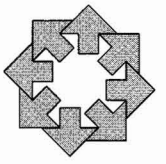
Purpose of this brief: This guide is designed to show how to read school productivity profiles. It explains the "value-added" approach to measuring school improvement.



A REPORT SPONSORED BY THE CONSORTIUM ON CHICAGO SCHOOL RESEARCH

Reader's Guide

Examining Productivity: How to Read Your Productivity Profile

March 1998

This report presents a new method of analyzing results from the Iowa Tests of Basic Skills (ITBS). The method summarizes changes in student learning at each Chicago public elementary school between the years 1987 and 1996. By charting the learning gains of students, we have created **school academic productivity profiles** that show how student learning in each grade of a school has changed over time.

When we talk about **academic productivity** in this report, we mean the contribution that a school makes to the learning of students who are enrolled for at least a year. Increasing productivity means that the school is contributing more to student learning over time—that students who are enrolled in a grade now are learning more than students enrolled in earlier years.

In the pages ahead, we describe our new system for assessing academic productivity and explain how to read the information about your school. To help you interpret your data, this packet also includes **Measurement Rulers** for reading and math that show how to relate specific test results to the content of the *ITBS*. (See enclosed Measurement Rulers.)

A "Value-Added" Approach

Average test scores help describe the overall level of student achievement in a school at the time the test is given. The testing population is made up of a defined group of students who are "eligible" and does not include some special education students and other

Drawn from the Technical Report **Academic Productivity of Chicago Public Elementary Schools**

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students who are learning to speak English. Currently, test scores also fail to take student mobility into account. If students move into the school in the middle of the year, their scores count in the average, even if they entered just before testing. Their scores tell us nothing about the effectiveness of the school if the students haven't been there long enough to learn much.

In Chicago, only 80 percent of the students tested in a given year were also tested in the same school the previous year. This means that 20 percent of the students tested are new in one year. More than a third of the students are new to the school over a two-year period.

Because of the high mobility, a simple average of a school's current students is not sufficient. We need a way to focus on **learning** rather than attainment. A school should be responsible for the learning that occurs while students are taught in that school. Rather than focus only on the average achievement levels at each grade level, we consider instead the gains in achievement made by students enrolled in the same school from one year's test administration to the next. A good indicator of academic productivity needs to take into account where children begin as well as where they end up.

The Grade Productivity Profile

Each school's academic productivity profile is composed of a set of grade profiles, one for each grade, second through eighth, offered in the school. (If few first and second grade students took the ITBS in your school, the second and third grade profiles are less informative and should be viewed cautiously.) Figure 1 shows how a grade productivity profile is constructed.

A school should be responsible for the learning that occurs while students are taught in that school.

A productivity profile presents three inter-related pieces of information for each school grade: the **input** for the grade, the **output** for the grade, and the **learning gain** recorded for that grade.

- The **input status** consists of the test scores from the previous year of only those students who were tested in the same school. For example, for grade six in the sample school, we matched the end of grade five test scores for students who had grade six scores from the same school. The average of these students' previous year's test scores is the input status for that school grade. This input status is what teachers had to build on to advance the learning of the stable sixth-grade students that year. Students who move into and out of a school during the academic year do not count in the productivity profile for that year.

- The **output status** tells us about the knowledge and skill levels of our stable group of students at the end of a year of instruction. This is at the end of grade six in our example.

- The **learning gain** for each school grade is simply how much the end of year ITBS results (output) have improved over the input status for this same group of stable students. In this example, we calculated the learning gains for the stable grade six students.

[Note: We recommend that the CPS testing system find a fair way to include mobile students in the school's academic profile. For this study, only scores of the students who were tested for two consecutive years were included.]

Figure 1. Constructing the Grade Productivity Profile

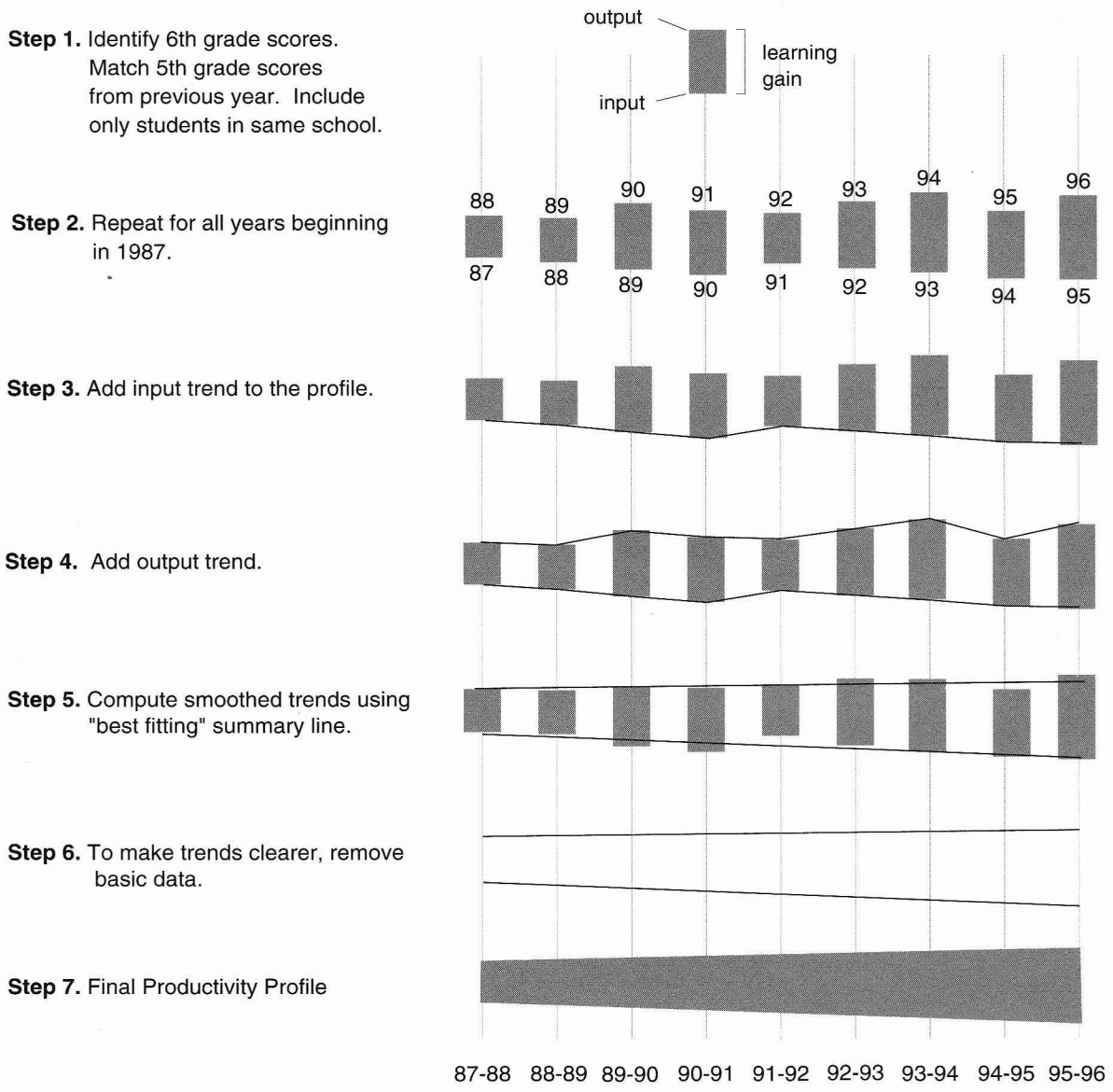

Figure 1 shows how the profile was constructed. Step 1 displays the base year input status, learning gain, and output status for grade six. Step 2 adds the grade six data for all years. Step 3 adds the corresponding information for the years post 1991. This is all of the basic data for examining academic productivity in grade six.

Since we are interested in the changes in academic productivity, we look at the variation over time in these data. When we add an input trend line in Step 3, we can see that the input status in grade six at the sample school may be declining over time. Step 4 fills in the **output trend**, which appears to be increasing. Even so, notice that each of these trend lines varies considerably from year to year, possibly obscuring any real overall trend in

the data. To highlight this we compute **smoothed trends** that involve estimating the best summary line that fits these data. These are presented in Step 5. To make the trends even clearer, Step 6 presents the trend lines with the basic data removed.

In Figure 1 the inputs to grade six have declined, but the learning gains have increased. This positive **gain trend** is reflected by the fact that the input and output trend lines spread apart over time. Moreover, since the learning gains increased faster than the input decline, the net effect is an overall positive output trend. An important component necessary for this judgment is the use of a statistical model to estimate the smoothed trend lines. This analysis generates our most concise visual summary of a grade productivity profile. Step 7 represents the final productivity profile for grade six in our sample school.

Fitting a statistical model to smooth the trend lines also serves another important function. It allows us to adjust the trend estimates for other factors that can change over time besides school effectiveness. In seeking to develop the best possible estimates of school productivity for the CPS, we considered a range of factors including changes in a school's ethnic composition, percentage of low income students, retention rates, percentage of students enrolled who are old for grade, and proportion of bilingual students. Generally, the effects associated with these factors are not large. In addition, most CPS schools did not vary much on most of these factors over the 10-year period from 1987 to 1996. As a result, the adjusted trends are quite similar to the unadjusted estimates.

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Interpreting Productivity Profiles

Each grade profile involves three trends: input trends, learning gain trends, and output trends. Observing only one of the three, such as when we monitor an output trend or a gain trend, separately, can be misleading. After much work with these data, we have decided that we achieve the most constructive view of academic productivity by looking primarily at the output trend and the gain trend.

Look at the sample grade profiles in Figure 2 (next page). In School A, we see an increasing output trend that has occurred even though the input trend is flat. Because of the increasing amount of learning in this school over time, the output trend has increased. Students who are entering this grade are no more prepared than in previous years, yet they are making greater learning gains. Although we do not know precisely what is producing this improvement, it is probably related to the school's instructional program.

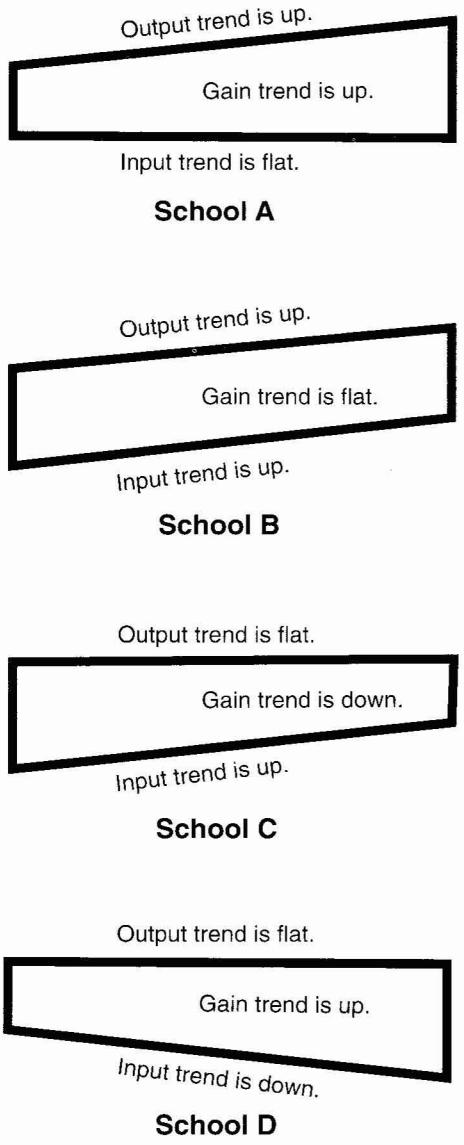
In School B, notice that the output trend is up substantially but so is the input trend. In fact, the learning gain trend is flat, because the input trend has gone up at the same rate as the output trend. (Notice that the input and output trend lines are parallel.) This implies no change over time in the value added to student learning. The positive input trend shows that the students entering each year are more advanced than the previous year's students

are. The teachers must recognize this and modify their instruction each year. Since at least some of the instruction will be new each year, teachers must also engage in continuous evaluation—trying to figure out what is working and what is not and adjusting accordingly. Without such activity, we might expect a profile more like School C. Here, the improving input trend appears to go unrecognized; perhaps teachers continue to teach as they have in the past. Succeeding students may make less progress because instruction is simply a repeat of past lessons. (The learning gain trend is actually negative.)

Finally, consider School D. The output trend is flat, but the gain trend is increasing due to the rapidly decreasing input trend. The positive learning trend is reflected in increased distance between the output and input trend lines. From a strict value-added perspective, this is a case of success over time, but we remain somewhat cautious until we have a better understanding of why the input trend is down.

Examining examples such as this has led us to conclude that we need to look simultaneously at both the learning gain trends and output trends to classify improvement efforts. Taken together, these two trends provide a more detailed summary of changing school productivity over time.

Figure 2. Interpreting Productivity Profiles



School Improvement Summary

Our statistical analyses have identified negative relationships between profiles in adjacent grades. That is, improving productivity at one grade tends to be followed by some declines at the next, and the reverse is also true. As a result, to judge a school by looking at selected grades only can be very misleading. From a statistical perspective, averaging across at least a couple of adjacent grades provides a more stable estimate of school productivity.

Educational concerns also push us in this same direction. A good accountability system should promote cooperative improvement efforts among faculty across grade levels. This suggests grouping two or three grades together to focus accountability analyses on the performance of meaningful groups within a school. In this way, the accountability system creates incentives for teachers to work cooperatively.

In sum, for both educational and statistical reasons, we have grouped grade level profiles to summarize a school's overall productivity. Since most Chicago elementary schools have kindergarten through grade eight, we report the following where there is sufficient information:

- Primary Grades Summary (grades two, three, and four)
- Intermediate Grades Summary (grades five and six)
- Upper Grades Summary (grades seven and eight).

Your School Productivity Profiles

Attached to this report are your school's productivity profiles for reading and math. In addition to the profiles, you will see all three trends for each year classified as "up," "down" or "flat." (We have used statistical criteria to make these determinations so that "up" and "down" are statistically significant trends.) The three grade summary groupings are shown at the bottom of the page. The summary labels are based on the output trend of the final grade within the grade grouping (that is, four, six, or eight) and the average gain trends of the grades in the grouping.

Note that the vertical scale marked off on the left side of the profile runs from 0 to 100. This is a new scale that we have created for this study. To interpret this scale, look at the attached Measurement Rulers. These scales connect the difficulty of material on the tests to the scores. You can roughly translate a score into content material by looking at these measurement rulers. The right hand side of the profile marks off the national norms for fourth, sixth and eighth grades.

Your School Summary Tables

Finally, your report contains the actual grade-by-grade statistics that are included in the productivity profiles. Again, the scores are on a new scale ranging from 0 to 100. You should note the number of students included in the report, remembering that these are the students whose scores are matched for two consecutive years in the same school.

If You Have Questions,
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