Jumping or Pushed? The Effect of High Stakes Accountability on Student Mobility

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Researchers have found that schools engage in wide variety of strategic behaviors in the face of high stakes accountability evaluations. These actions, aimed at influencing the test results used for the evaluations, have ranged from simple cheating (Jacob and Levitt 2003) to measures that are less flagrantly dishonest but more subtle and shrewd. Schools have attempted to manipulate the testing pool through classifying low-performing students into special education programs (Cullen and Reback 2006; Figlio and Getzler 2006; Jacob 2005); retaining students (Jacob 2005); or by doling out harsher punishments to low-performing students than high-performing students during testing time (Figlio 2006). Schools even engage in strategic feeding of students (Figlio and Winicki 2005). Finally, there is evidence that schools alter teaching practices in undesirable ways in response to high stakes testing: teaching to the test; narrowing the curriculum; and focusing on the "bubble students" who are on the borderline of passing the test.

In Arizona, the state's policy of fostering school choice has created another alleged method for schools to game the accountability system. Arizona has in place two policies that encourage school choice by parents. First, Arizona has a significant number of independently run charter schools. Second, the state has a policy of open enrollment: parents may enroll their students in any public school district if that district has space. Schools districts take advantage of this law in a positive way through active marketing and even providing transportation to children who reside outside of their boundary lines.

Schools may also take advantage of the law in a negative way. School choice in Arizona has given rise to the Legend of the 100-Day Dump. According to the legend, after the 100th day of the school year—the last day students are counted for funding purposes—principals and counselors fan out to their low-performing and problem students and encourage them to find a better educational fit at another school. Although charter school operators complain the loudest about having to enroll students leaving another school in mid-year, the traffic allegedly moves both ways. The alleged dump occurs well before testing time so principals could affect their ratings by pushing low-performing students on to the school down the road.

The purpose of this study is to find out if the legend is true: do schools engage in strategically pushing certain students out? The study seeks to answer this question with a quantitative analysis of state wide enrollment and testing data.

The Method

The analysis consists of three parts. The first is an examination of the pattern of student entries and exits over the course of the school year. Do we see spikes at certain times?

The second part of the analysis employs a multinomial logistic regression to determine the factors that influence student exit. The purpose of this second part is to determine the student characteristics that affect the type of exit decision. If the decision to transfer is truly exogenous, then the factors that affect the probability of transferring to another school should be the same as those for obviously exogenous reasons for exiting such as illness. Furthermore, test scores should not be expected to have a significant influence. However, if students who transfer look a lot like students who drop out, or if test scores have a large influence, then there is the possibility of schools strategically pushing students to transfer.

Test performance, however, is not truly exogenous, and it may be that any relationship between mobility and performance is due to the influence of another, unobservable, factor like student ability. The third part of the analysis accounts for this possible correlation by using a regression discontinuity analysis like that used by Papay, Murnane, and Willett (2008) in their study of high stakes tests exit exams.

The method takes advantage of the fact that a nearly continuous measure of ability, the student's raw or scale score on a test, is divided into discrete, exogenous performance levels, the most important being pass and fail. Students on one side of this divide have a significantly different impact on school evaluations than the other. If on the pass/fail margin, the relationship between exiting and test performance is continuous, then it is likely that both mobility and test performance are jointly determined by student ability. However, if there is a sharp discontinuity in the relationship—marginally passing students are much less likely to transfer than marginally failing—then the likelihood of strategically exiting students is higher.

The Data

The study's primary source of data will be Arizona's Student Accountability Information System (SAIS). Used primarily for funding purposes, SAIS contains student-level demographic and enrollment information that follows students through their career in Arizona's public schools—traditional and charter. SAIS contains the dates of enrollment and exit, the reason for exit, student race/ethnicity, gender, participation in the English language learner and special education programs, and socio-economic status. Students are identified by unique ID numbers that allow tracking across schools and years, and linking of information to Arizona's standardized test, the AIMS.

The test information used is from the state's AIMS test: the criterion-referenced test administered in reading, writing, and math for grades 3 through 8, and at the high school level. Students first take the high school level AIMS in grade 10. However, since

passing AIMS is a requirement to receive a diploma, students who do not pass the high school test on their first try may retake it again in subsequent years.

Student Enrollment and Exits

In the 2007 school year the number of enrollments in Arizona public schools (traditional districts and charters) was 1,312,381 of which 11 percent were in charter schools. Due to the existence of concurrent enrollments, the number of enrollments does not equal the number of actual students. In 2007, 1,140,591 distinct students were enrolled at some time during the year. The vast majority enrolled in only one school during the year. Nearly 90 percent of students enrolled in no more than two schools; however some particularly footloose students enrolled seven, eight, or nine or more times. Although these highly mobile students were small in terms of the total number enrolled, there were over 25,000 students who enrolled in three or more schools. Mobility was somewhat higher for high school (grades 9 through 12) with 16 percent of students enrolling in two or more schools compared with 11 percent for the lower grades.

In 2007, there were 263,073 exits during the school year. Again, these are events not students. Eighteen percent of individual students left a school in which they were enrolled during the year. The percentage for high school students, 26 percent, is higher than that for elementary students: 15 percent.

Schools are required to report the reason for a student leaving during the year. Table 1 shows the distribution of exit reasons for the 2007 school year by elementary and high school grades. In Arizona a distinction in reporting is made between a student who drops out and a student whose status is unknown. Dropouts are students that schools can verify as residing in the state but not attending school. As table 1 shows, actual dropouts make up a small fraction of those leaving school during the year. A student for whom a school is unable to verify any information after he leaves is classified as "status unknown."

For accountability and reporting purposes exit reasons fall into two categories. The first are exits that count against schools in accountability measures such as graduation and dropout rates and school evaluations such as those required by No Child Left Behind. These reasons include dropouts, status unknown, and expulsion. Students who exit for these reasons are counted as dropouts and as non-graduates. Students who leave for the second category of exit reasons, which includes transfers and home-schoolers among others, are not counted as dropouts, and are considered to have exited their graduation cohort. Hence, students exiting for these reasons do not adversely affect accountability measures or evaluations.

The first step in examining if schools are strategically urging problem students to transfer is to examine the pattern of transfers both in time and among school types. Recall, that the stereotypical anecdote involves the student being counseled to transfer after the 100th day of school (the last day the student counts for funding). Figure 1 and figure 2 show the distribution of the inflow and outflow of students at the elementary and

high school levels over the 2007 school year. For the vast majority of schools (75 percent) the 100th day falls sometime in January; with another 13 percent having their 100th day in February, and another 6 percent in March. Neither graph shows evidence of a significant movement of students after the 100th day. Exits reach a maximum at the natural holiday/semester end in December. Exits in the first three months of the calendar year, when the 100th day occurs for 94 percent of schools, are less than during the previous fall.

The stereotypical story regarding strategic transfers has the student moving from a district to a charter school. A high proportion of charter schools specialize in serving at-risk students, or providing credit recovery for those who have fallen behind. There may also be other features of charter schools, small size or self-paced study for example, that can be used to make the case for a better academic fit. Charter schools also are not limited by attendance boundaries and may provide transportation over a larger area. Although under Arizona's open enrollment law a student transferring may transfer to any other traditional district school, the school likely will not provide transportation to a student outside of its attendance boundary. For these reasons, strategic transfers are likely to take place between charter and traditional schools.

In 2007, there were 156,475 cases where a student transferred between two Arizona public schools, of these 83 percent were students leaving a traditional school, and 17 percent were students leaving a charter school. Thus, compared to enrollment traditional schools experience a slightly higher exit rate. Table 2 shows the distribution of these transfers by the type of school left and the type of school entered. Most students, 70 percent, transferred between two traditional schools, with 12 percent of total transfers from a traditional school to a charter school.

Table 3 presents the same information adjusted for the size of the source school type: so, for example, of the students who transferred from a traditional school in the middle of the year, 85 percent re-enrolled in another traditional school. In contrast, the type of destination school is balanced for students who left a charter school: little more than half enroll in another charter school while a little less than half enroll in a traditional school. The tables 2 and 3 do indicate a large fraction of students that might be involved with strategic transfers, and that charters may be as likely to be perpetrators as victims of any strategic transfers.

Factors Associated with Student Mobility

In this section we turn to an examination of the factors associated with student mobility. Its purpose is to determine if there is a significant difference, especially in terms of academic achievement, between dropouts and transfers. If transfers and dropouts have similar characteristics then it may be that transfers in general are not exogenous events, for example caused by a student moving, but rather events that schools may affect.

The data used for this analysis were student-level enrollment and exit information taken from the Arizona Department of Education's SAIS database for the 2007 school year. These records were matched to students' test scores from the spring administration in the 2006 school year.

Students were classified into three groups. The first are those who exited during the school year and whose exit reasons fell in the first category described in the previous section. The largest number of students in this group are those who left and whose whereabouts are unknown, and students who dropped out. This category also includes students who were expelled and who left to obtain a GED or vocational certificate. For ease of discussion we will refer to this group as dropouts. The unifying assumption of this category is that reasons for exit are considered within a school's control, and as mentioned previously, adversely affect school performance measures that are publicly reported and used in evaluations.

The second group of students is those who exited during the school year and whose exit reasons fell into the second category described previously. By far the largest number of students in this group are transfers, but it also includes students who left due to illness or institutionalization, choosing to be home schooled, or death. For ease of discussion we will refer to this group as transfers. The unifying assumption of this category is that the reasons for exit are considered outside of a school's control, and as mentioned previously, schools are held harmless by the state's accountability and reporting. The final group of students is those who remained in school.

Tables 4 and 5 provide the summary statistics of the three categories of students for the elementary and high school grades. Both dropouts and transfers performed worse on the state's standardized test; for high school much worse. Special education students, English language learners, males, African Americans, Hispanics, and Native Americans make up disproportionate shares of both dropouts and transfers. In general the shares of these groups change in a stepwise manner; with their share of dropouts being larger than the share of transfers, which in turn is larger than their share of students who remain at the same school. However there are some exceptions. At both the elementary and high school level, African Americans make up a larger share of transfers than of dropouts; and at the high school level their share of dropouts equals their share of students that remained in school. At the high school level English language learners make up a smaller percentage of transfers than of those who stayed. At both levels, Native Americans make up a much larger share of dropouts than of transfers. The percentage of transfers who are Native American is very close to the percentage of those who stayed in school who are Native American. This is may be due to few alternatives being available in the remote rural areas where the largest number of Native Americans live.

The percentages are lower for economically disadvantaged students at the high school level because socio-economic status is determined by eligibility for a free or reduced lunch. Even though the criteria is eligibility, not participation, and all schools are required to report this information, high schools have been lax in reporting this

information because traditionally the participation rate of high school students has been less than that at lower grades.

The analysis was conducted using multinomial logit regression. The student characteristics listed in tables 4 and 5 were used as explanatory variables. In addition, grade was included at the elementary school level, and grade and cohort year (expected graduation year) was included at the high school level. Test performance was measured by scale score rather than pass/fail. The analysis was conducted separately for each subject of AIMS tested: reading, writing, and math. Only the math results, which are representative of the other two subjects, are reported

Tables 6 and 7 present the results in the form of odds ratios. The impact of test performance is reported in the odds ratio when scoring one standard deviation above the mean. At the elementary level, once confounding factors are controlled for, special education students and English language learners were less likely to dropout or transfer. Economically disadvantage students were more likely to dropout, but are no more likely to transfer than the economically advantaged. Compared to white students, African Americans, Hispanics, and Native Americans were more likely to dropout or transfer. Females were less likely to leave a school than males.

There are several notable changes at the high school level. Special education students and English language learners were still less likely to leave, but so were the economically disadvantaged. Hispanics were no more likely to leave than whites. African Americans were more likely to transfer than whites, but less likely to dropout. The opposite is true for Native Americans. While the likelihood of leaving school increased with grade at the elementary grades, it decreased with grade in high school.

Do the tables show the sought after evidence of strategic transfers? That is, do students who transfer look like students who dropout? Although, thanks to extremely large sample sizes, the odds ratios for dropouts are statistically significantly different than those for transfers, the impact of student characteristics is largely the same for both events. Furthermore, it is telling that academic performance has an effect on transfers—the better scoring students tend to stay put. Thus, transfers generally are not neutral events caused by circumstances unrelated to a student's academic attainment, but rather the decision to switch schools during the year is tied to a student's achievement. This tie can be direct: poor performance leads to the search, or the suggestion to search, for a better academic fit; or outside circumstances (unrelated to race, socio-economic status, or language ability) may be causing the student to move and harm his accomplishment in school.

Results of Discontinuity Regressions

In the previous section we found academic performance inversely related to student mobility. Students who performed poorly on tests in the previous year were more likely to leave school in the current year—either as a transfer or a dropout. This is not a surprising result, and the form of the relationship between academic performance and

mobility may be imagined to take many different paths. In this section we will use discontinuity regression try to determine if the relationship between performance and mobility can be attributed to strategic transfer.

The logic behind the analysis is straightforward. If the correlation between test scores and mobility is the result of a link between academic ability (as measured by test scores) and mobility, then we can expect the relationship of test score and the likelihood of moving to be relatively smooth and monotonic. If, however, strategic transfers are a significant phenomenon then the pass/fail cutpoint looms large. Although the difference in academic ability may be small between a student who barely passes the test and a student who just fails, the impact of the two students on a school's evaluation could be significantly different. Consequently, strategic transfers on a large scale should manifest themselves in a significant break in the test score-transfer relationship at the pass/fail cutpoint. Furthermore, the setting of the pass/fail cutpoint is an event independent of observed and unobserved student characteristics. Thus the analysis is a form of natural experiment on the effect of failing on mobility (as opposed to the effect of academic ability as measured by the test.)

The analysis starts with figures 3 and 4 which show the percentage of students leaving, either as transfers or dropouts, plotted against the raw score (total number of questions correct) of the student on the test taken the previous spring. The scores have been normalized so that a raw score of zero is passing. The graphs show the negative relationship between test performance and mobility discovered in the previous section, but do not show a dramatic break at the pass/fail threshold.

Imbens and Lemieux (2007) state that if plots of the data do not show the hypothesized effect, then it is unlikely that more sophisticated analysis will find it. Nevertheless, we will plow forward with a regression analysis in order to confirm what our eyes are telling us. The method used will be that outlined by Imbens and Lemieux, using local linear regressions fitted to the data ± h away from the pass/fail cutpoint c:

$$\min_{\alpha_l,\beta_l} \sum_{i|c-h<X_i<c}^{N} (Y_i - \alpha_l - \beta_l \cdot (X_i - c))^2 \ ,$$

$$\min_{\alpha_u,\beta_u} \sum_{i|c\le X_i<c+h}^{N} (Y_i - \alpha_u - \beta_u \cdot (X_i - c))^2 \ .$$

The subscript l indicates the parameters below the cutpoint and the subscript u those above the cutpoint. The effect of passing the test is estimated as

$$\hat{\tau} = \hat{\alpha}_u - \hat{\alpha}_l \ .$$

Alternatively, we will do as Imbens and Lemieux suggest and estimate the single equation

$$\min \alpha, \beta, \tau, \gamma : \sum_{i|c-h<X_i<c+h}^{N} (Y_i - \alpha - \beta \cdot (X_i - c) - \tau \cdot P_i - \gamma \cdot (X_i - c) \cdot P_i)^2 \quad .$$

P_i is a dummy variable that equals 1 if student *i* passed the test. Under the condition $h \propto N^{-1/5}$ the asymptotic bias of $\hat{\tau}$ is unbiased and the least squares variance leads to valid confidence intervals (Imbens and Lemieux). This implies a bandwidth *h* =1 for the elementary and high school grades.

Tables 8 and 9 provide the results. The regressions included student ethnicity, grade, socioeconomic status, and whether the student was an English language learner or special education student. The regressions were carried out for bandwidths of 1, 2, and 3 to investigate the sensitivity of the results. Imbens and Lemieux recommend examining the change in mean squared error over a range of bandwidths to determine the optimal bandwidth size. However, the condition under which inference using least squares estimates discussed in the previous paragraph implies a danger to larger bandwidths. In any case, as the tables show, there is little change in the mean squared error over the different bandwidth sizes.

Only in the case of math at the elementary levels is there some indication of a break at the pass/fail threshold. However, the result is not robust to changes in bandwidth. At the high school level, there is some evidence for change in the coefficient of the test score at the pass/fail cutpoint, with the slope becoming steeper for students in the passing range, but again the result is not robust. The regression analysis confirms the ocular analyis, there is no significant jump in the likelihood of leaving a school at the pass/fail threshold. Thus, the inverse relationship between test performance and mobility cannot be attributed to large-scale manipulation of accountability measures through strategic transfers.

Conclusion

This study examined the intersection of two commonly advocated school reform policies: choice and high-stakes evaluations. It looked to see if there is any truth behind the legend of principals strategically counseling students out of their schools on to the school down the road. It has found that—despite school folklore and the occasional confession of an ex-principal—strategic transfers are not a significant phenomenon at the state level. (It would be interesting to see if it can be detected at the school level.) There is no noticeable blip in the annual pattern of transfers at the important 100-day mark; and similarly, there is no discontinuity in the likelihood of leaving at the pass/fail threshold.

Nevertheless, this paper has found results important to education policy and accountability. Education policymakers and accountability systems place great weight on graduation rates and dropout rates as measures of school performance. The calculation of

these rates typically distinguishes between students who leave school for bad reasons, dropouts, and students who leave school for neutral reasons, transfers. Schools are held accountable for the first group but not the second. A student who drops out lowers a school's graduation rate and raises a school's dropout rate. A student who transfers has no effect.

This paper has found that in fact there is little difference in the profile of dropouts compared to graduates. The same factors associated with dropping out of school are associated with changing schools. Given the harmful effects of switching schools, graduation and dropout rates calculated in the convention way may be sending a too-rosy picture of school performance to the public. Students who are failing to find a permanent academic home are invisible because they can try another school for a month or so. Only when they finally become discouraged, or age out, will they appear as dropouts.

For more meaningful measures of accountability, policy makers might consider measures of mobility, or time enrolled. Other possibilities are to hold the first school in which the student enrolled rather than the last school accountable for the student's graduation. Finally, policy makers might want to examine abolishing the distinction between exit reasons that are considered neutral, and those that are considered negative.

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Table 1. Reasons for Exit		
	Elementary Schools	High Schools
Transfer	89%	68%
Dropout	<1%	3%
Status Unknown	6%	13%
Expulsion	1%	2%
Early Graduate	NA	5%
Home School	2%	<1%
GED/Vocational	NA	2%

Table 2. Distribution of Transfers by School Type (percent of total events).		
Leave	Enter	
	Charter	Traditional
Charter	9%	8%
Traditional	12%	70%

Table 3. Distribution of Transfers by School Type (percent of sending type).		
Leave	Enter	
	Charter	Traditional
Charter	52%	48%
Traditional	15%	85%

Table 4. Summary Statistics for Elementary Grades			
	Dropouts	Transfers	Stayed in School
Special Education	14%	13%	12%
English Language Learners	15%	12%	11%
Economically Disadvantaged	62%	51%	45%
Female	41%	47%	49%
Asian	1%	2%	3%
African American	7%	9%	5%
Hispanic	51%	47%	41%
Native American	14%	6%	5%
White	26%	36%	46%
Percent passing AIMS (Math)	59%	73%	85%
Number (percent)	6,739 (1.3%)	66,499 (12.9%)	440,803 (85.8%)

Table 5. Summary Statistics for High School			
	Dropouts	Transfers	Stayed in School
Special Education	14%	10%	12%
English Language Learners	10%	5%	6%
Economically Disadvantaged	39%	31%	30%
Female	44%	48%	50%
Asian	1%	1%	2%
African American	6%	9%	6%
Hispanic	49%	45%	37%
Native American	12%	6%	7%
White	32%	39%	48%
Percent passing AIMS (Math)	23%	37%	61%
Number (percent)	7,076 (6.5%)	22,428 (20.7%)	78,824 (72.8%)

Table 6. Multinomial Logit Results for Elementary Grades		
	Dropouts	Transfers
Special Education^	0.53*	0.65*
English Language Learners	0.61*	0.67*
Economically Disadvantaged^	1.43*	0.99
Female^	0.72*	0.91*
Asian	0.87	1.07*
African American^	1.36*	1.56*
Hispanic^	1.34*	1.13*
Native American^	2.51*	1.05*
AIMS scale score (Math)^	0.35*†	0.51*†
Grade^	1.94*	1.29*
N = 514,041		
*Different from 1 at the 95 percent level. ^ Odds ratio for transfer differs from dropout at 95 percent level. †Odds ratio for one standard deviation from state mean.		

Table 7. Multinomial Logit Results for High School Grades		
	Dropouts	Transfers
Special Education^	0.42*	0.39*
English Language Learners^	0.64*	0.47*
Economically Disadvantaged^	0.96	0.78*
Female^	0.79*	0.90*
Asian^	0.52*	0.90
African American^	0.87*	1.23*
Hispanic^	1.04	1.04
Native American^	1.22*	0.75*
AIMS scale score (Math)^	0.31*†	0.43*†
Grade^	0.65*	0.73*
Cohort^	0.47*	0.70*
N = 108,328		
*Different from 1 at the 95 percent level. ^ Odds ratio for transfer differs from dropout at 95 percent level †Odds ratio for one standard deviation from state mean.		

Table 8. Results of Discontinuity Regressions, Elementary Grades						
Variable	Math			Reading		
Raw score	0.005 (1.01)	-0.000 (-.016)	-0.002 (-1.15)	-0.011* (-2.32)	-0.006* (-2.74)	-0.006* (-4.00)
Pass	-0.018* (-2.08)	-0.009 (-1.48)	-0.006 (-1.24)	0.005 (0.65)	0.000 (0.03)	0.001 (0.25)
Raw score * Pass	-0.005 (-0.84)	-0.001 (-0.44)	-0.000 (-0.02)	0.009 (1.74)	0.004 (1.34)	0.001 (0.79)
R-squared	0.006	0.006	0.005	0.006	0.006	0.007
Mean squared error	0.131	0.130	0.137	0.131	0.131	0.131
Bandwidth	1	2	3	1	2	3
N	51,722	72,424	93,427	66,639	92,893	119,868
t-values in parentheses *Significant at .05 level.						

Table 9. Results of Discontinuity Regressions, High School Grades						
Variable	Math			Reading		
Raw score	-0.005 (-0.36)	0.004 (0.59)	0.001 (0.14)	0.012 (1.00)	-0.002 (-0.37)	-0.014* (-3.36)
Pass	-0.004 (-0.17)	-0.021 (-1.23)	-0.021 (-1.42)	-0.024 (-1.11)	-0.009 (-0.57)	0.009 (0.71)
Raw score * Pass	-0.020 (-1.24)	-0.022* (-2.66)	-0.013* (-2.43)	-0.030* (-2.07)	-0.007 (-0.94)	0.005 (0.93)
R-squared	0.018	0.016	0.015	0.014	0.014	.016
Mean squared error	0.201	0.201	0.200	0.213	0.214	0.214
Bandwidth	1	2	3	1	2	3
N	10,075	14,040	18,009	13,505	18,998	24,574
t-values in parentheses *Significant at .05 level.						

Figure 1. Inflow and Outflow of Students
Elementary Grades

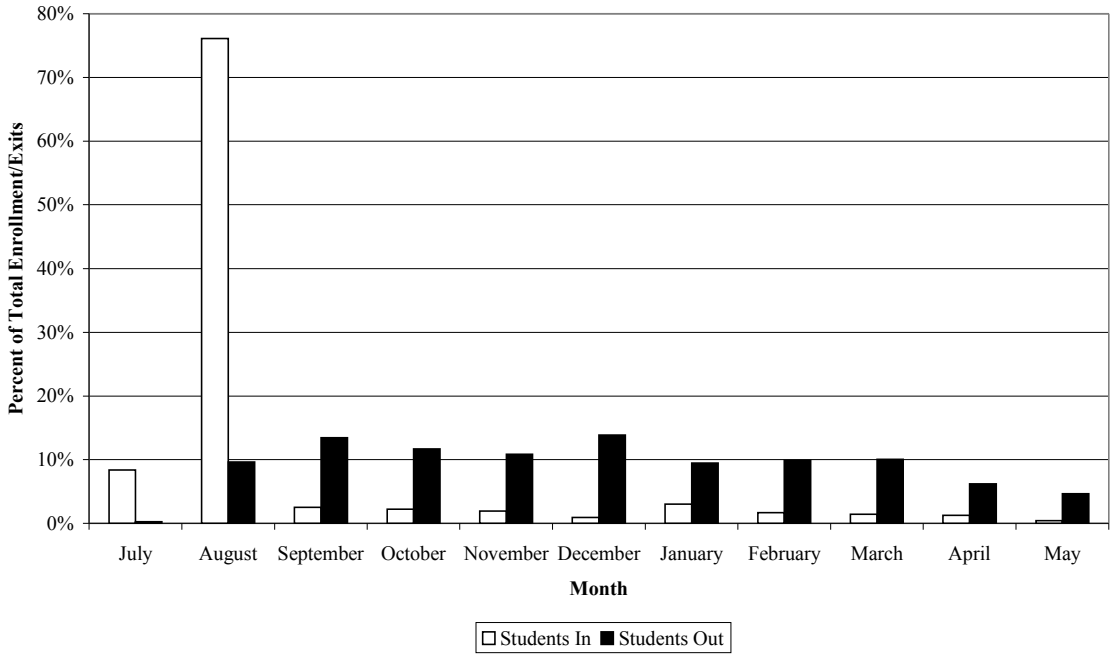

Figure 2. Inflow and Outflow of Students High School

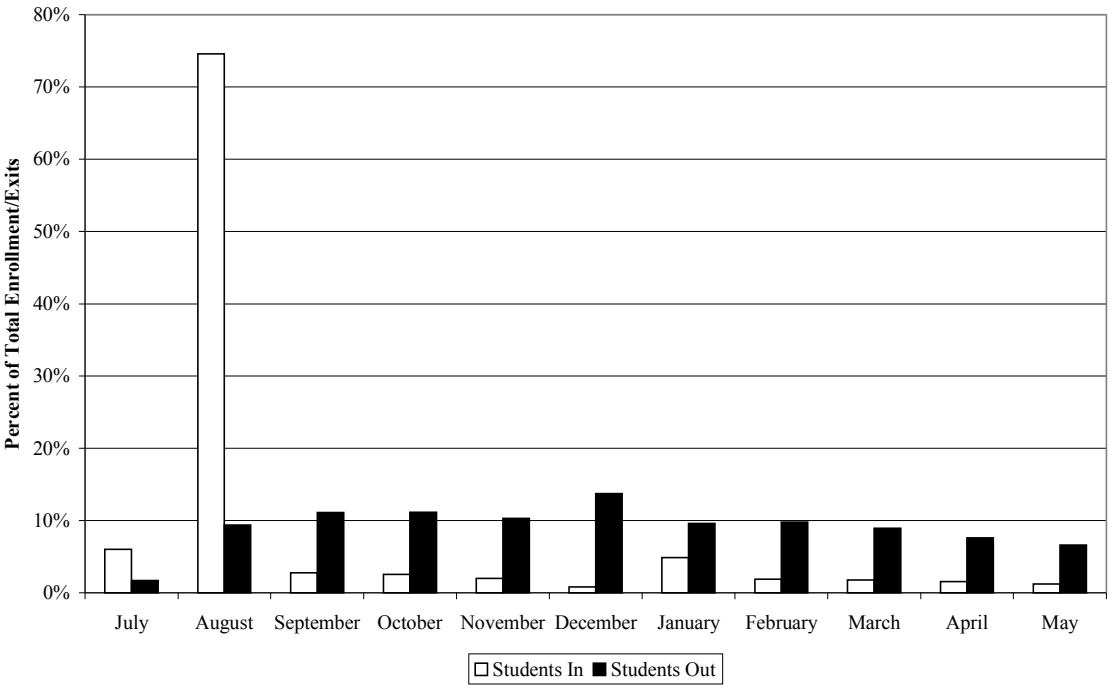

Figure 3. Elementary Math

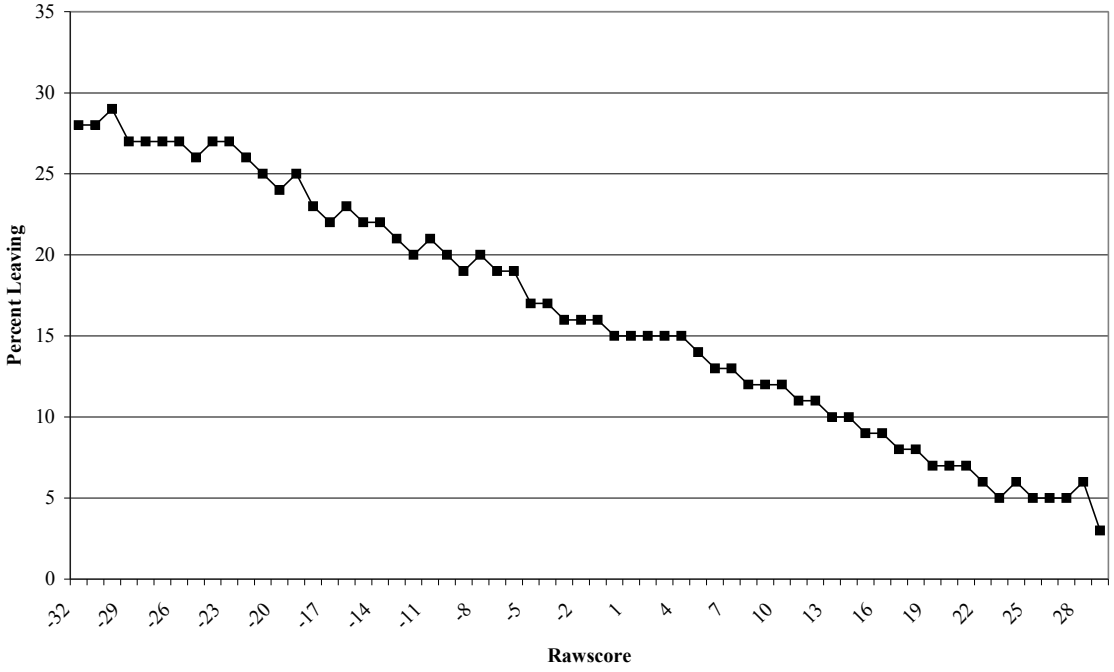

Figure 4. High School Math