Unpacking the concept of Uni-dimensional Assessment

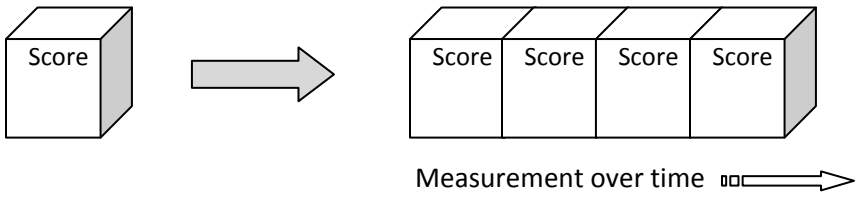
By William H. Zaggle

What is uni-dimensional assessment and why is it a good thing? With the move to more standards based education, one aspect of grading student performance that has needed to change is the concept of measuring uni-dimensionally, or along one dimension. This concept sounds simple, but is often difficult to both explain and comprehend. To really grasp the new idea of measuring student performance along a single standard dimension it is helpful to first understand how the existing system of grading performance is most often multidimensional.

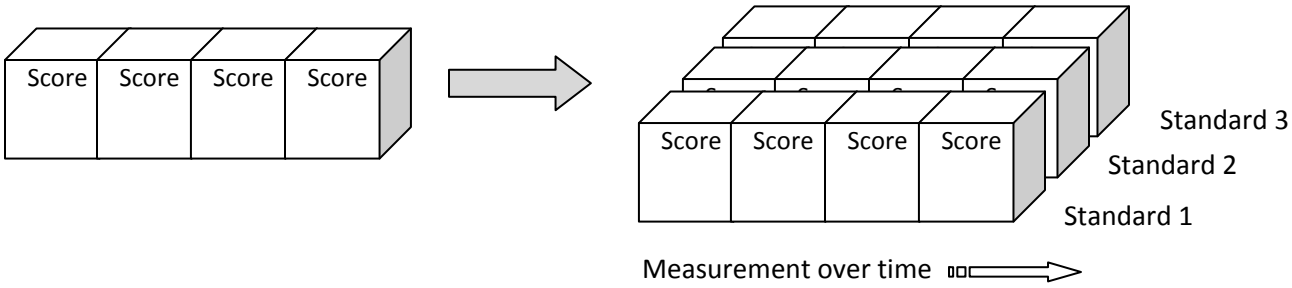
In multidimensional measurement, teachers typically grade a student's knowledge or performance and compare that measurement to their expectation of where that student's knowledge or performance should actually be at this point in the curriculum. Those students, who meet or exceed this expectation, typically get A's or B's and those who fall below it get C's or D's. Those students who show little or no knowledge or performance ability typically get a grade of F. The format and construction of the measurements typically cover several of the topics or standards within the curriculum. For those students on either end of the grading scale who either show perfect knowledge or performance or show zero knowledge or performance, it can be assumed that they also showed an equal measurement of each individual standard. For those students in the middle, it is not possible to determine the exact mix of knowledge or performance on each standard that contributed to their total measurement. In a more uni-dimensional model, knowledge and performance of standards are all measured independently and only combined when required for producing some form of summary score.

If we look at the concept of grading student performance over time as a 3-dimensional space, a grading "cube" so to speak, it becomes easier to both see and understand the dimensions and why uni-dimensional assessments are so important for accurately measuring standards based progress.

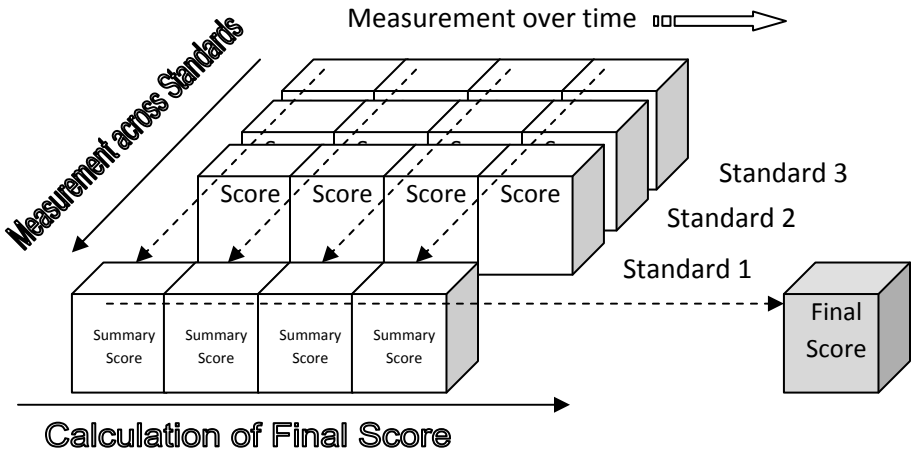
In the fig1 below, a single measurement of a single student's performance on a single concept can be seen as a simple block of assessment. These blocks of assessment can then be placed side by side as time progresses, indicating a student's performance or knowledge gain over time on that single concept. This is the uni-dimensional measurement that is needed to get an accurate picture of a student's performance ability or knowledge of this concept or standard.



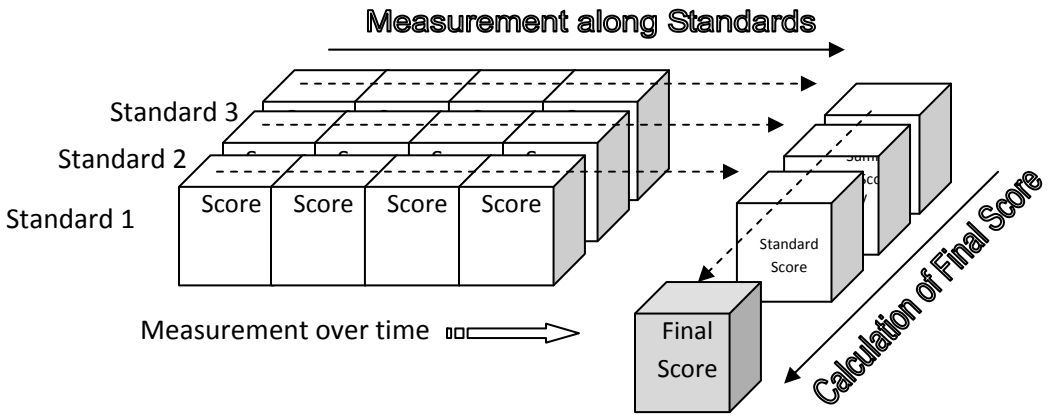
To contrast that with the more typical multidimensional classroom measurement, we can add another dimension to this diagram so that each of the many different standards being simultaneously measured can be seen along the same time line.



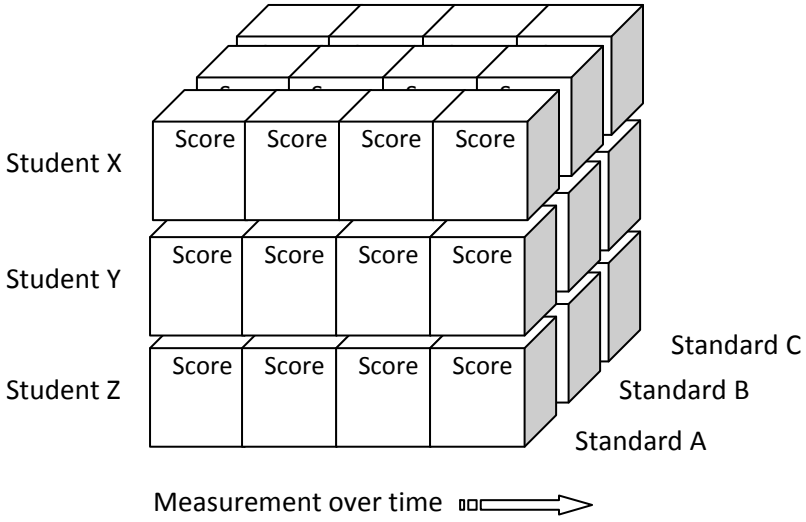
So where is the multi-dimensional aspect of the existing practice, which needs to be changed into a uni-dimensional method? This traditional multi-dimensional aspect can be seen by combining measurements of more than a single concept or standards together into a single score at each point in time that measurements are taken. Looking at the figure below it is seen how typical day to day measurement of student progress is first made across standards. Standard scores at each point in time are either combined, or never actually made separately to begin with, to form composite scores from the z-axis or standards dimension. These are the well known and traditional grades on things like quizzes, homework, tests, daily work, etc. These traditional grades are then combined again with or without a division step to create an average, to form total scores or final grades for students from the x-axis, or time dimension. Thus the term "multi" dimensional assessment or assessment from more than one dimension, axis or direction is applicable. Actually in the case of standards, the term "cross" dimensional or across standards might actually make more sense.



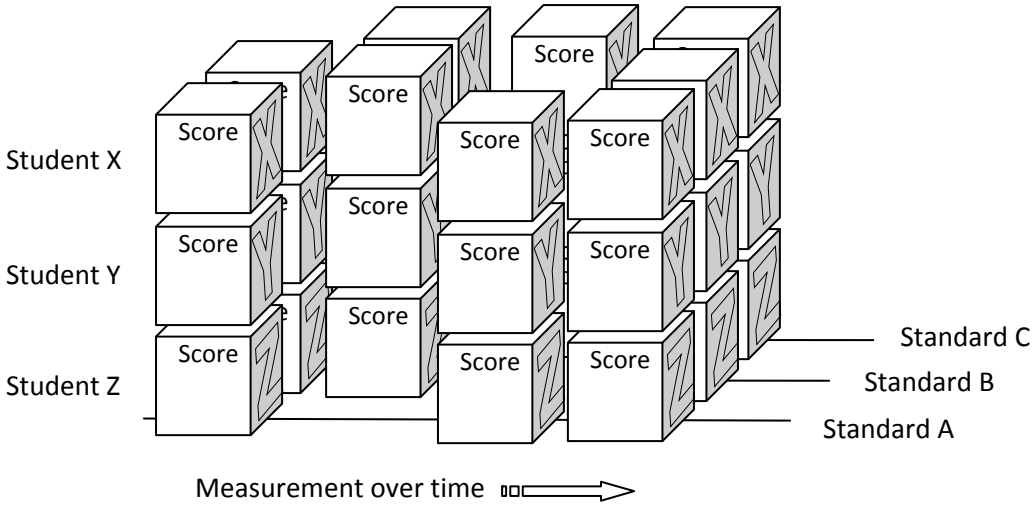
Seeing this same idea from a more uni-dimensional or single dimension of measurement perspective, the initial summary or combination of measurements to form composite scores is not made across standards, but rather with them. This creates the more accurate and actionable standards scores rather than the less accurate and less actionable Summary scores. The required Final score is still possible by simply combining the Standards scores when required. To illustrate this, the diagram above can actually be redrawn to look something more like what is seen below.



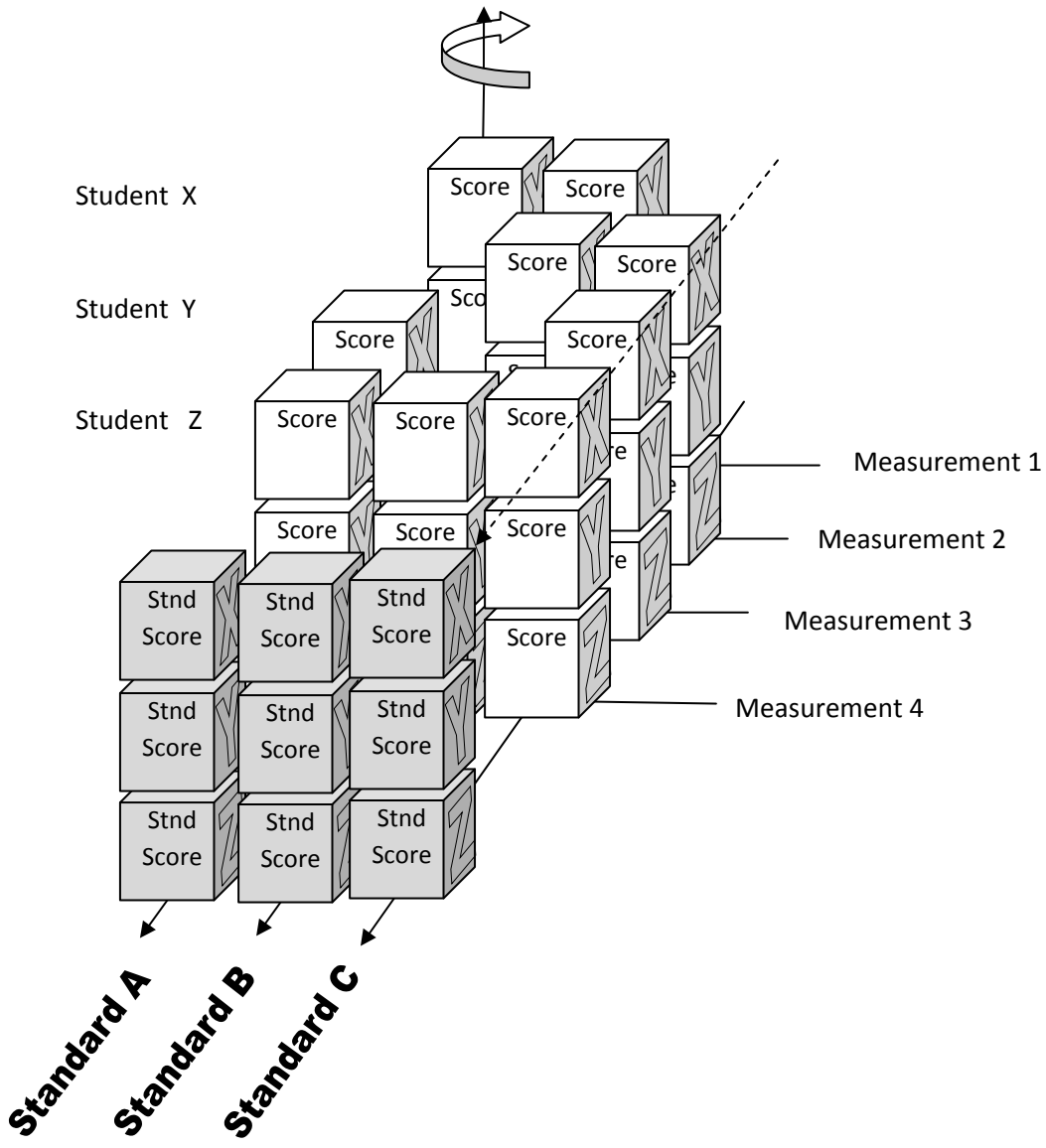
It is possible to extend this new model of measurement along standards rather than across standards to see what it would look like for entire class of students in a traditional teacher gradebook. The current diagram is only representing the measurement of multiple standards for a single student. By stacking students together into classes, the full cube of classroom measurement becomes apparent as seen below. Here, each layer from top to bottom represents measurements for a single student. Each layer from front to back represents measurements over a single standard. Each layer from left to right represents a single measurement event in time.



Of course to get a perfect cube of measurements like the one shown above would require that every standard be measured during every measurement event, for every student. Naturally this does not actually occur in real life. It is safer therefore to think of these smaller cubes in this diagram more as placeholders for the scores rather than the actual scores. Actual measurements would appear more spread out in both time and in the aligned standards as shown below. In this diagram, different measurements are performed at different points in time for all students, but not always over all of the standards. The first measurement is only over standards A and B. The second measurement is over standards B and C. The third measurement is over standards A and C and the last measurement is over all three standards.



This traditional left to right, time based view of measurement is typical of almost any gradebook format seen in any classroom. However it remains valuable in this model, only from the perspective of seeing what concepts were measured at what points in time. The more valuable perspective is the same cube of measurements as they would be viewed looking on to them from the right hand side. By rotating this cube of information clockwise around the student or y-axis, it is possible to see these same measurements from a true standards based perspective. The diagram of four measurements over three standards for three students that was shown above from the time based perspective would now look like the following diagram from the standards based perspective. The uni-dimensional running standards summary score for each student and each topic is also represented by the grey blocks. This new group of summary blocks actually replaces the more traditional time based view of summary grades to help inform teachers of each student's progress towards the mastery of each standard. This score can also be made to be more independent of time through the use of methods like trend scores and other formulas that already account for a student's expected learning over time.



Many new assessment tracking products like the GlobalScholar Pinnacle gradebook already provide teachers with the tools needed to isolate and track the separate scores for each standard collected from a single measurement, like a test or project. Being able to switch between time based and standards based views of the scores allows for a better understanding of where each student stands with respect to their knowledge or performance on each standard, as well as a look at their current learning trends, or progress towards these goals over time. From these new perspectives it is easier for teachers to improve the accuracy of their measurements and subsequently further diversify the types of instruction they offer as well as better group students into more effective learning groups.