

Arizona and New York Schools Push the Envelope

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In the United States, accountability measures from the No Child Left Behind (NCLB) legislation have opened K-12 (Pre-school to A-Level) educators to the use of increasingly sophisticated improvement tools and processes. In their efforts to accelerate improvement in targeted areas, schools are (re)turning to techniques such as data envelopment analysis (DEA). Specifically, school improvement teams in “under performing” schools want to know which high-performing schools are “just like them” and then to understand what they are doing to achieve that higher performance.

Statewide initiatives in Arizona and in New York State are using data envelopment analysis to identify benchmark, or best-in-class, schools. These benchmark schools complete self studies and, in some cases, are studied by researchers from higher educational institutions in order to identify their effective practices. The exchange of effective practices occurs in conferences, in peer-to-peer conversations and via the Web. K-12 educators are adding benchmarking to their school improvement toolkit.

The need

Although schools have always sought improvement, NCLB and its penalties for poor performance have accelerated and focused efforts to raise the performance of all students and of subsets of students, such as those with disabilities, those living in poverty or those from various ethnic groups.

School improvement efforts face many obstacles. In many schools faculty and staff believe they are “doing the best they can with the kids they have.” They also believe that the improvement targets set by NCLB are arbitrary and possibly unreasonable, established by bureaucrats who do not understand the challenges they face daily in their classrooms. Further, although state departments of education collect enormous amounts of financial, demographic and other performance data, they do not have the tools to answer this critical question: “Which school with the same constraints that I have is outperforming me and all other schools like me?”

Even if that question *could* be answered, there is still no infrastructure for the identification of effective programs, strategies and practices at the benchmark schools or for their exchange and replication to lower performing schools.

Towards a systematic improvement process

A software tool (Frontier Analyst[®]) is used to identify benchmark schools at key grade levels: in New York State, at grade 4, grade 8 and at grade 12; and in Arizona at grade 3, grade 8 and at grade 10. Researchers at Syracuse and Arizona State Universities identify and visit the most compelling of the benchmark schools. During their visits researchers meet with and interview vertical teams that can include district and school administrators, teachers, staff, parents and students.

The researchers produce summary profiles of each benchmark school that highlight its approach to curriculum, instruction, and assessment as well as any specific programs, practices or strategies that contribute to its benchmark performance. These profiles are shared with other lower performing schools which can then use them to set appropriate targets and identify and select improvement strategies. Statewide and regional

organizations host benchmarking conferences where benchmark schools present to their lower performing colleagues.

In Arizona, the Department of Education and Arizona State University have access to a website that allows them to drill-down into the benchmark data and identify compelling performers or successful strategies/behaviours. In New York State, the Magellan Foundation is funding the development of a “Dropout Rate Improvement Service.” Users of this web-based service will be able to identify high schools that are benchmarks in the area of graduation and dropout rate. The long-term goal is to build robust, data-informed performance improvement solutions based on a combination of collaborative analysis and planning tools, and highly-targeted benchmarking workshops.

Benchmarking with data envelopment analysis

Data envelopment analysis defines efficiency as:

$$Efficiency = \frac{\textit{Weighted sum of outputs}}{\textit{Weighted sum of inputs}}$$

Assume for the purposes of illustration that we are studying the efficiency of a set of schools by measuring one input, the schools’ Student Wealth Index (SWI), a measure of prosperity, and two outputs, exam results for English Language Arts (ELA) and math. Two performance ratios result: ELA/SWI and math/SWI. The efficiency of the schools could be shown in a scatter diagram (Figure 1).

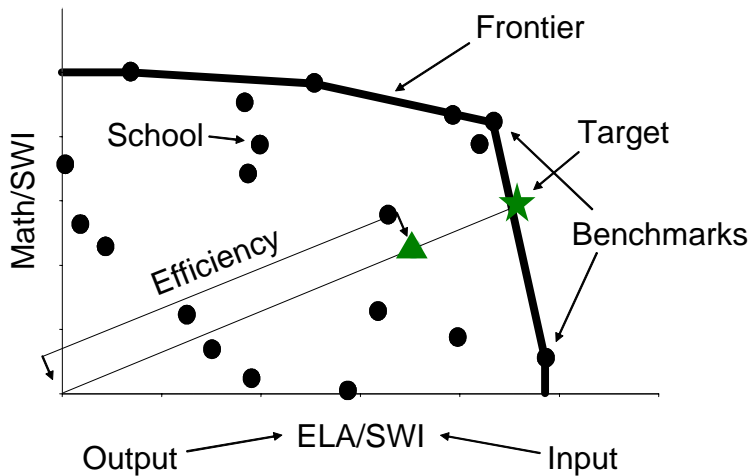


Figure 1: Scatter diagram showing efficient frontier

The efficient frontier “envelops” the inefficient schools and clearly shows the relative performance of each school. Any unit on the frontier receives a score of 100% and is considered a benchmark school. Any unit below the frontier receives a proportionally lower score. The analysis weights each unit’s inputs and outputs in order to show it in its best possible light.

In this example, there are five benchmark schools. The efficient frontier represents a standard of best-achieved performance. This does not imply that the schools on the frontier cannot improve their performance.

Benchmarks are identified for each school in the set. These are the high-performing schools that have the similar input-output profiles to the lower performing school. In the example above, the school represented by the triangle has two benchmarks.

The simple example in Figure 1 has one input and two outputs. The Arizona and New York State studies include up to four inputs and six outputs, each the average of three to five year’s data. The inputs and outputs were selected based on consultation with dozens of district superintendents, chief school officers, assistant superintendents, school principals, and other educational leaders.

Figure 2 shows efficiency scores for 680 New York State high schools (not including high schools in New York City). There are 48 schools receiving a score of 100%. These are the benchmark schools representing all demographic profiles that will be the focus of the field research to identify the best practices.

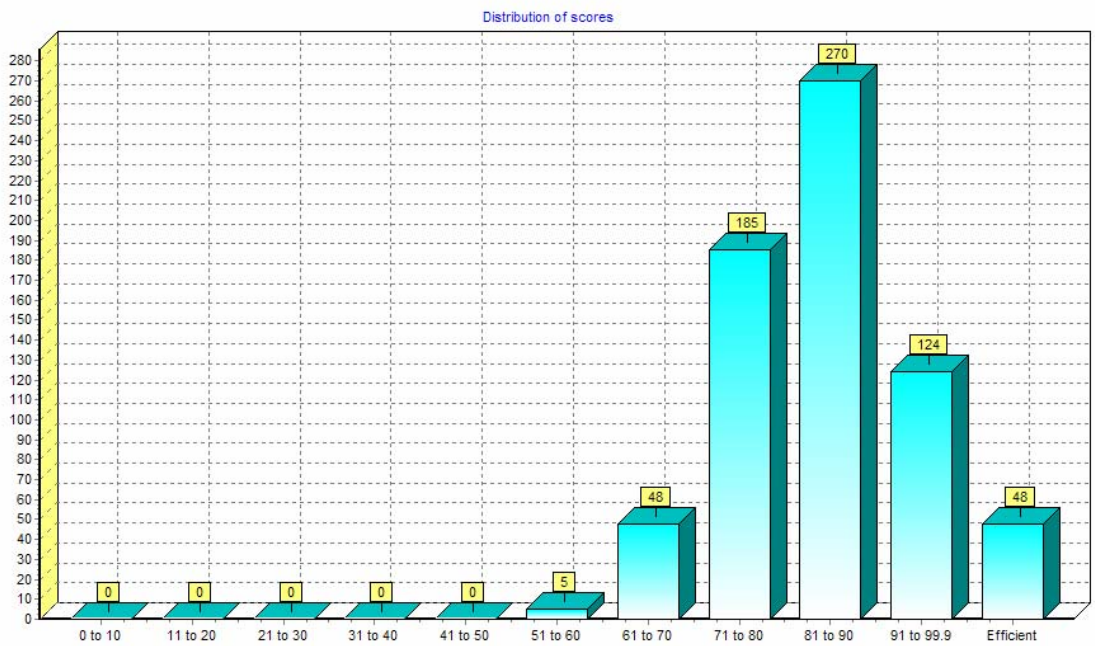


Figure 2: Efficiency scores for schools reporting grade 4 state assessment results

Consider the example of Groton High School. Copenhagen High School is one of its benchmarks. Figure 3 shows the relative difference of input and output data for Groton and Copenhagen High Schools. Groton High School's inputs and outputs are scaled to 100% and shown in blue bars. Copenhagen's are shown as red bars. The first four rows are inputs and the last three rows are outputs. Note that Copenhagen has similar or lower inputs—specifically, it spends less per student, has lower community wealth and has higher poverty than Groton. Yet Copenhagen outperforms Groton on all three outputs.

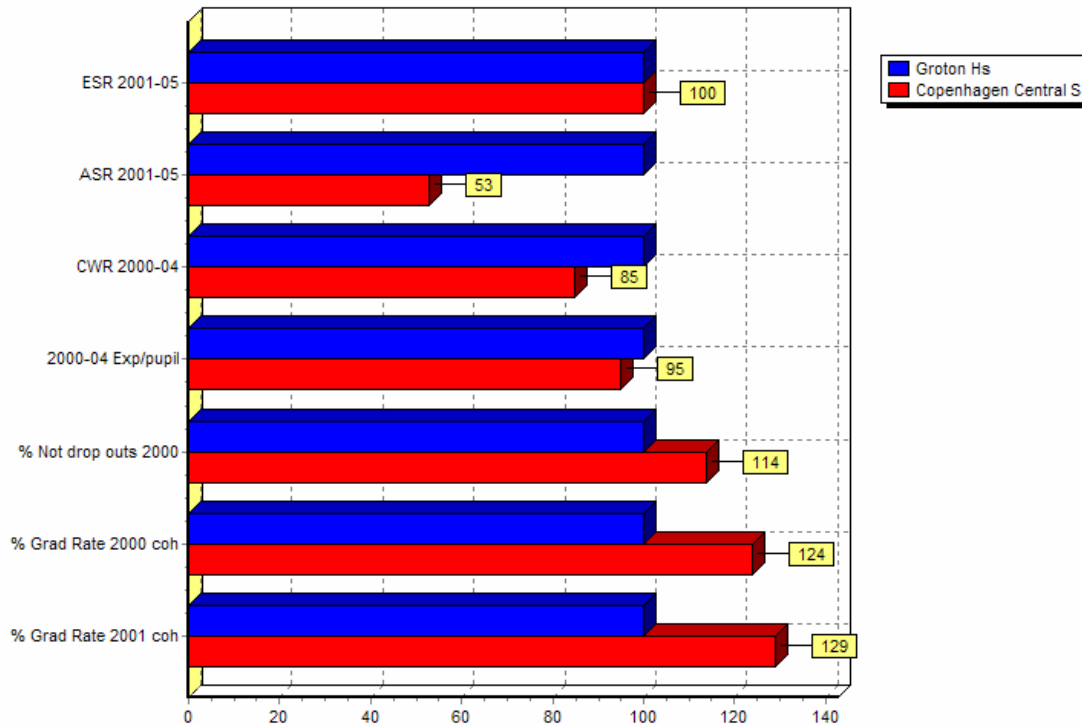


Figure 3: Comparison between Groton High School and one of its benchmarks

Target setting

School-to-school comparisons create the opportunity to set realistic targets for improvement. Groton High school is challenged by Copenhagen's performance. Whereas Copenhagen has 86% of its students graduating within four years and 92% within five years, Groton has 66% and 74% respectively. And whereas Copenhagen's five-year dropout rate is 4%, Groton's is 16%. There is large opportunity gap for Groton High School. It now has a compelling benchmark to help it set and, more importantly, *justify* aggressive improvement targets.

The value of data envelopment analysis lies not in the efficiency ratings, but in its ability to show "real world" results that cannot be ignored by stakeholders. Externally imposed "one-size-fits-all" targets are likely to be challenged and dismissed in politically charged environments. Data envelopment analysis presents more compelling arguments.

Exchange of effective practices

The full value of benchmarking is realized in detailed, school-to-school discussions. Data envelopment analysis identifies both the discussion partners and the agenda.

- What might Copenhagen High School be doing differently than Groton High School to achieve better results despite its greater constraints?
- Is there anything Groton High School could learn from Copenhagen High School regarding:
 - curriculum alignment;
 - local assessment of student performance;

- instructional practices;
- organizing and scheduling for learning;
- professional development;
- parent involvement;
- use of data to inform instructional decisions; and
- academic intervention service design.

Groton High School can pursue answers to these questions via phone conversations or site visits. Or it can benefit from university research at Copenhagen High School. For example, Syracuse University (in New York State) is producing benchmark school research briefs using a protocol that addresses the following areas:

- local assessment of student performance;
- instructional practices;
- organizing and scheduling for learning;
- aligning curriculum with learning objectives;
- professional development;
- use of data to inform instruction decisions;
- academic intervention service design;
- student response to change;
- parental involvement;
- leadership; and
- school culture and climate.

Arizona State University's protocol is designed around the Arizona Department of Education school improvement rubric.

Summary

Schools need better ways to assist their improvement efforts. Benchmarking using data envelopment analysis provides a systematic approach to improvement. In order to improve schools need more than the ability to identify isolated programs that work. They need to be able to identify whole schools that work. And they need to understand the interrelated programs, practices, processes and strategies that combine to make the successful system within those high achieving schools.

About the authors

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The data envelopment analysis for the New York State Schools and Arizona State Schools is carried out using the Frontier Analyst[®] software which is developed and distributed by Banxia Software Ltd. (www.banxia.com).