Birds of a feather ... Selection and socialization processes in youths' social networks

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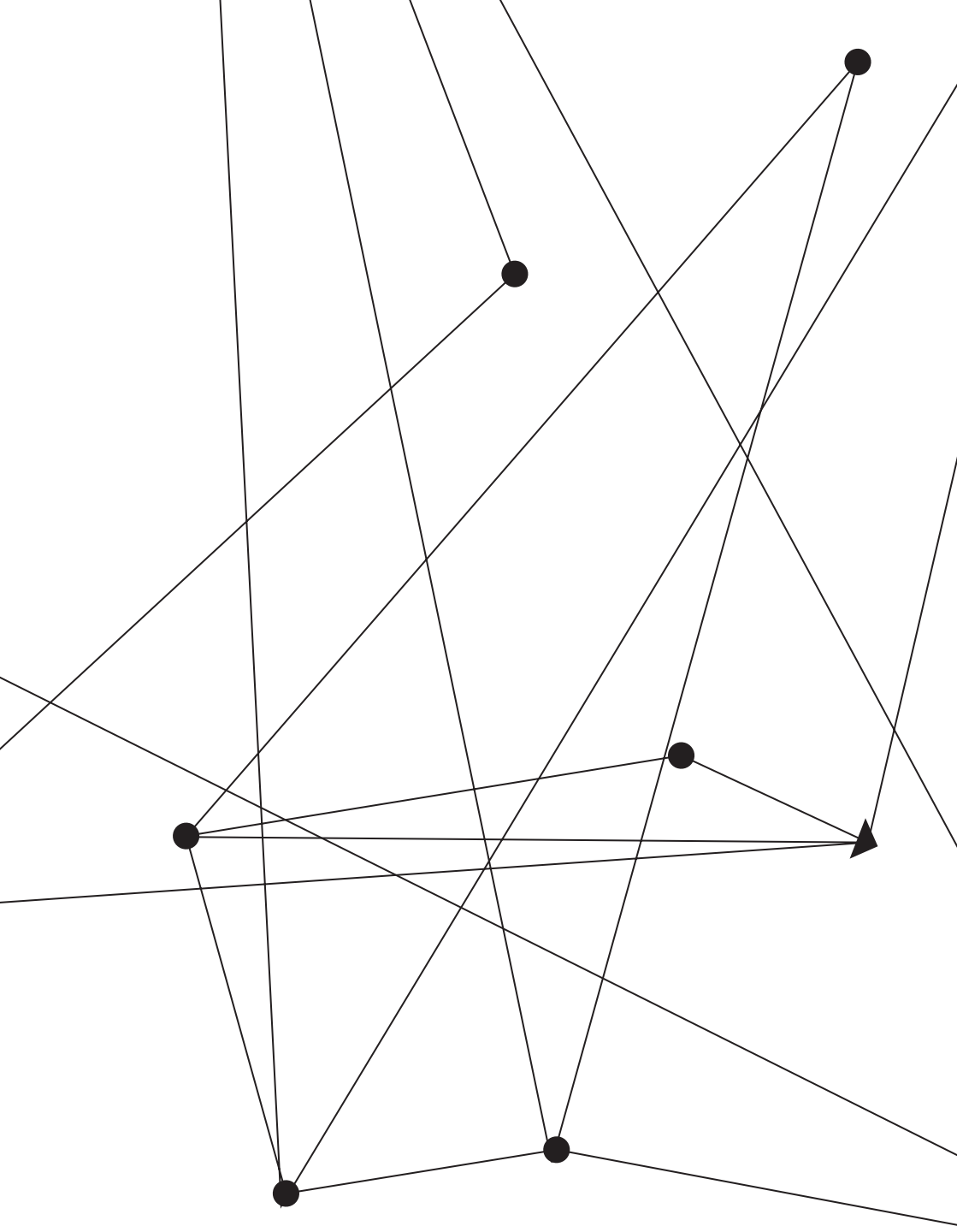

CHAPTER 3

Peers and academic achievement: A longitudinal study on selection and socialization effects of in-class friends

Abstract

The current study was conducted to analyze whether in-class friends influence each other's grades, and whether adolescents tend to select friends that are similar to them in terms of academic achievement. During one academic year, 542 eighth grade students (mean age 13.3) reported on three different occasions on their in-class friendship networks. At these occasions their report card grades for three subjects were copied from their files. We tested whether academic achievement functions as a selection criterion for friendship, and/or whether academic achievement is influenced by in-class friends, using social network analytic techniques. Socialization effects for Dutch and English language grades, but not for math grades, were found. We found no support for selection effects of grades.

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1 Introduction

Many parents worry that their children's school performance suffers under the company their children keep. They would like their children to seek the company of well performing and well-adjusted peers, peers that do not distract from learning and, ideally, make good models for high performance. Do friends influence each other's school grades? Arnett (2000) pointed out that in modern societies adolescents need a prolonged period for orienting on their future. Education plays an important role in adolescents' future orientations, because of its instrumental value to achieve future career goals. Generally, the intensity of this orientation to the future has proven to have a positive association with mental health and social adjustment (McCabe & Barnett, 2000). These positive consequences also have their down side in that lower academic achievement and academic underachievement have been linked to several negative outcomes such as delinquency (Bergin & Bergin, 2009), school drop-out (Garnier, Stein, & Jacobs, 1997), lower self-esteem (Crocker, Karpinski, Quinn, & Chase, 2003), lower occupational outcomes (lower status jobs and lower paying jobs), and even higher divorce rates (McCall, Evahn, & Kratzer, 1992). Report card grades are particularly important, because they are decisive for grade repetition, and in the long term they have a profound effect on students' educational and social attainment (Goza & Ryabov, 2009).

In the study of predictors of students' academic performance and engagement, the peer context is a major source of interest (Ide, Parkerson, Haertel, & Wahlberg, 1981; Kindermann, 2007; Kurdek & Sinclair, 2000). During adolescence peers are assumed to become increasingly more important for youths' social and emotional development (Masten, Juvoonen, & Spatzier, 2009). Irrespective the consequences for school adjustment students generally enjoy the informal and authentic learning opportunities provided by peers, particularly when compared with opportunities for formal learning in school. The activities they embark upon and the social structure of the informal settings is such that they feel motivated to get and stay engaged (Rogoff, Paradise, Arauz, Chorrea-Chavez, & Angelillo, 2003). During such

informal activities participants may get engaged in serious learning which may either distract from, or be strongly supportive of intended and formal learning in schools (Dodge, Dishion, & Lansford, 2006). Although the importance of the peer network for adolescent (social and cognitive) development has long been recognized (Rubin, Bukowski, & Parker, 1998), and the importance of the peer network specifically for educational outcomes has also been acknowledged (Coleman, 1961; Ide et al., 1981), relatively few studies have focused on the role of peer networks in academic achievement. Although some researchers have shown that students in peer networks are similar with regard to academic achievement (Chen, Chang, & He, 2003; Kiuru, Nurmi, Aunola, & Salmela-Aro, 2009; Kurdek & Sinclair, 2000; Liu & Chen, 2003, Wentzel, Barry, & Caldwell, 2004), academic focus (Barth, Dunlap, Dane, Lochman, & Wells, 2004), and the value they attach to academic standards (Rydell Altermatt & Pomerantz, 2003), for all these studies the question remains: How come that the peers are similar? Were they similar in the first place (a selection effect) or did they become similar after they met (a socialization effect or peer influence)? Most studies argue for either or both of these effects, or offer some evidence of socialization effects without concurrently estimating selection effects (Epstein, 1983; Ryan, 2001). In the current study, we aim to advance the knowledge on socialization and selection effects in academic achievement by analyzing these effects with a stochastic actor based model for network dynamics; such a model corrects for the interdependence of children in a classroom and can simultaneously estimate socialization and selection effects (Kenny, Kashy, & Cook, 2006; Laursen, Popp, Burk, Kerr, & Stattin, 2008; Ripley, Snijders, & Preciado, 2011; Steglich, Sinclair, Holliday, & Moore, 2012).

Current Study

Both common sense notions and many studies on cooperative learning (e.g., Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003), on the impact of bullying (Salmivalli, 2009) and on class disruptive behavior (Wilson & Lipsey, 2007) demonstrate that peers influence each other for better and for worse. This influence is reflected in students' well-being as well as in their school achievements. We use these studies as the basis for our first hypothesis:

peers socialize each other towards stable achievements or either negative or positive changes in achievements. In short, peers matter for achievements and changes in achievement over time.

For selection effects the picture is less clear. Peers may select each other's company based on salient characteristics, but what these characteristics are is not always clear, given that similarities are always accompanied by many differences (Hamm, 2000). Moreover, salience of characteristics depends on particular settings or contexts. Wearing a bathing suit during a gala diner would be highly salient, whereas during swimming lessons it would nicely fit the occasion. And in case a characteristic is sufficiently salient it is unclear whether a drive towards similarity or towards distinction is at stake. For instance, studies referring to situations in which a status hierarchy is particularly important, e.g., the rat race for best grades and best universities, point out that similarity in social status is not what drives peers to connect, but differences in status: high performers versus low performers. Connecting with a high status student may improve your own status (cf., Hallinan, 1978). Other scholars (e.g., Wehrens, Kuyper, Dijkstra, Buunk, & Van Der Werf, 2010) suggest that association with a non-similar peer accentuates the peers 'otherness'. This accentuation based on social comparison may have positive consequences for students characterized by appreciated characteristics (e.g., learning easy and being a good student) for which the comparison results in or is accompanied by positive feelings and a boost in self-esteem. If, however, the comparison results in negative self-reflections about one's capacities and jeopardizes self-esteem, this may have serious negative consequences for learning and development. These latter students would be better off selecting similar peers. Results from sociometric studies show support for both possibilities (Gorman, Kim, & Schimmelbusch, 2002). In short, with respect to selection effects studies are largely inconclusive. Hence, we cannot formulate a clear hypothesis as regards the selection of peers with similar average achievements.

2 Method

Participants

In the Netherlands, secondary education is track-based, and track levels range from lower (VMBO, junior vocational high school), intermediate (HAVO, general academic junior high school) to higher (VWO, pre-university) level. Students start their secondary education in seventh grade classes that are either of one track-level or combine two or three levels. Classes in our sample consisted of students of the same track in all schools except one. In this school, students from the intermediate and higher track were taught in classes together. In total, two schools with 10 classes of the lower track *(n* = 166), one school with mixed intermediate/higher track (six classes, *n* = 161) and one school with five intermediate track classes and three higher track classes *(n* = 215) participated. Because the two tracks in the latter school were distinct and separate, the networks of this school were analyzed separately, and treated as two 'schools'.

The sample used for this study consists of 542 students (51% female) from 24 eighth grade classes in four schools in the western part of the Netherlands. Sample size per school ranged from 40 to 215, class size from 12 to 31. Students ranged in age from 12 to 16, with a mean age of 13.3 (*SD* = 0.5), and 98% of the students were early adolescents (aged 14 or less) at the first measurement. In terms of ethnic background, the sample was mixed, 62% of the students had a Dutch background, 11% were Turkish, 2% Moroccan, 1% Surinamese, 1% Dutch Antillean and 16% had some other ethnic background, many with a mixed ethnic background, e.g. Dutch-Moroccan. Of 8% percent of the pupils the ethnic background was not known. The highest level of education that either parent finished determined SES. Of the parents 4.1% did not complete school or finished only primary school, 15.3% finished junior vocational high school, 11.4% general academic junior high school, 9.2 % pre-university level school, 6.5% senior vocational high school, and 16.6% held a university degree. Of the children 33.9% did not know their parents' education or did not answer the question regarding their parents' education.

Measures

Friendship networks. Students could nominate up to seven students that they liked within their classroom. The friendship network was represented in a matrix of all students in a classroom, where a '1' indicated the presence of a tie or nomination of this student, and a '0' the lack of a tie. Ethnic background was determined by asking the students to indicate in which country their parents were born. For the analyses, ethnic background was transformed into a dichotomous variable, indicating whether the student was a native Dutch student or an immmigrant student. In accordance with Dutch national policy students with mixed native-immigrant backgrounds were classified as immigrant students.

Academic achievement. Report card grades were collected from school records. At T1 –the start of the school year– we used the grades that were given at the end of the 7th grade, at T2, the grades that were given for the Christmas report card and at T3 the grades of the Easter report card. Report card grades were noted for three subjects: English, Dutch and Mathematics. Grades in the Netherlands theoretically range from 1-10. Very few students actually receive a 1, 2, 3 or 10. We therefore transformed grades 1, 2, or 3 into a 4 and a score of 10 into a 9. The proportion of missing data per achievement indicator was as follows: Dutch achievement: 5.9%, English achievement: 5.8%, math achievement: 6.2%.

Procedure

A researcher administered questionnaires, with teachers present. During one school year, each school was visited three times, once during autumn, once in winter and once in spring. Questionnaires took approximately 40 minutes to complete. The data-collection moments were three months apart. At each occasion, an identical questionnaire was administered. All students in each classroom were invited to participate in the study. Parents received information prior to the study, and could indicate whether or not their child could participate.

Analyses

We used the social network analytical package SIENA (Snijders, Steglich, Schweinberger, & Huisman, 2008). SIENA can be used to test socialization and selection effects in a longitudinal network using stochastic actor based models. Within a stochastic actor based model the evolution of a network is viewed as a stochastic process driven by the actors. Probabilities of tie changes may be influenced by the network structure, by characteristics of actors, or by characteristics of pairs of actors (Snijders, Van de Bunt, & Steglich, 2010). First we ran network analyses per school. Then we performed a meta-analysis using SIENA08 (Snijders, 2008; Snijders, & Baerveldt, 2003) on the outcomes of the first analyses, to generalize the findings from the individual schools. Because some school samples were small and would not allow the estimation of the many parameters, we ran a single model for each achievement model (math, English, Dutch), as opposed to estimating all effects for the achievement measures simultaneously.

To test our hypotheses, we included selection effects (choosing friends that are similar in terms of grades) and socialization effects (becoming similar to friends in terms of grades over time) in the models for math, English and Dutch. Furthermore, all models were controlled for the structural network effects Outdegree[2] (the extent to which actors tend to nominate others) reciprocity[3] (the tendency to return a friend's nomination), and Geodesic distance of two[4] (a negative parameter suggests the tendency for network closure: becoming friends with friends of friends). Controlling for these structural network effects is advised in the SIENA manual (Ripley et al., 2011).

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[2] mathematical definition: S_{i1}^{net} (x) S_{i1}^{net} = $x_{i+} = \Sigma_j x_{ij}$, x_{ij}=1 is the presence of a tie, x_{ij}=0 is the absence of a tie.

[3] mathematical definition: S_{i2}^{net} (x) S_{i2}^{net} = $\Sigma jxijxji$

[4] mathematical definition: S_{i12}^{net} (x) S_{i12}^{net} = $\neq\{j \mid x_{ij}=0, \max h(xihxhj)>0\}$

Because, in the Netherlands as well as in other western countries, girls tend to perform better academically than boys (Fuligni, Eccles, Barber, & Clements, 2001; Kiuru et al., 2009; Van Houtte, 2004), and immigrant students tend to have a poorer academic performance than native students (Centraal Bureau voor de Statistiek, 2012), and simultaneously both gender and ethnicity have been found to be related to friendship selection (e.g., Baerveldt, Zijlstra, De Wolf, Van Rossem, & Van Duijn, 2007; Burk, Steglich, Snijders, 2007), we control the analyses for gender and ethnicity selection effects.

The networks were collected within classrooms, but later on were merged to school-level networks to prevent small sample sizes that may cause instable parameter estimates (Snijders et al., 2008). To achieve school-based networks, structural zeros were used for ties between classes. This means that a tie between students from different classes was made impossible. During T1, 1.4% of the ties were missing on average per network. During T2, 3.1% percent of the ties were missing on average per network, and during T3, 1.7% of the ties were missing. Missing ties mostly occurred because students were absent on the day of the data collection, and thus on that day could not nominate peers as friends. If the number of missing ties is lower than 10% it is unlikely that missing data will cause difficulties or distortions in the estimation procedure (Ripley, Snijders, Boda, Vörös, & Preciado, 2013). Only non-missing data is used in the estimation of the parameters (Ripley et al., 2013).

3 Results

The mean grades and standard deviations for Dutch, English and Math are presented in Table 2. The grades for Dutch and English were stable in the first two waves, but dropped in the third wave. The grades for Math declined each wave, but also showed the sharpest decline in the third wave. A repeated measures ANOVA demonstrated a multivariate significant effect (Wilks' lambda $F(6, 1864) = 17.723$, $p < .001$, $\chi^2 = .054$). Follow-up univariate ANOVAs revealed significant declines of Dutch grades ($F(2, 934) = 6.597$,

Table 1. Means (and standard deviations) of original grades

	Dutch	English	Math
T1	7.01 (.83)	7.11 (.97)	6.72 (.93)
T2	7.05 (1.08)	7.11 (1.30)	6.61 (1.47)
T3	6.91 (1.10)	6.74 (1.11)	6.43 (1.30)

p =.001, χ^2 =.01), English grades (F(2, 934) = 35.189, p < .001, χ^2 = .07), and math grades (F(2, 934) = 17.528, p <.001 χ^2 =.04).

The friendship networks are characterized by reciprocated friendships (see the significant reciprocity parameter), which suggests that actors tend to reciprocate friendship nominations. Significant selection effects for gender and ethnicity suggest that children tend to become friends with peers with similar ethnicity and gender. A negative and statistically significant outdegree suggests that children tend to not establish friendships with unspecific others, or in other words, establishing a tie is 'costly' and will only happen when this tie offsets the initial 'cost' of establishing a tie by positive rewards in the form of positive parameters for other factors, such as for instance a similarity in gender, in the case of a positive gender effect. A non-significant result for geodesic distances of two reflects that actors in the included networks are not prone to network closure; that is, they do not tend to become friends with friends of friends. For none of the subjects did we find statistically significant selection effects. We found significant socialization effects though, indicating that students' Dutch and English achievement is influenced by their friends' achievement. The socialization effect for math was not significant. The results are summarized in Table 2.

Table 2. Meta-analysis of models describing interdependence of friendship networks and Dutch-language, English language and math.

	Mean	SE
Network dynamics		
Outdegree	-2.89***	0.19
Reciprocity	1.75***	0.28
geodesic distance	-1.00	.30
Gender similarity	2.10***	.29
Ethnic similarity	.27*	.11
Math similarity	.08	.58
Dutch Similarity	-.35	.73
English Similarity	.10	.47
Behavioral dynamics		
Math average similarity	.72	.54
Dutch average similarity	2.67***	.62
English average similarity	1.56**	.57

*=p<.05; **=p<.01; ***=p<.001

4 Discussion

In this study, we set out to determine the role that academic achievement plays for adolescents in selecting peers to interact with, and to determine whether peers influence adolescents' academic achievement. The results indicate that there are no selection effects, but that there are socialization effects on English and Dutch language achievement.

Selection and Socialization Effects on Academic Achievement

Adolescents' achievement is influenced by their friends' achievement. This effect was found in separate models for English and Dutch, whilst controlling for structural network effects and gender and ethnicity selection effects. It is a finding that indicates that friends are an important factor in academic achievement development. This is not to say that friends do have a positive effect. The fact that we also found that over a year grades go down for all subjects could mean that they negatively impact on each other's achievements. Matter of factually, the results suggest that peers may positively or negatively affect academic achievement, and that over time friends tend to become more similar in terms of grades. Dodge and colleagues (2006) indeed suggested that socialization means that peers can both support and detract from learning, depending on the particular attitude of the peers. That there was no socialization effect for math may perhaps be explained by the rather special status of math in the curriculum (Maassen & Landsheer, 2000). Math scores are also relatively strongly related to intelligence (Blackwell, Trzesniewski, & Dweck, 2007; Douglas, Burton, & Reese-Durham, 2008) and math anxiety (Ashcraft, 2002), and perhaps these personal influences prevent a strong influence from peers.

For the selection of friends the young adolescents participating in our study generally used other criteria than school achievements. Although school and school activities may absorb substantial proportions of young persons' time most days of the week, week in week out, year in year out, most of these

youngsters do not see formal learning as cool and fun, at least not in western countries (Hendry, Shucksmith, Love, & Glendinning, 2005; Verma & Larson, 2003). At the same time studies (e.g., Hendry et al., 2005; Mansfield & Wosnitza, 2010) show that being together with peers and helping each other is important for young adolescents. The combination of these two tendencies may explain why we did find less support for selection than for socialization effects. De Klepper, Sleebos, Van de Bunt, and Agneessens (2010) have a simpler explanation: selection occurs more frequently with regard to visible behavior and attitudes, which are visible before students become friends, whereas socialization occurs more frequently for non-visible attributes (e.g., school achievements). For non-visible attributes, similarity between friends more often is the result of socialization. Although this argument is by no means definitive, we do classify report card grades as an attribute that is not highly visible – they are actually private and confident– and therefore is more likely to be socialized than that it is used as a selection criterion.

Although this makes sense, it does not explain why we do not find socialization effects for math. It is not likely that math achievements are more visible than language achievements. Earlier we suggested that personal resources like intelligence, are more important for math achievements. For language competence in English and Dutch it is more likely that social resources (TV, internet, and opportunities to communicate) are more important.

Limitations and Prospects

A point of discussion with regard to the networks in our study is that we collected network nominations within classrooms, and then combined these classroom networks into school networks. It was impossible for students in our study to indicate relations that they had with other students in the same school or same year-group, even though these relations may have been present. A central issue in all peer context research is how to define the borders of the peer context, or in this case network. There are many practical advantages of limiting the network to the class, as well as substantive reasons. One main reason for us to limit ourselves to classrooms was that adolescents of this age

take all their classes with the same students. Hence, we ensured that they chose peers that they spent a lot of time with.

We also would like to address one shortcoming in both the literature of peer socialization and in our study. By separating selection and socialization effects, we have taken a first step towards describing the processes that result in peer group homogeneity. But we need real process studies to tell us exactly how selection and socialization occurs. If, for instance, socialization occurs because frequent contact allows behaviors to be copied ('contagion effect'), we would expect socialization to occur more often in high frequency contact relationships. If socialization occurs through the means of thought sharing and discussion we would expect socialization to mainly occur within peer groups that are defined by intimate relations motivated or characterized by a willingness to share thoughts and discussions. We would also expect socialization to occur more in girls' networks, as there is some evidence that girls' friendships are more defined by thought sharing than boys' friendships (Van Houtte, 2004), and girls talk more about what they have learned in school (Bishop et al., 2004). Girls also repeatedly view their friendships as more positive than boys and know more about their friends than boys do (Berndt & Keefe, 1995). Yet we found no evidence of increased socialization for girls, suggesting that discussion and thought sharing is not the (most important) process through which socialization occurs, at least for academic achievement. We know of no micro-developmental studies that closely and intensively followed children characterized by particular peer relationships to find out what interaction processes are at stake in selection and socialization processes, and feel this area of research would benefit greatly from such a study.

Educational Implications

Our finding that students influence each other's achievement entails a challenge to find out whether and how this can be used for developing an educational tool. Although we hope that with time peer interaction might start serving particular learning goals, it is perhaps presumptuous to expect

teachers or parents to influence preferences for friends or peer networks in the classroom. Teachers, however, can place students in cooperative dyads or groups. Hence, teachers can influence the interaction students have with each other. It would be interesting to test whether the socialization effects also occur within teacher-formed cooperative groups. Positive teacher-steered interaction experiences might influence future (free) choice of cooperation partners. Obviously, not just finding a way to give peers a more prominent role in students' formal learning is at stake here, but also the question how to make sure that peers have a positive impact, leading to gains in competence.

To conclude, we have shown in this study that the peer context is relevant for the academic achievement development of adolescents. Adolescents do not select peers on the basis of their achievements, but they are influenced by the language achievement of their peers.

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