A New Tool to Uncover Curricular Shortcomings

By Bill Herman

During the past 10 years at Monona Grove School District in Monona, WI, we have developed and refined our methods of analyzing student assessment data. During this time, there has been one constant: Our only reason to assess students is to measure their proficiency or their growth.

Before 2002, we used the Wisconsin state test, Wisconsin Knowledge Concepts Examination (WKCE), as our primary tool for assessing general student achievement. WKCE was not designed to measure student growth, or rate of learning over time, so we used it primarily as a measure of student proficiency or amount learned to date.

But we weren't satisfied with WKCE. It took months to get the results back. Its scale scores were frequently recalibrated, making it impossible to determine trends over time. Its scale scores were also not continuous across grade levels, making it impossible to gauge student improvement from grade to grade. And perhaps most important, its scores were not linked to a skill continuum, so it was difficult to know what they meant in terms of student achievement.

In 2002, we began administering Measures of Academic Progress (MAP), a standardized assessment created by the Northwest Evaluation Association (NWEA). The design of MAP alleviates many of WKCE's shortcomings. MAP measures proficiency so that growth can be accurately calculated and ties scores to a clearly defined skill continuum that is consistent over time. In addition, because MAP is administered by computer, it gives students questions at their ability level, and results are returned within days.

At first we used MAP primarily for measuring student proficiency so we could group students within classrooms by ability. We also used it to chart individual student growth over time, but we did not have tools examine the growth of groups of students collectively. This left us unable to identify groups whose rate of learning was weak.

In 2004, NWEA introduced a tool designed to calculate group growth. With it, we immediately discovered a problem we had never identified. We knew that our seventh graders' level of proficiency in math was strong—half scored in the top third nationally. However, we had not known that their growth was, in fact, below average compared with students who scored in the top third nationally. Essentially, our seventh graders knew more math than average, but were learning math slower than average. This came as a shock to us. We were forced to reconsider how well they were doing and how well we were teaching them.

Why we developed Ascent

This discovery made us hungry to learn more about student group growth, and soon we wanted a tool that would enable us not only to calculate group growth but also to perform a sequence of quick queries. With these capacities, we would be able to zero in on subgroups that might be dragging down the average growth of a larger group. In addition, we wanted to be able to look at group growth over time to determine whether a single year's results were an anomaly.

Because there was no tool available to provide these capacities, we developed Ascent, a web-based software program funded by a federal American Recovery and Reinvestment Act grant administered by the state of Wisconsin, and developed by EarthIT of Madison, WI.

The general purpose of Ascent was to enable us to identify pockets of weak growth within our student population—by subject, building, grade level, classroom, gender, ethnicity, and custom defined groups—so that we could investigate the causes and address them by targeted curricular and instructional modifications.

The original design objectives of Ascent were:

1. Define, aggregate and disaggregate groups of students quickly and simply.
2. Quickly calculate the growth of groups of students, relative to national norms.
3. Compare the growth of selected groups of students on the same screen, side by side.
4. Flexibly rank selected student groups by growth relative to national norms.
5. Enable users to import student information and test results with the push of a button.
6. License the program as open source, so it would be freely available and extensible.

Initially, Ascent was designed to make its growth calculations on MAP data only. As we moved forward, however, we extended its design to incorporate results from Explore, Plan and ACT, as well. These tests are well-suited to measuring growth because their scores are tied to a clearly articulated skill continuum. However, because ACT does not currently release data about national growth norms, it is not possible to use it to make meaningful growth comparisons between student groups using Explore, Plan or ACT.

The importance of measuring growth relative to national norms

It is critical to recognize that simply calculating the average point gain of various groups does not enable us to make meaningful comparisons between them. For example, NWEA's growth norms data show that on MAP, students in early grades and students with lower scores tend to gain more points during a school year than older students and students with higher scores. This would skew a direct comparison between second and eighth-grade growth, and in many cases, would give the false impression that second-graders were "learning better" than eighth-graders.

It is only by reference to national norms that we can make meaningful comparisons between different student groups. This means that we need to be able to calculate not only the average growth of the group's members, but also their average amount of deviation from national norms.

What Ascent does

Although the original purpose of Ascent was to make comparisons of average group growth relative to national norms, as we developed it, we learned that Monona Grove's users and data analysts wanted additional metrics for group comparison. These were:

- **Group proficiency metric:** What percentage of students in a group scored "proficient" as we define it?
- **Growth metric one:** What percentage of students in a group met or exceeded average growth relative to national norms?
- **Growth metric two (our original metric):** By how many points, on average, did students in a group exceed or fall short of national norms?
- **Growth metric three:** What is the average *z* score, or amount of standard deviation, of the growth of group members, relative to national norms?

Within Ascent, each selected group is represented as a row exhibiting these metrics, as shown in Figure 1.

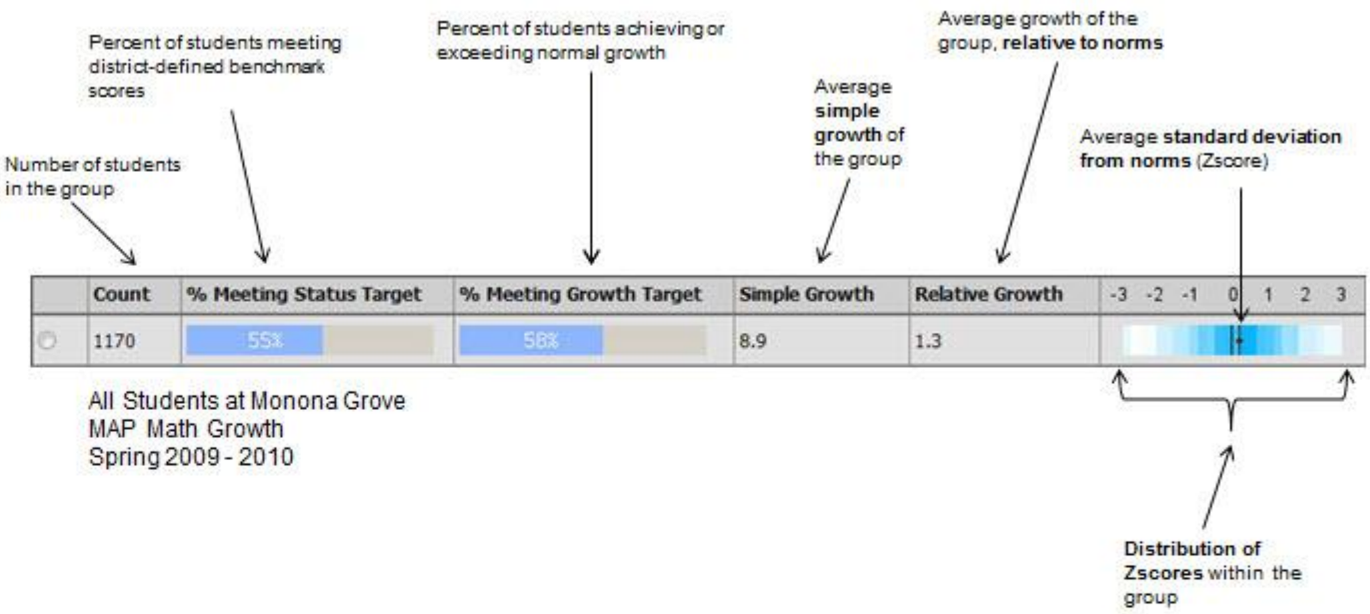

Figure 1

How Ascent works

Ascent is essentially a group disaggregator and data calculator. For example, for growth metric two above, each step Ascent takes in disaggregating and calculating is as follows:

1. Find each student in the identified group
2. For each student:
    a. Find his or her raw growth (Score T_2 - Score T_1).
    b. Look up national growth norms for students his or her age with his or her score at T_1.
    c. Compare his or her growth relative to national norms (raw growth - normal growth).
3. Calculate the average of all students' relative growth.

Calculating the proficiency metric requires merely counting the number of students in a group who meet or exceed a district-defined proficiency score; and calculating growth metric one requires counting the number in a group who met or exceeded normal growth. The process for calculating average *z* score is similar to the process above, except step 2c compares raw growth against the standard deviation of normal growth, which is provided by NWEA in its norms tables.

Case study: 6th grade math at Monona Grove

The primary purpose of Ascent is to expose areas of weak growth so we can investigate causes and design solutions—usually curricular or instructional. When we began exploring the growth of groups of students using Ascent at Monona Grove in 2010, we discovered that in math, students in every grade except sixth exceeded national growth norms. By contrast, Ascent revealed that sixth-graders showed negative growth relative to the same norms, as shown in Figure 2.

	Grade	Count	% Meeting Status Target	% Meeting Growth Target	Simple Growth	Relative Growth	-3 -2 -1 0 1 2 3
	3	190	55%	63%	14	2.1	
	4	219	46%	58%	10.5	0.9	
	5	187	57%	61%	10	2.1	
	6	189	60%	51%	5.4	-0.4	
	7	201	65%	60%	7.2	1.6	
	8	188	63%	56%	5.8	1.2	

Figure 2

Further investigation showed that this was not an anomaly. Ascent's report on the trend of Monona Grove sixth-graders in math over time showed their math growth has consistently fallen short of national norms, since 2003, as Figure 3 illustrates.

Term	Count	% Meeting Status Target	% Meeting Growth Target	Simple Growth	Relative Growth	-3 -2 -1 0 1 2 3
Spring 2010 to Spring 2011	187	57%	50%	6	0.1	
Spring 2009 to Spring 2010	189	60%	51%	5.4	-0.4	
Spring 2008 to Spring 2009	183	60%	45%	4.8	-1	
Spring 2007 to Spring 2008	182	57%	41%	3.8	-2	
Spring 2006 to Spring 2007	195	66%	52%	5.5	-0.3	
Spring 2005 to Spring 2006	181	55%	50%	6	0	
Spring 2004 to Spring 2005	228	52%	48%	5.9	-0.1	
Spring 2003 to Spring 2004	193	45%	41%	7.4	-1.9	

Average z score

Figure 3

An Ascent analysis showed that over the same time period, in every other grade from second to sixth, growth was consistently above national norms. Because the problem was isolated to sixth-grade, and happened year after year, we suspected there was an issue with our curriculum in sixth-grade math, and we looked closer.

We found that in contrast to the math curricula at our other grades, our sixth-grade math curriculum was not well aligned to the Common Core Standards, which we have adopted for Monona Grove. This could account for low growth on the MAP test because MAP is closely correlated with the Common Core. The finding has led us to revise the instructional materials, content and sequence of skills in our sixth-grade curriculum to alight them with the Common Core. As we measure the growth of our sixth-graders going forward, we will be able to gauge the effectiveness of our curricular modifications by measuring their ongoing growth relative to national norms.

This example illustrates the greatest value of Ascent: to uncover trends in student achievement—proficiency and growth—that expose areas in need of improvement in curriculum and instruction. In many cases, the existence or extent of these areas of need cannot be quantified or even recognized because of the impracticality of making the necessary calculations by hand.

Ascent in the future

Although we have depleted the grant money that paid for the development of Ascent, there are many improvements we would still like to make. First, the reporting screen can be improved by applying the linear dispersion graphic, currently used to represent the distribution of *z* scores, to all of the other metrics. It is helpful to produce a single number that represents the accomplishment of an entire group, but it is more illuminating to provide that number within the context of the whole group's dispersion, at a single view. The linear dispersion graphic helps us easily distinguish between group averages that are more meaningful (when the individuals are tightly clustered around the mean) and less meaningful (when the individuals are more widely and randomly dispersed). Adding dispersion graphics will make Ascent's data easier to comprehend at a glance. In addition, because group comparisons are not meaningful unless referenced to national norms, we intend to remove the "simple growth" column from Ascent's reports.

Beyond these reporting changes, we must make a calculation change. We have learned that NWEA excludes students whose growth is very high and very low from its calculations: In these cases, calculated growth amounts are unlikely to represent actual growth. Because Ascent's calculations include every student in every selected group, its results can differ from results in NWEA reports. School districts—including Monona Grove—have used NWEA's reports annually to chart their students' progress. It is therefore, unfortunately, impractical for them to adopt Ascent as a primary tool for their longitudinal data analysis until its calculations can be revised to match NWEA's.

More ambitiously, we would like to develop a growth norms calculator that can import student data to calculate regional and local growth norms for MAP, as well as growth norms for assessments that currently do not provide growth norms data. For example, results from the Explore, Plan and ACT assessments would be even more valuable if they could be used to analyze group growth relative to norms. A growth norms calculator would make this possible, enabling districts to pool their data to develop custom norms for the districts they are most interested in comparing themselves against, whether local, regional, national or hand-picked.

Finally, and most ambitiously, we would like to work with the state of Wisconsin to develop universal data hooks to its data warehouse, so Ascent and other third-party tools can be designed to connect to the data warehouse and access its student information, as permitted by system security. With this mechanism, Ascent and other third-party tools could incorporate school districts' student data directly from the data warehouse and disaggregate it in a variety of ways without requiring users to create and import student information files. The state has expressed interest in this project, but outside funding will be required.

In Ascent, we have created a powerful tool that enables school districts to discover, and then address previously hidden pockets of weak student growth. Because it is open source and without cost, we are eager to work with any school district wanting to use Ascent and with any district interested in developing it further.

Bill Herman is the technology director at Monona Grove School District in Monona, WI. He earned a master's degree in philosophy from Johns Hopkins University. Herman is the designer of Ascent, an open source software tool for analyzing and visualizing group proficiency and growth, and is working to foster collaboration among school districts for the purpose of pooling data and developing open source data analysis tools.