or rubrics or other?

<table>
<thead>
<tr>
<th>Letter grade</th>
<th>Percentage</th>
<th>Grade Points</th>
<th>Weighted Grade Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>100-99</td>
<td>4.00</td>
<td>4.33</td>
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<tr>
<td>A</td>
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<tr>
<td>A-</td>
<td>94-93</td>
<td>3.67</td>
<td>4.00</td>
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<tr>
<td>B+</td>
<td>92-91</td>
<td>3.33</td>
<td>3.67</td>
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<tr>
<td>B</td>
<td>90-87</td>
<td>3.00</td>
<td>3.33</td>
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<tr>
<td>B-</td>
<td>86-85</td>
<td>2.67</td>
<td>3.00</td>
</tr>
<tr>
<td>C+</td>
<td>84-83</td>
<td>2.33</td>
<td>2.67</td>
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<tr>
<td>C</td>
<td>82-79</td>
<td>2.00</td>
<td>2.33</td>
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<tr>
<td>C-</td>
<td>78-77</td>
<td>1.67</td>
<td>2.00</td>
</tr>
<tr>
<td>D+</td>
<td>76-75</td>
<td>1.33</td>
<td>1.33</td>
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<tr>
<td>D</td>
<td>74-73</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>D-</td>
<td>72-70</td>
<td>0.67</td>
<td>0.67</td>
</tr>
<tr>
<td>F</td>
<td>69-0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
What Else is Wrong With Points?

• Answer-getting over Problem-solving.
• Remove student ownership of learning. (Paint by Number)
• Illusion of validity and objectivity.
• Oversimplifies a complex field of study to simple “right” vs. “wrong”.

https://drive.google.com/a/notredameacademy.com/file/d/0B1XnJ3sngLBKY0VlbgPNUNJ5VEE/view?usp=sharing
What else?

If assessments are “scored”, most students tend to identify their “grade” and put the work in their folder, never to be seen again. Many will use their grade to justify that they are “no good at math”.

What Else is Wrong With Points?

Instead of Punishing students for what they do wrong, we should be rewarding students for what they do right, including recognizing their own mistakes.
Intro to Chemistry and Physics
Quiz Chapter 12
Mrs. Hearden

1. What is the acceleration of a 68.5g box pushed with a force of 125N?

\[
\begin{align*}
\text{Given:} & \quad m = 68.5\text{g} = 0.0685\text{kg} \\
\text{Equation:} & \quad F = ma \\
\text{Sub:} & \quad a = \frac{125\text{N}}{0.0685\text{kg}} \\
\end{align*}
\]

\[a = 1811.6\text{ m/s}^2\quad \text{OK}\]

2. State Newton’s Second Law of Motion.

The acceleration of an object is directly proportional to the unbalanced force on the object and inversely proportional to the mass of the object.

3. What does “g” stand for? (not the number)

\text{Constant of universal gravitation} \quad \text{Acceleration due to gravity}
4. Name the SI unit of force. (the word, not the symbol)

Newtons

5. Terminal velocity is the term given to the constant speed of a falling object. This speed happens when the forces are balanced.

6. What is the shape of the trajectory of a projectile? (Use a word not a drawing)

Parabola

You must use the 5 steps to receive credit for any calculations.

7. What is the mass of a person weighing 475N?

<table>
<thead>
<tr>
<th>Given</th>
<th>Equation</th>
<th>Substitution</th>
</tr>
</thead>
<tbody>
<tr>
<td>m?</td>
<td>( \frac{W}{g} = m )</td>
<td>( m = \frac{475 \text{ N}}{9.8 \text{ m/s}^2} )</td>
</tr>
<tr>
<td>W = 475 N</td>
<td>( W = mg )</td>
<td>( m = 0.02 \text{ kg} )</td>
</tr>
<tr>
<td>( g = 9.8 \text{ m/s}^2 )</td>
<td>( m = \frac{g}{9} )</td>
<td>( m = 48.5 \text{ kg} )</td>
</tr>
</tbody>
</table>
8. If a snowball is thrown horizontally from the top of a 78m tall building with a speed of 18.9m/s, how far away from the building will it land?

Equation: \( t = \sqrt{\frac{2d}{g}} \)

\[ \begin{align*}
H & \quad V \\
V &= 18.9m/s \\
d &= 78m \\
t &= 3.99s \\
d &= 75.4m \\
\end{align*} \]

Substitution: \( t = \sqrt{\frac{2(78m)}{9.8m/s^2}} \)

\[ t = 3.99s \]

Equation: \( v_f = \frac{d}{t} \)

Substitution: \( d = (18.9m/s)(3.99s) = 75.4m \)

9. When a penny falls from a tall building, how fast is it going after 3.15 seconds?

\[ \begin{align*}
\text{Given} & \quad \text{Equation} & \quad \text{Sub} \\
v_i &= 0m/s & \quad g = \frac{v_f - v_i}{t} & \quad v_f = (0m/s) + (\frac{9.8m/s^2(3.15s)}{9.8m/s^2}) \\
g &= 9.8m/s^2 & \quad v_f = 30.8m/s \\
t &= 3.15s & \quad v_f = v_i + (gt) \\
v_f &= 30.8m/s \\
\end{align*} \]

10. Name the 2 things that affect the force of gravity according to the Law of Universal Gravitation.

- Mass
- Distance
10. Name the 2 things that affect the force of gravity according to the Law of Universal Gravitation.

- Mass
- Distance

11. Define “free fall.”

when the only force affecting objects is gravity.

12. A rock is thrown horizontally from the top of a hill at 14.6 m/s and lands 31.2m away. How high is the hill?

\[
\begin{align*}
H &= \frac{V}{U'} - 11.62 \\
&= \frac{9-2.8\text{ m/s}^2}{t=2.14\text{s}} \times \frac{d=31.2\text{m}}{t=2.14\text{s}} \\
&= \frac{t_1=2.14\text{s}}{t_2=2.14\text{s}}
\end{align*}
\]

Equation 1

\[V = \frac{d}{t} \]

Sub 1

\[t = \frac{31.2\text{m}}{14.6\text{m/s}} = 2.14\text{s} \]

Equation 2

\[d = \frac{1}{2}gt^2 \]

Sub 2

\[d = \frac{1}{2}(9.8\text{m/s}^2)(2.14\text{s})^2 = 22.4\text{m} \]
What to do with all of those points?

- Average?
- “Curve”, then Average?
- Drop lowest test score?
- “Extra Credit”? 

Quick survey... Am I talking too fast? F Is my pacing okay? A
“Averaging falls far short of providing an accurate description of what students have learned. . . . If the purpose of grading and reporting is to provide an accurate description of what students have learned, then averaging must be considered inadequate and inappropriate”.

What about the Learning Curve?
Compliance vs Quality
What are we really looking for?

Math Learning Objectives
- Knowledge and understanding
- Problem-solving
- Communication and interpretation
- Technology
- Reasoning
- Inquiry approaches.
There seems to be more to math than getting a correct answer or acquiring enough points.

SO What Instead?
One more thing. . .

Forms, BackPax, etc.

Many applications now score math work for you so that you don’t have to. I am really uncomfortable with these “time savers”.

A) Kids won’t get meaningful feedback, just a score.
B) An undermotivated student won’t likely bother to find and fix misunderstandings.
C) I become unaware of the types of misconceptions students have.
Isn’t Every Assessment Formative?

Formative assessment informs both teaching and learning. It is concerned with providing accurate and helpful feedback to students and teachers on the kind of learning taking place and the nature of students’ strengths and weaknesses in order to help develop students’ understanding and capabilities. Formative assessment can also help to improve teaching quality, as it can provide information to monitor progress towards meeting the course aims and objectives.
My Assessment Process
In 3 Parts

Teacher Provides Feedback On Student Assessments

Students Evaluate Work Against the Standards and Feedback

Teacher Monitors Evaluations for Accuracy
Why Self-Assessment?

“Student self-assessment serves cognitive purposes . . . but it also promises to increase students’ responsibility for their own learning and to make the relationship between teachers and students more collaborative.” Shepard (2000)

http://www.jstor.org/stable/1176145?seq=1#page_scan_tab_contents
Why Self-Assessment?

“What self-assessment is more accurately defined as a process by which students

1) monitor and evaluate the quality of their thinking and behavior when learning and

2) identify strategies that improve their understanding and skills.

That is, self-assessment occurs when students judge their own work to improve performance as they identify discrepancies between current and desired performance.”

Implications for Teaching and Learning

**Students**
- Increased Ownership
- Improve Reflective Practice
- Shift from “Answer Getting” to Concept Mastery
- Lasting Learning
- Reduced Stress
- Higher Quality Work

**Teachers**
- Learn More About Students
- Enables More Directed Interventions for Struggling Learners
- Able to Include Richer Assessment Tasks
- Promotes Richer Instructional Activities
- Redirect Focus on Math and away from points and scores
IB learners strive to be:

- Inquirers
- Knowledgeable
- Thinkers
- Communicators
- Principled
- Open-Minded
- Caring
- Risk-takers
- Balanced
- Reflective
One Alternative to Points

How I try to increase the value of assessment.
Where To Start?

**Define Objectives**
Establish overall standards or goals that need to be achieved as a part of a course.

**Describe Tiers of Success**
Start from the highest achievement levels, and work your way down to the lowest tier.

**Create a Generalizable Form**
Students should be able to gauge their success against the standards for each item on an assessment.
My Source For Math Descriptors: IB

**Grade 7**
Demonstrates a thorough knowledge and understanding of the syllabus; successfully applies mathematical principles at a sophisticated level in a wide variety of contexts; successfully uses problem-solving techniques in challenging situations; recognizes patterns and structures, makes generalizations and justifies conclusions; understands and explains the significance and reasonableness of results and draws full and relevant conclusions; communicates mathematics in a clear, effective and concise manner, using correct techniques, notation and terminology; demonstrates the ability to integrate knowledge, understanding and skills from different areas of the course; uses technology proficiently.

IB Uses a 7-point scale. I adopted a variation of this for all of my courses to move away from the traditional 4-point scale.
Grade 6
Demonstrates a broad knowledge and understanding of the syllabus; successfully applies mathematical principles in a variety of contexts; uses problem-solving techniques in challenging situations; recognizes patterns and structures, and makes some generalizations; understands and explains the significance and reasonableness of results, and draws relevant conclusions; communicates mathematics in a clear and effective manner, using correct techniques, notation and terminology; demonstrates some ability to integrate knowledge, understanding and skills from different areas of the course; uses technology proficiently.
Grade 5
Demonstrates a good knowledge and understanding of the syllabus; successfully applies mathematical principles in performing routine tasks; successfully carries out mathematical processes in a variety of contexts, and recognizes patterns and structures; understands the significance of results and draws some conclusions; successfully uses problem-solving techniques in routine situations; communicates mathematics effectively using suitable notation and terminology; demonstrates an awareness of the links between different areas of the course; uses technology appropriately.
Grade 4 Demonstrates a satisfactory knowledge of the syllabus; applies mathematical principles in performing some routine tasks; successfully carries out mathematical processes in straightforward contexts; shows some ability to recognize patterns and structures; uses problem-solving techniques in routine situations; has limited understanding of the significance of results and attempts to draw some conclusions; communicates mathematics adequately, using some appropriate techniques, notation and terminology; uses technology satisfactorily.
Grade 3 Demonstrates partial knowledge of the syllabus and limited understanding of mathematical principles in performing some routine tasks; attempts to carry out mathematical processes in straightforward contexts; communicates some mathematics, using appropriate techniques, notation or terminology; uses technology to a limited extent.
**Grade 2** Demonstrates limited knowledge of the syllabus; attempts to carry out mathematical processes at a basic level; communicates some mathematics but often uses inappropriate techniques, notation or terminology; uses technology inadequately.

**Grade 1** Demonstrates minimal knowledge of the syllabus; demonstrates little or no ability to use mathematical processes, even when attempting routine tasks; is unable to make effective use of technology.
Elements of Good Mathematics:

• Work is clear, concise, easy to follow
• Mathematical notation is used appropriately
• Appropriate, efficient algorithms are applied to solving problems
• Work is well-supported using multiple perspectives
• Flaws in execution are spotted and corrected
How Important Is Mathematical Communication?
## Communication

- Proper use of vocab
- Efficient presentation
- Readable organization
- Appropriate notation
- ATTEMPT to justify results
- ATTEMPT to represent results in inappropriate form
  (fraction/decimal/radical/ordered pair/etc)
## Methods

- Appropriate use of algorithms
- Use Numerical approach correctly to answer
- Use Algebraic approach correctly to answer
- Use Geometric approach correctly to answer
- Use Mathematical Models appropriately to represent information in problem
Comprehension

- Support with multiple approaches
- ACCURACY in justifying answer
- Self-critique (student knows own work is correct or incorrect)
- Understanding of Command Terms (like "Solve", "Simplify" or "Factor")
- Represent answer in appropriate form (fraction/decimal/radical/ordered pair/etc)
Current Evaluation Form:
https://docs.google.com/forms/d/188FgsALPk_nJ3JW9SxEyjs-uxGnm8dJ0q92DwPzVZo4/edit?usp=sharing
What to Do With Those Scores?

I use non-scientific Score Trends to determine Summative Term Grades.

<table>
<thead>
<tr>
<th>Student A</th>
<th>85</th>
<th>83</th>
<th>89</th>
<th>93</th>
<th>90</th>
<th>92</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student B</td>
<td>85</td>
<td>98</td>
<td>90</td>
<td>81</td>
<td>83</td>
<td>85</td>
</tr>
</tbody>
</table>

*I have not gotten push-back from parents. If challenged, I will turn the conversation to student evaluations instead of their scores.*
Questions Commonly Asked:

• How do I check my answer?
• Is this notation appropriate?
• I got the answer this way, but is there a better way?/another way?
• I know I did something wrong because this answer doesn’t make sense, but I can’t figure out what I did wrong. What am I doing wrong? (*nothing btw)
• I know how to get the answer, I just don’t know how to explain it. How would you explain this?
• Is this a simple mistake or a comprehension issue?
This Year's Samples

Simon - 12 Quadratics in Vertex Form
Eli - 12 Quadratics in Vertex Form
Delaney - 12 Quadratics in Vertex Form
Thomas - 12 Quadratics in Vertex Form
THANKS!

Any questions?

You can find me at dguyette@notredameacademy.com
Articles related to Self Assessment

- https://drive.google.com/a/notredameacademy.com/file/d/0B1XnJ3sngLBKWXV1Y3R4TEQ4djg/view?usp=sharing
- https://drive.google.com/a/notredameacademy.com/file/d/0B1XnJ3sngLBKV0pVaGhJQTJOWnc/view?usp=sharing

Self Assessment Form as a Google Doc (Instead of a Form).

- https://docs.google.com/document/d/1sWVeqdOKrfoG98fYtjh4OjSY_ESfXGmBOOCDji15iRs/edit?usp=sharing