Standards-based Grading Suggestions for Grades 8-12

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Introduction

Standards-based grading (SBG) was originally hinted at by Bloom in the 1950's, but actually goes back to Ralph W. Tyler in the 1930's. Tyler argued that standards should be stated in terms that clarify the desired outcomes of student learning (Stones, 2012). SBG gained more traction in the US in the mid-1980's and it has had resurgence in the past few years. Its renewed popularity results from opportunity for growth mindset in the mathematics classroom. In her most recent book, *Mathematical Mindsets*, Boaler (2016) describes assessment to promote the growth mindset as having two components: clear communication of what students have learned, and a method to help students understand where they are on their journey to mastery and where they still need to improve. Both of these components are key signatures of SBG. SBG also aligns well with numerous aspects of quality assessment as described by the BC Ministry of Education such as: "fair, transparent, meaningful… focuses on… knowing, doing, understanding… is ongoing, timely, [and] specific" (BC's New Curriculum, 2016).

There are four common aspects to practicing SBG in a classroom (Standard-based assessment, n.d.):

1. Dividing the content of the school year into learning objectives or standards.
2. Designing a rating system for each standard.
3. Developing a system to synthesize the overall learning.
4. Utilizing an efficient student feedback system to document and communicate each child's learning.

Although at first glimpse this seems like a lot of work, in my experience I have found that besides the obvious need for tweaking (as you will see below) once you establish a plan for one year, the following years' work is much easier.

SBG 1.0: My First Attempt

In September 2015, I decided to try SBG with my Pre-Calculus 12 class. In accordance with the first aspect listed above, I went through the curriculum and divided the year into twenty-five standards. The creation of the standards was not too difficult, as I knew the prescribed learning outcomes from the curriculum documents. Then, to each standard, I allocated a small percentage of the year (approximately 4% each).

When these outcomes are divided and listed (as in Figure 1), it allows a teacher to have a greater understanding of how an aggregated percentage mark is generated than a traditional points assessment.

I used an overall weighting of those units similar to the weighting of units on old provincial examinations. I also tried to align with the set weightings of my school-based final examinations.

The rating system that I used was different than many of the systems that I had come across in my readings. Instead of utilizing a numbered approach (1-5) or a descriptive approach (not yet meeting, meeting, exceeding, et cetera), I used an approach that utilized the cognitive levels of questioning, namely: knowledge (K), application (A), and higher-level thinking (H). I chose to use these levels to mimic the B.C. Ministry of Education's cognitive levels

				Start	K1	K2	A1	A2	H1	H2
	Standard	%	Textbook Sections	10%	30%	50%	70%	90%	95%	100%
1	Demonstrate an understanding of operations on, and compositions of, functic	2	1.1, 1.2, 1.3	1	1	1	1	1	1	1
2	Demonstrate an understanding of the effects of horizontal and vertical transla	2	1.4, 1.6	1	1	1	1	1	1	1
3	Demonstrate an understanding of the effects of horizontal and vertical stretch	2	1.4, 1.6	1	1	1	1	1	1	1
4	Apply translations and stretches to the graphs and equations of functions.	4	1.4, 1.6	1	1	1	1	1	1	1
5	Demonstrate an understanding of the effects of reflections on the graphs of fu	3								
5.1	• x-axis	1	1.4, 1.6	1	1	1	1	1	1	1
5.2	• y-axis	1	1.4, 1.6	1	1	1	1	1	1	1
5.3	• line y = x.	1	1.5, 1.6	1	1	1	1	1	1	1
6	Demonstrate an understanding of inverses of relations	2	1.5, 1.6	1	1	1	1	1	1	1

Figure 1

and to provide a tiered approach, similar to Bloom's Taxonomy, to defining a student's deepening understanding of each standard.

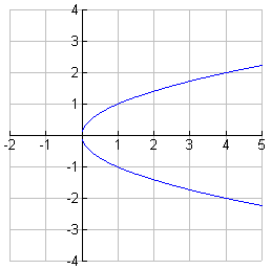
Working Definitions

I needed to solidify a framework for the types of questions I would ask at each of the cognitive levels, so I defined them as follows:

Knowledge (K): These questions can usually be answered in one step. (Bloom's New Taxonomy: Remember and Understand)

Example:

1K What is the domain of the relation shown below?



Application (A): These questions can usually be answered using multiple steps. (Bloom's New Taxonomy: Apply)

Example:

1A Given $f(x)=2x-\frac{1}{x}$ and $g(x)=x-3$, find the domain of $(f\circ g)(x)$. You must answer using a different form (set, interval, etc.), than your answer in 1K above.

Higher-Level Thinking (H): Questions that use the standard in either a new way or in conjunction with past knowledge. These questions may include other standards already covered from this year. (Bloom's New Taxonomy: Analyze, Evaluate, Create)

Example:

H: An *odd* function, $y=f(x)$, has the property that $f(-x)=-f(x)$. In words, what is the graphical, transformational process to show that a function is odd?

As outlined in Figure 1, each standard was scored against seven ranks (Start, K1, K2…H2); the goal I had for my students was to show evidence of their learning progressing from knowledge to higher-level thinking levels; and, in this scoring, the student needed to show me that they could complete each cognitive level question at least two times (hence the need for K1 and K2, A1 and A2, and H1 and H2). A score for each standard was given for the highest sequential learning that was shown for that standard. This method requires a student to show evidence of their learning multiple times to increase their score. I aligned each level (K1 to H2) with a percentage, which is unlike many other SBG (that use words such as "exceeds expectations", for example). A student who demonstrates their understanding gets a percentage according to this chart (also in Figure 1):

K1	K2	A1	A2	H1	H2
30%	50%	70%	90%	95%	100%

This scale allows a student who can show basic understanding twice (to the K2 level) to pass. Past provincial examinations included approximately 10% higher-level thinking questions, so I made the H-level account for the top 10%.

Example:

On Standard #1, Abby completes two K-level questions and one H-level question. She scores KKA_H_, or 70%. On Standard #2, she completes only one H-level question and scores K_A_H_, or 30%. Later, if Abby completes an A-level question for Standard #2, she will score KKAAH_ and jump to 95%.

You will notice that Abby's mark jumped drastically! This is due to the fact that Application questions presuppose the Knowledge level and she is credited for one single missing K-level questions for Standard #2.

In addition, many of the H-level questions that were given covered more than one standard for the year. If a student was successful on an H-level question that covered standards 1, 2, and 4, then they would get credit (if needed) for one Knowledge and one Application question for each standard.

Students who could complete two K questions on one standard received 50% for that standard. My school adopted a policy that 10% of assessments should be at the higher-level thinking rating, so the 90% cap for two A's was set using that policy.

The overall, quantitative mark could be calculated by a spreadsheet using a few simple formulas once the grid of standards is created with weights for the course, as well as weights for the completion of the standard rankings. As the teacher, I knew the opportunities for assessment that I had given the students at each point in the year. The student marks could be calculated by comparing the sum of their learning demonstrated divided by the learning covered to date.

Finally, I needed a simple, transparent system to communicate the learning directly to the student. As my school uses Google Suite, I chose to create a Google Sheet (an online, shareable spreadsheet) that I could use as my mark-book. I created a tab for the "learning covered to date" that I could fill in as the year progressed. I added an additional column to track the number of H-level opportunities I had given the students; this helped tremendously to remind me which standards I had tested multiple times and which ones hadn't been integrated into very many high-level questions. In fact, it was very useful as I could look for opportunities to create questions that would blend standards together that hadn't been tested as often. I then created a tab for each student, cloning the first tab. Finally, I shared that tab with the individual student; as scores are inputted

on the master document, all of it is then shared and the student has an instant and transparent understanding of their learning in the course. As well, it gives both the teacher and the student the immediate, clear message about their current level of understanding for each dis-aggregated learning standard.

Implementation Challenges

As the end of September approached, I began to face building my first quiz which would cover the first and second standard of the year. I decided to make the quiz have five questions: two for each of standards 1 and 2 K, two for each of standards 1 and 2 A, and one H-level question that incorporated both standards. I built a grid and readied the master sheet's "learning covered to date" tab to indicate the opportunities had been given for standard 1 (KKAAH_) and likewise for standard 2. Then, I waited for the day of the class and handed out the quizzes. The students breezed through the K questions, worked on the A questions, then attempted the H. They worked and worked. Thirty minutes passed, then forty. When only two students had handed the quiz in at the hour mark, my anxiety grew. At the end of the eighty-minute class, the students sheepishly handed in their quizzes; at least they had rolled up their sleeves and attacked the mathematics! After that, I ensured that *all quizzes only covered K and A level questions.* This adaptation allowed the students to check-in with their understanding without taking an exorbitant amount of class time away from learning and practicing of new material.

The development of H-level questions was certainly a challenge. The balance between very easy and very difficult, as well as the option to blend together different standards posed some exciting new approaches, but also some challenges to designing questions. One needs to think carefully about the exact standard(s) being asked and to allow for multiple opportunities to complete the H-level questions throughout the year. One piece of advice that I implemented at the start of the year was *to keep track of the number of times that I had given students the opportunity to complete each standard to the highest level.* I didn't worry about the number of times that I assessed students at the K and A-levels as they had individual quizzes and the unit tests to show me that level of understanding. However, once I limited the H questions to unit tests, I needed a tracking system to ensure that I was giving additional opportunities to show their knowledge on each standard, without repeating a standard ad infinitum. Another key point: although I clearly indicated on assessment the standards for the K and A questions, *I did not indicate the standards covered on the H-questions.* If I had indicated those standards, then a student who had memorized the standards could potentially know the approaches to use.

The next main challenge was with explaining this new process. As described by Brookhart (1997), it is important to justify to students the value and importance of each learning opportunity to increase the success of smooth implementation. The students caught on fairly quickly, but needed a few quizzes and one unit test to see the process more completely. By the time the second unit test had occurred–and the students had seen an H-level question that synthesized standards from both the current and past unit–they saw the power of continued learning and assessment that SBG allows; many students who had not yet shown understanding of material in unit 1 were able to complete the H that incorporated both units and were delighted to earn (back) credit for the earlier standards. The parents needed a little more explanation; although their children were the main source of information, I created a video outlining both the reasons for the change as well as the practical implementation. No parents contacted me after October to discuss this change in assessment.

Finally, I had made a decision at the onset of the year that to get credit at any level, the students needed to master that level. This decision followed from research that mastery learning leaves students with positive feelings about class and beliefs that their efforts will yield success (Brookhart, 1997) and aligns closely with growth mindset ideas around assessment for learning (Boaler, 2016).

For instance, if students completed an application question, they needed to communicate their work and answer correctly to get the credit; if they missed defining variables, or assigning their answer the correct units, they were not credited with that standard and this lead to quite a bit of frustration for students if they made a small error. In future interactions of SBG, I needed to re-visit this decision and have relaxed this mastery view somewhat.

Implementation Successes

At the start of the year, I set two goals for myself pertaining to SBG:

1. To have 95% of the students agree to the statement "SBG is at least as good as other assessment systems" and,

2. To have a class average within 2% between their SBG mark and their (traditional) final examination mark.

On the end of year survey 100% of students responded that SBG was "at least as good as" traditional approaches; more exciting, over 90% agreed that it was "better than" traditional approaches and almost 10% said that it was "the best way" to learn mathematics. The survey responses also indicated:

- 95% of students scored 8 out of 10 or higher that SBG has "clear learning goals"

- 95% of students scored 9 out of 10 or higher that in SBG "assessment is accessible"

- 90% of students scored 9 out of 10 or higher that in SBG "assessment is transparent" and it "includes opportunities for improvement"

- Over 80% of students scored 8 out of 10 of higher that in SBG "assessment is fair"

Student anecdotal feedback included:

- "gives students many opportunities–allows students to target their studying"

- "The Standard Based Grading gives motivation to students to improve their math skills, because they would recognize that there is always learning space for improvement."

- "it allowed us to know exactly our strengths and weaknesses in the course"
- "I think it [SBG] is the best way to learn because we get more than one chance and show our best potential"
- "I would prefer Standard Base Grading to be implemented into our other classes."
- "This type of grading has significantly taken off a LOT of stress in the course. As to how, I'm not exactly sure what the direct link is, but I have been able to cope with this class a LOT better than the other classes, and math is not a walk in the park for me. I highly suggest implementing this system into other classes if possible."

Their final examination mark was roughly 3% below their SBG grade; although it was not within 2%, the outcome was quite similar showing that the learning was mostly on par when given a summative, traditional points-based examination.

There were three other aspects of SBG that I found (surprisingly) successful:

1. Assessment differentiation: As students showed me their understanding on quizzes, their SBG grids filled up. Since they could not lose a box on their grid once it had been filled in, they found unit tests had a new focus. I created a unit test that allowed any student in the class to get 100% on each standard from that unit. Often, however, the students had all shown mastery of K (and even A) questions from those standards and I did not need to include those level questions on the test. As well, students were encouraged to re-visit their SBG charts prior to the test and were allowed to bring in a list of the standards and levels that they still needed to show me. This lead to students all having the same test, but doing different questions–a much more differentiated approach than any traditional points test that I had made earlier in my career.

2. Marking: As I had decided that I was looking for mastery, marking questions became easier and anecdotal comments were added to support students in understanding their successes and gaps.

3. Final exam review: The H-level questions forced students to review previous concepts continually throughout the year; however, final exam review gave us another opportunity to assess student learning. Students were keen to have yet another opportunity to show their learning and be given credit for the standards as we completed review quizzes during the review periods in preparation for the final examination.

SBG 2.0: My Second Attempt

In preparing for a second year using SBG, I made three small changes. As I mentioned earlier, I de-emphasized the mastery for credit of each standard. I started accepting small errors and have found the students greatly appreciated this change.

I also reduced the number of total outcomes, which forced a change in the percentages at each level to better fit with my professional judgment of the students' learnings under SBG. Finally, I desired a system that enabled me to quickly garner information about each class's overall understanding of the concepts covered. To do this, I created a tab that pulled the information from all the student tabs that allowed me to quickly see where the gaps were so that those areas could be assessed again at a later point.

SBG AP 1.0

For my AP Calculus AB class, I decided to respond to one piece of student feedback: part marks. As I divided the year into standards, I conscientiously thought of how I could assess those standards outside of the K, A, H format. Instead of looking for multiple questions for each standard, I decided to design the assessment on the AP scale of 1-5. I used the UBC equivalency for the basis of my grading (namely, 1=0%, 2=70%, 3=80%, 4=86%, and 5-96%). I also included a second 5 category (for 100%) for those students who showed me mastery multiple times on a standard during the year.

Conclusion

Standards-based grading promotes a growth mindset by removing the connotation of finality that is present in traditional grading, and replaces it with a feeling of hope for students. It is based on the idea that the purpose of assessment and a grade is to report accurately the achievement level of the student.

SBG, using this process as a basis, has begun to spread throughout my school and on to other mathematics departments of local schools. Assessment has always been a great conversation point between teachers (of any department), but SBG can truly allow for the consistency, transparency, and growth-mindset approach that we are all looking to implement.

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