Close Encounters: Analyzing How Social Similarity and Propinquity
Contribute to Strong Network Connections

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ABSTRACT

Models of network formation emphasize the importance of social similarity and propinquity in producing strong interpersonal connections. The positive effect each factor can have on tie strength has been documented across a number of studies. And yet we know surprisingly very little about how the two factors combine to produce strong ties. Being in close proximity could either amplify or dampen the positive effect that social similarity can have on tie strength. Data on tie strength among teachers working in five public schools was analyzed to shed light on this theoretical question. The empirical results indicated that teachers who were similar in age were more likely to be connected by a strong tie, especially teachers for whom age similarity was more likely to be salient. Moreover, teachers who took breaks at the same time or who had classrooms on the same floor communicated more frequently and felt more emotionally attached. Among the public school teachers, propinquity amplified the positive effect that age similarity had on tie strength. The strongest network connections occurred among age-similar teachers who had classrooms on the same floor. The empirical results illustrate the value of considering how social similarity and propinquity contribute to strong ties independently and when combined with each other.

Introduction

Models of network formation emphasize the importance of social similarity and propinquity in producing strong interpersonal connections (McPherson et al., 2001, provide an extensive review). A network connection is strong when the two parties involved in the relationship have known each other for a long time, communicate frequently, or feel emotionally attached (Marsden and Campbell 1984). The importance of social similarity and propinquity in producing strong ties has been established for a number of characteristics, including age (Marsden 1988, Burt 1991), education (Yamaguchi 1990), gender (Brass 1985, Ibarra 1992,1997), race (Marsden 1987, Ibarra 1995, Moody 2001), religion (Laumann 1973), and organization and professional tenure (Zenger and Lawrence 1989), as well as for a number of propinquity indicators, including classrooms (Shrum et al. 1988), dormitories (Festinger et al. 1950), neighborhoods (Mouw and Entwisle 2006), voluntary organizations (McPherson and Smith-Lovin 1986, 1987), and seating arrangements (Caldiera and Patterson 1987).

   Although we know a great deal about how social similarity and propinquity contribute to strong ties independently, we know less about how social similarity and propinquity combine to produce strong interpersonal connections. In particular, being in close proximity could either amplify or dampen any positive effect that social similarity has on tie strength. On the one hand, proximity in time or space provides two people with an opportunity to develop a more meaningful relationship, but the two individuals must be interested in developing a relationship (McPherson and Smith-Lovin 1987). For example, putting an older person and a young person in the same office cubicle will not improve their relationship if they are not interested in developing it. Being in close proximity could make their interactions even more problematic. One explanation for why sharing a demographic characteristic has a positive effect on tie strength maintains that individuals have a preference for socially similar interactions (Laumann 1966). People who prefer socially similar relationships should be more likely to take advantage of an opportunity to

develop a strong tie with a socially similar contact. Thus, being in close proximity should amplify any positive effect that social similarity can have on tie strength (Zeng and Xie 2008). For example, prior research has established that people similar in age are more likely to be connected (McPherson et al. 2001: 424-425). People of the same age could prefer to interact with each other either because they have had a similar life history (e.g., were born during the 1950s or attended college during the Vietnam War) or because they are currently at a similar point in their life course (e.g., entering graduate school, becoming a new parent, or considering retirement). Given a preference for age-similar encounters, any positive effect that being the same age can have on tie strength should be even more positive when people the same age are in close proximity.

On the other hand, more-frequent contact between in-group members could reduce the positive association between social similarity and tie strength. Recent research has shown that the positive association is a function of actual and expected similarity (Hogg and Hardie 1991, Hogg et al. 1995). Expected similarity is a function of sharing a demographic or social characteristic, whereas actual similarity is a function of sharing unobserved attitudes, behaviors, and beliefs. When an in-group member meets or exceeds prior expectations with respect to unobserved attributes, his or her relationships with in-group members are stronger (Hogg et al. 1995). However, if two people who share a demographic or social characteristic are similar only on the surface, propinquity would provide them with more opportunities to discover how very little they actually have in common, which should reduce the positive effect that social similarity can have on network connections (Ziebro and Northcraft 2009: 148-149). For example, if a young person assumes all young people are liberal Democrats, more opportunities to interact with a young conservative Republican would make it more likely their differences in political philosophies would be revealed and, consequently, the positive effect of being the same age would be diminished.

Thus, while it is reasonable to assume that proximity and social similarity combine to define tie strength, exactly how the two factors combine is unclear. My research objective is to shed light

on this theoretical question. First, I provide a more detailed discussion of how social similarity and propinquity contribute to strong ties alone and in combination. I then analyze data on tie strength among teachers working in five schools and examine how social similarity and propinquity contribute to tie strength when social similarity is defined by age and status. Empirical analysis indicated that age was a primary source of demographic diversity in each school and therefore was likely to be salient or socially significant. The analysis also indicated that status was weakly connected to age and, therefore, any effect that status similarity had on tie strength was orthogonal to any effect of age similarity. The empirical results indicated that status similarity had no effect on tie strength. Age similarity had a positive effect on tie strength, and the positive effect was even more positive when teachers the same age had more opportunities to interact with each other (i.e., two teachers had a classroom on the same floor). This paper concludes with a discussion of the theoretical implications of the observed research findings.

Social Similarity and Propinquity

Initial explanations for the positive association between social similarity and tie strength focused on interpersonal dynamics in generating strong network connections. People who shared a demographic characteristic were assumed to also share life histories, experiences, and attitudes, which made it easier for them to interact (Laumann 1966, Byrne 1971, Schneider 1987). An easier and more pleasant encounter was more likely to result in a strong network connection. Any positive effect that social similarity had on tie strength was a function of people who were similar on the "surface" (e.g., both women) also being similar with respect to "deep," or unobserved, behaviors, attitudes, and characteristics (e.g., both liberal). More-recent theoretical arguments have emphasized how the salience or social significance of a demographic characteristic shapes the association between social similarity and tie strength. Even if two people share a demographic characteristic, it will be of little consequence if the characteristic is unimportant. For example,

sharing the characteristic of being American could result in a more positive interaction if two Americans meet one another on a street in Paris. But if the same two individuals were to meet on a street in Chicago, sharing that same characteristic would have little or no effect on their interaction, because almost everyone in Chicago is an American. In Chicago, the most important characteristic could be social or economic class.

Salience is important because individuals are more likely to identify with a salient characteristic, and identification with a characteristic generates positive affect for in-group members (Hogg and Turner 1985; Hogg and Hardie 1991; Hogg 1992, 1993; Hogg and Hains 1996; Grieve and Hogg 1999).[1] Researchers have emphasized how two demographic factors shape the salience of a characteristic. One factor is the composition of the focal organizational unit or group. If an organizational unit contains a minority and a majority group, its composition is skewed (Kanter 1977: 209). The demographic characteristic that defines minority status is more likely to be salient, while the characteristic that defines majority status is less likely to be salient (Tafjel and Turner 1979, Mullen 1983, Turner 1985, Brewer 1991). For example, if women represent ten percent of an organizational unit and men represent the remaining ninety percent, the category of female will be salient for women but the category of male will not be salient for men. As the composition of the unit becomes more balanced, in-group status will become more salient for every member of the unit. For example, if men and women each represent fifty percent of a unit (i.e., the unit is balanced demographically), the category of male will be salient for men and the category of female will be salient for women. A second factor is the correlation among demographic characteristics. A characteristic is more likely to be salient when in-group status with respect to one characteristic is reinforced by in-group status with respect to multiple characteristics (Blau and Schwartz 1984, Lau and Murninghan 1998). When multiple

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[1] The assumption in this line of work is that identification is a function of demographic factors (i.e., proportion of in-group members) and that it is beneficial. Research has shown, however, that individuals can be primed to identify with a characteristic. Such identification can be beneficial (Kane et al. 2005) but need not be (Ambady et al. 2001).

characteristics are correlated, the boundary between the in-group and the out-group is more clearly delineated. For example, if all the women on a team are young and all the men are older, membership in each in-group (i.e., young women and older men) will be salient. Thus, a demographic characteristic can be salient even for members of a numerical majority if those members share multiple demographic characteristics.[2]

The general idea is that two individuals will assign more weight to their social similarity as the characteristic that defines their social similarity becomes more salient, which in turn should increase the magnitude of the positive association between social similarity and tie strength. Research findings are consistent with the two explanations for salience discussed above. Reported empirical results indicate that social similarity is more likely to produce a strong tie when people who share the focal characteristic (a) are part of a numerical minority (Mehra et al. 1998, Mollica et al. 2003, Reagans 2005), (b) are assigned to a balanced organizational unit (Moody 2001, Bacharach et al. 2005, Mouw and Entwisle 2006), or (c) share multiple characteristics (Blau and Schwartz 1984). Given these results, I expect sharing a salient characteristic to have a positive effect on tie strength.

HYPOTHESIS 1: *Sharing a salient social characteristic has a positive effect on tie strength.*

More-sociological explanations for strong ties give causal priority to propinquity (Festinger et al. 1950; Feld 1982, 1984; McPherson et al. 2001; Ingram and Morris 2007).[3] Propinquity in time and space could have a positive effect on tie strength either because repeated exposure provides

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[2] The importance of being similar along multiple dimensions is not limited to demographic characteristics. For example, if members of a numerical minority all perform the same task or activity in an organization, or if minority status in a firm corresponds with minority status in the general population, the characteristic that defines minority status will be more salient (Turner 1987: ch. 6).

[3] It is important to distinguish propinquity-based explanations for strong network connections from contact theory (Pettigrew 1998, Troop 2007). Contact theory is concerned with the set of conditions that must exist before negative attitudes about the out-group change, while the propinquity argument emphasizes the importance of opportunity in determining tie strength. Having a strong tie with a member of the out-group is not equivalent to having positive attitudes. For example, a man could feel emotionally close to his female colleagues but believe women are inferior to men. Contact theory and propinquity-based explanations for strong ties are distinct but are also compatible (Pettigrew 1998: 75-77).

individuals with an opportunity to discover mutual or compatible interests or because individuals become more appreciative or tolerant of their differences. Propinquity-based explanations for strong ties emphasize the opportunities that individuals have to interact with each other rather than the characteristic they share. Within this framework, if sharing a demographic characteristic is correlated with strong ties, it is because institutional and structural forces provide socially similar people with more opportunities to develop a network connection. For example, typecasting by employers segregates men and women at work (Bielby and Baron 1986). As a result, men and women have more opportunities to develop relationships with members of their respective in-groups. The very same dynamics could just as well produce stronger ties between people who do not share a characteristic. For example, most of us are educated with people our own age, which generates strong ties between individuals who are proximate in age. But because most schools are coed, the same process creates stronger cross-gender ties. Housing segregation by race in the United States generates strong ties among people who belong to the same racial group. But the same dynamic can generate stronger network connections between individuals of different education levels or who belong to different economic classes. This line of thinking leads to the second hypothesis.

HYPOTHESIS 2: *Proximity has a positive effect on tie strength.*

Propinquity provides two individuals with an opportunity to develop a more meaningful relationship, but they must have some interest in developing a strong tie. If they are not interested in interacting, being in close proximity will not have a positive effect on subsequent interactions. More-frequent encounters could make future encounters more problematic. Researchers who emphasize the importance of proximity in producing strong network connections have, at least implicitly, acknowledged the importance of motivation. Those scholars have assumed that even if individuals prefer socially similar contacts, if socially similar colleagues are unavailable, individuals will develop network connections with dissimilar colleagues (McPherson and Smith-

Lovin 1987). This rationale has been used to explain a positive association between the composition of an organizational unit and the composition of a person's contact network. The same rationale also implies that the magnitude of the propinquity effect varies with how similar proximate individuals are. Any positive effect that sharing a salient characteristic has on tie strength should be even more positive when coupled with proximity, either because people who identify with the same characteristic are more interested in interacting or because when an individual identifies with a characteristic, the threshold for developing a strong tie with in-group members is lower. This line of argument leads to the following hypothesis.

HYPOTHESIS 3A: *The positive effect that sharing a salient characteristic has on tie strength increases as proximity increases.*

Although it is possible that the positive association between social similarity and tie strength is even more positive when proximity is high, the exact opposite could also be true. Initial research assumed that people who shared a demographic characteristic also shared unobserved behaviors, attitudes, and beliefs. However, the extent to which that is true is an empirical question, and the available empirical evidence indicates the association between the two kinds of similarity is often weak (Harrison et al. 1998). Moreover, more-recent research indicates that both kinds of similarity contribute to strong ties (Hogg and Hardie 1991, Hogg et al. 1995). Despite the weak correlation between surface and deep similarity, however, people often assume that there is a positive association between surface and deep characteristics (Phillips 2003, Phillips and Lewin Loyd 2006). If people who identify with a salient characteristic assume that surface and deep similarity are congruent for members of their group, then, when two group members meet, each will expect deep (i.e., actual) similarity to be near its maximum value or at least above some threshold value. If the assumption holds, a stronger network connection will occur. If, however, the in-group members discover that deep similarity is lower than expected, sharing the characteristic will have less of a positive effect on tie strength. For example, when people who

share a characteristic discover that surface and deep similarity are incongruent, they are often irritated and annoyed (Phillips 2003). Thus, when surface and deep similarity are weakly correlated, propinquity will provide in-group members with more opportunities to discover what they do not have in common. Consequently, any positive effect that social similarity can have on tie strength should be diminished when proximity is high. This line of argument leads to the following hypothesis.

HYPOTHESIS 3B: *The positive effect that sharing a salient characteristic has on tie strength declines as proximity increases.*

Method

The Study Population

Elementary and middle school teachers who worked in five different schools in a large metropolitan area defined the study population. The teachers had experienced a number of change initiatives aimed at improving student performance, and relationships with colleagues affected how the teachers interpreted each initiative. Moreover, relationships between teachers were important because network connections allowed teachers to benefit from each other's experience and expertise (Gibbons 2004), which could have increased the quality of their teaching. The schools had a number of features that made them attractive settings for evaluating the current research questions. With respect to the first hypothesis, the schools were small. The number of teachers in each school varied from 22 to 65. This small number made it more likely that the teachers were aware of each other's demographic characteristics (Lawrence 2006). As a result, it was more likely that each teacher would know where he or she was located in the distribution of a particular characteristic. Greater awareness should have translated into how much each teacher identified with the focal demographic characteristic and how he or she interacted with colleagues who shared the characteristic. With respect to the second hypothesis, teachers were scheduled to

take breaks at different times during the week. The break schedule was set for each teacher at the beginning of the academic year and provided them with the opportunity to interact. How the teachers spent their break time varied. Some took the break in their classroom, while others spent the time socializing or working in the teachers' lounge. However teachers decided to spend their break time, taking breaks at similar times during the week provided them opportunities to interact. In addition to the break schedule, the physical layout of the school shaped the opportunity teachers had to interact. Teachers with classrooms on the same floor had more opportunities to interact.

<div align="center">INSERT TABLE 1 ABOUT HERE</div>

Demographic and Social Characteristics

The teachers were surveyed four times over a one-and-a-half-year period (approximately every three months). A section of the survey asked teachers about demographic characteristics such as age, gender, race, professional tenure, and school tenure. Table 1 shows the descriptive statistics for the demographic characteristics.[4] In addition to the demographic characteristics, Table 1 includes an indicator of organizational status, which came from asking each teacher to name five colleagues that he or she would nominate for teacher of the year on the basis of their "strength, competence, and ability as a teacher. To define each teacher's standing in the teaching-status hierarchy, the number of nominations received by each teacher was divided by the maximum number of nominations received by any teacher in the school. As noted above, the schools varied in the number of classroom teachers who were employed at the school. There were 30 teachers in school A; 65 in school B, 39 in school C, 22 in school D, and 26 in school E. The results in Table 1 indicate that the vast majority of the teachers were female. The large proportion of female teachers was consistent with the demographic composition of the broader teaching population, as over 90 percent of the elementary and middle school teachers in the state were female. The results

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[4] The results in Table 1 illustrate the average characteristics of the teachers and ignore time. There was little change in the teaching population across time, so the descriptive statistics at each point are essentially equivalent.

in Table 1 also indicate that most of the teachers were White. They were the majority of the teaching population in three of the five schools. In comparison to gender, however, there was more variation in race. White and Latino teachers represented between thirty and forty percent of the teachers in schools C and E. African Americans and Asians represented a small minority of the teaching population and were absent in a number of schools. With respect to age and tenure, the teachers in schools C and E tended to be younger and less experienced than the teachers in the other three schools, and this was especially true for the teachers in school E.

The final column in Table 1 shows the response rate to the survey at each school. Every classroom teacher employed by the focal school at time t was asked to fill out the survey. Response rates were averaged across time for each school. The results indicate that the response rate to the survey varied across schools (F = 8.76). An analysis of individual response rates indicated that none of the demographic characteristics in Table 1 affected the likelihood that a teacher responded to the survey at a specific time. The teachers who responded were demographically similar to the teachers who did not respond.[5]

A factor analysis of the characteristics (results not shown to conserve space) illustrated how the different characteristics "intersected" in the individual teachers. Two factors explained 34 percent of the covariance among the demographic characteristics. The first factor explained 28 percent of the covariance and illustrated the positive association between individual age, professional tenure, and school tenure. The second factor explained 6 percent of the covariance and distinguished African American teachers from Latinos and women. Although it was possible for a teacher to classify him- or herself as African American and Latino, most teachers did not. Moreover, male teachers tended to be African American. The organizational-status variable was positioned in the

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[5] This statement is based on the estimates from a logistic regression analysis with responding to the survey as the dependent variable and with the demographic characteristics in Table 1 as predictors. To control for variation across schools, four school fixed effects were included in the model. An equation was estimated for each survey point, and teachers employed by the school at the time of the survey defined the risk set. Race and gender data were available for every teacher, including teachers who never responded. However, some of the demographic data for respondents and nonrespondents were missing. Missing demographic data were imputed using a multiple imputation technique.

center of the characteristic space, which indicated that status was virtually uncorrelated with the other characteristics. Additional empirical analysis reinforced this finding. The results indicated that organizational status was uncorrelated with race and gender in all five schools, and it was uncorrelated with individual age, professional tenure, and school tenure in schools A, C, and D. School tenure had a positive effect on organizational status in school B, and professional tenure had a positive effect on organizational status in school E.

The results described above illustrate how the demographic characteristics intersected in teachers and how different kinds of teachers were distributed across the five schools. The results can also provide guidance in testing the social-similarity argument. In particular, the factor analysis indicates that age and tenure were the primary sources of demographic diversity in each school. Thus, age and tenure were a readily available source of social differentiation and were more likely to be salient characteristics. Given within-school variation in age and tenure, it would be informative to test the identification-based explanation for tie strength with either age or tenure. In particular, previous research has focused on the salience of race and gender in defining how much individuals identify and interact with members of their respective in-groups, and the results indicate that women and people of color are more likely to be strongly connected to members of their respective in-groups. Identification-based explanations for strong ties emphasize the importance of dynamics *inside* an organizational unit that make a characteristic more salient and therefore produce stronger relationships between in-group members. In the general population, people of color are part of a minority, and women are equally represented. The two conditions, minority status and equal representation, are conditions under which a characteristic is more likely to be salient. Thus, the exclusive focus on race and gender in prior research makes it difficult to know if the observed positive effects for race and gender result from dynamics inside an organizational unit or from the standing of women and people of color in the general population.

As age and tenure are the primary source of demographic diversity within each school and they vary within each school, it is possible for teachers who are the same age or tenure to be part of a numerical minority *inside* a school, and it is also possible for them to be part of a balanced unit independent of their standing in the general population outside the school. Age and tenure represent an opportunity to provide a more robust test of the identification argument. I test the social-similarity argument with age and not tenure, and I do so for two distinct reasons. First, like race and gender, age is a visible demographic characteristic (Tsui and Gutek 1999: 48). Therefore, variation in age is more likely to be visible than variation in tenure. Second, the age data were more complete (in terms of missing data) than the tenure data. But since age and tenure were correlated, they were more likely to be salient because in-group status with respect to age would be correlated with in-group status with respect to tenure. Thus, age could be more salient, either because of a school's composition with respect to age or because of the consolidation between age and tenure among the teachers. The increase in salience, however, should increase the positive association between age similarity and tie strength. I also test the social-similarity argument with organizational status. Organizational status was uncorrelated with age and the tenure variables in most schools, so the degree to which an individual identified with his or her organizational status when his or her status was salient should be uncorrelated with the extent to which the individual identified with his or her age.

When compared to age and organizational status, there was less within-school variation in race and gender. The results in Table 1 indicate that almost all the teachers were female. Men represented a numerical minority and although it would be informative to test the first prediction with the characteristic of male defining minority status, the number of male teachers was small. The results also indicate that each school had a distinct racial composition. The schools differed in the kinds of racial groups that were present and also in each racial group's representation when members of the group were present. Given the distinct racial makeup of each school, it would be hard to distinguish any effect associated with belonging to a racial group (e.g., both African

American) from unmeasured school effects. Given these data limitations and the possibility of putting identification-based explanations for tie strength on firmer empirical grounds by focusing on age, I focus on age and organizational status in my empirical analysis. I do, however, control for similarity in race and gender.

Tie Strength

Network data were collected using the sociometric roster approach (Wasserman and Faust 1994: 43-56). Each respondent was given a roster of names and asked to describe his or her relationship with each listed colleague in terms of communication frequency and emotional closeness. Emotional closeness and communication frequency represent distinct dimensions of tie strength (Marsden and Campbell 1984). To reduce the potential for survey response bias, tie strength data were collected at two distinct points in the survey. At the beginning of the survey, each teacher indicated how frequently he or she communicated ("less than once a month," "once a month," "multiple times a month," "once a week", "multiple times a week," "once a day," or "multiple times a day") with each listed colleague. At the end of the survey, each respondent was presented with the same roster of names and asked to describe his or her relationship with each colleague in terms of emotional closeness ("especially close," "merely close," "less than close," or "distant").

   Analysis of the tie strength data indicated that the response rate to the emotional closeness question was lower on the initial two rounds of the survey. The reason for the low response rate is unclear. Responding to a sociometric question is time-consuming, and subjects were asked to respond to the emotional-closeness question at the end of the survey. However, conversations with teachers indicated that they were concerned about revealing those sentiments for particular colleagues. As a result, the emotional-closeness data were not collected after the second wave. A cross-tabulation of the two tie-strength variables indicated that they were significantly correlated at time 1 and time 2. Pearson's Chi-Square in the first period was 3,523 (p < .001), and in the second period it was 2,482 (p < .001). One can reject the independence assumption in both time

periods. Since more data were available for communication frequency, the predictions were tested with communication frequency as the primary indicator of tie strength. As a robustness check, however, the predictions were tested with the emotional-closeness data from the first two time periods.

Independent Variables

Social Similarity. Sharing a demographic or social characteristic is more likely to produce a strong tie when the focal characteristic is socially significant or salient. Thus, how two people respond to their social similarity is relative. In some instances, their social similarity will matter a great deal, and in other situations, it will not matter very much at all. The focus on relative similarity is consistent with the position taken by researchers who highlight the importance of relational instead of simple demography (O'Reilly et al. 1989, Tsui et al. 1992, Chatman et al. 1998). For example, instead of analyzing the influence of a person's age on the focal outcome (e.g., integration, satisfaction, etc.), relational demography researchers emphasize the importance of a person's relative age, because the meaning that an individual (and any other group member) assigns to a person's age depends on the age of other group members. Relational demography scores can be used to construct a social-similarity variable that is sensitive to where social similarity occurs in the broader characteristic distribution. For any focal characteristic, an individual has a relational demography score that describes where he or she is located relative to the typical member of the group. In the current context, $(x_{ikt} - x_{kt})$ measures how far away teacher i is from his or her colleagues at school k with respect to characteristic x at time t. x_{ikt} was the level of the focal characteristic x for person i in school k at time t, and x_{kt} was the mean of x in school k at time t when person i was not included in the calculation (Tsui et al. 1992: 561). If the focal characteristic is age, large positive values would indicate the focal individual

was much older than his or her peers, and large negative values would indicate the individual was much younger than his or her peers.

For two people, the product of their relational demography scores, $(x_{ikt} - x_{kt})(x_{jkt} - x_{kt})$, is a social-similarity variable. The magnitude of the variable is a function of the composition of the broader organizational unit. Consider a 100-person organizational unit composed of two age cohorts. Individuals in the younger cohort are 30 years old, and individuals in the older cohort are 40 years old. If the younger cohort contains 20 people and the older cohort contains 80 people, the individuals in the younger cohort represent a numerical minority, and the individuals in the older cohort represent a numerical majority. The social-similarity variable would equal 65 for two members of the younger cohort (i.e., the minority group), and it would equal 4 for two members of the older cohort (i.e., the majority group). If the younger cohort contained only 10 people and the older cohort contained 90 people, the variable would equal 82 for two members of the younger cohort, and it would equal 1 for two members of the older cohort. If the older cohort contained 80 people who were 50 years old, the variable would equal 261 for two members of the younger cohort, and it would equal 16 for two members of the 50-year-old cohort. The example illustrates that the magnitude of the social-similarity variable increases as people of a kind become more of a numerical minority and especially as members of the minority become more and more distant from members of the majority group. If the organizational unit was balanced, and younger people were 30 years old and older people were 40 years old, the social similarity would equal 25 for two members of either cohort. If the older cohort contained 50-year-olds, the social-similarity variable would equal 102 for two members of either cohort. Overall, the social-similarity variable varies in ways that are consistent with theoretical explanations for salience. If the organizational unit contains a minority and a majority group, the variable for the minority group increases as the minority group becomes more of a minority *and* as the distance between the minority and majority group increases. The variable declines for the majority group as its

members become more of a majority but to a lesser extent as the distance between the minority and majority grows. The presence of a very small but distant minority can increase the salience of social similarity for members of a majority group (Harrison and Klein 2007). If the organizational unit is balanced, the variable increases as the distance between the two groups increases.

   The social-similarity variable is useful but far from perfect. In particular, if the distribution of the focal characteristic is skewed, normal, or bimodal, the variable produces scores that are consistent with prior theorizing. However, if the distribution is uniform or multimodal, the variable would be high for socially similar individuals at the edge of the distribution but low for similar individuals toward the center of the distribution. Under these conditions, one would be better off defining relational demography as a function of distances between individuals as opposed to distance from the mean, because under a uniform or multimodal distribution, defining relational demography as a function of distance from the mean would obscure important demographic information. Moreover, the rate at which the variable increases with minority status or with the distance between groups is arbitrary. One could imagine transforming the relational demography scores, which would affect the rate at which distance and representation contribute to the variable. However, I do not have a theoretical reason for preferring one transformation over another or over the raw relational demography scores, so I have used the most basic approach.

   Proximity. Each teacher was scheduled to take breaks during the course of a day. Overlap in the break schedule provided teachers with the opportunity to interact. The variable break overlap was defined as the "break time" that teacher i spent with teacher j, $\text{break overlap}_{ijt} = \sum_{k} P_{ikt} P_{jkt}$.

P_{ikt} equaled 1 if person i took a break during period k at time t. P_{jkt} equaled 1 if person j took a break during period k at time t. So $P_{ikt} P_{jkt}$ equaled 1 if both teachers took a break during period k at time t. Summing across all the breaks k for each time t defined the number of hours that teacher i and teacher j could have interacted. In addition to the break schedule, the physical layout

of the schools provided teachers with an opportunity to interact. Teachers with classrooms on the same floor had more opportunities. To test the effect that physical proximity had on tie strength, a same-floor indicator variable was created and set equal to 1 if two teachers had classrooms on the same floor.

The proximity variables are expected to have a positive effect on tie strength. It is possible, however, that people who want to be strongly connected act in ways to increase their physical and temporal proximity. Although I cannot rule out this possibility completely, there are reasons to suspect that any influence that reverse causality had on the observed association between proximity and tie strength was limited. For example, administrators at the schools maintained that they designed the break schedule to facilitate the education of students, so the schedule was more likely to be influenced by logistics and subject matter. However, it would be naïve to think that seniority, politics, and preferences did not play a role as well. And yet, even when these factors did influence when a teacher (or two teachers) took breaks, their effects were constrained by the number of teachers who could take breaks at the same time. Even if some teachers were able to decide when they took a break, the limit on the number of teachers who could take a break at the same time constrained the ability of teachers to take breaks only with colleagues they preferred. The result was that on average, overlap in the break schedule was outside the immediate control of individual teachers. A similar logic applies to the same-floor variable. Even if some teachers were able to select where their classrooms were located, their choices limited the alternatives that were available to other teachers. As a result, while it is possible that tie strength affects proximity, it is more likely that any association I observed between proximity and tie strength is a function of the effect that proximity has on tie strength.

Controls

The control variables were categorical and continuous. The categorical control variables were race (Asian, African American, Latino,White), gender (Female, Male), and teaching certificate

(Yes, No). The teaching-certificate variable is an indicator of knowledge and expertise because a teacher could apply for a certificate after he or she completed his or her M.A. degree. To control for any effect that being the same race had on how two teachers interacted, four same-race indicator variables were created (*both African American*, *both Asian*, *both Latino*, and *both White*). Cross-race interactions provided the baseline for the same-race effects. To control for any influence that being the same gender had on how two teachers interacted, two same-gender indicator variables were created (*both female* and *both male*). Interactions between men and women provided the baseline for the same-gender effects. To control for any effect that having the same level of education had on how teachers interacted, two same-education indicator variables were created (*both certified* and *both not certified*). Interactions between teachers with different education levels provided the baseline for the same-education effects. The teachers were responsible for a number of subjects across a number of grades. To control for any effect that overlap in subjects or grades could have produced, models control for overlap in the grades taught (*grade overlap*) at time t and for overlap in the subjects covered at time t (*subject overlap*). The grade overlap and subject overlap variables were continuous and although it seemed likely that grade and subject overlap would have an effect on how teachers interacted, the exact origin of that effect was unclear. Teachers who worked in the same area could have had more opportunities to interact, and the opportunities they had to interact could have been orthogonal to the opportunities defined by being on the same floor or taking breaks at similar times. Or two teachers who taught the same grades or subjects could have viewed themselves as being more similar, which could have resulted in stronger ties. Or teachers who taught similar subjects and grades could have been more relevant as colleagues, and the knowledge that they had in common could have made it easier for them to interact, thereby increasing the frequency of their communication. Although it seemed clear that the subject- and grade-overlap variables would have an effect on tie strength, it was unclear why. Therefore, instead of using the variables to test any of the predictions, the overlap variables were included as control variables. Finally, all

models included a fixed effect for four of the five schools to control for any unmeasured differences across schools and a fixed effect for three of the four time periods to control for any unmeasured differences in tie strength across time.

Results

The responses to the communication-frequency question were ordinal. The distances between response characteristics could be unequal. For example, the distance between "once a day" and "multiple times a day" could be larger than the distance between "less than once a month" and "once a month. Instead of assuming equal spacing, ordinal logits estimate the distance between consecutive response characteristics. A second methodological concern was the units of analysis. Dyads were the units of analysis and, after excluding missing data, there were 9,176 observations. The observations were not independent. Each teacher-colleague combination could be observed multiple times. This kind of clustering violates the independence assumption in regression analysis and can artificially deflate standard errors, thereby inflating significance tests. To adjust the standard errors, a random intercept was estimated for each teacher-colleague combination. In addition to adjusting the size of the standard errors for clustering, the random intercept controls for unmeasured dynamics that could have affected how a focal teacher interacted with a specific colleague. For example, formal work requirements could have affected how much a teacher communicated with a focal colleague. Or the teacher and the colleague could have been strongly connected to each other because they belonged to the same professional club or organization or simply traveled in the same informal social group. The ordinal logit model with random intercepts was estimated using the gllamm command in Stata.[6]

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[6] More formally, the error term (ξ_{ijt}) in the equation describing the communication frequency between teacher i and colleague j at time t was assumed to equal $\zeta_{ij} + \varepsilon_{ijt}$. ζ_{ij} is a random intercept, and each intercept was specific to a teacher-colleague interaction. The random intercepts were assumed to be normally distributed with zero mean and variance ψ, with ψ being estimated from the data. During estimation, ζ_{ij} was not forced to equal ζ_{ji}. Substantive conclusions are the same if ζ_{ij} was assumed to equal ζ_{ji}. However, there is no reason why the unobserved dynamics that affected how a teacher interacted with a colleague should have the same effect on how the colleague interacted with the focal teacher. Moreover,

The random intercepts allow me to adjust the standard errors for clustering and also to control for omitted variables, but the approach is not without its limitations. In particular, I make some quite strong assumptions about the association between the random intercepts and the independent variables in the regression equation. I assume the independent variables are uncorrelated with the random intercepts (Rabe-Hesketh and Skrondal 2005: 95). The assumption seems reasonable for some unmeasured features (e.g., formal work requirements) of a relationship but unreasonable for other features (e.g., membership in the same informal group). This approach, however, represents an improvement over techniques that control for omitted variables only at the individual and not the dyadic level of analysis (Reagans 2005). It falls short of the ideal of being able to control for omitted features of a relationship that could be correlated with the independent variables in the regression equation. Estimating a fixed effect for each dyad would allow controlling for omitted variables that are correlated with the independent variables. The small number of observations for each teacher pair precludes adopting a dyadic fixed effect approach.

Descriptive statistics for the variables are in Table 2. Correlations are in Table 3. The row and column numbers in Table 3 correspond to the row numbers in Table 2. In the current organizations, the correlations between the variables that measure propinquity and the variables that measure salient social similarity were modest, and thus the two factors varied independently. The results from the ordinal logit are in Table 4. Predictors were introduced in blocks. The control variables were introduced in Model 1. The first hypothesis is tested in Model 2. The second hypothesis is tested in Model 3. Hypotheses 1 and 2 are tested in Model 4. Hypotheses 3a and 3b are tested in Model 5.

INSERT TABLE 2 & 3 ABOUT HERE

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interpersonal relationships are not reciprocal by definition (Carley and Krackhardt, 1996). A teacher and a colleague did not have to feel the same way about each other. Moreover, in addition to describing how frequently two teachers communicated, reported communication frequency most likely reflected differences in who initiated communication or the desire a teacher had to communicate with a specific colleague more frequently.

I focus on the estimates in Model 5. The coefficients for the control variables are consistent with prior research. For example, overlap in grades and subjects taught had a positive effect on communication frequency. As noted earlier, the positive effects associated with these control variables could reflect increased opportunity, social similarity, or the relevance of communication. With respect to gender, interpersonal connections between women were more negative than connections between men and women, while connections between men were more positive than connections between men and women. Men represented a minority population in the schools, while women were part of a numerical majority. Thus, the observed gender effects are consistent with the idea that people who are part of a numerical minority are more likely to be connected by a strong tie, whereas similar people are more likely to be connected by a weak tie when they are part of a numerical majority (Reagans 2005). A similar pattern was observed for education. When both teachers did not have a teaching certificate, the teachers communicated with each other more frequently. When both teachers were certified, they communicated less frequently. Uncertified teachers were part of a numerical minority, while certified teachers were part of a numerical majority. With respect to race, the coefficients for both African American and both White were positive and significant. The coefficient for both Asian was positive but was only marginally significant, and the coefficient for both Latino was not significant. Again, given the unique racial composition of each school, it is difficult to interpret the exact meaning of the same-race coefficients.

For the predictions, the results appear to provide only partial support for the first hypothesis. Consistent with the first prediction, the coefficient for the age-similarity variable is positive and significant.[7] However, the coefficient for the status-similarity variable is not significant. Although the coefficient for the status-similarity variable does not provide support for the first prediction, it

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[7] Although I have focused on age similarity, teachers for whom age similarity is more likely to be salient are the same teachers for whom similarity in school or professional tenure is more likely to be salient. Thus, the observed effect for age similarity more than likely reflects the combined influence of salience with respect to representation and the consolidation of multiple demographic characteristics.

is possible that it is inappropriate to test the first prediction with the status data. Salience-based explanations for strong ties assume that individuals are aware of their similarity. Teachers who were similar in terms of their organizational status could have been unaware of their social similarity. Not only is status less visible than age, but in each school, there was more variation with respect to age than status. Therefore, when compared to differences in age, differences in status were more fine grained and could have been more difficult to detect. Moreover, two teachers with the same public standing in the status hierarchy could have held very different private beliefs about their social standing (Anderson and Spataro 2005). Variation in private beliefs would affect the salience of status similarity and therefore the extent to which similarity in status translated into more-positive relationships. Thus, instead of providing mixed support for the first prediction, the results for organizational status help clarify the factors that underlie the social-similarity effect. In particular, individuals have to agree they are socially similar. If possessing a characteristic or if membership in a group is ambiguous and/or open to self-serving interpretations, people who appear to be similar (i.e., are similar on the surface) could disagree about their similarity, which would reduce any effect surface similarity could have on the strength of their relationship.

The results provide unambiguous support for the second prediction. The coefficient for the break-overlap variable is positive and significant, as well as the coefficient for the same-floor variable. The results indicate that teachers with classrooms on the same floor or who had more opportunities to interact communicated with each other more frequently. Since the main effect for the status-similarity variable was not significant, the interaction terms to test the third hypothesis were calculated for the age-similarity variable. The coefficient for the interaction between age similarity and the same-floor variable is positive and significant. The coefficient indicates that age-similar teachers communicated with each other more frequently when they were on the same floor and age-dissimilar teachers communicated with each other less. This was especially true for teachers for whom age was more likely to be salient. The coefficient for the interaction between

age similarity and break overlap was not significant. Therefore, the empirical results provide only moderate support for Hypothesis 3a. Model 6 replaces communication frequency with emotional closeness as the dependent variable, and the coefficients for the variables of interest are essentially the same. Both proximity variables had a positive effect on emotional closeness, and the coefficient for the age-similarity variable was also positive and significant. However, the coefficient for the interaction between age similarity and the same-floor dummy was not significant. Recall that the emotional-closeness data were available only during the first two time periods. If Model 5 is re-estimated with data from the first two time periods, the coefficient for the interaction term between the age similarity variable and the same floor variable is not significant. Detecting a significant interaction requires more data and it is possible that with more emotional-closeness data, the interaction between the age similarity variable and the same-floor variable would be positive and significant.

Summary and Discussion

My research objective was to analyze how social similarity and propinquity contribute to strong network connections alone and when combined with each other. Although a number of studies have documented the importance of either social similarity or propinquity, very few have focused on how the two mechanisms combine to produce strong ties. In addition to having a direct effect on tie strength, propinquity could moderate the positive association between social similarity and tie strength. Being in close proximity could either increase or decrease any positive social-similarity effect. In an analysis of network connections among teachers working in five public schools, I found that age similarity and propinquity had positive effects on tie strength. I also found that proximity in space amplified the positive association between age similarity and tie strength.

The findings illustrate how social similarity and propinquity contribute to strong ties and, in so doing, help clarify an important theoretical framework. It is widely believed that the positive effect that an increase in the salience of social similarity can have on tie strength will come at the expense of the positive effect that opportunity can have on relationships between dissimilar individuals (Blau and Schwartz 1984, Brewer and Kramer 1985, Moody 2001, Hewstone et al. 2002). Scholars who adopt this view focus on how the demographic diversity of an organizational unit affects the salience of social similarity *and* the opportunities that individuals have to interact with dissimilar colleagues. Researchers have theorized that an increase in the demographic diversity of an organizational unit increases the salience of social similarity, which in turn increases the positive effect that social similarity can have on tie strength, but the same increase in diversity should also provide individuals with fewer opportunities to interact with dissimilar colleagues, reducing the positive effect opportunity can have on relationships between dissimilar colleagues. Therefore, an increase in demographic diversity sets in motion a sequence of events that produce a trade-off between social similarity and opportunity.

Among the teachers I studied, I found no evidence for a proposed trade-off between salience and opportunity. The correlations between the indicators of propinquity (i.e., the same-floor and break-overlap variables) and salient social similarity (i.e., the age- and status-similarity variables) were modest. An increase in one mechanism did not come at the expense of an increase in the other. The research findings do indicate that the positive effect that opportunity had on relationships between socially dissimilar people declined as social similarity became more salient. Recall that the positive effect of age similarity on tie strength was even more positive under the conditions that should have increased the salience of being similar in age. And the positive age-similarity effect was even more positive when teachers of the same age had rooms on the same floor. Thus, any negative effect that age dissimilarity had on tie strength was even more negative when age-dissimilar teachers were more aware of their differences and also had classrooms on the same floor. Or, in other words, the positive effect that physical proximity had on relationships

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between age-dissimilar teachers declined as differences in age became more salient. Thus, the empirical results are consistent with prior theorizing in the sense that the positive effect that opportunity had on the strength of relationships between dissimilar individuals declined as social differences became more salient. The decline in the opportunity effect was not a function of dissimilar individuals' having fewer opportunities to interact with each other. As differences in age became more salient, age-dissimilar individuals were less likely to take advantage of the opportunity to build a strong tie. The decline was significant and theoretically interesting; however, it should be considered in the context of the large and positive effect that propinquity had on tie strength. Overall, the results indicate that teachers did develop strong ties with age-dissimilar colleagues as their opportunity to develop a strong tie increased.

The research findings are important because they shift our attention away from either salience- or opportunity-based explanations for strong ties and refocus our attention on how the two mechanisms can combine in the production of network connections. I emphasize *can* because although I found a positive interaction between social similarity and propinquity among the teachers I studied, it is not immediately clear that propinquity will always increase the positive effect that social similarity can have on tie strength. In fact, I expected to find a negative interaction between social similarity and propinquity if people who were similar on the surface did not share important attitudes, behaviors, and beliefs. If socially similar individuals are only similar on the surface, more-frequent interactions should reveal how little they actually have in common and therefore reduce the positive effect that surface similarity can have on network connections (Ziebro and Northcraft 2009). I expected to find a positive interaction between social similarity and propinquity if surface and deep similarity were consolidated or congruent.

There was a positive interaction between age similarity and propinquity. And although it is possible that teachers who were similar in age were also similar in unobserved attitudes, behaviors, and beliefs, prior research has established that the association between surface and deep similarity is often weak (Harrison et al. 1998). Perhaps the critical issue is not what people

actually have in common but what they believe they have in common. If an individual identifies with a demographic characteristic, perhaps he or she could assume that everyone who shares the characteristic also possesses the behaviors and characteristics that define in-group status (Hannan et al. 2007: ch. 5). Identification with a salient characteristic could increase the tendency to give in-group members the benefit of the doubt during interactions. If in-group members are assumed to possess certain behaviors and characteristics, an individual is more likely to notice those behaviors and characteristics when they are exhibited. Individuals often see what they expect to see and do not see what they do not expect to see. If individuals are motivated to draw distinctions between themselves and members of their in-group, perhaps because they compete against members of their in-group for attention (Reagans 2005) or because they are concerned about how ties to in-group members will affect their standing in the larger group (Duguid et al. 2010), proximity would provide them with more opportunities to justify those differences. Identifying the set of factors that shape how propinquity moderates the association between social similarity and tie strength seems worthy of future inquiry.

This project makes a number of contributions to existing research on network formation. However, like any research project, it is not without its limitations. For example, although the analysis is based on tie-strength data collected at four different times, the relationships are not new, and the empirical analysis focused on the level of tie strength. Significant insight could be gained by analyzing how the causal factors operate in a dynamic framework. For example, the main effect for age similarity suggests that people defy propinquity and go out of their way to develop strong ties with socially similar colleagues when being the same is salient. It is possible that when social similarity is salient, socially similar people self-select into situations that provide them with more opportunities to interact (Denrell 2005). This raises the question of how much effort individuals are willing to exert to find similar others when a demographic or social characteristic is salient (Ibarra et al. 2005). Moreover, I have emphasized the importance of salience and in-group identification in producing the positive effect that social similarity can have

on tie strength. Prior research has established that individuals are more likely to identify with a salient characteristic and that identification with a characteristic has a positive effect on ties with in-group members. My social-similarity variable was constructed to be high when the conditions that increase salience are present (i.e., when similar individuals are part of a numerical minority or a balanced group). I did not measure salience or in-group identification and thus do not know whether this social-similarity variable predicts either dynamic. This is clearly a limitation of the study. A more systematic analysis would consider the extent to which the social-similarity variable predicts salience and in-group identification and the extent to which these dynamics mediate the association between the social-similarity variable and tie strength.

Despite these limitations and others, the current project advances our understanding of dynamics that can affect the origin of strong interpersonal connections. Scholars would be well advised to consider in future research how social similarity and propinquity combine in the production of strong ties and the dynamics that shape how propinquity moderates the association between social similarity and tie strength.

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Table 1	Individual Characteristics and Response Rate									
	Female	African American	Asian	Latino	White	Age	Tenure in school	Tenure in profession	Status	Response rate
School A	100	10	0	0	90	43	10	13	.17	87
School B	94	5	6	2	88	45	11	15	.14	66
School C	90	9	11	43	37	38	6	10	.15	85
School D	91	0	0	5	95	44	9	19	.19	89
School E	79	15	12	31	42	32	3	5	.19	74

Note. The race proportions in School B do not sum to 100 percent because of rounding.

Table 2	Descriptive Statistics			
	Mean	Standard Deviation	Minimum	Maximum
1. Communication frequency	4.20	1.88	1	7
2. Same grades	.46	.86	0	7
3. Same subjects	2.47	1.92	0	6
4. Both certified	.51	.49	0	1
5. Both not certified	.11	.31	0	1
6. Both female	.88	.31	0	1
7. Both male	.003	.05	0	1
8. Both African American	.002	.05	0	1
9. Both Asian	.003	.06	0	1
10. Both Latino	.03	.18	0	1
11. Both White	.64	.47	0	1
12. Break overlap	3.45	2.62	0	19
13. Same floor	.30	.46	0	1
14. Age teacher	42.87	13.49	23	68
15. Age colleague	42.92	13.47	23	68
16. Age similarity	-6.28	171.05	-506.24	559.11
17. Status teacher	.27	.28	0	1
18. Status colleague	.27	.28	0	1
19. Status similarity	.002	.08	-.20	.71

Table 3 Correlations							
	1	2	3	4	5	6	7
1. Communication frequency	1.0000						
2. Same grades	0.2407	1.0000					
3. Same subjects	-0.0708	-0.3877	1.0000				
4. Both certified	0.0153	0.1487	-0.1070	1.0000			
5. Both not certified	0.0390	-0.0743	0.0354	-0.3709	1.0000		
6. Both female	-0.0570	-0.1270	0.1345	-0.0031	-0.0148	1.0000	
7. Both male	0.0419	0.0587	-0.0371	0.0053	-0.0091	-0.1557	1.0000
8. Both African American	0.0219	-0.0065	0.0084	-0.0164	0.0279	-0.0284	0.0029
9. Both Asian	0.0100	-0.0253	0.0265	-0.0497	0.0583	0.0216	-0.0034
10. Both Latino	0.0105	-0.0387	0.0834	-0.1278	0.1465	0.0675	-0.0105
11. Both White	0.0967	0.0214	-0.1242	0.2567	-0.2849	0.0491	-0.0162
12. Break overlap	0.1930	0.1524	0.0023	0.0653	-0.0494	0.0446	-0.0334
13. Same floor	0.2359	0.0853	0.0453	-0.0200	0.0552	0.0630	-0.0066
14. Age teacher	0.0268	0.1187	-0.1143	0.3468	-0.2628	0.0551	-0.0104
15. Age colleague	0.0167	0.1180	-0.1139	0.3436	-0.2598	0.0551	-0.0106
16. Age similarity	0.1049	0.0291	0.0272	0.0497	0.0917	-0.0079	-0.0040
17. Status teacher	0.0385	-0.0299	0.0305	0.0600	-0.0256	-0.0078	0.0125
18. Status colleague	0.1007	-0.0310	0.0326	0.0559	-0.0204	-0.0095	0.0123
19. Status similarity	0.0507	-0.0097	0.0118	0.0246	-0.0114	-0.0048	-0.0033
	8	9	10	11	12	13	14
8. Both African American	1.0000						
9. Both Asian	-0.0031	1.0000					
10. Both Latino	-0.0098	-0.0115	1.0000				
11. Both White	-0.0693	-0.0808	-0.2525	1.0000			
12. Break overlap	-0.0316	-0.0117	-0.0363	0.1759	1.0000		
13. Same floor	-0.0344	-0.0124	0.0325	0.0176	0.1395	1.0000	
14. Age teacher	0.0096	-0.0502	-0.0865	0.1897	0.0186	-0.0115	1.0000
15. Age colleague	0.0130	-0.0505	-0.0873	0.1853	0.0152	-0.0137	0.0490
16. Age similarity	0.0088	0.0599	0.0020	-0.0123	0.0290	0.0029	-0.0226
17. Status teacher	-0.0219	-0.0081	-0.0138	0.0800	-0.0089	-0.0056	0.1565
18. Status colleague	-0.0093	-0.0083	-0.0145	0.0747	-0.0120	-0.0078	0.0008
19. Status similarity	-0.0130	-0.0121	-0.0044	0.0367	0.0209	-0.0032	0.0362
	15	16	17	18	19		
15. Age colleague	1.0000						
16. Age similarity	-0.0248	1.0000					
17. Status teacher	0.0021	-0.0030	1.0000				
18. Status colleague	0.1522	-0.0028	-0.0062	1.0000			
19. Status similarity	0.0353	0.0000	0.1988	0.1954	1.0000		

Table 4 Predictors of Communication Frequency

	I. Controls	II. Social similarity	III. Opportunity	IV. Similarity & opportunity	V. Similarity X opportunity	VI. Emotional closeness
Same grades	1.088•	1.082•	.972•	.962•	.962•	.331•
	(.060)	(.060)	(.059)	(.059)	(.059)	(.075)
Same subjects	.139•	.126•	.111•	.097•	.096•	.037
	(.027)	(.027)	(.026)	(.026)	(.026)	(.035)
Both certified	-.113	-.203•	-.083	-.192•	-.196•	.229
	(.096)	(.100)	(.094)	(.098)	(.098)	(.135)
Both not certified	.535•	.420•	.504•	.393•	.395•	.856•
	(.153)	(.154)	(.150)	(.150)	(.150)	(.219)
Both female	-.554•	-.541•	-.606•	-.599•	-.604•	.005
	(.171)	(.168)	(.166)	(.163)	(.163)	(.215)
Both male	1.982•	1.936•	1.983•	1.931•	1.915•	-.182
	(.933)	(.918)	(.906)	(.888)	(.888)	(1.105)
Both African American	1.742	1.717	2.304•	2.278•	2.287•	1.266
	(.990)	(.974)	(.956)	(.939)	(.938)	(1.260)
Both Asian	1.615•	1.273	1.613•	1.274	1.282	1.574
	(.822)	(.812)	(.798)	(.785)	(.784)	(1.120)
Both Latino	.519	.514	.308	.295	.301	1.140•
	(.300)	(.295)	(.291)	(.285)	(.285)	(.370)
Both White	1.222•	1.172•	1.201•	1.144•	1.136•	1.300•
	(.137)	(.135)	(.133)	(.131)	(.130)	(.175)
Break overlap		___	.069•	.072•	.071•	.070•
			(.015)	(.015)	(.015)	(.022)
Same floor		___	1.516•	1.539•	1.559•	1.190•
			(.106)	(.104)	(.105)	(.146)
Age teacher		.003	___	.005	.005	.022•
		(.004)		(.004)	(.004)	(.005)
Age colleague		-.001	___	.001	.001	-.008
		(.004)		(.004)	(.004)	(.005)
Age similarity		.002•	___	.002•	.001•	.004•
		(.0003)		(.0002)	(.0004)	(.0006)
Status teacher		.085	___	.159	.161	-.134
		(.140)		(.137)	(.137)	(.221)
Status colleague		.895•	___	.956•	.957•	1.885•
		(.140)		(.138)	(.138)	(.229)
Status similarity		.204	___	.253	.242	.001
		(.438)		(.433)	(.433)	(.757)
Age similarity X Break overlap					.000	-.000
					(.000)	(.000)
Age similarity X Same floor					.001•	-.000
					(.0005)	(.0007)
Log likelihood	-15135	-15089	-15020	-14966	-14964	-47000
/cut 1	-3.630	-3.425	-3.006	-2.652	-2.660	-2.529
/cut 2	-2.334	-2.133	-1.720	-1.369	-1.378	1.483
/cut 3	-.879	-.681	-.2778	.068	.058	5.825
/cut 4	.553	.747	1.148	1.489	1.480	___
/cut 5	2.902	3.091	3.500	3.834	3.825	___
/cut 6	4.597	4.781	5.203	5.529	5.522	___

• p < .05.
The table includes coefficients with their standard errors in parentheses. Models I-V include four fixed effects to control for unmeasured school effects and three fixed effects to control for time. Model VI includes four fixed effects to control for unmeasured school effects and one time dummy.