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ABSTRACT

This paper examines the relationship between the climate of teacher-student relations within a school and individual student's likelihood of freshman year success. Using administrative data from the Chicago Public Schools and survey data, researchers used hierarchical linear modeling to determine whether teacher-student climate predicts students' likelihood of being on track to graduate by the end of the freshman year. Teacher-student climate is a factor which covers a wide range of questions focused on whether students believe teachers treat them with fairness and respect and whether they help them when they struggle with their school work. Results find that teacher-student climate does have a significant effect, even after controlling for individual race, gender, poverty, and prior achievement, as well as the school level average achievement of the entering cohort. Researchers found a much smaller effect when looking at the effect of teacher-student climate on achievement on a standardized test and a nonsignificant effect on student absences. Because being on-track is significantly correlated with graduating within 5 years, researchers believe focusing on improving the climate of teacher-student relationships in the schools might be an important component in reducing school failure. (Contains 11 references.) (Author/SM)

Falling Off Track:
How Teacher-Student Relationships Predict Early High School Failure Rates

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Abstract

This paper looks at the relationship between the climate of teacher-student relations within a school and individual student's likelihood of freshman year success. Using administrative data from the Chicago Public Schools and survey data, we use hierarchical linear modeling to determine whether teacher-student climate predicts students' likelihood of being on track to graduate by the end of freshman year. Teacher-student climate is a factor which covers a wide range of questions focused on whether students believe teachers treat them with fairness and respect and whether they help them and help them when they struggle with their school work. We find that teacher-student climate does has a significant effect, even after controlling for individual race, gender, poverty, and prior achievement, as well as the school level average achievement of the entering cohort. We found a much smaller effect when looking at the effect of teacher-student climate on achievement on a standardized test, and a non-significant effect on student absences. Because being on-track is significantly correlated with graduating within 5 years, we believe focusing on improving the climate of relationships between teachers and students in the schools might be an important component in reducing school failure.

Falling Off Track:
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By Shazia Rafiullah Miller

Far too many high schools face the problem of high student failure: Students fail to learn while in school and fail to stay in school long enough to complete their degrees. The ultimate decision to dropout is often made long after the downward spiral of low achievement has begun. How can this decline be stopped before it gains momentum?

This paper examines the role of the climate of teacher-student relationships in starting students off on the right foot. We hypothesize that the climate of relationships between schools' teachers and students, as defined by students, affects whether or not students are on track to graduate at the end of their freshman year and that the effect is more important for getting past this threshold of achievement than it is to a linear measure of either achievement or engagement (as measured by absences). While the push to improve schools often focuses on strictly academic factors such as basing the curriculum on the "basics" or setting levels of achievement on external tests, our analyses suggest that improving the climate of interpersonal relationships between students and teachers may be a more fruitful method of ensuring that schools meet the basic goal of keeping students progressing in their education.

Background

It has been over a decade since the U.S. Secretary of Education called Chicago's schools the worst in the nation, and the city's schools have improved dramatically since then. In Chicago public high schools, for example, the percent of students at or above national norms in math on the Tests of Achievement and Proficiency rose from 19.3% in 1992 to 30.9% in 1998 (Chicago Public Schools, Office of Accountability). However, the gains in the high schools have not been without drawbacks. While test scores have been rising, so have drop-out rates (Kelleher, 1999), and Chicago's dropout rates remain roughly three times the national average of 11% (NCES, 1999).

Research has shown that high school performance is extremely important to future life outcomes, particularly in terms of the adult world of work. As Aaron Pallas pointed out, "In our society, adulthood is often defined in terms of the ability of an individual to be financially and emotionally independent and self-sustaining, and is operationalized through the accession of adult work and family roles" (Pallas, 1995)" High schools are the last institution to affect all youth, and therefore can play an important role in preparing young people for the adult world, and research has shown that schools do have an effect. Both academic achievement (Gamoran, 1994; Kroch, 1994, Miller, 1998) and attaining the credential of a high school diploma (Faia, 1981, Hill and Nixon, 1984) predict success in the labor market in terms of obtaining jobs and earning better wages, and dropping out is significantly related to a weaker sense of personal control (Lewis et al., 1999).

If keeping students progressing in school is an important goal, then the question becomes: what keeps high school students from dropping out? This paper starts from out finding that many dropouts can be spotted from their poor performance freshman year. Our

research suggests that being off track (not having enough credits to move into the next grade on time or having more than one F in a core course) by the end of freshman year is strongly and significantly correlated (.55) with failure to graduate within 5 years.[1] Moreover, some schools have extraordinarily high numbers of students off track, often half of their freshman population. This suggests that there might be something about individual schools that encourages this early poor performance. While the obvious answer is that some schools start off with more unprepared students, and this is certainly true, there are other factors which may play a role.

James Coleman's seminal work on social capital suggests that relationships among people form a resource base which can be tapped to create socially desirable outcomes (1988). We draw on Coleman's premise and test the hypothesis that the strength of the social capital created by the relationships between teachers and students plays an important role in keeping students off the downward spiral of early poor performance, even after controlling for both individual students' level of preparation and the average readiness of the entering class at a school. Finally, we test whether teacher-student climate similarly predicts other measures of student performance and engagement, looking at their scores in reading on the TAP and their absenteeism.

Data and Methods

To examine these propositions, we use an unusually rich source of data, the archives of the Consortium on Chicago School Research, which includes administrative data on the school performance and outcome data on virtually every child in the Chicago public school system (CPS), the third largest school system in the country. We link that data to school level

[1] We allowed student 5 years to graduate or drop out as there are sizable changes in both rates when given one

information from surveys administered to 10th grade students in CPS high schools. Specifically, we examine a cohort of 11,752 students who entered CPS high schools from CPS elementary schools in the 1997-98 school year and had test scores for both 8th and 9th grade and grades for ninth grade. Because it is highly likely that students who perform poorly in school will rate the teacher-student climate less favorably precisely because are performing poorly, we did not use the same class to both define the school climate and to test the relationship between that climate and being off-track. As such, we measured the school climate from the responses of the 10th grade class in the 1996-97 school year and tested our theory on the class of 9th graders in 1997-98, one year later.

Our primary outcome variable is "off track" a dichotomous variable developed from the administrative data. A student is off track if they either fail to accumulate enough credits to move into the 10th grade on time or they have two or more Fs in the core subjects of English, math, science, and social science (over two semesters that makes for eight possible grades). If students were missing data for one semester they were assigned enough credits and/or no Fs. This makes it more likely that students will be identified as not off track and is therefore a more difficult test of our hypothesis.

The independent variable of primary interest is teacher-student climate. Teacher-student climate was created in a multi-step process. First, we surveyed 10th graders in CPS high schools. In the end, our sample included 68 percent of CPS 10th grade students, and 55 of the 67 regular, diploma granting high schools in CPS. The school level sample was not significantly different from the total population in terms of race, percent of students at

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year beyond senior year to either graduate or officially leave school.

national norms on the TAP, or the percent of low income students.[2] There were approximately 12,000 student responses in total.

The teacher-student climate measure was created from four intermediate measures created through Rasch analysis. Rasch analysis uses a set of selected survey items to produce an interval scale on the desired concept. This scale determines item difficulties and person measures. Item difficulty is determined by how likely an item is to be endorse, and the scale of item difficulty is then used to create a person measure, a quantitative measure of the individual's attitude on the measure.

Four Rasch measures were used in turn to create the teacher-student climate variable using factor analysis. The measures are teacher-student trust (TRTS), classroom personalism (PERC) academic press (ACAD), and liking school (LIKE). The following items were used to create these measures.

- Teacher-student Trust – How much do you agree with the following statements:
    - My teachers always keep their promises.
    - My teachers punish kids without even knowing what really happened (reverse coded).
    - My teachers can't be trusted; they say one thing one time and something different the next time (reverse coded).
    - My teachers get mad whenever I make a mistake (reverse coded).
    - My teachers always try to be fair.
    - I feel safe and comfortable with my teacher in this school.
    - My teachers will always listen to students' ideas.
    - My teachers don't care what I think.
    - My teacher really care about me.
    - When my teachers tell me not to do something, I know they have a good reason.

Overall, teacher-student trust focuses on the quality of relationship between students and teachers in terms of atmosphere and fairness.

[2] Three schools were missing values for one or more of the measures, and they were assigned the system average so that their students responses could be used in making the teacher-student climate measure.

- Classroom Personalism – How much do you agree with the following statements:
    - [In math class] My teacher notices if I have trouble learning something.
    - [In English class] My teacher relates this subject to my personal interests.
    - [In math class] My teacher really listens to what I have to say.
    - [In math class] My teacher helps me catch up if I am behind.
    - [In English class] My teacher relates this subject to my personal interests.
    - [In English class] My teacher really listens to what I have to say.
    - My [math] teacher doesn't know me very well.
    - My [English] teacher helps me catch up if I am behind.
    - My [English] teacher notices if I have trouble learning something.
    - My [Math] teacher is willing to give extra help on schoolwork if I need it.
    - My [English] teacher is willing to give extra help on schoolwork if I need it.
    - My [math] teacher believes I can do well in school.

Overall, classroom personalism measures whether teachers give them individual attention and shows concern for them as learners.

- Academic Press – How much do you agree with the following statements:
    - [In English class] My teacher encourages me to do extra work when I don't understand something.
    - [In math class] My teacher encourages me to do extra work when I don't understand something.
    - [In English class] My teacher praises my efforts when I work hard.
    - [In English class] My teacher cares if I don't do my work in this class.
    - [In math class] My teacher cares if I don't do my work in this class.
    - [In English class] My teacher cares if I get bad grades in this class.
    - [In math class] My teacher cares if I get bad grades in this class.
    - [For English] In class, I often feel put down by the teacher.
    - [For math] In class, I often feel put down by the teacher.
    - [In English class] My teacher expects me to do my best all the time.
    - [In math class] My teacher expects me to do my best all the time.
    - [In English class] My teacher expects me to complete my homework every night.
    - [In math class] My teacher expects me to complete my homework every night.
    - [In English class] My teacher might think I'm dumb if I ask a question about something I don't understand.
    - [In math class] My teacher might think I'm dumb if I ask a question about something I don't understand.
    - [In English class] My teacher thinks that it is very important that I do well in this class.
    - [In math class] My teacher thinks that it is very important that I do well in this class.

Overall, academic press gauges whether students feel their teachers challenge them to reach higher levels of academic performance and creates an atmosphere where students can ask questions without being made to feel foolish.

- Liking School – How much do you agree with the following statements:
    - I'm glad to get back to school after summer vacation.
    - I'm bored in school.
    - I usually look forward to school.
    - I wish I didn't have to go to school.
    - I wish I could go to a different school.

Overall, liking school measures how students feel about their own school and their commitment to going there.

These four measures captured the core of what students think about their relationships with their teachers. Are teachers fair and reasonable? Do they care about students as individual learners? Do they push students in their academic work? And is the overall climate one that makes them feel committed to their school. To combine these measures into an overall measure of teacher-student climate, we did a factor analysis. Each measure contributes to the factor as follows:

Teacher-student trust, 0.79
Classroom Personalism, .79
Press towards academic achievement, 0.71
Liking School, 0.69

Let us stress again, teacher-student climate is measured at the school level. We looked at whether the school climate of teacher-student relationships affect individual student's propensity to be off track, not whether students who felt their relationships with their teachers were bad were likely to be off track.

We later use two other outcomes to clarify our findings: achievement and absences. For achievement we use the students grade equivalent scores in reading on the TAP, which they take in the spring of the school year. For absences, we created a measure of course-day absences by adding up the number of classes a student skipped freshman year and divided it by the number of courses they took. This gives us a measure of absences which does not hinge upon getting marked absent for an entire days (which can be unreliable), proportionately penalizes students who skip classes selectively, and does not overly penalize students who take heavier courseloads.

At the individual level, we controlled for four things. First, we controlled for students' incoming test scores on the Iowa Tests of Basic Skills (ITBS), because students who are already behind in their learning are more likely to be off-track in future years and more likely to drop out. This, of course, reduced our sample to only those students who came from a CPS 8th grade and excluded most students in special education and some in bilingual programs. Second, we controlled for the level of poverty in the student's home neighborhood using 1990 census information, because poor students are more at-risk for school failure. Third we controlled for race because of strong racial differences in school performance. Because African-American's are the largest racial group in the system we used that group as our excluded category. Because the percentage of Native American's in the system is extremely small, we grouped them with African Americans. Fourth, we controlled for students' gender, as boys tend to perform more poorly than girls in CPS high schools. See Table 1 for descriptive statistics.

TABLE 1: Student Level Descriptive Statistics

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
OFFTRACK	11752	0.37	0.48	0.00	1.00
MAVB98 (# of absences)	11752	8.29	7.96	0.00	63.57
READGE	11752	9.38	2.53	3.85	19.70
SCON997 (poverty)	11752	0.19	0.71	-4.19	6.04
RREAD97 (ITBS score)	11752	1.40	0.86	-1.59	5.98
BLACK	11752	0.58	0.49	0.00	1.00
LATINO	11752	0.28	0.45	0.00	1.00
WHITE	11752	0.10	0.29	0.00	1.00
NATAM (Native American)	11752	0.00	0.05	0.00	1.00
ASIAN	11752	0.04	0.20	0.00	1.00
MALE	11752	0.46	0.50	0.00	1.00

At the school level, the main control we used was the average incoming reading score for the Iowa Tests of Basic Skills (ITBS) of the schools' students (RREAD97). This control captures whether a school's off-track rate is attributable to the academic preparation of its student body. Here we expected a synergistic effect where in schools where many students are ill-prepared more students would do poorly and implicitly or explicitly discourage their classmates from succeeding. For all ITBS scores, we used their Rasch scores which equate scores across years and levels of the test. A one point (1.0) increase in a Rasch score is roughly equivalent to improvement of one-half a grade. We tested, but did not find significant and therefore excluded from the model, school level average mobility, percent low-income, percent male, and racial composition. See Table 3.

Table 3: School Level Descriptive Statistics

VARIABLE NAME	N	MEAN	SD	MINIMUM	MAXIMUM
OFFTRACK	55	0.45	0.14	0.10	0.68
STCLIM	55	-0.16	0.77	-1.94	2.44
(teacher-student climate)					
RREADMN	55	1.21	0.44	0.69	3.09
(ave. school ITBS score)					
ACADMN	55	4.75	0.30	3.85	5.41
LIKEMN	55	4.61	0.40	3.80	5.95
PERCMN	55	4.31	0.44	3.40	5.39
TRTSMN	55	3.66	0.40	3.16	5.33
PLOINC97	55	78.09	14.37	37.20	96.90
(% low income)					
MOB97	55	33.60	30.35	3.30	172.09
(% mobility)					
SIZE97	55	1480.67	675.82	185.00	4102.00
(school size)					
AFAM	55	0.51	0.50	0.00	1.00
(majority African American)					
LATINO	55	0.07	0.26	0.00	1.00
(majority Latino)					
INTEG	55	0.07	0.26	0.00	1.00
(at least 30% white)					
MIXED	55	0.16	0.37	0.00	1.00
(80% African American or Latino, but not LATINO or AFAM)					
MINTY	55	0.18	0.39	0.00	1.00

To run the model, we used logistical hierarchical linear modeling, capturing the effect of school climate controlling primarily for factors at the individual level.[3] All variables were grand mean centered, so results can be read as if looking at an average student in a CPS high School.

Level 1: LOG[P/1-P]= B0 + B1*(SCON997) + B2*(RREAD97) +B3*(HISP) +B4*(WHITE) +B5(ASIAN) +B6(MALE)

Level 2: B0=G00 + G01*(RREADMN) + G02*(STCLIM) + U0
B1=G10
B2=G20
B3=G30
B4=G40
B5=G50
B6=G60

[3] We tested controls for school level mobility, size, poverty level and racial composition but found them all to be non-significant and were removed from the model.

Results

The good news is, the average student will not be off-track. As one might expect, entering 9th grade with higher reading scores on the ITBS decreases a student's likelihood of being off track as does entering with a class that has higher ITBS scores on average. And the demographic characteristics play out as would be expected; boys are more likely to be off track, and among racial categories, African American's are most likely to be off track, Latinos slightly less likely, whites a little less likely still, and Asians the least likely to be off track. See Table 3.

Concerning the variable of interest, we find support for our hypothesis. The climate between students and teachers does indeed have a strong and significant effect on predicting whether a student will fall off-track during his or her first year of high school. A one unit increase in school climate decreases the likelihood of a student being off-track by .17. This, for example, suggests that an average student has a 35.9% chance of being off-track by the end of freshman year, an average student at the school with the highest teacher-student climate rating would have a 26.4% chance of being off-track, a student at the school with the worst climate would have a 43.0% chance of being off-track.

We tested for interaction effects between school climate and students' incoming test scores, but did not find any significant relationship. The effect of teacher-student climate on the likelihood of being off-track appears equally strong for students with higher and lower entering test scores.

Table 3: Does Teacher-Student Climate Predict Students Being Off Track

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	-0.584790	0.056827	-10.291	52	0.000
RREADMN, G01	-0.469971	0.117994	-3.983	52	0.000
STCLIM, G02	-0.168481	0.073039	-2.307	52	0.025
For SCON997 slope, B1					
INTRCPT2, G10	0.151361	0.037668	4.018	11743	0.000
For RREAD97 slope, B2					
INTRCPT2, G20	-0.490188	0.046096	-10.634	11743	0.000
For HISP slope, B3					
INTRCPT2, G30	-0.201484	0.077800	-2.590	11743	0.010
For WHITE slope, B4					
INTRCPT2, G40	-0.247204	0.098272	-2.516	11743	0.012
For ASIAN slope, B5					
INTRCPT2, G50	-1.690569	0.136905	-12.348	11743	0.000
For MALE slope, B6					
INTRCPT2, G60	0.534137	0.049613	10.766	11743	0.000

We designed off-track to capture something different from straight achievement. We wanted to know whether teacher-student climate predicted whether or not students would meet a baseline of performance that would set them on the right track to ultimately graduating. But does it also predict achievement, performance above or below simple adequacy? To test this possibility, we ran a (non-logistic) two-level HLM to see if teacher-student climate also predicts achievement on the TAP (see Table 3). Here we see that teacher-student climate is significant in predicting student's TAP score only at the weaker .10 standard, and the coefficient is substantially smaller with a one standard deviation change in student climate leading to only a .089 increase in TAP scores. This suggests that the teacher-student climate has more to do with keeping students in school and progressing than helping them achieve higher levels of subject mastery. See Table 4.

Table 4: Does Teacher-Student Climate Predict Reading Achievement

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	9.120710	0.048323	188.747	52	0.000
RREADMN, G01	1.218539	0.105514	11.549	52	0.000
STCLIM, G02	0.115256	0.067686	1.703	52	0.094
For SCON997 slope, B1					
INTRCPT2, G10	-0.052201	0.035712	-1.462	11744	0.144
For RREAD97 slope, B2					
INTRCPT2, G20	2.022943	0.067039	30.175	11744	0.000
For HISP slope, B3					
INTRCPT2, G30	0.380243	0.061564	6.176	11744	0.000
For WHITE slope, B4					
INTRCPT2, G40	0.807937	0.085827	9.414	11744	0.000
For ASIAN slope, B5					
INTRCPT2, G50	0.484751	0.126483	3.833	11744	0.000

Perhaps the difference between predicting whether a student will be off track and predicting their test scores lies not the simple baseline of getting students to come to class. To check this possibility, we looked at whether teacher-student climate predicts students' absences from class. Using the same model as for achievement, we see that teacher-student climate actually has no significant effect on the number of absences a student has. Apparently, teacher-student climate is capturing a very specific relationship with students that particularly applies to their meeting basic thresholds of achievement. (See Table 5.) The most important factor in this model for predicting absences was by far the average test score of their freshman class. While the lack of significant effect (or effect in the expected direction) may seem odd at first, upon reflection we hypothesize teacher-student climate measures teachers relationships with students, but absences are a social behavior more heavily influenced by peer composition, student-student relationships. If a large percentage of the school's students enter ill-prepared for high school work, it is likely that some will become disenchanted with the frustrating work and encourage their also frustrated peers to skip unpleasant classes.

Table 5: Does Teacher-Student Climate Predict Course Absences

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	8.894684	0.263349	33.775	52	0.000
RREADMN, G01	-3.226452	0.547555	-5.892	52	0.000
STCLIM, G02	0.224466	0.523291	0.429	52	0.669
For SCON997 slope, B1					
INTRCPT2, G10	0.700907	0.191647	3.657	11744	0.000
For RREAD97 slope, B2					
INTRCPT2, G20	-0.890261	0.158941	-5.601	11744	0.000
For HISP slope, B3					
INTRCPT2, G30	-1.101449	0.372432	-2.957	11744	0.004
For WHITE slope, B4					
INTRCPT2, G40	0.481137	0.407686	1.180	11744	0.238
For ASIAN slope, B5					
INTRCPT2, G50	-2.937206	0.534428	-5.496	11744	0.000

Educational Significance

In far too many schools a substantial group of the student body drops out before graduation. The negative effects of dropping out on a students' life-course trajectory are sizable and well documented. This paper suggests that the climate of teacher-student relationships can play an important role in getting students off on the right foot, thus reducing their chances of future bad outcomes.

That teacher-student climate has an effect of keeping students off track is in many ways not surprising. First, the attributes that make up a positive climate are in many ways just what an adult would desire in a learning or work environment. Schools that have students who are more likely to be on track at the end of their freshman year are schools where students trust teachers to be fair and reasonable, to treat them with respect, and to guide them in their learning when they are having trouble. This climate also suggests a level of personal interaction; a teacher cannot respond to students' struggles in a particular area or offer them extra help if they are not aware that the student is struggling with something. This in turn

falls in line what principals at the ground level have to say about school reform. The National Association of Secondary School Principals (NASSP) calls for smaller units within schools "in which anonymity is banished," and where schools are oriented to creating caring and coaching teacher-student relationships. While NASSP argues for the importance of strong teacher-student relationships, this paper provides evidence that this type of relationship is especially important, not in increasing academic achievement broadly or preventing students from skipping classes, but in keeping students engaged enough in the schooling process to progress through the system.

These results are highly encouraging to those interested in improving high schools. They suggest that something as simple as improving interpersonal relationships can have an important effect on students' transition into high school. Furthermore, the study was done in a large urban system which has had chronic problems with student failure which shows promise for other difficult schools and systems. These analyses suggest that schools wishing to improve their students' outcomes would do well to look not only at curriculum issues but also at the social capital created by the climate of teacher-student relationships.

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