If You Are Not Blueprinting Your Assessments, Read This Article

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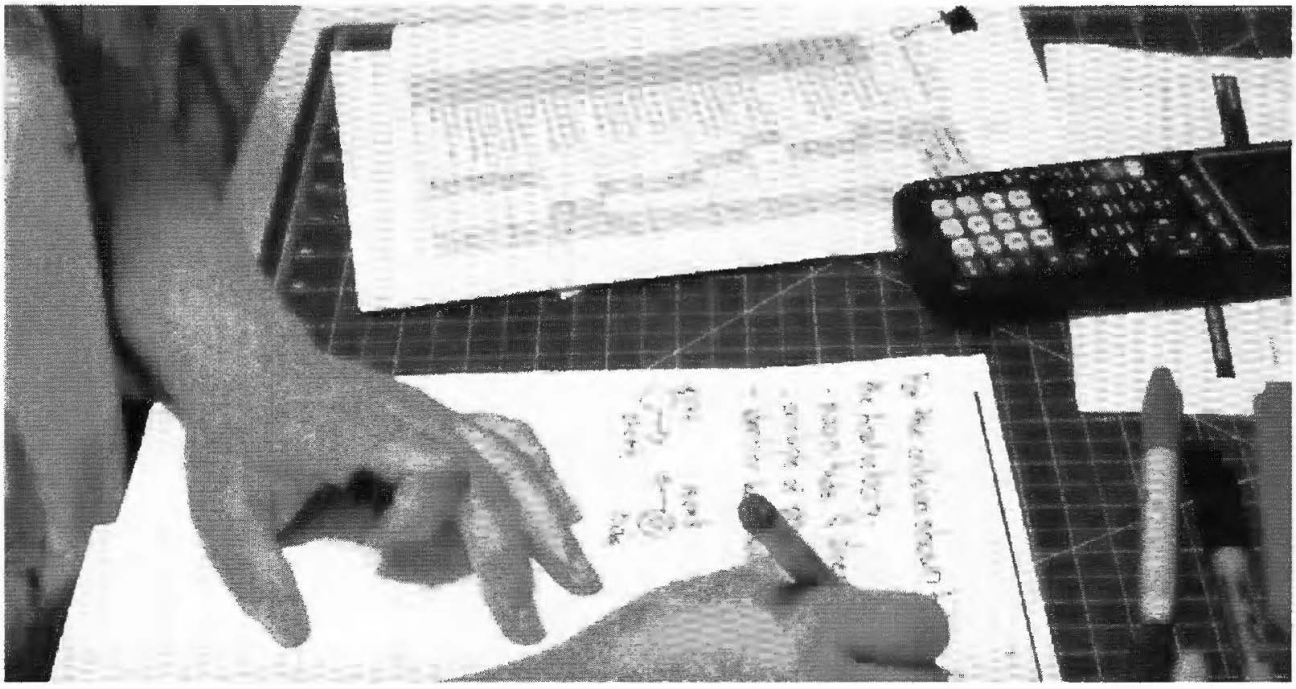

The task of blueprinting is a matter of analyzing the learner outcomes in a program of studies (POS) and constructing an assessment tool, or series of assessment tools, to measure student proficiency based on those outcomes. Good blueprinting practice considers the verbs in the outcomes, the cognitive level implied by the outcomes, and strives to use appropriate weightings to assess all outcomes with equity in mind. My experience with blueprinting has caused a profound mental shift in assessment practice for me, as well as many of my colleagues who have shared this experience with me.

If one had to identify a golden rule when it comes to assessment, it would be that teachers must report student achievement based solely on the outcomes in the Alberta POS. For example, a teacher cannot evaluate a student's proficiency at memorizing the genetic code in Science 9 because no such outcome exists in the POS. In theory this makes sense in that all students in Alberta should experience reliable instruction and assessment for a given program. This golden rule, however, brings up some interesting questions. For example, if students misbehave; for example, cheat on a test, miss class or refuse to complete an assessment, should they receive a reduced mark? If so, what outcomes are reflected in this reduction? Should some outcomes have greater weightings than others? How is a final mark generated based on all of the evidence of student performance? Is it valid to review concepts only minutes prior to an assessment? Different teachers will have conflicting opinions on the answers to these questions. It is important

for educators to find clarity about what a mark is actually meant to describe.

If we were to agree to the golden rule, we would need to have the ability to identify the outcomes that students perform well in as well as those that students experience difficulty. Regardless of a student's mark, the teacher should be able to answer the question, "Which outcomes from the Alberta POS are met and not met?" In order to make sure that our assessments fit with the POS, teachers must analyze the outcomes and design assessments in a purposeful manner. I have done this task and found it to be both incredibly taxing yet extremely enlightening.

The first step of blueprinting is to analyze each learner outcome and interpret its meaning. It is likely that many outcomes from any given POS will be interpreted differently by different teachers. Group consensus is a great way to dive into the outcomes and reach a common understanding of what they mean and how they should be assessed. One way to encourage conversation about learner outcomes is for teachers to identify cognitive levels (CL) in both outcomes and assessment tools. I focused on three cognitive levels; knowledge (K), comprehension/application (C/A) and high mental activities (HMA).

- K-level outcomes ask students to identify, list, describe, classify and so on. These outcomes could be met by looking the information up in a book or accessing the Internet. These outcomes test student memory of basic facts.
- C/A-level outcomes require students to comprehend concepts and therefore apply their knowledge to new situations. In these outcomes, students must be able to interpret information in order to solve a new problem.
- HMA-level outcomes assess students' ability to articulate their own original thoughts about something. They may be asked to justify, create, analyze or evaluate.

Discourse about CL provides an opportunity for teachers to unpack the outcomes and gain a closer understanding of what it is students should be expected to do. It is this clarity that is of greatest benefit to teachers.

Summative assessment tools are created that focus specifically on the end, the outcomes. Whether these assessment tools are tests, discussions, debates or presentations, they must all perform the same task: to measure proficiency of the outcomes and nothing else. Teachers must justify that the assessment tool measures student achievement around the outcomes as described in the POS and the blueprint template is ideal for this. Assessment tools that test knowledge, skills or attitudes outside of those outcomes are never used as evidence for reporting student achievement. For example, in the Science 7 POS in the Structures and Forces unit, students must "interpret examples of variation in the design of structures that share a common function, and evaluate the effectiveness of the designs (e.g., compare and evaluate different forms of roofed structures, or different designs for communication towers)." The CL of this outcome is HMA because students must interpret and evaluate. Therefore, an assessment of students' ability to identify designs of structures is inadequate to meet the criteria of this outcome. However, an outcome stating that students must "identify points of failure and modes of failure in natural and built structures (for example, potential failure of a tree under snow load, potential failure of an overloaded bridge)" has all three possibilities for CL. It would be rich discussion for teachers to reach consensus on the CL of this outcome because justification for all three levels is possible. The discussion about outcomes reveals a variety of interpretations that a professional learning community can draw from to blueprint assessments.

Teachers must analyze the outcomes and design assessments in a purposeful manner.

The next advantage of blueprinting is that teachers gain a clear vision of the end, and therefore are better able to consider the means. For example, at one school we constructed a Grade 9 math test on the Patterns and Relations strand. The test was perfectly blueprinted in that every outcome was assessed at the appropriate CL and the outcomes were evenly weighted. No questions were easier or more difficult than what is indicated by the outcomes in the POS. We wrote the test afterward to discover that the questions seemed to be more difficult due to the increase in HMA-level assessment. The obvious next step was to ask questions about how to change teaching practice. The process of blueprinting has a profound effect on professional reflection, readiness to accept new ideas and initiating a change in practice.

Figure 1 shows a blueprinted assessment tool using questions picked from the released materials of Alberta provincial achievement tests. In this case, all questions are at the CL implied by the outcomes, and the weighting of questions is appropriate for each outcome.

Figure 1: Blueprint of a test made from a cohort of teachers that was designed to match the outcomes in the Patterns and Relations strand of the Alberta program of studies.

Math 9 Patterns and Relation Unit Exam Blueprint

Program of Studies Outcome		Cognitive Level of Outcome/Task			Weight
Strand	Specific	K	C/A	HMA	
PAR	1		2013:mc21 2013.nr1		2
PAR	2	2013. MC38	2010 MC35,36	key PR pq 4	4
PAR	3		2010 MC.2 2013 mc 17		2
PAR	4		2010 MC.6, NR 8	2010 MC 8,29	4
PAR	5		2010mc23		1
PAR	6	(WR) taken from 2010 mc21	(WR) taken from 2010 mc21 2013 MC29		3
PAR	7	2013nr9	2013mc3, 39		3

Many questions are raised when engaging in this process. Can blueprinting be used to better pinpoint where students have difficulty? Can self-assessment practices be incorporated to make students involved in the process of unpacking the outcomes, appraising their own work and setting goals to improve? Can adapted assessments be blueprinted to have lower CL sections that are formative and a summative section that follows the CL implied by the outcomes? Should we reconsider the implementation of mandatory final exams containing mostly K-level outcomes? How can we include the front matter of the POS in a blueprint to develop an assessment plan that incorporates skills and attitudes?

Below is a self-assessment tool that uses a blueprint of the test to help students analyze their performance and set goals to improve.

Many teachers struggle with finding a strategy to allow students opportunities to improve their grades as knowledge is developed after assessments are graded. Retesting has obvious trade-offs such as increased teacher workload, more time devoted to summative assessment and the possibility of further decreasing motivation to learn. One strategy that effectively utilized blueprinting to increase marks was to provide students with opportunities to change the

Figure 2: Self-assessment tool using a blueprint of the Number strand of Mathematics 6.

Grade 6 Mathematics
Number Strand Analysis

Task

As we go over the test, **circle** the questions that you answered correctly.

Specific Outcome	Cognitive Level			Weight
	Knowledge	Comprehension /Application	Higher Mental Activity	
1. Demonstrate an understanding of place value, including numbers that are: • greater than one million	MC 12			1
1. Demonstrate an understanding of place value, including numbers that are: • less than one thousandth.	MC 1			1
2. Solve problems involving whole numbers and decimal numbers.		MC 4		1
3. Demonstrate an understanding of factors and multiples by: • determining multiples and factors of numbers less than 100		MC 2, MC 11		2
3. Demonstrate an understanding of factors and multiples by: • identifying prime and composite numbers	MC 3			1
3. Demonstrate an understanding of factors and multiples by: • solving problems using multiples and factors.		MC 2, MC 4		2
4. Relate improper fractions to mixed numbers and mixed numbers to improper fractions		MC 7		1
5. Demonstrate an understanding of ratio, concretely, pictorially and symbolically.		MC 6		1
6. Demonstrate an understanding of percent (limited to whole numbers), concretely, pictorially and symbolically.		MC 9		1
7. Demonstrate an understanding of integers, concretely, pictorially and symbolically.		MC 10		1
8. Demonstrate an understanding of **multiplication** of decimals (1-digit whole number multipliers).		NR 1		1
8. Demonstrate an understanding of **division** of decimals (1-digit natural number divisors).		NR 2		1
9. Explain and apply the order of operations, excluding exponents, with and without technology (limited to whole numbers)			MC 8	1

Analyze your Data

1. What specific outcome did you do well on? Explain why.

2. What specific outcome do you need to work on? What were some possible reasons for your difficulties?

marks for the outcomes. Any student can raise his or her grade by making a video showing proficiency with the outcome(s) that were unsatisfactory. Students uploaded their instructional videos on YouTube and shared the links with me. Three benefits of this approach became clear. Students took ownership of their own learning and achievement. Making the videos required a higher level of thinking, and students developed permanent knowledge through this practice. Finally, I had a valid collection of evidence to support raising marks.

Blueprinting provides a degree of clarity to grading

Reporting on student achievement through a single value seems insufficient in the same way that a letter grade fails to adequately describe a patient's health. Blueprinting provides a degree of clarity to grading in that each outcome is graded separately and a final grade is determined based on proficiency with the outcomes. When students are involved in this process, they become the drivers of their own learning and motivation is increased. Although the amount of work to assess this way is significant, I would not fall back on the ways I assessed previously.

Greg Wondga has been teaching secondary biology, chemistry and physics since 1997 in Edmonton, Alberta, with a brief one-year exchange to Queensland, Australia, in 2012. Greg is currently a teacher consultant for the department of curriculum and resource support at Edmonton Public Schools. In this role, Greg is responsible for meeting the professional learning needs of teachers in this district, researching best practices and consulting with educators and educational leaders in the implementation of district changes in practice. Prior to this, he has been a classroom teacher, field experiences associate with the University of Alberta Faculty of Education, human resources consultant, curriculum coordinator and assistant principal. In the many roles that Greg has filled, he has had the opportunity to learn from an incredible range of master educators. Greg has an infectious passion for sharing successful teaching and learning strategies. He was invited by the Rotary Club Belize Literacy Project to lead a group of teachers to plan and implement professional learning sessions for Belizean teachers. As well, Greg is a member of the ATA Science Council as the Division III director. Greg holds a master's degree of education in secondary science with a focus on constructing conceptual understanding. He also holds a bachelor of science and a bachelor of education degree.