

Combining Multiple Data Sources

As you brainstorm possible data points that could be used to establish baseline measures, the best policy may be to include everything you think matters. However, this also means that you will have to eventually decide which sources will be most helpful to you as you establish learning targets for students.

This process may be further complicated if you are asked to enter a single baseline score in a spreadsheet rather than multiple measures. A decision will need to be made as to how to combine those values. Weighting one measure over another is only recommended when there is a strong rationale for doing so, in most cases all measures will be treated equally.

The following provides several approaches to combining multiple data sources:

Sample Scenario: Let's imagine that you are a high school Spanish IV teacher. You might have final exam scores from Spanish I, II, and III. We can combine those scores to help predict performance in our Spanish IV class even if the final exam scores are not based on the same point scale.

1. *Estimate and Categorize:* Combine the data together and estimate its value to your SLO. Set general categories of readiness: "High", "Medium-High", "Medium-Low", and "Low" for example. Use estimates based on looking at all of the data to place students in the categories, and create common targets for each group.

Student	Spanish I	Readiness Category	Spanish II	Readiness Category	Spanish III	Readiness Category	Overall Readiness	Common Target by Group
A	55	H	67	ML	110	L	ML	70
B	53	MH	67	ML	120	ML	MH	80
C	56	H	65	L	113	L	ML	70
D	53	MH	65	L	116	L	ML	70
E	56	H	67	ML	131	ML	MH	80
F	52	ML	71	MH	142	MH	MH	80
G	50	L	73	H	160	H	H	85
H	52	ML	72	H	157	H	H	85
I	49	L	70	MH	145	MH	MH	80
J	54	MH	68	ML	120	ML	MH	80

Cautions: Be aware, you are mentally weighting the information. Do you have a reason to think that some data is more telling than the rest? Can you quantify how much more telling? If you can't articulate why the data differs, but wish to treat sources differently, don't be overly precise.



2. Standardize scores for comparison: One issue that may arise is that the data you are using is not based on the same scale. This is quite common if you are including exam scores from different classes.

Standardizing Scores for Comparison: One option is to convert each of the test scores into a “z” or standard score. A standard score is a convenient way to compare a student’s performance across tests or across classes. It converts the scores into a common scale with a mean (M or average) of zero and a standard deviation (SD or a measure of dispersion or spread for the scores) of 1, regardless of the original scale of measurement. The formula is simple, the z-score equals the raw score minus the average, all divided by the standard deviation:

$$z = (x - M)/SD$$

For illustrative purposes, we will complete all of these calculations for you as shown in the table below.

Interpretation: To interpret these scores, simply remember that because *zero* is the average, positive scores indicate that the scores are *above* the mean, and negative scores indicate that the scores are *below* the mean. Are the scores on the Spanish I, II, and III exams saying the same thing about student performance? Look across and within the standard score columns. Do you notice a pattern in these results?

Student	Spanish I	Spanish II	Spanish III	Standard Score Spanish I	Standard Score Spanish II	Standard Score Spanish III
A	55	67	110	0.85	-0.53	-1.16
B	53	67	120	0.00	-0.53	-0.62
C	56	65	113	1.27	-1.23	-1.00
D	53	65	116	0.00	-1.23	-0.83
E	56	67	131	1.27	-0.53	-0.02
F	52	71	142	-0.42	0.88	0.57
G	50	73	160	-1.27	1.59	1.55
H	52	72	157	-0.42	1.23	1.39
I	49	70	145	-1.70	0.53	0.74
J	54	68	120	0.42	-0.18	-0.62

Mean	53	68.5	131.4
SD	2.3570226	2.8382311	18.452341
Maximum	60	100	170

Interpretation Continued: One thing should be readily apparent. The Spanish I results are not consistent with Spanish II and Spanish III results. If you look across any row, you will find that the “positive and negative” signs do not align in almost all cases. Students who were above average in Spanish I often score below average in Spanish II and III. If you see these kinds of results, it indicates that these tests are not well aligned with one another. Something about Spanish I is different. Perhaps the class was not as challenging as subsequent classes. Or, the final exam may have been of a lower level of rigor than the later assessments.

Conclusion: The bottom line here is that the Spanish I results are not likely to be useful as a baseline measures and may even add confusing information if you are trying to predict how students will perform in Spanish IV. Take a look back at how the inclusion of Spanish I results in our estimates used in approach one, estimate and categorize, influenced the readiness category that was used in some cases. When scores are standardized for comparison it becomes more apparent that the teacher would benefit from using only the Spanish II and III scores as baseline.

One of the conveniences of having standard scores becomes evident; you are able to tell if students are close to average, above average, or below average. This might be particularly useful data when the baseline data is going to be used to determine student growth targets.

Caution: As we saw here, assessment rigor and/or results may not be equal. Converting to standard scores will not “correct” for that. So, if you have reason to believe that the assessments may not be of equivalent quality or depth of knowledge, it would be best not to use this option.

3. ***Minimum Growth Expectation:*** If the available data is not allowing you to identify trends and/or patterns in student performance you may be better served by holding the same expectation for all students, based on a set level of proficiency or mastery measured against your course’s standards. After the SLO is completed, you may be able to better examine the links between the data sources and your students’ performance on the summative assessment and inform future approaches to target setting.