Apples to Apples:

Comparing Replacement and Conversion Approaches to High School Turnaround

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Background

A central debate in current high school turnaround discussions is between those who advocate closing existing low-performing schools and then reopening new and better schools in their place (“replacement”); and those who advocate working with existing schools and school staff to transform their organizational and instructional practices (“conversion”). In this paper, we offer what we hope will be some clarifying concepts and a useful tool to inform these discussions.

Replacement and conversion strategies share three common goals:

- First, they both seek to dramatically impact the success rates of students currently attending underperforming high schools;
- Second, they both believe creating a more personalized, academically rigorous and meaningful school experience is the way to reach this goal; and
- Third, they both want to scale up their turnaround efforts to reach the millions of students in thousands of high schools who need these changes to occur.

These approaches differ markedly, however, in how they pursue these common goals. These differences create serious and vexing issues when decision-makers try to compare the two approaches’ efficacy, feasibility and costs.

For example:

- Conversion approaches typically do not radically alter the composition of the staff in the existing high schools, whereas replacement approaches do in the new schools they create.

- Replacement approaches tend to repopulate the new high schools (with students and staff) over multiple years whereas conversion approaches begin their work with the full complement of students and staff in the existing school.
- Conversion approaches do not require any form of active consent for student and family enrollment, whereas replacement approaches often recruit volunteer students and families to attend the replacement schools and many place conditions on them remaining in the schools.

The implications of these differences for achieving "apples to apples" comparisons of the two approaches' efficacy, feasibility and costs will become clearer as we present a method for addressing these differences.

How to make the approaches comparable?

The first step toward getting apples to apples comparison is to select a common measure of student success. Given that both the replacement and conversion approaches to high school turnaround seek to increase student achievement, we have chosen achievement test performance (in mathematics) as the measure of student success for this example.[1] Specifically, we use the number of students achieving proficient or higher on the state assessment of mathematics among all students tested 9th through 12th grade.

The second step is to make sure we're comparing change in this outcome over the same amount of time for both approaches. For this example, we have chosen two years of implementation as the time frame; that is, we measure student performance in math at the end of the second year a group of students receive the supports provided by the conversion or replacement reform strategy.[2]

Third, we need to define the population of students the turnaround approach intends to impact. In our example, we have chosen eight comprehensive high schools in four diverse Texas communities serving approximately 14,300 students – the vast majority of which come from minority (Hispanic and African-American) and economically disadvantaged backgrounds.[3] These students and schools are fairly typical of those targeted for turnaround supports.

[1] Other measures could be added or substituted using the same method being proposed.

[2] We recognize that both conversion and replacement approaches can require a "planning year" before initial implementation. We also recognize two years is a relatively short implementation period; however, many turnaround definitions and the new ARRA federal investments use this 2-3 year timeframe.

[3] Defining the target population becomes critical in these comparisons because the decision to adopt these approaches can be taken at the building level (thus targeting the population of students in that building), the

Next, we need to create a common baseline of performance against which to compare math test performance after two years of turnaround implementation. We chose as the baseline measure the proportion of students[4] scoring proficient or higher on the math assessment in the four years prior to reform implementation.[5]

Finally, we need to identify and estimate the effects of important differences between these approaches that could undermine comparing them. In our example, we incorporate four potential differences between conversion and replacement approaches: 1) pace of implementation; 2) success rates; 3) baseline levels of student performance; 4) redistribution effects.[6]

Data used for analysis.

From the state website and district sources, we obtained data on the target population of eight high schools who are participating in a multi-year foundation and federally-funded high school conversion project.[7] These data included test scores of all 9th - 12th grade students taking the state math assessment for four years prior to the implementation of the conversion strategies and two years following implementation.[8]

Research questions.

1. *How many new replacement schools would it take to have produced the same changes in math performance achieved by the conversion approach over the same two year period?*

2. *How does the projected number of replacement schools vary, depending on:*
    a. *Pace of implementation of the replacement schools (size and roll-out schedule)?*

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cluster level (targeting the population of students in multiple high schools within or across districts – the latter being the case in our example), or district level (targeting all of the high schools in a given district).

[4]Students were tested at all four grade levels (9-12) in the eight schools participating in the conversion approach.

[5] The author recognizes more compelling comparisons include those using longitudinal data on individual students, comparison trends from demographically comparable schools, or availability of control schools selected through random assignment.

[6] These potential differences are defined more fully later in the paper.

[7] The project included a planning and capacity building year prior to initial implementation of the conversion strategies.

[8] Over the six year time period (four years pre-implementation and two years post-implementation) between 8,000 and 9,000 students were tested annually.

b. *Varying rates of success in the replacement schools?*
c. *Selection effects on baseline levels of performance for students attending the replacement schools?*
d. *Effects of teacher and student redistribution on students remaining in existing schools (i.e., not participating in replacement schools)?*

Using simulation analysis to address the research questions.

Attachment 1 reproduces an Excel spread sheet used to provide information on the research questions. Readers are advised to print out this one-page attachment and have it available for ease of reference. Below are more specific definitions of each of the variables included in the simulation.[9]

Total population of students (column A).

What is the total population of students targeted by the turnaround approaches? The enrollment in the schools in the school year before the conversion strategies were implemented was approximately 14,300 students.

Replacement school students enrolled each year (column B).

How many students does each new replacement school enroll each of the two years of implementation? Most replacement approaches enroll a single grade level per year until they reach their total enrollment of 400. In the simulation we have included a 200 student per year enrollment rate as well.

Success rates (columns C and D).

What percentage of students score proficient or higher on the math state assessments when tested near the end of the second year of implementation? For the conversion approach, 64% of the students tested proficient or higher (Column C). *See Footnote 8*. For the simulated replacement schools (Column D), we've included both 95% and 85% success rates as illustrative <u>examples</u> drawn from existing literature on several replacement approaches.

Redistribution effects (column F).

What effect does the redistribution of staff from the existing high school to the replacement schools have on the expected performance of students who do not or cannot enroll in the replacement schools? The replacement schools' ability to select teachers (as well as enroll students and families who volunteer to participate) to go to these schools could create a

[9] Analyses were conducted using the formulae derived in the Technical Note included at the end of this document.

negative effect on overall instructional quality in the existing schools for students not enrolling in the replacement schools. In the scenario shown in Attachment 1, Row 4, Column F, we have assigned a .1 value to reflect a potential 10% decline in the performance of the target population members not enrolled in the replacement schools.

Selection effects on baseline student performance in replacement schools (column G).
What percentage of students in the replacement school scored at proficient or higher on the state assessment of mathematics for the four years before their enrollment in the replacement school? With the actual baseline level established at 50% scoring proficient or higher for the total student population (Column E), we raise the baseline level by 10% in one of the simulation scenarios – shown as a .1 value in Row 5, Column G – to simulate possible student selection effects on the baseline levels of performance of students voluntarily enrolling in the replacement schools.[10]

Number of replacement schools needed (column J).
How many replacement schools (maximum size 400) would need to be started over the two year period to produce the same level of success of the conversion approach in the entire target population of students (i.e., to produce the same increase in the number of students scoring proficient or higher in math)?

Results.

Reading the simulation results.
Each row in Attachment 1 presents a simulation scenario including assumptions for each input variable and results on the output variable – number of replacement schools needed to reproduce conversion approach results.

For example, in Row 1, Column B, we assume the replacement schools will enroll the typical 100 students per year with an additional 100 9th graders added each subsequent year; for a total of 400 students over four years and 200 students by the end of the second year. Success rate of the conversion approach (Row 1, Column C) is set at 64% – the <u>actual</u> rate obtained after two years across all eight schools participating in the conversion approach. Success rate of replacement schools (Row 1, Column D) is set at 95% – meaning 95% of students in the

[10] Studies by MDRC of enrollment by lottery in Career Academies showed marked disparities in achievement levels between students who entered the lottery to enroll in these "new schools" and the general high school population.

replacement schools tested after the first two years of implementation are projected to score proficient or higher in mathematics.

Pre-implementation success rate (Row 1, Column E) equals 50%, the actual rate obtained by calculating an average percentage of proficient or higher students in math across all eight schools for the four years prior to implementation of the conversion approach. *See footnote 8*. For this scenario we assume no redistribution effects on students not participating in the replacement schools by entering a zero (0) in Row 1, Column F; and we assume students enrolling in the replacement schools are identical in their pre-enrollment math performance by entering a zero (0) in Row 1, Column G.

Key findings.

Under the Row 1 scenario, approximately 22 replacement schools would have to have been started and run for two years to match the increase in the numbers of students in the target population scoring proficient or higher in mathematics during the two years the conversion approach was being implemented.

Subsequent rows in the table change the value of one variable at a time from this scenario and present the resulting number of new replacement schools needed to match the results obtained by the conversion approach.

The results in the rest of the rows of Attachment 1 indicate that, with all other assumptions in the first scenario (Row 1) holding:

Row 2 – doubling the typical implementation pace of the replacement approach lowers the number of replacement schools needed to 11 in order replicate the conversion approach findings;

Row 3 – lowering the projected success rate of the replacement school to 85% after two years increases the number of replacement schools needed from 22 to 29;

Row 4 – a drop of 10% (.1) in the expected levels of performance in the students not enrolled in the replacement schools, most likely due to more successful teachers going to the replacement schools, increases the number of new schools needed to replicate the conversion approach's results from 22 to 31; and

Row 5 – raising the baseline level of math performance of students entering the replacement schools by 10% (a .1 increment) due to potential selection effects increases the number of new schools needed to replicate the conversion approach's results from 22 to 29.

The simulation findings compare actual data from schools using a conversion approach to a series of simulated scenarios under which new replacement schools could have been launched. The findings suggest that significant numbers of replacement schools performing at very high levels would had to have been launched under very favorable conditions to match the conversion results.

Limitations of Simulation Study.

This initial simulation has several limitations.

First, assumptions regarding rates of implementation, success rates, selection, and redistribution effects associated with the replacement approach are just that – assumptions. Future uses of this tool will estimate these values using as much data as possible – for example, data on how students choosing to enroll in replacement schools do differ from the general population in terms of math performance; or, how much, if any, effect does the departure of significant numbers of students and teachers from existing schools have on those students left behind in those schools and in the entire district.

Second, not being able to estimate the percentages of students enrolled versus students tested in the simulated replacement schools, forced us to choose one or the other to use in all calculations in order to maintain an "apples to apples" comparison of the two approaches. We chose "students enrolled at the beginning of implementation" as the total student population estimate for all calculations. In future applications of the tool, we intend to incorporate percentages of students tested as a variable in simulations that use test score data.

Third, the simulation results in this study only focus on one student outcome, and the variables affecting this outcome are being manipulated one variable at a time for the purposes of clear explication. Future work can specify different student outcomes (e.g., graduation rates, post-secondary enrollment), and multi-outcome models. Combinations of the factors included in the simulation model can be specified as well – for example, where both selection effects and redistribution effects have non-zero effects on how many students would need to enroll in replacement schools to replicate the conversion approach's results.

Final Thoughts

Recognizing these limitations, we believe use of this tool and the definitions and methodology underlying it can help decision-makers across the educational spectrum bring much more clarity, rigor and fairness to discussions of the relative merits of different high school turnaround approaches. Extensions of this work will provide quantitative estimates of how long it will take and how much it should cost to achieve various outcomes of high school reform using one reform approach versus another or in combination.

To our knowledge, this kind of analytic tool has not been available to inform critically important decisions being made every day by superintendents, federal/state/local policy makers and investors in high school turnaround. We hope the concepts and methodology behind this tool and the tool itself will help these decision-makers compare “apples to apples” as they grapple with which turnaround approaches and in what combinations make the most sense for their particular situation.

For more than ten years, I have participated in discussions of the relative merits of these two approaches to improving students’ outcomes in chronically under-performing high schools. Most of these conversations have felt like "ships passing (and sometimes firing) in the night". My hope is that the ideas behind this tool (and the tool itself) will help illuminate these conversations and, by doing so, quiet the guns as well.

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Attachment 1

	Simulation Results from Comparing Conversion and Replacement Approaches to High School Turnaround									
	A	B	C	D	E	F	G	H	I	J
ROW	Total Student Population	Replacement Schools Student Enroll Per Year	Success Rate of Conversion Schools	Success Rate of Replacement Schools	Pre-Implementation Success Rate in Total Student Population	Redistribution Effects on Success Rate on Students Not Enrolled in Replacement Schools	Selection Effects on Baseline Performance in Replacement Schools	Conversion Approach Increase in Number of Successful Students	Total Number of Students Required to be Enrolled in Replacement Schools	Number of Replacement Schools Needed
1	14,300	100	0.64	0.95	0.50	0	0	2002	4449	**22**
2	14,300	**200**	0.64	0.95	0.50	0	0	2002	4449	**11**
3	14,300	100	0.64	**0.85**	0.50	0	0	2002	5720	**29**
4	14,300	100	0.64	0.95	0.50	**0.1**	0	2002	6240	**31**
5	14,300	100	0.64	0.95	0.50	0	**0.1**	2002	5720	**29**

Technical Note
Mathematical Derivation of Simulation Formulæ

Carl de Boor

Let
A be the total number of students in the target population,
B be the students per year taken on by one replacement school,
C be the conversion success rate after two years,
D be the replacement success rate after two years, and
E be the pre-implementation success rate
All rates in decimal fractions.

Then the conversion strategy can be credited with

$$H := A(C - E)$$

additional students having reached proficiency over baseline.

The goal is to compute the number of replacement schools (at 2*B* per school) needed to achieve the same number of additional proficient students. Let ***I*** be the total number of students enrolling in replacement schools.

Assuming no special selection taking place when assigning students to the replacement strategy, then the replacement strategy gets credit for (***D* - *E***) additional proficient students over baseline. Hence, if it must produce ***H*** additional proficient students from the ***I*** students assigned to it, then

$$I\,(D - E) = H,$$

Or

$$I = H = (D - E).$$

(1) What if the pre-implement success of those selected for the replacement schools is not ***E*** but, rather, ***E* + *G*** (for some positive ***G***, but the formula would also work for negative ***G***). Then

$$I = H/Z, \quad \text{with } Z := D - E - G.$$

(2) What if the success rate of the remaining students is not ***C*** but, rather, ***C* - *F*** (for some positive ***F***, but the formula would also work for negative ***F***). Then,

$$(A - I)F$$

must be added to the number ***H*** of additional proficient students the replacement strategy has to supply, i.e., we now get the equation

$$I = (H + (A - I)F)/Z,$$

Or

$$I(1 + F/Z) = (H + AF)/Z,$$

Or

$$I = \frac{(H + AF)/Z}{(Z + F)/Z} = (H + AF)/(Z + F).$$

Note: The derivation breaks down when ***Z*** = 0, i.e., when ***E* + *G* = *D***. This would occur only if these students enrolling in replacement schools are already performing at the success rate targeted by the replacement strategy.

Finally, substituting the original expression $H = A(C - E)$ for H into the formula for ***I*** gives

$$I = A\frac{C - E + F}{D - E - G + F}.$$