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Smart by Association: Perceived Classroom Friendships and Teacher Academic Expectations

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Smart by Association:

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Abstract

Studies of teacher expectations generally assume they form based on individual student and/or teacher characteristics. Yet to be studied is the effect of classroom social structure, specifically teacher perceptions of classroom friendships. In this paper, I study whether a focal 8th-grade teacher's perceptions of her students' friendships influenced the teacher's academic expectations. I find that the teacher was significantly more likely to hold consistent expectations for students she perceived to be friends, but not students that mutually self-reported as friends. Similarly, the teacher's expectation of a student's perceived friends was a significant information source for her expectations of the student. Consistent with cognitive balance theory, these relationships held in the spring, but not autumn, of a school year. Findings suggest that teachers may be susceptible to the reputational effects of classroom social networks, as they perceive them. Also, perceived classroom social networks can serve as distinct and insightful explanatory domains when theory warrants.

Smart by Association:

Perceived Classroom Friendships and Teacher Academic Expectations

Remember dear, we shall all be judged by the friends we keep.

—George Banks, in "Mary Poppins"[1]

Is George Banks correct? In the eyes of others are we the company we keep? Or would it be more precise to say – at least, equally appropriate to say – "we shall all be judged by the friends we are *perceived* to keep?" This question is more than a simple case of semantics. A sizable and contentious literature has developed to define and explicate the phenomenon of teacher expectations. Teacher expectations are the "inferences that teachers make about the present and future academic achievement and general classroom behavior of their students" (Brophy and Good 1974:32). While studies generally find that teachers form expectations, and that teacher expectations affect teacher practices, much debate remains as to their bases, and the extent to which they affect learning outcomes through mechanisms such as Merton's (1948) Thomas theorem (see Jussim and Harber 2005 for a recent comprehensive review).

In contrast to George Banks's wisdom, the literature assumes that teachers form expectations based solely on a teacher's and/or student's individual characteristics such

[1] From the Broadway musical production script, which differs from the motion picture production.

as race, gender, achievement or classroom behavior (Dusek and Joseph 1983), or the interaction of student and teacher characteristics (Alexander, Entwisle and Thompson 1987). Alternatively, scholars focus on the role of signals such as the student's position within a school's curricula structure (Meyer 1977; Pallas, Entwisle, Alexander and Stluka 1994). In either approach, students are treated as isolated individuals. That students learn with other students in classrooms, and are likely perceived by those who judge them (teachers) to be associated with particular classmates, has yet to trigger a "company we keep" hypothesis in which teacher expectations are influenced by a student's perceived associations. Cognitive balance theory argues that when we perceive individuals (or objects) to be associated in some way, our inclination is to balance our sentiments towards these individuals so that they are cognitively consistent (Heider 1946). For example, we assume the friend of a high performer is also a high performer.

To explore whether perceived friendship among students might indeed influence a teacher's expectations, I conduct a series of quantitative analyses using data collected through a single-subject case research design. Specifically, I analyze data collected from one teacher as she formed expectations for more than 100 students across four class periods of the same course. By studying multiple classrooms taught by the same teacher, I hold the teacher-perceiver and a variety of contextual factors "naturally" constant (e.g., same subject, track, physical classroom, task structure). Given the lack of prior empirical work on classroom social structure and teacher expectations, this approach allows me to explore cross-classroom variation without the confounding influence of multiple teacher-perceivers and classrooms that differ in their non-composition characteristics.

Consequently, the study represents an empirical exercise in discovery and small-scale theory testing, rather than one of verification and generalization.

Are a teacher's academic expectations susceptible to this perceived associational effect? If so, does the causal process flow in one particular direction? To what extent does the effect significantly influence her academic expectations above and beyond other sources of information such as student achievement, behavior, academic track location, race and/or gender? Are her expectations specific to her perceptions of classroom friendships and performance expectations, or simply a reflection of the tendency by students to be friends with classmates who are similar academically (i.e., academic homophily) or other confounding influences?

Background and Theory

In this paper, I investigate the extent to which a teacher's perceptions of student classroom friendships influenced her academic expectations. For sociologists of education, hypothesizing an associational effect raises two intriguing possibilities. First, it proposes classroom relational social structure as a heretofore-understudied information source for teacher expectations. Second, it reminds us that classroom relational social structure can have consequences through *cognition* of the structure. While a less common focus, perceived social relations often differ from their behavioral or affective counterparts (Bernard, Killworth and Sailer 1984; Casciaro 1998; Hammer 1985; Krackhardt 1987; Kumbasar et al. 1994). This difference is typically treated as error; a distortion of the "actual" social relations the researcher sought to measure and study.[2] Alternatively, social tie perceptions are used as a data collection technique (Neal 2008). In neither approach are perceived classroom social structures analyzed as distinct and insightful explanatory domains, the approach taken in this study.

Dating back to the 1940's, researchers have consistently documented the degree to which teacher perceptions of classroom social networks – specifically, friendship networks – differ from student self-reports (Bonney 1947; Gest 2006; Gronlund 1951; Pittinsky and Carolan 2008). For example, Gest (2006) recently found that teacher perceptions of student friendships in classrooms evidenced low, albeit statistically significant, absolute levels of correlation with student self-reports. Gest also found that teachers tended to judge students they *perceived* to be friends more similarly than students who *self-reported* as friends. This relationship between perceived association and performance judgments has been documented outside of education contexts as well. For example, Kilduff and Krackhardt (1994) found that performance reputations in a hi-tech company were influenced by the prominence of a worker's *perceived* friendships, not their self-reported friendships.

Teacher Expectations

The term *teacher expectation* requires elaboration. As West and Anderson (1976:616) argued, "One problem in teacher expectancy research is the wide variety of definitions of expectancy or of operational variables that investigators take to indicate the existence of expectancy." Cooper and Tom (1984) identify three general approaches to

[2] "Actual" based on some criterion network.

the measurement of teacher academic expectations. The first approach measures teacher expectations as a teacher's judgment of student ability. The second approach measures teacher expectations as a teacher's prediction of future performance, or change in performance. The third approach measures teacher expectations as the difference between the teacher's judgment of student performance and some external measure. In this study, I use a combination of the latter two approaches.

While research into the importance and consequences of teacher expectations predates 1968, in many respects the publication of *Pygmalion in the Classroom* (Rosenthal and Jacobson 1968) marked the beginning of contemporary teacher expectations research. In its focus on intelligence gains through the mechanisms of a self-fulfilling prophecy (Merton 1948), Pygmalion's findings were immediately criticized as social science research. Nevertheless, Pygmalion ignited interest in teacher expectations as a broader research concern.

While researchers have disagreed whether academic expectations are usually "accurate" or "biased," and whether they alter student performance trajectories or reflect them (Jussim 1989; Natriello and Dornbusch 1983), the link between differential expectations and differential classroom interactions has been well documented (Brophy and Good 1974; Braun 1976; Good 1981). Research has been conducted as part of the teacher expectations literature, the focus here, as well as in literature addressing tracking (Gamoran and Berends 1987; Oakes 1985) and within-classroom ability grouping (Eder 1981). For example, low expectations are often (though certainly not always) associated with lower quality curriculum, lower order classroom discussion, less homework, and less academic time in general (Good 1981). Conversely, teachers elevate instruction when interacting with students for whom they have high expectations (Brophy and Good 1970).

Most studies of teacher expectations assume that teachers base their expectations on an individual student's achieved or ascribed characteristics, such as race, achievement, or physical attractiveness (Adams and LaVoie 1974; Clifford and Walster 1973; Natriello and Dornbusch 1983; Rist 1970; Williams 1975; 1976). Similarly, researchers have studied the *teacher's* ascribed characteristics (Good, Sikes and Brophy (1973) and "pupil-teacher background congruence," defined as the degree of "social distance" between teacher and student (Alexander et al. 1987). Less often cited in the teacher expectations literature, but commonly studied elsewhere, is a student's academic track location, which can serve as a powerful institutional "signal" of a student's academic "capabilities" (Meyer 1977; Oakes 1985; Pallas et al. 1994).

In all of these approaches, the literature assumes that teachers develop their expectations using information derived from a student *independent of classroom social relations*. Individual attributes, not relations, are the explanatory factors of interest. Indeed, a classroom relational social structural influence – perceived or otherwise – is notably absent from the literature (e.g., Dusek and Joseph 1983).[3]

[3] The literature does address the related question of sibling spillover, in which teachers are thought to form expectations for students based on their experience with older siblings (e.g., Heines and Hawthorne 1978).

Cognitive Balance Theory

Heider's (1946, 1958) theory of cognitive balance suggests that a teacher's perceptions of classroom social relations might indeed influence the teacher's academic expectations. Stated abstractly, Heider's balance theory argues that our inclination as humans is to group things based on perceived similarity. Heider calls this "unit formation" – the grouping together of objects. If we hold a sentiment towards an object, we carry forward that sentiment to other objects with which we think the original object is related. Importantly, the grouping process is cognitive. We are concerned with the mind's tendency to group "like with like" and seek consistency in sentiment among grouped objects, regardless of their actual form in the world, if such a determination can be made.

Figure 1 illustrates the concept of *imbalance* in an education context:

[INSERT FIGURE 1 ABOUT HERE]

In this triad, the teacher (T) maintains a formal relationship with two students (A, B), as represented by the solid line. The teacher perceives a mutual friendship between A and B, as represented by the dotted line. Finally, the teacher holds a positive (+) academic expectation for A, and negative (-) academic expectation for B. In this simplified illustration, the teacher is in a state of cognitive imbalance (+/-) for the A-B dyad. A state of cognitive balance would exist if she held consistent academic expectations for students A and B ((+/+) or (-/-)), *or* if she ceased perceiving A and B as mutual friends.

Applying balance theory to the present study, the academic expectation a teacher holds for a student is a type of sentiment, existing in positive and negative form.

Similarly, the teacher's perception of friendship ties is a type of grouping. If balance is operative, the teacher will group like with like; students for whom she shares a similar expectation will be grouped together as friends, *or* students whom she perceives to share friendship ties will be assigned similar expectations. In doing so, a cognitive balance effect should emerge; in the beginning of the school year a teacher's academic expectations and perceptions of friendships will be nascent and imbalanced, and as the school year progresses they will evolve to maximize the teacher's cognitive balance.

ISSUES

On further reflection, however, there is reason to be skeptical that such an effect will be observed and certainly reason to be quite careful in how any test of cognitive balance is modeled. In particular, I consider and test four issues specific to empirical studies of balance: longitudinal development, selection of the relevant cognitive unit, construction of the relevant sentiment statistic, and causal direction.

First, if a teacher learns more about her students over time, presumably indirect cues of ability will play a more prominent role earlier in the year, declining in importance over time. Also, classrooms are settings where multiple types of perceivable relations exist among students, and multiple forms of sentiments exist as well. Scott (1963) argues that the more attributes with which a group of actors can be categorized – the more complex the "cognitive domain" of the observer – the less likely a balanced structure will emerge. The complexity of the cognitive domain is determined by the "amount and kind" of information the observer has, along with the salience of the attributes to the task structure of the setting. Scott's principle suggests that teachers might rely on balance earlier in the year, and less so as their cognitive domain grows more complex. In the present study, I use longitudinal data to explore this issue empirically.

Second, in the case of friendships, teachers likely perceive friendship ties in classrooms differently depending on the level measured (e.g., friendship dyads vs. friendship groups) (Gest 2006). To the extent that a student has more than one friend, there are multiple cognitive units that could evidence differing degrees of consistency in sentiment. Balance theory predicts that the greatest cognitive dissonance would be generated by imbalance among those perceived friends who share the strongest (i.e., most restrictive) measure of friendship. I test alternative specifications of the cognitive unit in order to assess this prediction.

Third, just as the teacher likely perceives multiple friends of a student, she likely holds heterogeneous academic expectations of these friends. For example, she might perceive a student to be in three friendship dyads, two with students she holds in high academic regard and one with a student she holds in low academic regard. This may be true even for perceived friends who share the same core friendship group. How might the teacher reflect these heterogeneous sentiments back as a cohesively signed expectation of a student's "friends" with which she seeks balance? Econometric studies of behavioral peer effects tend to use the group mean to approximate a peer influence (see Marmaros and Sacerdote (2006:81-82) for a discussion). Conversely, in their study of performance reputations in a hi-tech company, Kilduff and Krackhardt (1994) used the maximum score. I test both approaches in my research, and use the maximum statistic approach in this paper.

Fourth, there are two ways in which cognitive balance could have been achieved as a function of balance theory. Unit formation could have influenced sentiment formation (i.e., her perception of friendship influenced her academic expectations), or sentiment formation could have influenced unit formation (i.e., her academic expectations influenced her perceptions of friendships). Of course, outside of balance theory, correlated influence could have simultaneously affected unit and sentiment formation. To clarify these causal dynamics, I control for confounding influences and conduct several post-hoc tests to assess whether one method of balance was particularly prevalent (perceived tie change versus sentiment change).

HYPOTHESES

Given the literature just discussed, I hypothesize the following: (1) Student dyads perceived by the teacher to be mutual friends will be internally consistent in teacher academic expectations at significantly elevated rates; (2) The elevated rates of internal consistency observed will reflect a cognitive interaction between teacher perceived social ties and teacher academic expectations, distinct from student academic homophily and confounding influences; (3) The teacher's academic expectations of her students' perceived friends will significantly influence the teacher's academic expectations of her students; (4) These effects will be found later in the school year, as her perceptions of friendships and academic expectations move into balance.

SAMPLE AND METHOD

Setting and Population

To test these hypotheses, I use data collected at two time points in four 8th grade science classrooms (*N*=108) taught by the same teacher. These 108 students, nested in four classrooms of 27 students each (in autumn), can also be analyzed as 1,404 possible non-directed (symmetric) dyads.[4] I studied multiple classrooms taught by the same teacher because they allow me to hold the perceiver constant, and vary the "actual" social networks she perceived across classrooms that were otherwise quite similar (e.g., academic track, subject, physical location). As described in the introduction, the benefits of this "naturally" occurring setting, and the exploratory nature of my hypotheses, motivated my use of a single-subject case design.

I collected data through surveys administered to all participants in autumn (November) and spring (May), approximately 16 classroom observations I conducted throughout the year, repeated interviews of the teacher, interviews with 20 students, review of the student yearbook, and targeted review of student records (e.g., previous year and current year achievement in science). I collected these data at a public middle school located in a suburb of a large northeastern city in the United States. The community's racial composition was approximately 50% White, 30% Black, 15% Hispanic, and 5% Asian/Pacific Islander. Families living in the district divided approximately into thirds in terms of those who earned less than $50,000, between $50,000-$99,999, and more than $100,000.

[4] Calculated as *(classroom n * (classroom n – 1)) / 2* summed across the four classrooms.

The participating teacher was a Hispanic, bi-lingual (English and Spanish) female who, at the time, was tenured, 33-years-old, and had seven total years of classroom experience, five of them in her current school.[5] During the study year, the teacher taught five class periods of 8th grade science at the same academic track level (standard track), using the same curriculum, and with one exception (not studied), in the same physical classroom. The teacher taught students who were roughly representative of the gender and prior year's science achievement (final marks) composition of the school's 8th grade class, but not its racial composition, with a modest over-representation of Black and Hispanic students and under-representation of White students.[6]

Participation Rates and Sample Description

Of the teacher's five classes, four were selected to participate in the study. The classes selected were Periods 1 and 4, which occurred before lunch and gym, and Periods 7 and 9, which occurred after lunch and gym. The basis for selecting the four was pragmatic. All classes that the teacher was willing to include, and for which sufficient informed consents were provided, were included. Period 2 was the only class that

[5] The research project was described to all participants and site liaisons as a study of, "how classmates influence the learning processes and outcomes of their peers, particularly friends."

[6] When asked to explain these differences, the school administrator responsible for scheduling attributed it to an over-representation of White students in the school's open-enrollment honors science classes.

provided both a low response rate of consents and garnered expressions of concern by the teacher that involvement in the study might negatively affect their performance.

Participation rates in the four classes were 93% to 100% in autumn and 100% in spring.[7] Table 1 describes the sample in greater detail.

[INSERT TABLE 1 ABOUT HERE]

A noteworthy feature of the sample is its per classroom racial and gender composition (given the sample's overall mix, which was reflective of the school's 8th grade). For example, Period 1 began the year 30% male and, while equal in terms of Black and White students (both 41%), had approximately one-third the Hispanic population of Period 7 (11% vs. 36%). This imbalance was not unique to Period 1. The teacher's Period 9 class was also only 27% male in autumn, while her Period 7 class was approximately 80% male. These differences illustrate how class-scheduling processes can create non-random distributions of students across even same-track, same-teacher class periods. They also open the door to exploring racial and gender dynamics in a way unforeseen in the original research design. The classes were statistically similar in their previous year final numeric marks in science.

[7] Six students left the population entirely, including two of the three non-participants. The third non-participant in autumn agreed to participate in spring. In addition, two students joined the population, both of whom agreed to participate. One student stayed in the population but changed class periods.

Measures

Classroom Friendships

To measure each classroom's friendship network – both teacher-perceived and student-reported – I collected sociometric data from each student, and the teacher provided similar reports on all students. I collected two different measures of teacher-perceived friendships. First, in both November and May, the teacher was asked to nominate as many classroom friends as she thought appropriate for each student (including none at all). In this study, I analyze those teacher-perceived friendships that were mutual (she named student A as a friend of student B and she named student B as a friend of student A). The second measure focused on classroom friendship *groups*, rather than classroom friendship *dyads*. At both time points, the teacher was asked to identify major friendship groups in the class and to assign students into those friendship groups (or into no group at all). Both measures were collected using paper-based survey instruments (per class period) that included the full roster of students in the class period.

For student-reported friendships, I used a single measure that was collected at both time points. Students were given a class roster and asked to describe their relationship with each fellow student in the class. Choices included "best friend," "friend," "know-like," "know," "know-dislike," "strongly dislike," and "don't know." I coded all "best friend" and "friend" choices as ("1") friend, and all other choices as ("0") not friend. As with teacher-perceived ties, in this study I analyzed only mutual (symmetric) student-reported friendships.

My decision to focus on symmetric perceived and self-reported friendships is consistent with the literature (e.g., Gest 2006; Kilduff and Krackhardt 1994). In the case of 8th graders, focusing on symmetric ties helps account for those students who might generously nominate large numbers of classmates as friends, when in fact only a subset were mutual and on par with the meaning of "friend" used by the other students in the class. As well, it *conservatively* enables greater agreement between teacher and student measures – to expect teachers to perceive the nuance of asymmetric ties is an unnecessarily high standard in this case. Even so, the data evidence low rates of agreement (20% to 30%) between student-reported and teacher-perceived claims of friendships.

Teacher Academic Expectations

To assess the teacher's academic expectations of each student, I asked her to estimate each student's past (7^{th} grade) and future (8^{th} grade) final science marks (numerically). I collected these data at both time points using a paper-based survey instrument and I was present as she completed the surveys to ensure that she generated her answers without consulting her records. The teacher's top-of-mind estimates of each student's prior and current year science performance represent two distinct but related types of academic performance judgments and are consistent with measures often examined in the teacher expectations literature (Cooper and Tom 1984). I also reviewed student records to confirm their actual final 7^{th} grade science mark (numeric 100 point scale),[8] and eventually their actual final 8th grade science mark (numeric 100 point scale). I describe how these measures of teacher-estimated and student-actual achievement are used in the context of each analysis.

Other Measures

In addition to measures of student self-reported friendship relations, student actual achievement, teacher-perceived friendship relations, and teacher academic expectations, I collected several additional measures. Table 2 describes each of the variables used in the analysis.[9]

[INSERT TABLE 2 ABOUT HERE]

ANALYSES

To assess the study's hypotheses, I analyzed all possible symmetric dyads of students, by classroom, that had complete data for the core variables. For example, I took Period 1's 27 students (in autumn), combined them into their 351 possible symmetric dyads, and subtracted dyads where one or both students lacked teacher academic

[8] Students new to the school in the 8th grade could not have their actual 7th grade science marks confirmed. Also, the teacher did not provide estimates for a small number of English as a Second Language (ESL) students in autumn (but did so in spring). These were the primary reasons for missing data.

[9] A question designed to measure student socio-economic status was administered to the sample. However, the wording of the question created confusion among some students and the measure proved unreliable.

expectations or actual performance data. The result was 1,067 dyads in the full sample in autumn (80% of possible dyads in sample) and 981 dyads in spring (75% of possible dyads in sample). Second, I classified each pair as friends ("1") or not friends ("0") using the teacher-perceived and student-reported mutual friendship measures. Third, I constructed a dichotomous, signed measure of teacher academic expectations and actual student academic performance by median-centering (per classroom) both the *teacher's estimates* of each student's previous year final science mark and their *actual* previous year mark. Specifically, if a mark was at or above the classroom median, it was coded "+" and if a mark was below the classroom median, it was coded "-". Finally, I classified each pair as consistent ("1") in teacher academic expectations (or student academic performance) if both students were positive or negative (+/+ or -/-) and ("0") if not (+/- or -/+).

Once the data were transformed as described, I analyzed two primary relationships:

1. A dyad's dichotomous state of being consistent in *student academic performance* based on the dyad's dichotomous state of being *student-reported mutual friends*. If student-reported mutual friends were consistent in their actual past performance at a significantly elevated rate than non-student-reported mutual friends, this would suggest academic homophily; birds of the same academic feather flocked together (or at least reported flocking together).
2. A dyad's dichotomous state of being consistent in *teacher academic expectations* based on a dyad's dichotomous state of being *teacher-perceived*

mutual friends. If teacher-perceived mutual friends were consistent in teacher-estimated past performance at a significantly elevated rate, this would suggest that the teacher's perceptions of mutual friendships and her expectations of student academic performance were associated.

Of course, in both cases the relationship in question may be an artifact of one or more confounding influences. The models estimated account for this possibility as well. Nevertheless, for narrative purposes, I refer to these two primary relationships as *student academic homophily* and *teacher academic balance*, respectively.

Models

I estimated logistic regression models to test for student academic homophily and teacher academic balance. I calculated confidence intervals (CI) and significance levels using the non-parametric bootstrap method (Efron 1979; Stine 1989).[10] My outcome

[10] The bootstrap approach to calculating standard errors involves creating a researcher-determined (e.g., 5,000) number of alternative samples that might have been found had the researcher surveyed the same population multiple times. Re-sampling with replacement from the original sample creates these alternative samples. The regression model is then estimated using the original sample and each of the 5,000 alternative samples to create a distribution of coefficients against which the observed coefficients can be compared. The distribution of the coefficients across the 5,000 model estimates, and the value of the observed coefficients relative to that distribution, is then used to calculate the coefficients' standard errors. While computationally intensive, this approach

variable was dyadic consistency in actual past performance and dyadic consistency in estimated past performance. The confounding influences I considered were dyadic racial composition (both White, both Black, Both Hispanic contrasted with mixed race), gender composition (both male, both female, contrasted with mixed gender), number of shared courses (continuous variable), and number of shared extracurricular activities (continuous variable). I used these dyadic characteristics as controls for the primary relationship of student-reported friendship and consistency in *actual* past performance (i.e., academic homophily), and teacher-perceived friendship and consistency in *estimated* past performance (i.e., academic balance). For the academic balance test, I also used student-reported friendship and dyadic consistency in actual past performance as controls.

RESULTS

My discussion of results proceeds as follows. I begin by reporting results from the autumn and spring cross-section logistic regression models estimating academic homophily. I then report results from the autumn and spring cross-section logistic regression models estimating academic balance. Finally, I report results from several longitudinal tests I conducted to further confirm cognitive balance as the operative process and to assess the dynamics of causal direction. I conclude by estimating cross-sectional multiple regression models designed to predict the teacher's academic expectations at the student-level. I assess whether the teacher's academic expectations of a student's teacher-perceived friends significantly contributed to the models, above and

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relaxes several statistical assumptions and is appropriate for these data, where dyad cases are not independent.

beyond a variety of achieved, ascribed and institutional sources of information that the teacher had available to her when forming her expectations.

Student Friendship and Consistent Actual Past Performance

Table 3 reports the student academic homophily results. I find statistically significant levels of academic homophily among student dyads in autumn, but not spring. Model 1 reports the autumn main 2x2 relationship between a dyad being student-reported friends and the dyad being consistent in actual past performance. The relationship was statistically significant in autumn (OR = 1.53, 95% CI = 1.17 – 2.01, $p < .01$). Approximately 59% of dyads that were student-reported friends were consistent in actual past performance, versus 49% of dyads that were not student-reported friends. Model 2 reports the same autumn 2x2 relationship accounting for the previously described confounding influences. Our primary interest is again student-reported friendship, which remained significant even after controlling for race, gender, course overlap, and activity overlap (OR = 1.37, 95% CI = 1.03 – 1.82, $p < .05$). Model 2 translates to a predicted probability of .57 that student-reported friends were consistent in actual past performance, versus .49 for dyads that were not student-reported friends, holding the remaining variables at their means. Interestingly, in the spring, academic homophily declined to non-statistically significant levels after controlling for confounding influences (Model 4). Model 4 translates to a predicted probability that student-reported friends were consistent in actual past performance of .54, versus .51 for dyads that were not student-reported friends, holding the remaining variables at their means. In summary, students evidenced statistically significant academic homophily in autumn, but not spring, after controlling for confounding influences.

[INSERT TABLE 3 ABOUT HERE]

Teacher-Perceived Friendship and Consistent Teacher Academic Expectations

Given the evidence of *academic homophily* in autumn, it is quite possible that any evidence of *academic balance* in autumn was simply a reflection of student-reported friendships and their consistency in actual past performance. Table 4 reports results from the academic balance logistic regression estimates. Models 1 and 2 report the autumn relationship between teacher-perceived friendship and dyadic consistency in teacher academic expectations. Focusing on Model 2, while not statistically significant, the relationship between a dyad being teacher-perceived friends and being consistent in teacher expectations was actually negative. The predicted probability that teacher-perceived friends were consistent in teacher expectations was .54, versus .64 for dyads *not* perceived to be friends, holding the remaining variables at their mean.

Models 3 and 4 report results from the spring measures; they show significant evidence of academic balance. In the spring, being teacher-perceived friends was significantly related to being consistent in teacher academic expectations above and beyond the confounding influences tested. Model 3 reports the relationship prior to controlling for the covariates (OR = 2.44, 95% CI = 1.59 – 3.75, $p < .01$). Approximately 71% of teacher-perceived friendship dyads were consistent in teacher expectations, versus 50% of the student dyads not perceived to be friends. Model 4 reports the relationship after controlling for covariates, including “actual” student-reported friendship status (OR = 2.11, 95% CI = 1.28 – 3.47, $p < .01$). Model 4 translates to a predicted probability of .68 that teacher-perceived friendship dyads were consistent in teacher academic expectations, versus .50 for student dyads not perceived to be friends, holding the remaining variables at their means. The teacher's tendency towards cognitive balance in the spring was considerable, statistically significant, and a reflection of more than the confounding influences of race, gender, and the actual academic similarity of student-reported friends.

[INSERT TABLE 4 ABOUT HERE]

In summary, although the teacher did not tend towards cognitive balance in her academic expectations and teacher-perceived friendships in November, by May a balance process had emerged. To my surprise, these findings were consistent across class periods despite their different "actual" (student-reported) friendship network structures.[11]

Evidence of Movement Toward Academic Balance

The academic balance analyses reported so far were cross-sectional. It is possible that autumn unbalanced pairs did not evidence a movement toward balance at an elevated rate. If so, this would undermine my conclusion that the spring balance results emerged out of a tendency toward cognitive balance as unit and sentiment formation evolved into alignment over time.

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[11] For example, the four student-reported classroom friendship networks differed significantly in characteristics such as density, transitivity, reciprocity and their degree distributions.

To address this issue, I followed each possible student dyad that was continuously enrolled in the same class from autumn to spring. I then identified those dyads that were student-reported mutual friends, but *not* teacher-perceived mutual friends, and inconsistent in teacher academic expectations in autumn. This unique subpopulation of student-reported mutual friends allowed me to account for the effect of teacher-perceived friendship. I also identified those dyads that were teacher-perceived mutual friends and inconsistent in teacher academic expectations in autumn.

Reinforcing the evidence of cognitive balance, the odds of an inconsistent teacher-perceived mutual friendship dyad in autumn (n = 37) becoming consistent (i.e., balanced) in spring were significantly higher than all other autumn inconsistent dyads (OR = 2.08, 95% CI = 1.05 – 4.14, $p < .03$). However, the odds of an inconsistent student-reported mutual friendship dyad in autumn not perceived by the teacher to be friends (n = 57) becoming more consistent were *not* significantly higher than all other autumn inconsistent dyads (OR = 0.99, 95% CI = 0.55 – 1.76, n.s.). While these subpopulations were small, they were the best available groups with which to assess longitudinal evidence of teacher academic balance. Their different odds of movement into consistency further indicate a tendency by the teacher toward cognitive balance. Overall, my findings suggest the teacher developed a tendency toward balance in her academic expectations, even as academic homophily declined to non-significant levels.

Causality

Until now, the presentation of results has focused primarily on relationships, rather than claims of causation. Yet the premise of the paper is one of a particular causal direction: perceived friendship *caused* consistent teacher expectations at the student dyad level. It is inherently difficult to empirically support such causal claims with non-experimental data. Nevertheless, while not definitive, the evidence predominantly favors the causal direction hypothesized.

Spurious Causation by Other Factors

The results presented in Model 4 of Table 4 address whether one or more of the confounding influences tested explained the relationship between teacher-perceived friendship and consistent teacher expectations. As a reminder, consistent “actual” performers were not “actually” friends (student-reported) at a significantly elevated rate. Similarly, the relationship between being teacher-perceived friends and being consistent in teacher expectations held even after controlling for consistent actual past performance and “actual” (student-reported) friendship. If the relationship was explained by the fact that students of the same race, gender, shared activities or course schedules were more likely to be perceived as friends, and more likely to be viewed consistently by the teacher, then the effect would have largely disappeared between Models 3 and 4 in Table 4. It did not.

Certainly, one can imagine other confounding influences not tested. And it is not the case that the influences tested were unrelated to both teacher-perceived friendship and teacher expectations. For example, in the spring the teacher perceived consistent performers to be friends. The predicted probability of two consistent actual performers being perceived to be friends was .15, versus .08 for dyads that were not consistent actual performers (basic 2x2 relationship). It is also the case that the teacher held consistent *expectations* for consistent actual performers. The predicted probability that the teacher held consistent expectations for consistent actual performers was .68, versus .36 for dyads of inconsistent actual performers. But the perceived friendship and teacher expectation relationship held even after controlling for this correlated effect of consistent actual performance. This is evidenced in Model 4 of Table 4. And it is supported by findings from more parsimonious alternative models (not reported) that assessed the sensitivity of the basic 2x2 relationship to consistent actual performance, among other factors.

Finally, if balance was a *cognitive* effect of the teacher's perceptions of mutual friendships, I should not find elevated rates of consistency in teacher expectations based on *student-reported* mutual friendships in the spring. (As noted earlier, student-reported mutual friendships and teacher-perceived mutual friendships were quite distinct.) Consistent with this prediction, spring student-reported mutual friends were not consistent in teacher expectations at a significantly elevated rate. The spring effect was specific to teacher-perceived mutual friendships.

Causal Direction

Table 5 reports post-hoc findings that suggest teacher perceptions of friendships did indeed influence teacher academic expectations. I estimated logistic regression models using all spring dyad observations with complete data that were also possible dyads in autumn (n = 921). The models predict spring academic balance (i.e., teacher-perceived friendship dyads that were consistent in teacher academic expectations). In particular, I contrasted two alternative autumn dyadic states: dyads that were teacher-perceived friends, not consistent in expectation; and dyads that were consistent in expectation, not teacher-perceived friends. I also included the same set of dyadic covariates used in the earlier analyses.

[INSERT TABLE 5 ABOUT HERE]

The odds of an autumn dyad that was teacher-perceived friends, but not consistent in teacher expectations, becoming balanced were significantly elevated (Model 1: OR = 8.92, 95% CI = 4.25-18.75, $p < .001$). However, the odds of an autumn dyad that was consistent in academic expectations, but *not* teacher-perceived friends, becoming balanced were significantly reduced (Model 4: OR = 0.53, 95% CI = 0.33 – 0.85, $p < .01$). These two relationships held in all models that accounted for potential confounding influences, including dyadic consistency in past performance and autumn student-reported friendship state. These results suggest that autumn perceived friendships status, not autumn consistency of teacher expectations, was the catalyst for spring academic balance.[12]

[12] Several additional analyses using logistic regression to estimate spring balance state based on autumn balance state for subsets of dyads (not reported here), confirmed this general finding. A dyad's autumn teacher-perceived friendship state seems to have significantly increased its rate of becoming or remaining consistent in the spring, but a dyad's autumn consistency state seems not to have significantly elevated its rate of becoming or remaining teacher-perceived friends.

Perceived Ties as Academic Expectations Information Source

Were the teacher's academic expectations of a student's perceived friends a significant source of information for the teacher as she formed academic expectations about the student? To assess the information sources that influenced the teacher's academic performance expectations, I regressed the outcome of interest, teacher academic expectations, using two different specifications of the primary explanatory influence of interest, the teacher's academic expectations of a student's friend(s). In the first specification, I calculated the teacher's maximum academic expectation for all teacher-perceived *mutual friends*. In the second specification, I calculated the teacher's maximum academic expectation for only teacher-perceived *friendship group co-members*. I tested both specifications on the premise that her expectation for a student's "friends" as a unit would be better modeled using a group-level cognitive unit, not by aggregating all dyadic judgments (Gest 2006).

To minimize collinearity in the model, I used the teacher's *current year* science final numeric mark estimate as the measure of her academic expectation of a student's friend(s), and I used her *previous year* science final numeric mark estimate as the measure of her academic expectation of the student (not median centered, as with the balance analysis, but in its original continuous form). I again used the non-parametric bootstrap method to calculate confidence intervals and standard errors.

Given that the dyad-level analysis found evidence of cognitive balance in spring, but not autumn, I report findings from the spring analyses only.[13] Table 6 reports results from the regression models.[14] Model 1 estimates the contribution of the two most commonly cited achieved characteristics that the teacher might use when estimating a student's previous year final science mark: achievement and behavior. Model 2 estimates the contribution of two most commonly cited ascribed characteristics: race and gender. Model 3 carries forward the achieved and ascribed characteristics that explained the most variance, and adds to them a student's academic track location. In doing so, Model 3 establishes a baseline against which the contribution of our primary variable of interest can be compared. Model 4 introduces that primary variable; the teacher's maximum academic expectation of the student's teacher-perceived mutual friends. Model 5 introduces the alternative specification of the primary variable; the teacher's maximum

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[13] Consistent with the dyad-level analysis, I found no evidence that the teacher's judgment of a student's teacher-perceived friends was a significant source of information in autumn.

[14] To enable appropriate comparisons across models, only records with complete data for the variables used in all models were analyzed. One consequence is that social isolates – students not perceived or self-reported to have friends based on one of the three definitions tested – were excluded. This exclusion is proper, given that a spillover effect can only be found among tied students. But it has the practical consequence of excluding records that were complete for a subset of models. Results did not change when each model was tested using complete records per model.

academic expectation of the student's teacher-perceived core friendship group co-members. Model 6 introduces a third version of the same primary variable, constructed using the teacher's maximum expectation of a student's *self-reported* mutual friendships. If Model 6 also significantly improves the baseline model, it would undermine the claim that the effect is specific to the teacher's *cognitive* social network.

[INSERT TABLE 6 ABOUT HERE]

Model 3, the full baseline model, explains 55% of the variance in the academic expectation measure: the teacher's estimates of her students' previous year final science marks ($p < .001$). Interestingly, while the achieved characteristics model explains 44% of variance (Model 1), the ascribed characteristics model explains only 5% of variance (Model 2). Track location, a scale that sums the total number of remedial (-1 point) and honors (+1 point) classes (other than science) in a student's schedule, is also highly significant.

An adjusted R-squared of .55 is quite large and is statistically significant ($p < .001$). What happens when the teacher's academic expectation of the student's teacher-perceived friend(s) is included? The specification based on all teacher-perceived mutual friends does not contribute significantly to the model (Model 4). However, the specification based on the core teacher-perceived friendship group contributes significantly to the model ($p < .05$), increasing the explained variance by an additional two percentage points (Model 5). This significant finding for the friendship group specification, but not mutual friendship dyad specification, is consistent with a premise of balance theory; the stronger the relationship, the greater the cognitive dissonance of imbalance. The coefficient size and magnitude of this increase suggests that a student's perceived friendship group was a modest source of information. Nevertheless, given how much variance Model 3 already explained, the increase is notable and represents a statistically significant improvement in model fit. The fact that this information source proved statistically significant in the spring, but not autumn, is consistent with balance as the process given the dyad-level analysis findings. Finally, reviewing Model 6, this cognitive peer effect disappeared when student-reported friendships were tested.

In the spring, the teacher's academic expectation of a student's perceived friends did indeed positively influence the teacher's academic expectation. Consistent with balance theory, however, this effect was only significant when the population tested captured the narrower universe of perceived friend(s) whom the teacher would likely draw on when seeking cognitive balance (core friendship group co-member(s)). It was not found in the autumn regression models, nor was it found in the spring regression models that introduced a weaker measure of teacher-perceived friendship, or a measure based on student-reported friendships.

Robustness

As is the case in any empirical investigation, the method and analyses presented in this paper required making substantive choices in terms of variable construction and model estimation (among others). Before concluding, it is worth briefly considering the degree to which the findings reported were robust to certain alternative approaches. In the dyad-level analyses (Tables 3 - 5), I dichotomized and signed (+/-) teacher expectations and student actual past performance using the classroom median. Separate analyses, using mean-centered estimates, produced similar results. Separate analyses also confirmed that my use of a dichotomous approach to consistency did not create "inconsistent" dyads that were actually similar in their continuous estimates. Similarly, in the student-level analyses (Table 6), results were similar in substance and statistical significance regardless of whether the maximum or mean statistic approach was used to construct the teacher-expectations-of-friends variables. Finally, I replicated all findings in parallel analyses that used "best friend" only, as the measure of student-reported friendship.

As discussed earlier, the findings reported were consistent in substance and statistical significance across the four class periods. This was unexpected. Indeed, a principal reason for taking the case study approach – analyzing four classrooms taught by the same teacher – was to gain insight from different findings across multiple classroom contexts (in particular, their different behavioral social networks and student composition mixes) without adding the complexity of multiple perceivers, multiple classroom task structures, etc. I found no significant classroom interactions. Because the four class periods were nested in the same teacher, and I found no evidence of significant class period variation in any of the academic balance models, the analyses reported here were conducted at the full sample level without using a more complex multi-level model. The nested nature of the data was accounted for in the bootstrap procedure by generating the bootstrap re-samples proportionally from the class period strata. Alternative tests using multilevel models produced similar results in terms of substance and statistical significance.

CONCLUSSION

In this paper, I tested empirically whether teacher-perceived friendship among students influenced a teacher's expectations for those students. Using data from four classrooms taught by the same teacher**,** I report several findings. First, the teacher evidenced a significantly elevated rate of consistency in her academic expectations for student dyads she perceived to be mutual friends versus dyads she did not perceive to be friends. This significantly elevated rate of consistency emerged in the spring (not autumn) and was distinct from student academic homophily and several potential confounding influences. As well, this elevated rate of consistency was specific to teacher-perceived mutual friendships, not student self-reported mutual friendships. I interpret these findings as evidence that the teacher developed a tendency towards cognitive balance in her academic expectations among students she perceived to be friends. As well, post-hoc analyses *suggest* that the teacher's perceptions of classroom friendships influenced her academic expectations, not the reverse.

Second, the teacher's academic expectation of a student's core friendship group was a significant information source as she developed her academic expectation for the student. Importantly, the dynamics of this effect were consistent with the findings on cognitive balance in their chronology (spring, not autumn). Consistent with cognitive balance theory, I found the effect where cognitive dissonance (Festinger 1957) would be greatest: the stronger perceived friendship tie measure tested (i.e., core friendship group-co-members). Finally, I did not find the effect to be sensitive to how the peer statistic was calculated (i.e., mean vs. maximum of friends). While a modest source of additional information when compared to the student's achieved and ascribed characteristics, this perceived-association information source was statistically significant and consistent with cognitive balance as the underlying social process.

The findings reported in this paper are limited in their generalizability because of my decision to focus on one teacher-perceiver. Generally speaking, it is common for perceived social relations to be studied on a small scale, and rare that they are studied at more than one time point.[15] In the present study, given the somewhat novel phenomenon proposed, the research goal was essentially one of discovery, not verification. As such, I believe the benefits of the single-teacher design justified this costs, particularly the ability to study multiple classrooms while "naturally" controlling for the confounding influence of multiple teacher-perceivers and different classroom characteristics. Nevertheless, having found the application of balance theory to teacher expectations to be potentially insightful, we now need to verify the prevalence of the observed effect with a representative dataset.

Regarding other limitations, my decision to collect data at two time points precluded me from engaging in a more granular and dynamic assessment of whether and

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[15] In their oft-cited papers, Kilduff and Krackhardt (1994) studied 36 workers at one high-technology company, while Casciaro (1998) studied 24 members of a research unit at an Italian university, and Kumbasar, Romney and Batchelder (1994) studied 25 co-workers in a department of a large computer company. Conversely, Gest (2006) studied perceived classroom friendships using measures collected at only one time point (April/May), as did Kilduff and Krackhardt (1994).

how the teacher's social perceptions and expectations evolved over time. And my use of a dichotomous measure of consistency, while true to balance theory, carried with it a cost in the lost information and variance that a continuous measure would have provided. Finally, my decision to focus the analysis on dyads leaves unexplored the effect of perceived social network "neighborhoods" on dyadic balance. For example, there may have been thresholds in the teacher's dyad-level movement toward balance based on the distribution of sentiment in each student's ego-network of teacher-perceived friendships over time.

As a test of a teacher's cognitive social network and its influence on teacher expectations, this paper contributes to several literatures. First, my findings make a case for bringing the classroom group into research on teacher expectation formation. Results suggest that with whom a student learns can indeed matter if the teacher uses a student's ties with classmates as a source of information when forming her academic expectations for the student.

Second, my findings emphasize the importance of testing perceived patterns of social relations when theory warrants. Results demonstrate that social networks can have an effect based on where an individual is perceived to be located within it, independent of whether this perception is reflected in some behavioral or affective form. Had self-reported friendships been used this effect would have been missed.

Finally, my findings extend the literature on balance theory by empirically testing a number of measurement issues that arise when testing for cognitive balance over time in complex cognitive domains. For example, I found, consistent with Gest (2006), that different cognitive units (dyad, group) generate different results. While it is tempting to construct a unit-sentiment statistic out of perceived dyad-level relations, the social mind likely works differently. The teacher showed evidence of a balance effect when the sentiment statistic was constructed from members of a cognitive group. I suspect that had I asked the teacher for her estimate of *the group's* previous year performance – rather than imputing it from her estimates of the individual members – the effect might have been even stronger.

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Figure 1.
Imbalanced triad illustration

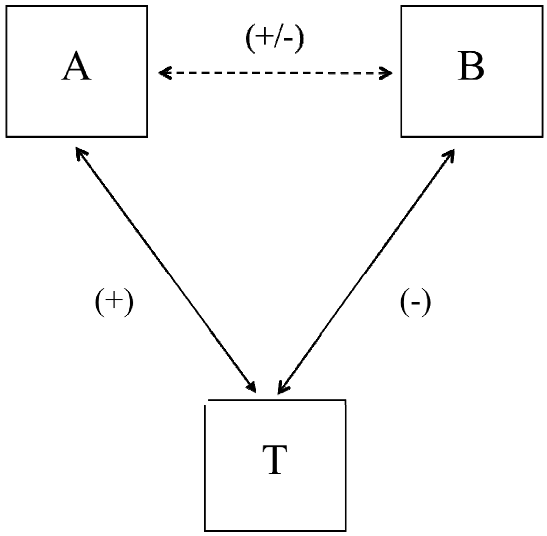

Table 1.
Participation Rates and Sample Description

	Period 1		Period 4		Period 7		Period 9	
Characteristic	***Autumn***	***Spring***	***Autumn***	***Spring***	***Autumn***	***Spring***	***Autumn***	***Spring***
Classroom Populations	27	26	27	27	27	24	27	27
Classroom Participation Rates	1.00	1.00	1.00	1.00	.93	1.00	.96	1.00
Classroom Sample Sizes	27	26	27	27	25	24	26	27
Classroom Sample Characteristics								
Female	.70	.73	.41	.41	.20	.25	.73	.70
Black	.41	.42	.41	.41	.28	.25	.65	.63
White	.41	.39	.37	.37	.32	.33	.15	.19
Hispanic	.11	.12	.22	.22	.36	.38	.15	.15
Other	.07	.07	.00	.00	.03	.04	.03	.03
Mean Science Achievement (sd)	79.0 (10.0)	79.1 10.2)	82.5 (8.0)	83.0 (7.8)	78.8 (8.0)	78.3 (8.1)	77.5 (8.2)	77.5 (8.2)
Classroom Student-reported Mutual Friendship Network Descriptive Measures								
Density	0.194	0.157	0.237	0.182	0.200	0.384	0.332	0.279
Transitivity	0.382	0.402	0.442	0.418	0.372	0.530	0.542	0.493
Reciprocity	0.504	0.398	0.589	0.485	0.441	0.453	0.614	0.957
Mean Degree	5.0	3.9	6.1	4.7	4.8	8.8	8.3	7.3

Notes on Social Network Measures:
Density: The rate of all possible student dyads that could have been mutual friends, that were mutual friends.
Transitivity: The number of transitive triads in the data divided by the number of cases where a single friendship tie could have made a triad transitive (i.e., the rate of easily transitive friendships that actually were).
Reciprocity: The rate of friendship nominations made from student A to student B that were reciprocated by student B to student A (i.e., mutual).
Mean Degree: The average number of mutual friendship ties per student in each class (i.e., total number of ties divided by number of students).

Table 2.
Summary and Descriptions of Variables Used in Analyses

Variable	Description
Student-level Characteristics	
Race	Self-reported: Black, White, Hispanic, Asian, Other.
Gender	Self-reported: Male, Female.
7^{th} Grade Final Mark: Continuous	Actual final numeric score student earned in science in the previous year (7^{th} grade).
7^{th} Grade Final Mark: Signed	Actual final numeric score student earned in science in the previous year (7^{th} grade), median centered by class period. Coded (+) if at or above class period median, (-) if below class period median.
8^{th} Grade Final Mark: Continuous	Actual final numeric score student earned in science in the study-year (8^{th} grade).
Achievement	Average of student's quarterly exam numeric scores as of the autumn and spring measurement dates, mean centered by class period.
Behavior	Teacher-assigned student behavior score (1 = poor… 4 = excellent), measured in autumn and spring, mean centered by class period.
Track Status	Continuous variable ranging from - 2 for a student in both remedial classes and no honors classes to + 3 for a student in all honors classes and no remedial classes. Based on autumn student schedule.
Teacher Academic Expectation: Continuous	Teacher's *estimate* of student's previous year (7^{th}) science final numeric mark, measured in autumn and spring. Alt.: teacher's *estimate* of student's current year (8^{th}) science final numeric mark, measured in autumn and spring.
Teacher Academic Expectation: Signed	Teacher's *estimate* of student's previous year (7^{th}) science final numeric mark, measured in autumn and spring, median centered by class period. Coded (+) if at or above class period median, (-) if below class period median.
Dyad-level Characteristics	
Student-Reported Friendship: Dyad	Both students in dyad named the other as a "friend" or "best friend," measured in autumn and spring. Coded (1) if mutual friends, (0) if not mutual friends.
Teacher-Perceived Friendship: Dyad	The teacher named students in dyad as mutual friends, measured in autumn and spring. Coded (1) if mutual friends, (0) if not mutual friends.
Teacher-Perceived Friendship: Group	The teacher named students in dyad as members of the same classroom friendship group, measured in autumn and spring. Coded (1) if group friends, (0) if not group friends.
Extracurricular Overlap	The number of yearbook-reported clubs and sports both students in dyad shared in common.
Course Overlap	The number of course sections other than science that both students in dyad shared in common.
Consistent Teacher Academic Expectation	The teacher's expectations for *both* students in dyad were positively or negatively signed (e.g., +,+ or -,-). (See definition for Teacher Academic Expectation: Signed). Coded (1) if consistent, (0) if not consistent.
Consistent Student Academic Performance	The actual 7^{th} grade final mark for *both* students in dyad were positively or negatively signed (e.g., +,+ or -,-). (See definition for 7^{th} Grade Finale Mark: Signed). Coded (1) if consistent, (0) if not consistent.
Academic Judgment of	Maximum of teacher's estimate of current year (8^{th}) science final numeric mark, collected

Student's Teacher-Perceived Friends	in autumn and spring, mean centered by class period,…
All	… drawn from all classmates perceived by the teacher to be mutual friends of the target student.
Core group	… drawn from all classmates who were co-members with the student of a teacher-perceived classroom friendship group.
Academic Judgment of Student's Student-Reported Friends	Maximum of teacher's estimate of current year (8th) science final numeric mark, collected in autumn and spring, mean centered by class period…
All	… drawn from all student-reported mutual friends of the target student.

Table 3.
Logistic Regression Analysis of Student Academic Homophily
(Dependent Variable: Students in Dyad Earned Consistent Actual Previous Year Final Science Numeric Marks = 1)

	Autumn		Spring	
Variables	***(1)***	***(2)***	***(3)***	***(4)***
Student-reported Friends =1				
(Autumn, Spring)	1.53**	1.37*	1.28	1.11
	(1.17-2.01)	(1.03-1.82)	(0.97-1.71)	(0.82-1.50)
Both White=1		1.74*		1.63*
		(1.12-2.70)		(1.02-2.61)
Both Black=1		1.46*		1.51*
		(1.09-1.97)		(1.10-2.07)
Both Hispanic=1		2.07		1.95
		(0.90-4.78)		(0.84-4.55)
Both Male=1		1.08		1.31
		(0.78-1.50)		(0.92-1.87)
Both Female=1		1.69***		1.88***
		(1.27-2.25)		(1.40-2.51)
Shared Courses=#		1.01		1.02
		(0.93-1.09)		(0.94-1.11)
Shared Clubs/Sports=#		1.16		1.15
		(0.73-1.84)		(0.82-1.61)
LR X^2(df)	9.60(1)**	35.15(8)***	2.96(1)	31.84(8)***
N (Dyads)	1066	1066	981	981

* p<0.05, ** p<0.01, *** p<0.001
Coefficients reported as odds ratios (OR) with confidence intervals (CI) in parentheses.
CI and sig. tests calculated by non-parametric bootstrap, with 5,000 replications generated by class period strata, using BCa estimates.
Notes on Variables:
Race and gender dyad composition contrasted with mixed race and gender dyads.
Gender sig. in autumn (LR $X^2(2)$ =14.34, p<.001) and spring (LR $X^2(2)$ =18.36, p<.001); Race sig. in autumn (LR $X^2(3)$ =13.20, p<.01) and spring (LR $X^2(3)$ =11.44, p<.01).
DV: Consistent Student Academic Performance: Both students in dyad at/above (+), or below (-), classroom median in actual prior-year numeric final science mark.
Primary IV: Student-reported Friends = 1: The students self-reported as mutual friends (autumn measure in autumn models, spring measure in spring models).

Table 4.
Logistic Regression Analysis of Teacher Academic Balance
(Dependent Variable: Students in Dyad Were Consistent in Teacher Academic Expectations = 1)

	Autumn		Spring	
Variables	***(1)***	***(2)***	***(3)***	***(4)***
Teacher-perceived Friends =1 (Autumn, Spring)	0.86 (0.56-1.32)	0.68 (0.41-1.11)	2.44*** (1.59-3.73)	2.11** (1.28-3.47)
Both White=1		0.93 (0.59-1.47)		1.17 (0.75-1.84)
Both Black=1		0.94 (0.69-1.29)		1.46* (1.05-2.04)
Both Hispanic=1		1.29 (0.50-3.34)		0.55 (0.21-1.45)
Both Male=1		0.65* (0.46-0.91)		1.23 (0.84-1.82)
Both Female=1		1.56** (1.14-2.14)		1.23 (0.90-1.68)
Shared Courses=#		0.94 (0.87-1.02)		0.99 (0.90-1.08)
Shared Clubs/Sports=#		1.21 (0.75-1.96)		1.20 (0.86-1.69)
Consistent Actual Past Performance		3.40*** (2.59-4.46)		3.64*** (2.79-4.75)
SR Friends =1 (Autumn, Spring)		1.31 (0.95-1.79)		0.81 (0.57-1.16)
LR X^2(df)	0.47(1)	114.77(10)***	16.91(1)***	121.01(10)***
N (Dyads)	1066	1066	981	981

* p<0.05, ** p<0.01, *** p<0.001
Coefficients reported as odds ratios (OR) with confidence intervals (CI) in parentheses.
CI and sig. tests calculated by non-parametric bootstrap, with 5,000 replications generated by class period strata, using BCa estimates.
Notes on Variables:
Race and gender dyad composition contrasted with mixed race and gender dyads.
Gender is sig. in autumn (LR $X^2(2) = 32.19$, $p < .001$) and spring (LR $X^2(2) = 6.34$, $p < .05$); Race is not sig. in autumn (LR $X^2(3) = 1.66$, $p > .646$), but is sig. in spring (LR $X^2(3) = 10.27$, $p < .02$).
DV: Consistent Teacher Academic Expectations: Both students in dyad at/above (+), or below (-), classroom median in teacher estimated prior-year numeric final science mark (autumn measure in autumn models, spring measure in spring models).
Primary IV: Teacher-perceived Friends = 1: The teacher perceived students in dyad to be mutual friends (autumn measure in autumn models, spring measure in spring models).

Table 5.
Logistic Regression Analysis of Autumn to Spring Movement Towards Academic Balance (Dependent Variable: Spring Balanced Dyad = 1)

	Become Balanced | Perceived Friends			Become Balanced | Consistent Expectations		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Autumn Teacher-perceived Friendship Dyads, Not Consistent in Teacher Expectations	8.92*** (4.25-18.75)	5.92*** (2.36-14.84)	5.43** (1.68-17.58)			
Autumn Dyads Consistent in Teacher Expectations, Not Teacher-perceived Friends				0.53** (0.33-0.85)	0.52* (0.32-0.86)	0.36** (0.20-0.67)
Both White=1		1.65 (0.72-3.82)	1.38 (0.57-3.36)		1.96 (0.89-4.34)	1.58 (0.66-3.78)
Both Black=1		3.13*** (1.76-5.56)	2.25* (1.13-4.46)		3.00*** (1.71-5.26)	1.93 (0.99-3.79)
Both Hispanic=1		0.71 (0.24-2.11)	0.32 (0.10-1.01)		0.65 (0.22-1.98)	0.63 (0.21-1.91)
Both Male=1		2.26* (1.11-4.60)	1.40 (0.63-3.14)		2.41* (1.22-4.77)	1.40 (0.65-3.05)
Both Female=1		1.87 (0.97-3.58)	1.51 (0.73-3.15)		2.17* (1.14-4.16)	1.44 (0.69-3.01)
Shared Courses=#		1.28** (1.10-1.49)	1.18 (0.99-1.41)		1.29*** (1.12-1.49)	1.20* (1.02-1.41)
Shared Clubs/Sports=#		2.56*** (1.67-3.92)	2.10** (1.34-3.29)		2.92*** (1.91-4.46)	2.94*** (1.79-4.84)
Dyad Consistent in Actual Past Performance=1			3.64*** (1.88-7.06)			3.93*** (2.02-7.62)
Student-reported Friends=1			10.23*** (5.37-19.51)			10.67*** (5.52-20.60)
LR X^2(df)	33.40(1)***	68.15(8)***	116.97(10)***	6.95(1)**	63.61(8)***	115.87(10)***
Dyad Observations	921	921	921	921	921	921

* p<0.05, ** p<0.01, *** p<0.001
Coefficients reported as odds ratios (OR) with confidence intervals (CI) in parentheses.
CI and sig. tests calculated by non-parametric bootstrap, with 5,000 replications generated by class period strata, using BCa estimates.
Notes on Variables:
Race and gender dyad composition contrasted with mixed race and gender dyads.
Gender was sig. in models 2 & 3 (LR $X^2(2) = 6.30$, $p < .05$) and models 5 & 6 (LR $X^2(2) = 19.99$, $p < .001$); Race was sig. in models 2 & 3 (LR $X^2(3) = 17.38$, $p > 001$), and models 5 & 6 (LR $X^2(3) = 28.31$, p <. 001)
D.V.: Balanced Dyad: Dyad consistent in teacher academic expectations and perceived by the teacher to be mutual friends.

Table 6.

Spring Multiple Regression Results
(Dependent Variable: Teacher's Spring Estimate of Student's Previous Year Final Numeric Science Mark)

	Student Attributes			Teacher's Academic Expectation of Friend(s)		
Variables	***(1)***	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***
Achievement (mean of quarterly exams)	0.45***		0.33***	0.33***	0.33***	0.34***
	(0.07)		(0.06)	(0.06)	(0.06)	(0.06)
Behavior (> more positive)	1.95*		2.16**	2.12**	1.75*	1.82*
	(0.93)		(0.74)	(0.73)	(0.74)	(0.76)
Gender (Male=1)		-2.41				
		(1.60)				
Race (White=1)		3.68*	1.71	1.77	1.96	2.27
		(1.81)	(1.17)	(1.21)	(1.17)	(1.16)
Track (> higher status course schedule)			2.31***	2.28***	2.07***	2.16***
			(0.54)	(0.55)	(0.52)	(0.53)
Teacher Academic Expectation of Student's Friend(s):						
Max of teacher-perceived mutual friends				0.04		
				(0.08)		
Max of teacher-perceived friendship group co-member(s)					0.14*	
					(0.07)	
Max of student-reported mutual friend(s)						0.03
						(0.10)
Adjusted R-square	***0.44****	***0.05***	***0.55****	***0.54****	***0.57****	***0.54****
Constant	77.22	77.18	76.88	76.84	76.97	76.78
Observations (individuals)	80	80	80	80	80	80

* $p < .05$, ** $p < .01$, *** $p < .001$, S.E. calculated by non-parametric bootstrap, with 5,000 replications generated by class period strata, using BCa estimates.

Un-standardized coefficients (SE).

Achievement: Average of Q1, midterm and Q3 examination scores, mean-centered by classroom.

Behavior: 5-point Likert scale evaluation (>positive) by teacher collected in spring, mean-centered by classroom.

Track: Range of -2 to +3 based on # of non-science remedial/honors courses taken in study year.

Teacher Academic Expectation of Student's Friends: Maximum of teacher's estimates of student's teacher-perceived (or student-reported) friends' *current year* (8^{th}) final numeric science marks collected in spring, mean centered by classroom.