

REDES- Revista hispana para el análisis de redes sociales
Vol.19,#12, Diciembre 2010
<http://revista-redes.rediris.es>

Why and how selection patterns in classroom networks differ between students. The potential influence of networks size preferences, level of information, and group membership.

Chris Baerveldt - Utrecht University - The Netherlands¹
Gerhard G. van de Bunt - VU University Amsterdam - The Netherlands
Ainhoa de Federico de la Rua - Université de Toulouse - France

Resumen

Los estudiantes de secundaria pueden escoger compañeros como nuevos amigos utilizando un repertorio de modalidades. Pueden querer activamente crear nuevas amistades, utilizar la estructura existente de la red y/o utilizar la información, escasa y a menudo errónea, sobre los "candidatos". En este artículo teórico argumentamos que dichas modalidades de selección no deben ser estudiadas como resultado de reglas generales tal y como se viene haciendo en los estudios sobre redes sociales. En concreto, afirmamos que las preferencias relativas al tamaño de las redes, el nivel de información sobre los atributos de los compañeros de clase y la pertenencia a grupos pueden ser distintas para cada alumno y, por ello, también sus modalidades de selección pueden ser distintas. En este artículo se esbozan las articulaciones teóricas entre ellos.

Palabras clave: Redes sociales – Teoría – Selección - Adolescentes.

Abstract

High school students can select class mates for new friendships using a repertoire of patterns. They can actively pursue new friendships, make use of the existing network structure, and/ or use the scarce and often erroneous information about candidates. In this theoretical paper, we argue that such selection patterns should not be studied as the result of general rules, as is usually done in social network studies. Specifically, we state that network size preferences, the level of information about individual attributes of fellow classmates, and group membership are likely to differ among high school students, and that as a result, also their selection patterns are likely to be different. In this paper we sketch the theoretical articulations between these.

Key words: Social networks – Theory – Selection – Adolescents.

¹ Send correspondence to : Chris Baerveldt (c.baerveldt@uu.nl)

Introduction

Highschool classroom networks offer an attractive focus for a theoretical paper about selection patterns. Peer networks play an important role in the adolescent life. During adolescence, peers gradually take over certain of the support roles of parents. Adolescence researchers show that peers influence the adolescent's behavior, such as delinquency, smoking, and pro-social behavior, their academic achievement and even their health (Rubin et al., 1998; Steinberg & Sheffield Morris, 2001). Especially, the peer network structure of groups consisting of persons that are mostly new to each other develops and changes very rapidly; the network dynamics are strong, which means that many new relationships are established or dissolved. Since this is often the case in the beginning of first year classes of secondary schools (e.g., Hardy, Bukowski & Sippola, 2002), and because of the importance of peers, we will focus on the development of friendship networks within such classes.

Selecting candidates for friendship is an uncertain enterprise within high school, in particular in the first period, because that is the time and place when friendships, often lasting during the whole school period, and sometimes even for life, are mostly formed. It is risky, for students might choose candidates with whom friendships may not offer them what they want or need. Also, a move to a candidate will not always result in a relationship: it takes two to tango. Apart from the loss of invested time and effort in such cases, moves may even have negative consequences. For instance, when a student makes a move to a candidate whom his or her friends disapprove of, he or she might lose status within the peer group or even lose friends. An additional problem is that students usually have only little and erroneous information about their fellow students, and poor information about the structure of the friendship network, and thus about existing friendship groups. As a consequence, it is hard for them to evaluate the eligibility of the candidate, whether he or she is inclined to react positively to a move, or even whether moves to candidates will provoke negative effects.

The complexity of the choice problem prevents researchers from accurately predicting which relationships will develop in a new network. There is always a wide range of potential outcomes. However, not all configurations are equally possible. While the actual choices may be hard to predict, it might be possible to distinguish between selection processes. In this theoretical paper, we assume that selection processes can follow different patterns, often related to well known selection mechanisms in the literature, like network closure or homophily (i.e. the preference

for fellow students similar in certain characteristics). We focus on first year students' networks. In such a context most students do not know each other when they start their new highschool life, so that they hardly have a choice but to make new friends. There, the selection patterns include a certain level of activity in changing friendship ties, and, when students are active, their responses to the network structure, and their superficial assessment of (error-prone) information about potential candidates. Note that the mechanisms in the literature are usually interpreted as general rules that apply equally for all members of a network. However, such an interpretation is hard to maintain from a theoretical point of view. We argue that the type of selection pattern is likely to depend on various conditions, and, consequently, is also likely to differ between network members and between time points. Currently, the literature hardly offers a theoretical basis for predicting such differences, and thus, this paper should be viewed as a first step on a long walk. Note that the opportunity structure will not be as important in this context as in many other network settings, because all students have ample opportunity to meet and befriend all fellow students. Still, there are ample reasons to expect different patterns. Here we have selected some effects of preferences, information and network structure. Accordingly, in this paper we present hypotheses about the influence of personal network size preferences, the level of information about fellow classmates, and group membership on student's selection patterns.

The repertoire of selection patterns

The literature provides for a variety of selection patterns, such as reciprocity, transitivity, and homophily to mention the most important ones. Here, we will not describe and review a complete list of patterns but instead focus on a subset of patterns that are feasible in in a context of first year students. This context is relatively uncomplicated, in the sense that interaction occurs under rather homogeneous conditions, and therefore an excellent starting point to introduce a repertoire of selection patterns. Consequently, the initial question we want to answer is: Which kinds of selection patterns are probable within a first year students' network? To answer this we have to imagine what students actually can do. First, they can vary their level of activity in the selection process. In most school systems, students are free to choose their friends. Therefore, in practice they can make moves to all other students, and accept moves from all other students. Second, if students make moves, they can make use of the already

existing friendship network. It might for instance be appealing to follow a transitive pattern, that is, to befriend friends of friends. Note that, while the initial network is generally sparse without much of a structure, there are probably already some existing friendships that could play a role in the friendship selection process. Third, students can respond to the qualities of their fellow students. Since the students usually have limited and erroneous knowledge about these qualities, they can be expected to respond initially only to characteristics they can distinguish, like ethnicity and life style. These characteristics are then acted upon as proxies to the qualities that would really matter to them, like trustworthiness, understanding, and upcoming shared activities. The students' level of activity regarding selection, and their response to the already existing network, and to the characteristics of fellow students, constitute the main repertoire of selection patterns. In the next section we take a closer look into these patterns and the reasons why students would behave according to them.

Level of activity: making and accepting moves

The level of activity is given by the answer to two questions: how many moves do students make and how many do they accept? A move is any kind of activity to initiate a friendship, like making contact, expressing interest, or proposing joint activities. Since people have different needs for social contact, some students might be more involved than others (Wrightsmann and Deaux, 1981; Zeggelink, 1993). Some students will not be directly involved in the selection process, not making any moves and not accepting any of the moves of their fellow students. Others might be involved by making moves, accepting them or both.

There are several reasons why the level of activity will be relatively high in freshmen networks. The start of a new school usually truncates the existing network from the old primary school. Generally, only a small minority of the old school friends visits the same class at the new school. For practical reasons as time and place, old friendships are partly or often dropped, and the students usually have less friends than they favor when they start at the new school (e.g., Van de Bunt, 1999). Also, as we already indicated, peer relations are of growing importance in adolescence; peers take over part of the roles from parents. Moreover, according to developmental psychology (e.g. Palmonari, Pombeni, and Kirchler, 1989, 1990; Heaven, 1994; Cotterell, 1996) and sociology (e.g. Percheron, Bonnal, Boy, Dehan, Grunberg, and Subileau, 1978), people are developing a social identity in adolescence. Adolescents learn by experimenting and

making mistakes what kind of person they are in social relationships, what they need and want in relationships, and with what kind of persons they agree in relationships. Consequently, in the beginning they often switch friends. Finally, a large part of the adolescent's life with peers takes place at school, and adolescents usually have many significant others (i.e. friends) at secondary school.

There are also some reasons why students would be less active in selection processes. Since the total time a student can invest in friendship is limited, there is a maximum to the number of friends. Therefore, students with many friends have less need to look for new friends (Zeggelink, 1993) compared to students with only a few friends. Accordingly, we expect less selection activity from students who already have many friends, either new ones, or from primary school. Moreover, the need to start friendships at school may be less when students already have more friends outside school, e.g. neighbors or sport mates. There is some evidence that the number of friends at school is negatively correlated with the number of friends outside school (Baerveldt et al., 2003). Finally, the level of need for friendship is unevenly distributed among persons (Wrightsmann and Deaux, 1981; Zeggelink, 1993). Besides being less active, students may also be passive (see Figure 1). They can wait for others to initiate a move and then reciprocate by entering into a friendship. Waiting might be a good option when they expect high costs to make a move, have no strong needs to establish new relationships, or lack useful information about candidates.

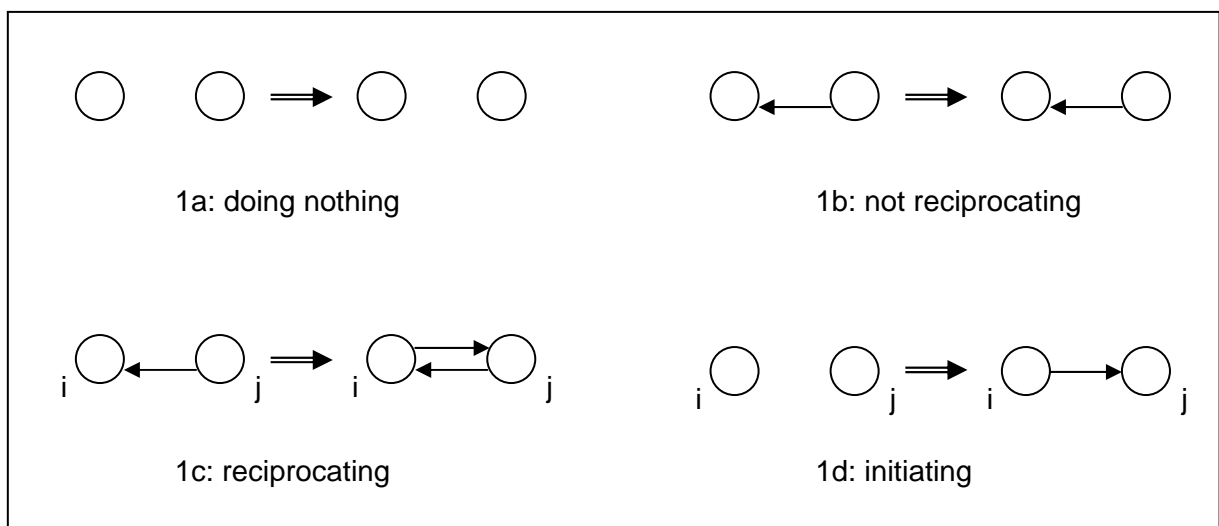


Figure 1: Levels of activity. From doing nothing and not reciprocating to reciprocating and initiating.

Given that students are actively engaged in making friends, they don't do so randomly. We assume that they make and react to moves using the scarce amount of information they have about the existing structure of the network, and

characteristics of potential candidates. This information is often incomplete, and sometimes even erroneous. In the next two sections we discuss these two types of friendship formation, respectively.

Responding to the structure: linking and jumping

Friendship networks in classes during adolescence often consist of small groups, that can be characterized by having many internal (i.e. within the group) and few external (outside the group) relationships. In the beginning of relationship formation, these closed groups generally do not exist yet. It is often shown that the network structure itself plays an important role in the further development of this structure. How do the freshmen respond to the network structure? First, we will discuss the most important effect of triadic configurations on relationship formation, namely structural balance. Second, as a result of triadic moves groups (with their own dynamics) will be established.

Even at the first moment (i.e. the first lesson) some structure may exist. Depending on conditions like the way classes are composed by the school organization and the integration of the school in a neighborhood, there can be a substantial proportion of students who were already friends before entering the class. The number of friendships usually grows rapidly in the first weeks after the network startup, bringing about a sometimes even substantial network structure (Van de Bunt, 1999). There are several theories explaining how students would respond to network structure. The most influential of these theories is the cognitive dissonance theory of Heider (1946, 1958); the basis of many structural balance models (e.g. Newcomb, 1961; Davis, 1963; Holland and Leinhardt, 1971, 1972; Hallinan, 1974; Hummell & Sodeur, 1990).² Balance theory assumes that individuals need consistency or balance in their pattern of relationships. (Im)balance is based on attitudes of two persons towards a third person. In terms of friendship, the two are in

² Besides balancing processes, the literature also suggests another closure mechanism that might lead to friendship formation, namely equivalence². Often two types of equivalence are distinguished, regular or role equivalence and structural equivalence. The latter one means that two persons have relationships with exactly the same persons, whereas the former one is more general and focuses on having similar relationships (Wasserman and Faust, 1994). The preference for structural equivalent relationships, and balanced relationships are closely related. Structural balance is restricted to three persons, whereas structural equivalence usually takes into account all others in the network. If the latter one is restricted to three persons, they are the same. Also transitivity and structural balance are closely related. In friendship research transitivity is generally applied to directed relationships but does not take into account whether relational sentiments are mixed within the triad, whereas structural balance is based on undirected relationships, and emphasizes the sentiments involved. The main correspondence is that all three mechanisms predict the closeness of a triad via linking. In friendship literature, structural balance and transitivity are very important mechanisms to make the network work. Equivalence related arguments are more studied in organizations, where equivalent positions may indicate similar roles and where cooperation between actors in equivalent positions can be fruitful. Since such roles are less prominent in friendship networks, we will not go into further detail regarding equivalence.

balance if they are friends and either both are also friends of a third person, or they both are not friends of this third person or even have a troubled relation with him or her. The two are also in balance if they are not friends (or even have a troubled relationship), and have a dissimilar feeling about the third person. According to balance theory individuals have a tendency to form balanced relationships rather than imbalanced ones; they maximize similarity in choosing friends or disliking others (Newcomb 1961). Note that in theory an actor may also turn an existing friendship sour to get the triad (i.e. a network configuration of three persons) in balance. In this paper, we will not dive into this matter. At the moment, we are only interested in the decision to initiate or not initiate friendship.

Following balance theory, we expect students to link, that is, to make moves to friends of friends. The linking mechanism in this figure is generally known as making the triad transitive. In general, linking makes it also easier to get acquainted with potential friends; the introduction can often easily be organized by the mutual friend. The members of this triad often already share activities, like sports, doing homework, or hanging around. Balance theory also predicts more stable friendships once a third person enters the story. There is, for instance, some guarantee that the mutual friend will also invest in the friendship between his or her two friends too, the main reason being that two of his or her friends being at odds with each other brings about cognitive dissonance for the mutual friend. In sum, linking reduces some of the risks of making moves, gives some guarantee of an outcome, and saves time.

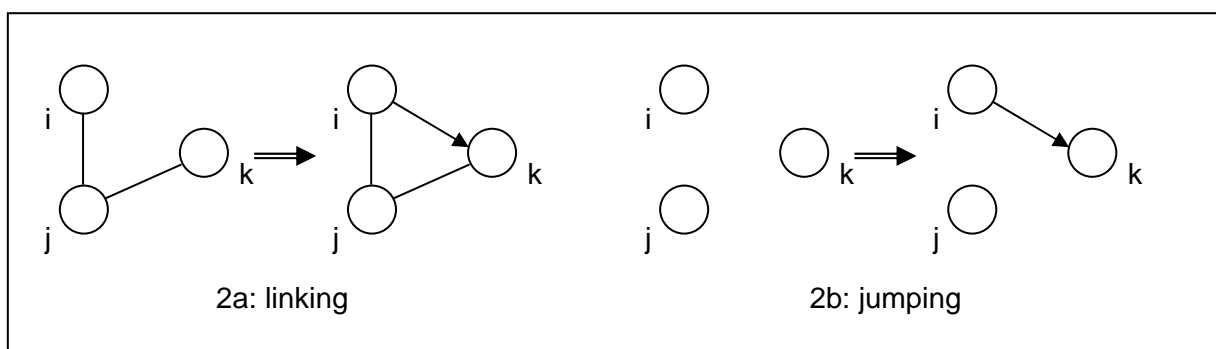


Figure 2. Jumping versus linking. A straight line stands for a friendship, and an arrow for a friendship initiation (i.e. proposal).

While linking is a probable option for students, there are also some reasons that students would jump instead, that is make moves to fellow students with whom they do not share friends (see Figure 2). The most obvious reason for a student to jump is not having a friend at all in the network (yet). In many networks linking is

only possible after some time when enough friendships have already developed. This is often the case in the first moments of a group being together. On the other hand, there are also some reasons why students jump when linking is possible. The main reason is that there are more attractive candidates outside the balanced triad. Also the number of fellow students to jump to is usually much larger than the number of fellow students to link to. Furthermore, even while cognitive dissonance theory predicts triads to be homogenous, friendships via linking are sometimes less fulfilling in *some* respects than some friendships achieved by jumping. With whom can students talk about sports, parents or homework, when none of their friends, with whom they have so much else in common, are interested? Whether students will jump depends on the salience of what is missed by linking and got by jumping (see also below). Also the history of the relationship is of importance. If triads of friendships from primary school are not closed, they can hardly be expected to close in the new network (at secondary school). Summarized, we can predict that in many networks, after a period dominated by jumping, the frequency of linking will rise when the network develops further.

Candidate patterns: responding to apparent characteristics of candidates

Students can respond to perceived characteristics of other students. It could be argued that students prefer candidates with whom they expect to get 'the best friendships' (see for instance, Zeggelink, 1993; Van de Bunt, 1999). However, the information students in first year classes have about their fellow students, is usually incomplete and partly erroneous to reliably point out the best candidates. It is, for instance, usually difficult for students to assess whether relatively unknown class mates can keep secrets or would understand family problems or falling in love. Still, it can be argued that students somehow respond to characteristics of candidates, in particular to characteristics that can easily be perceived, like gender, race, age, physical attractiveness, style and language use. The literature suggests two important kinds of 'candidate patterns', where students act on candidate characteristics, namely the preference for similar others, and the aspiration for specific others (Blau 1962), such as fellow students with much social capital.

The similarity pattern is the most famous selection pattern and is most studied in social research, even already a long time ago (e.g. Homans, 1950; Lazarsfeld and Merton, 1954; Morton, 1959; Newcomb, 1961) , in particular regarding friendship formation among children and adolescents (e.g., Tuma and Hallinan, 1979; Hansell, 1981; Dahlbäck, 1982; Aboud & Mendelson, 1996). The basic idea is simple:

members of a network will choose candidates with whom they have certain characteristics in common (see Figure 3). Depending on topic and theory, authors study similarity regarding different characteristics and combinations of characteristics. Similarity in the friendships of children and adolescents is found regarding a wide range of variables, e.g., gender (Maccoby, 1990), age (Cairns & Cairns, 1994), race/ethnicity/nationality (Hallinan, 1982; de Federico, 2003; Baerveldt et al. 2004; Baerveldt et al. 2007), socio-economic background (Kupersmidt, DeRosier, & Patterson, 1995), and physical attractiveness (Cairns & Cairns, 1994), several kinds of behavior (e.g., Cairns, Cairns, Neckerman, Gest, & Gariépy, 1988; Haselager, Hartup, Van Lieshout, & Riksen-Walraven, 1998; Rubin, Lynch, Coplan, Rose- Krasnor, & Booth, 1994), politeness, sense of humor, and sociability (Rubin, Bukowski, & Parker, 1998), sociometric status (Kupersmidt, DeRosier, & Patterson, 1995), academic motivation (Kindermann, 1993), and intellect (Rubin et al., 1998). While, at least regarding some of these variables, similarity could also be the outcome of influence processes, most authors recognize that adolescents choose friends with similar behaviors, attitudes, and identities.

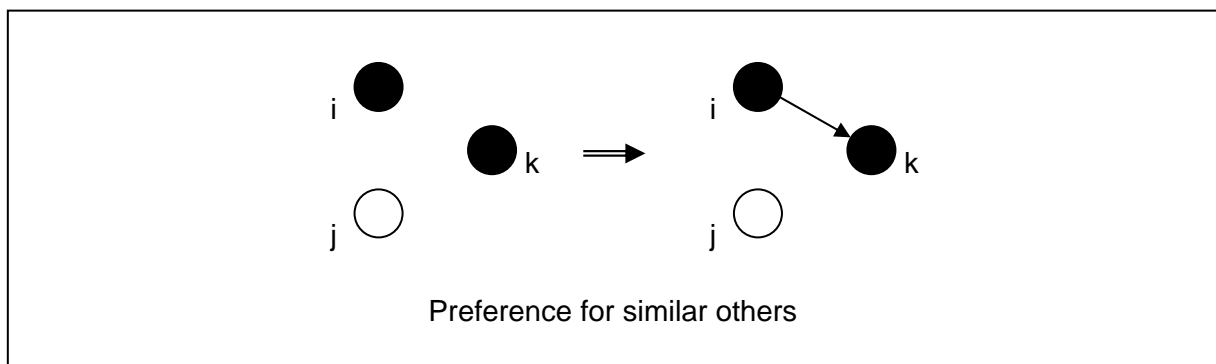


Figure 3. Example of a similarity pattern. An arrow stands for a friendship initiation (i.e. proposal).

Authors give different reasons for similarity patterns. A good review paper by McPherson, Smith-Lovin, and Cook (2001) presents the main causes of homophily cited in the literature. Some are of no interest to classroom friendship literature, such as geography, and to a lesser degree, family ties. Foci might be important (Feld, 1981). Those students that see each other also in other social arrangements have a larger probability to get engaged in social relationships. Also specific school arrangements could be of importance, for instance distinct classes for groups of different capabilities. Most causes, however, are opportunity arguments. If you see the other a lot, chances increase that you get a relationship. It does not explain, however, why if dissimilar people are also 'available', most people still prefer similar ones. According to psychologists it may be because of (again) making relationships in balance. Those who are similar often have similar beliefs, values, etc., so that to

keep a relationship in balance, one should pick out similar ones (Heider, 1946). Advocates of reinforcement theories argue that we like those who reward us (Byrne and Clore, 1970; Lott and Lott, 1974). Again, since similar others share beliefs and attitudes, the chances that they will reward us, are relatively large (see for instance, Lott and Lott, 1960, 1974; Byrne, 1961, Byrne and Clore, 1970). According to social comparison theorists, people need to continuously evaluate their behavior, ideas, etc., and because objective means are not always (or hardly ever) available, they need others that are capable to judge them. Again, these are similar, in lifestyle, personality, and ideas. If we apply this to freshmen, they would select those who share the same values and beliefs (e.g. regarding home work, petty crime, alcohol), same behavior (e.g. playing chess or soccer, gaming), same life style (e.g. smoking, driving a scooter, wearing skate cloths), similar preferences (e.g. being into rap or ballet), etc.

Two theories do not agree with the similarity argument and would rather correspond to aspiration for specific others. Social capital theory (Coleman, 1988; Lin, 2001; Flap & Völker, 2003) argues that students would opt for relationships with candidates who are able and willing to provide them with important goods, like support or information. The feature model states that certain characteristics of children (e.g., helpfulness) are positive factors, whereas other features are negative factors (e.g., aggression) for interpersonal attraction (Bukowski, Sippola & Newcomb, 2002; Newcomb, Bukowski & Pattee, 1993; Aboud & Mendelson, 1996). The feature model is a general model that applies to many children. It has been amply studied in the popularity or peer acceptance literature (e.g., Newcomb, 1961; Newcomb, Bukowski, & Pattee, 1993), but to a lesser extent in the literature on friendship (Aboud & Mendelson, 1996). Since, however, both models are less backed up with empirical evidence, and they speak about characteristics that are very difficult to see in potential friends in the developing network, we restrict ourselves to the similarity model.

Effects on selection patterns

Emperical network studies usually do not investigate differences in selection patterns between members of the same network. In effect, selection patterns are usually tested as a set of general rules or a general network theory that applies similarly to the studied type of network and its members. In addition, when different patterns are tested simultaneously over a network, the objective is generally to test what patterns are strongest over all network members; differences

between individuals are usually ignored. In the few cases that interaction effects of patterns and personal attributes like gender are tested, these effects are usually included only as control variables. Despite the differences, many presented theories and models suppose a considerable degree of homogeneity regarding personal motivations for relationships.³ However, homogeneity of motivations is highly improbable among high school students. Friendships may be useful for a wide variety of issues, including practical and emotional support (e.g., Kassenberg, 2002), social status, and intimacy (Dijkstra, 2003). The motivations can be social or interpersonal in nature and directed toward gaining communication, intimacy, and love, or individualistic in nature and directed toward gaining agency, power, and excitement (Bukowski, Sippola & Newcomb, 2002; Buhrmester, 1995). The literature shows that children do have different motivations regarding relationships. For instance, Rudolph (2010), one of the authors in an interesting new psychological research line, shows that children who view their peer relationships more as non-malleable, were more likely to focus on their status (impressing their peers). Another research line (e.g, Geary, 2003), states that girls have more need for intimacy, while boys are more directed to agency and social companionship. As a consequence, girls will go for a small number of trustworthy and close friends, while boys will select a larger number of more superficial friendships for shared activities like sports or hanging around. This implies that girls will be more selective and careful when engaging others, while boys will be much less discriminating in their friendships.

Besides the differences in preferences, there are also reasons to expect other conditions that cause differences among student's selection patterns in the same network. Some of the reasons to follow a certain pattern can be more feasible for one actor than for another. For instance, students who have no friends at school will probably take more initiative to make a move or reciprocate one, than students who already have (many) friends.

³ Note that statistical network models are often ahead of network theory. For instance, Michael Schweinberger's work on SIENA Plus (2009) already offers an opportunity to test homogeneity of motives over time in making network choices. SIENA (see the work of Snijders and colleagues in the special issue of Social Networks (e.g. Snijders, Van de Bunt and Steglich, 2010)) is only recently also capable to test interaction effects between endogenous network effects and exogenous network effects. This is exactly what is needed to test differences in selection patterns. Our paper is one of the first to fill the gap between theory and analysis.

	<i>Effects from:</i>		
	Preferred network size (larger)	Level of information (higher)	Group membership (yes)
<i>On:</i>			
Activity level	.	.	.
Linking	.	.	.
Candidate similarity	.	.	.

Table 1. Investigated effects of some personal conditions on selection patterns in classroom networks.

We aim to study selection patterns as depending on conditions that may differ between network members. Therefore, in this paper we will highlight the effects of three personal conditions on three selection patterns (see Table 1). Since we investigate patterns that are likely to occur in students' networks, we focus only on the level of activity, linking (versus jumping), and similarity patterns (as explained above). Regarding the choice of personal conditions, we decided to investigate one example of an effect of personal motives, one of information, and one of network position more thoroughly, in stead of giving an overview. Accordingly, we formulate and argue hypotheses regarding the effect of three personal conditions on each pattern which we will discuss below, namely the effect of the student's personal preferences for certain sizes of personal networks (sometimes referred to as their needs), the effect of the level of information about potential candidates and the network structure, and the effect of group membership.⁴

⁴ Although one can also add and explain dyadic variations in the proposed general rules, we choose not to because we think it is the individual person within a dyad that decides to reciprocate or not, to jump or not, to link or not, etc. Of course this person adjusts his behavior partly or even to a great extend to the behavior of the other, but they do not decide as a dyad which pattern to follow. Emperically however, these nuances are hard to detect because the time interval between observation points is often too large.

Effects of preferences for network size

Each individual needs social contact (Wrightsmann and Deaux, 1981; Milardo, 1986; Duck, 1988; Zeggelink, 1993). However, the number of friends has a maximum, if only because time and other resources are limited (Zeggelink, 1993; Van de Bunt, 1999). Consequently, the size of personal networks will be between certain limits, zero and some maximum. Following Zeggelink (1993), we assume that the larger the difference between the desired number of friends and the actual number of friends, the larger the tension. In order to reduce this tension, the students may follow particular selection patterns. As said personal network preferences may differ among students, and one of them, the preferred personal network size, is likely to do so. For instance, the number of friends is usually higher for boys than for girls, which is generally interpreted as a difference in optimal personal network sizes between the sexes (Benenson, 1990; Benenson & Christakos, 2003; Cairns et al., 1998; Eder & Hallinan, 1978; Estell et al., 2002; Lagerspetz et al., 1988). There are several explanations for different personal network size optima between students. For instance, some students, in particular girls, may have a larger preference or need for intimacy in friendships, and while intimacy is usually better ensured in small closed networks, they will have a smaller optimum. Note, that it is also possible that different abilities may create different optima, and that intimacy would only be a by product, as is sometimes argued by evolutionary psychologists (Geary et al., 2003). However, whatever the evolutionary reasons, we expect that network size preferences can differ, and we propose that different size preferences are likely to affect selection patterns. Note that the (preferred) network size does not refer only to the student's friends at school. The personal network of students exists of friends inside school and outside school. Having friends out of school may influence friendship formation at school, however, for the construction of our theoretical model, in the remaining, we assume all students to meet equal conditions, and that the ratio of friends at school and all friends (also outside school) is equal for all students.

The effect of preferred personal network size on activity level seems straightforward: when students prefer more friendships, they probably tend to make and accept more moves than students with a smaller preferred personal network size under the same conditions. However, it might be less simple than that; small personal networks may have a different meaning for students than large personal networks have. The former is more fit for, e.g., intimacy, whereas the latter is more useful for going out together. Assuming that personal networks are as important for all students, the importance of each friend is probably smaller for

those aiming at a large network than for those aiming at a small network. Under this assumption friendship choices are more critical when the preferred personal network size is smaller. It remains unclear, however, whether students with a small network size preference will dissolve emerging friendships and start new ones more than students with a large optimum. On the one hand they probably may have more reasons to dissolve friendships, on the other hand they are also more bound by such friendships and usually have few alternatives. Consequently, it is most reasonable to expect that students with a large network size preference will be more active. In a simulation study Zeggelink (1993) found that an increase of need variation leads to a decrease of the number of people reaching their needs, but an increase of the average need leads to an increase of the number of people reaching their needs. Finally, the larger the population (the class), the more people more or less reach their needs. Taken together this supports our expectation, at least not in defiance with it.

We expect that students with a preference for small personal networks will jump more and link less than students with a large personal network optimum. One of the reasons is that, students with a large network have more opportunities to link than those with a small network. Moreover, the exact nature of a single friend is more critical to students who want only a few friends. Each friend will take up more of the student's time and energy, will be more important and therefore it is more important to get that special one. Accordingly, students with preferences for small networks will be more inclined to take their pick from not only the friends of friends, but also from other candidates in the network. In sum, they jump more. Although we assume that all students face the same conditions when the network starts, after some time, students with a preference for large personal networks usually have more friends of friends, and therefore more candidates to link to. The above leads to two consequences: first, the larger a network the more students with preferences for a large personal network will link compared to those with preferences for a small network, and second, the difference regarding linking and jumping between students with small and large size preferences will grow when the network develops over time, *ceteris paribus*.

We propose that students with preferences for small personal networks will follow similarity patterns more often. The main reason is, again, that the exact nature of a single friend is more critical to those students. Accordingly, choosing friends involves more risk than for students who prefer large personal networks. The similarity literature usually stresses that similarity is probable because similarity

reduces risks. Consequently, similarity patterns are more likely to occur when students prefer small networks.

Effects of the level of information about classmates

Information about candidates and the existing network plays an important role in selection processes. The information about candidate characteristics includes a wide range of topics like information about the candidate's sex, ethnicity, educational level, norms, social abilities, character match, playfulness and style. Some of these characteristics are usually easy to perceive (e.g. sex and style), even in new networks, while others (e.g. character), are difficult. Following Zeggelink (1993), we will call the former category visible, and the second category invisible information. Usually, the level of information students have about their classmates is lower when it concerns invisible information than when it concerns visible information. The level of information a student has about his or her classmates can vary substantially between and within freshmen networks. Depending on the school system, the type of school, the community, or school politics, freshmen classes may or may not include a number of students who already know each other from primary school. This causes different information levels between classes and between students in the same classes as well. In this paper we focus on differences between students. Besides the information about individual candidate characteristics, also the information about the relationships between students is likely to vary. Social psychological studies (e.g., Casciaro 1998) stress that the knowledge people have about the network they live in, is bound to be incomplete; and that the level of information is likely to depend on such variables as network position, personal characteristics and the development of the network in time. Students who have relatively much information, should be better in picking out those to link or jump to. Therefore we also expect that the level of information is positively associated with the activity level, given equal conditions. Students who know little about the candidates and the relationships among them, have as much to gain from new friendships as students who have ample knowledge. However, because they have less information they can be less sure that they get what they need or want, and they probably experience more negative effects of friendship formation like lost time when friendships fail, and loss of reputation or even existing friendships. Consequently they will refrain from engagement in new friendships more often; they will make less moves and reciprocate moves less.

The level of information plays an important role when students decide between linking and jumping. The main argument is that when information about candidates is scarce, students tend to keep on the safe side. The literature usually indicates that befriending friends of friends is a safer option than jumping. Consequently, we hypothesize that when students have little information they are likely to link more.

The level of information plays an obvious role in candidate patterns, because students act on their perception of candidate characteristics, even when they realize that their perception of these characteristics is incomplete and erroneous, and that the characteristics they act on, like sex, ethnicity, and style, are only proxies to the characteristics that really matter to them, like shared norms, social abilities, and character match. Students who have little information about candidates will respond more often to characteristics that are easy visible (like gender, race and clothing) than students who have more information. Students who have more information will respond more often to characteristics that are less easy to perceive, like behavior outside school, norms, and personality.

Effects of group membership

Network members are known to occupy a wide range of positions, and much network literature is dedicated to define and measure such positions as outliers, central members and liaisons. Moreover, network positions are studied in the context of different structures of the entire network. In particular, group membership has been studied extensively, and on this one aspect of network position we will focus in this paper. Note that the number of friendships is usually low in the first stages of a students' network, which implies that group structures will be rare. However, in latter stages groups may develop. Groups may appear in the first, but mainly as a result of a number of old friends entering the network simultaneously.

Group membership has ample consequences for interactions within the entire network. In general, members of a friendship group 'share' common friends, meet each other on a regular basis and interact less frequently with outsiders than with members of their own group (Homans 1961; Cohen 1977 Romney and Faust 1982; Salzinger 1982; Ridgeway 1983). The formed intimate and homogeneous friendship group strongly influences the attitudes, values and norms of the members (Hallinan 1980). Being member of a group gives the individual the feeling of being someone. As a result behavior is partly shaped by group membership (Cohen 1977; Hogg and Turner 1987; Messick and Mackie 1989; Allan 1989), new friendships tend to

develop within the group (Granovetter, 1973; Salzinger, 1982), hereby assuring the future existence of the group (Zeggelink, Stokman, and Van de Bunt, 1996). Loosely put, group members may have external friendships, but not more than internal friendships. If this is the case, new members still may enter the group: first, one group member jumps to an outsider, and second, other members link to this new potential friend, as long as the ratio internal versus external friendships does not undermine the future of the group.⁵

We hypothesize that group membership will likely increase the possibility of passive selection patterns: students will make less moves, and will also often reciprocate less to candidates outside the group. Note that the development of new friendships is not impossible. First, new friendships may develop between group members; in fact the group structure facilitates them. Second, new members can enter the group. However, students inside a group, still have a tendency to be less active than outside a group. The main reason is that the group usually provides for most of the needs of the group members.

Group members are likely to link more than non-group members. Although such groups are not formed intentionally, linking mechanisms are put forward in the literature (see for instance, Johnsen 1986, 1989; Granovetter, 1973; Winship, 1977; Hammer, 1979). In groups, friends bring their friends together, purposively or not, and the probability increases that friends get to know other friends, frequently interact and also become friends (Granovetter 1973; Feld 1981). This suggests that linking is the driving force. Given the emergence of friendship groups, structural properties of a friendship group become an additional driving force in making friends. First, the more internal friendships there are, the higher the degree of closeness among its members, as shown by a high level of commitment and care about the group (Ridgeway, 1983). Second, the less external friendships exist between members and non-members, the more allegiance among the own group members, and the less allegiance between members and non-members.

Finally, we propose that group membership will increase the probability of similarity patterns. According to Cohen (1977), the preference for similar others is even the most important reason for group homogeneity. Similarity is part of the group morals, and whenever group members develop new friendships outside the group,

⁵ Cucó's anthropological work on friendship in Spain shows different possible collective group dynamics, in particular the distinction between "pandillas" and "cuadrillas". Pandillas are open friendship groups where links and people can come and go. In cuadrillas, members are more often fixed at some point in time. In some extreme forms of it (egg. in Valencia) members sign a kind of a contract ("carta de amigos") making explicit the rights and obligations of friends towards each other.

they will be pressed to engage only in friendships with outsiders who have much in common with the group members.

Conclusions and discussion

In this paper, we identified probable friendship selection patterns in high school classroom networks and proposed that these patterns differ systematically between the members of the network. We argued that selection patterns can be identified by three dimensions: (1) the student's level of activity regarding friendship selection; (2) the student's response to the structure, i.e., the use of the already existing friendship ties within the network; (3) the student's response to apparent information about candidates for friendship (candidate patterns). The literature proposes various patterns according to these dimensions, some of which are feasible in classroom networks, while other are not. First, we concluded that the student's level of activity shows in making moves for friendship ties to classmates, or reciprocating them. Second, the literature suggested that the most salient way of responding to structure is given by the dichotomy linking-jumping, where the former indicates that students try to befriend friends of friends (network closure), while the latter indicates that they do not, i.e., try to befriend classmates who are not friends of friends. Third, we concluded from a large body of literature that the most salient candidate pattern is the similarity pattern, indicating that students befriend candidates with similar attributes. Here we discriminate between superficial similarity, regarding attributes that are easy to perceive, like gender, age and race, and deep similarity, regarding characteristics that are more difficult to assess, like morals, character, and family situation.

Additionally, we stated that selection patterns should not be studied as general rules applying equally to all members of a network, as is often done in the social network tradition. Instead, we proposed that differences between network members lead to systematical differences in selection patterns. To illustrate our point, and to stimulate theoretical discussion and empirical research on those differences, we developed and argued three sets of hypotheses (see Table 2). The hypotheses concern effects on the occurrence of the three patterns that are most salient in classroom networks: activity level, linking and candidate patterns (see above). We explored the effects of three different kinds of 'independent variables', the student's preferred network size, the level of her information about candidates in our investigation, and group membership.

	Preferred network size (larger)	Effects from: Level of information (higher)	Group membership (yes)
<i>On:</i>			
Activity level	+	+	-
Linking	+	-	+
Candidate similarity	-	deeper*	+

* Similarity regards characteristics that are less visible.

Table 2. Expected effects of some personal conditions on selection patterns in classroom networks.

As Table 2 shows, we hypothesized that the larger the student's preferred network size, the higher his/her activity level (the student making and accepting more moves), the more he/she will link, and the less he/she follows a similarity pattern, given that all other conditions are equal. Also, we proposed that the higher the level of a student's information about friendship candidates, the higher his/her activity level, the less he/she will link (or the more he/she will jump), and the more he/she will follow a deep similarity pattern in comparison to a superficial similarity pattern. Finally, we argued that students who are member of a group, are less active, link more and follow candidate similarity more. Consequently, we concluded that we have ample arguments to predict that differences among students are likely to lead to different selection patterns.

Note that our aim was not to present an extensive theory about the effects of student's characteristics on selection patterns, this is part of future research. Our only aim was to stimulate the scientific discussion about this topic, and we felt that exploring specific effects often do their work better than meta-theoretical reasoning. We kept in mind that our attempt might help bridging the gap between the classical structuralist social network tradition, and scientific disciplines where differences between people are studied, like psychology, educational studies and criminology. For these reasons, we selected the independent variables in our hypotheses with the scientific relevance in those disciplines in mind. While preferences about friendships may include several features, we focused only on the preferred network size, not only for the reason that it is easy to interpret, but also because (1) personal network size plays an important role in gender studies, and (2) Zeggelink (1993) showed convincingly that network size is one of the most important variables in explaining friendship network structure. We included the level of information about candidates in our investigation, because social psychologists have criticized that complete information is too easily assumed in

many network models. Finally, we included group membership in our hypotheses, because theories in youth studies and criminology claim major effects of groups on individual functioning and friendship formation as well.

In this paper, we investigated systematic effects of differences between students in classroom networks. It can be questioned whether the same hypotheses would apply in other kinds of networks. Considering the differences in repertoire between types of networks, we are not inclined to generalize easily. The repertoire we sketched is applicable primarily to networks regarding informal positive non-instrumental relationships, where members have considerable freedom in choosing candidates, and have enough abilities (in particular social cognitive ones) to recognize network ties and similarities. Other types of networks often lead to other repertoires, if not in theory, then in practice. For instance, social capital patterns may be out of place in high school classroom networks, but they are probably important in many other kinds of networks, in particular in neighborhood, political and professional networks, but also intra-organizational networks. However, some of the reasoning behind our hypotheses might still be of value to other kinds of networks. The idea that some network members prefer larger personal networks than others, and that this affects selection patterns, can also apply to professional or workplace networks where preferences may be a result of the function held at work. For instance, some work requires many different sources of information, part of which is delivered by a mix of established relationships around the organization. All in all, while the particular repertoire and hypotheses in this paper may be limited to some types of networks, we hope that our approach inspires others to engage in similar theoretical activities for other kinds of networks.

We like to conclude with a remark about another extension of our approach. In our paper, we stressed differences between members of the same network and their effects on selection patterns. However, selection patterns are also likely to change over time. When a network develops, the number of friendships often rises and groups form. Moreover, the level of information about candidates is bound to increase in time in most networks. Even the network size preference can change in time (because students age or loose friendships outside school). We conclude that selection patterns are as time bound as they are person bound.

Bibliography

- About, F. E., & Mendelson, M. J. (1996). "Determinants of friendship selection and quality: Developmental perspectives". In W. M. Bukowski, A. F. Newcomb & W. W. Hartup (Eds.), *The company they keep: Friendship in childhood and adolescence* (pp. 87-112). Cambridge: Cambridge University Press.
- Allan, G.A. (1989). *Friendship, developing a sociological perspective*. New York: Harvester Wheatsheaf.
- Baerveldt, C., Van Rossem, R. & Vermande, M. (2003). "Pupils' delinquency and their social networks. A test of some network assumptions of the ability and inability models of delinquency." *The Netherlands' Journal of Social Sciences* 39, 107-125.
- Baerveldt, C., Van Duijn, M.A.J., Vermeij, L., & D. A. van Hemert (2004). "Ethnic boundaries and personal choice. Assessing the influence of individual inclinations to choose intra-ethnic relationships on pupils' networks." *Social Networks* 26, 55-74.
- Baerveldt, C., Van Rossem, R., Zijlstra, B. J. H., De Wolf, M., & Van Duijn, M. A. J. (2007). "Ethnic boundaries in high school students' networks in Flanders and the Netherlands." *International Sociology* 22, 701-720.
- Benenson, J. F. & A. Christakos (2003). "The greater fragility of females' versus males' closest same-sex friendships." *Child Development* 74, 1123-1129.
- Benenson, J. F. (1990). "Gender differences in social networks." *Journal of Early Adolescence* 10, 472-495.
- Bidart, C. (1997). *L'amitié, un lien social*. Paris : La Découverte.
- Bidart, C. & Legall, D. (1996). "Les jeunes et leurs petits mondes: relations, cercles sociaux et nébuleuses." *Cahiers de la MRSJ* 1995 (5), 57-76.
- Blau, P. (1962) "Patterns of choice in interpersonal relations." *American Sociological Review* 27, 41-55.
- Buhrmester, D., & Prager, K. (1995). "Patterns and functions of self-disclosure during childhood and adolescence." In K. J. Rotenberg (Ed.), *Disclosure processes in children and adolescents* (pp. 10-56). New York: Cambridge University Press.
- Bukowski, W. M., Sippola, L. K., & Newcomb, A. F. (2002). *Variability in friendship choice patterns across the same- and other-sex peer domains*. Ottawa, Canada.
- Byrne, D. (1961). "Interpersonal attraction as a function of affiliation need and attitude similarity", *Human Relations* 14, 63-69.

- Byrne, D. & Clore, G.L. (1970). "A reinforcement model of evaluative responses", *Personality* 1, 103-128.
- Cairns, R. B., & Cairns, B. D. (1994). *Lifelines and risks: Pathways of youth in our time*. Cambridge: Cambridge University Press.
- Cairns, R. B., Cairns, B. D., Neckerman, H. J., Gest, S. D., & Gariépy, J.-L. (1988). "Social networks and aggressive behaviour: Peer support or peer rejection?" *Developmental Psychology* 24, 815-823.
- Cairns, R. B. ; Xie, H. & Leung, M.C. (1998). "The popularity of friendship and the neglect of social networks: Toward a new balance." In A. H. Cillessen & W. M. Bukowski (Eds.), *Sociometry then and now: Building on six decades of measuring children's experiences with the peer group* (pp. 25-53). San Francisco: Jossey-Bass.
- Casciaro, T. (1998). "Seeing things clearly: social structure, personality, and accuracy in social network perception", *Social Networks* 20, 331–351.
- Cohen, J.M. (1977). "Sources of peer group homogeneity", *Sociology of Education* 50, 227-241.
- Coleman, J. S. (1988). "Social capital in the creation of human capital". *American Journal of Sociology* 94 (supplement), 95-120.
- Cotterell, J. (1996). *Social Networks and Social Influences in Adolescence*. New York: Routledge.
- Clore, G.L. & Byrne, D. (1974). "A reinforcement-affect model of attraction." In: Huston, T.L. (Ed.), *Foundations of interpersonal attraction* (pp. 143–170). New York: Academic Press.
- Cucó i Giner, J. (1995). *La amistad. Perspectiva antropológica*. Institut Català d'Antropologia : Icaria
- Dahlbäck, O. (1982). "Choices of contact, attraction and social relations. A study of peer relations". *Research report* (No. 19): Project Metropolitan.
- Davis, J.A. (1963). "Structural balance, mechanical solidarity, and interpersonal relations", *American Journal of Sociology* 68, 444-463.
- Davis, J.A. (1967). "Clustering and structural balance in graphs". *Human Relations* 20, 181-187.
- Dijkstra, A. B., Veenstra, R., Peschar, J., Flap, H., & Völker, B. (2003). "Social capital in education: Functional communities around high schools in the

netherlands". In H. Flap & Völker, B. (Eds.), *Creation and returns of social capital. A new research program* (pp. 119-218). London: Routledge.

Duck, S.W. (1988). *Handbook of personal relationships: Theory, research, and interventions*. Chichester: Wiley.

Eder, D. & Hallinan, M.T. (1978). "Sex differences in children's friendships". *American Sociological Review* 43, 237-250.

Estell, D.B., Farmer, T.F., Cairns, R.B. & Cairns, B.D. (2002). "Social relations and academic achievement in inner-city early elementary classrooms". *International Journal of Behavioral Development* 26, 518-528.

Federico de la Rúa, A., de (2003). "La dinámica de las redes de amistad. La elección de amigos en el programa Erasmus", *REDES. Revista hispana para el análisis de redes sociales* 4 (3).

Feld, S.L. (1981). "The social organization of social ties", *American Journal of Sociology* 86, 1015-1035.

Flap, H., & Völker, B. (2003). *Creation and returns of social capital. A new research program*. London: Routledge.

Geary, D. C., Byrd-Craven, J., Hoard, M. K., Vigil, J., & Numtee, C. (2003). "Evolution and development of boys' social behavior." *Developmental Review* 23, 444-470.

Granovetter, M.S. (1973). "The strength of weak ties", *American Journal of Sociology* 78, 1360-1380.

Granovetter, M.S. (1985). "Economic Action and Social Structure: The Problem of Embeddedness". *American Journal of Sociology* 91, 481-510.

Hallinan, M. T. (1982). "Classroom racial composition and children's friendships". *Social Forces* 61 (1), 56-72.

Hallinan, M.T. (1980). "Patterns of cliquing among youth". In: Foot, H.C., Chapman, A.J. & Smith, J.R. (Eds.), *Friendship and social relations in children*. New York: John Wiley and Sons.

Hallinan, M.T. (1974). *The structure of positive sentiment*. New York: Elsevier.

Hansell, S. (1981). "Ego development and peer friendship networks." *Sociology of Education* 54, 51-63.

Hammer, M. (1979). "Predictability of social connections over time", *Social Networks* 2, 165-180.

- Hardy, C. L., Bukowski, W. M., & Sippola, L. K. (2002). "Stability and change in peer relationships during the transition to middle-level school". *Journal of Early Adolescence* 22, 117-142.
- Haselager, G. J. T., Hartup, W. W., Van Lieshout, C. F. M., & Riksen-Walraven, J. M. A. (1998). "Similarities between friends and nonfriend in middle childhood". *Child Development* 69, 1198-1208.
- Heaven, P. C. L. (1994). *Contemporary Adolescence: a Social Psychological Approach*. Melbourne, Australia: Macmillan.
- Heider, F. (1946). "Attitudes and Cognitive Organization", *Journal of Psychology* 21, 107-112.
- Heider, F. (1958). *The Psychology of Interpersonal Relations*. New York: Wiley.
- Hogg, M.A. & Turner, J.C. (1987). "Intergroup behavior, self stereo typing and the salience of social categories", *British Journal of Social Psychology* 26, 325-340.
- Holland, P.W. & Leinhardt, S. (1971). "Transitivity in Structural Models of Small Groups", *Comparative Group Studies* 2, 107-124.
- Holland, P.W. & Leinhardt, S. (1972) "Some Evidence on the Transitivity of Positive Interpersonal Sentiment", *American Journal of Sociology* 72, 1205-1209.
- Homans, G.C. (1950). *The human group*. New York: Harcourt Brace.
- Homans, G.C. (1961). *Social behaviour: Its elementary forms*. New York: Harcourt Brace.
- Hummell, H.J. & Sodeur, W. (1990) "Evaluating Models of Change in Triadic Sociometric Structures". In Weesie, J. and Flap, H. (Eds.), *Social Networks Through time* (pp. 281-305). Utrecht: ISOR.
- Johnson, E.C. (1986). "Structure and process: agreement models for friendship formation", *Social Networks* 8, 257-306.
- Johnson, E.C. (1989). "The micro-macro connection: Exact structures and process". In: Roberts, F. (Ed.), *Applications of combinatorics and graph theory to the biological and social sciences* (pp. 169-201). New York: Springer Verlag.
- Kassenberg, A. (2002). *Wat scholieren bindt*. Groningen: University of Groningen.
- Kindermann, T.A. (1993). "Natural peer groups as contexts for individual development: the case of children's motivation in school." *Developmental psychology* 29, 970-977.

- Kupersmidt, J. B., DeRosier, M. E., & Patterson, C. P. (1995). "Similarity as the basis for children's friendships: The roles of sociometric status, aggressive and withdrawn behavior, academic achievement and demographic characteristics". *Journal of Social and Personal Relationships* 12, 439-452.
- Lagerspetz, K. M., Björkqvist, K. & Peltonen, T. (1988). "Is indirect aggression typical of females? Gender differences in aggressiveness in 11- to 12-year-old children." *Aggressive Behavior* 14, 403-414.
- Lazarsfeld, P.F. & Merton, R.K. (1954). "Friendship as Social Process: A Substantive and Methodological Analysis". In: Kendall, P.L. (Eds.) *The Varied Sociology of Paul F. Lazarsfeld* (pp. 298-348). New York: Columbia University Press.
- Lin, N. (2001). *Social capital*. Cambridge: Cambridge University Press.
- Lott, B.E. & Lott, A.J. (1960). "The formation of positive attitudes towards group members", *Journal of Abnormal Social Psychology* 61, 297-300.
- Lott, A.J. & Lott, B.E. (1974), "The role of reward in the formation of positive interpersonal attitudes". In: Huston, T.L. (Ed.), *Foundations of interpersonal attraction* (pp. 171-192). New York: Academic Press.
- McPherson, M., Smith-Lovin, L. & Cook, J.M. (2001). "Birds of a Feather: Homophily in Social Networks", *Annual Review of Sociology* 27, 415-444.
- Maccoby, E.E. (1988). "Gender as a social category". *Developmental Psychology* 24, 755-765.
- Messick, D.M. & Mackie, D.M. (1989). "Intergroup relations", *Annual Review of Psychology* 40, 45-81.
- Milardo, R.M. (1986). "Personal choice and social constraint in close relationships: applications of network analysis". In: Derlega, V.D. and Winstead, B.A. (Eds.), *Friendship and social interaction* (pp. 145-166). New York: Springer Verlag.
- Morton, A.S. (1959). *Similarity as a determinant of friendship: A multi-dimensional study*. Ann Arbor: UMI Dissertation Services (reprinted 1993).
- Newcomb, T.M. (1961). *The acquaintance process*. New York: Holt, Rinehart and Winston.
- Newcomb, A. F., Bukowski, W. M., & Pattee, L. (1993). "Children's peer relations: A meta-analytic review of popular, rejected, neglected, controversial, and average sociometric status." *Psychological Bulletin* 113, 99-128.

- Palmonari, A., Pombeni, M. L. & Kirchler, E. (1989). "Peer groups and evolution of the self-system in adolescence", *European Journal of Psychology of Education* 4, 3–15.
- Palmonari, A., Pombeni, M. L. & Kirchler, E. (1990). "Adolescents and their peer groups: a study on the significance of peers, social categorization processes and coping with developmental tasks", *Social Behaviour* 5, 33–48.
- Percheron, A., Bonnal, F., Boy, D., Dehan, N., Grunberg, G. & Subileau, F. (1978). *Les 10-16 Ans & La Politique*. Paris: Presse de la Fondation Nationale des Sciences Politiques.
- Requena, F. (1994). *Amigos y redes sociales*. Centro de Investigaciones Sociológicas. Siglo XXI. Madrid.
- Ridgeway, C.L. (1983). *The dynamics of small groups*. New York: Saint Martens Press.
- Romney, A.K. & Faust, K. (1982). "Predicting the structure of a communication network from recalled data", *Social Networks* 4, 285-304.
- Rudolph, K.D (2010). "Implicit theories of peer relations". *Social Development* 19, 113-129.
- Rubin, K. H., Bukowski, W.M. & Parker, J.G. (1998). "Peer interactions, relationships, and groups". In: Damon, W. and Lerner, R.M. (Eds): *Handbook of child psychology, III, Social, emotional, and personality development* (pp. 619-700). New York: Wiley.
- Salzinger, L.L. (1982). "The ties that bind: The effect of clustering on dyadic relationships", *Social Networks* 4, 117-145.
- Schweinberger, M. (2009). "Latent Class Models for Longitudinal Network Data". *Working Paper*, Department of Statistics, University of Washington.
- Snijders, T.A.B., Bunt, G.G. van de & Steglich, C.E.G. (2010). Introduction to stochastic actor-based models for network dynamics. *Social Networks*, 32, 44-60.
- Steinberg, L. & Sheffield Morris, A. (2001). "Adolescent development". *Annual Review of Psychology* 52, 83–110.
- Tuma, N.B. & Hallinan, M.T. (1979). "The Effects of Sex, Race, and Achievement on Schoolchildren's Friendships". *Social Forces* 57, 1265-1285.
- Van de Bunt, G.G. (1999). *Friends by choice: An actor-oriented statistical network model for friendship networks through time*. Amsterdam: Thela Thesis.

Wasserman, S.S. & Faust, K. (1994). *Social Network Analysis: Methods and Applications*. New York: Cambridge University Press.

Winship, C. (1977). "The allocation of time among individuals." In: Schuessler, K. (ed.), *Sociological Methodology*. San Francisco: Jossey-Bass.

Wrightsman, L.S. & Deaux, K. (1981). *Social psychology in the eighties*. Monterey: Brooks/Cole Publishing Company.

Zeggelink, E.P.H. (1993). *Strangers into Friends. The Evolution of Friendship Networks Using an Individual Oriented Modeling Approach*. Amsterdam: Thesis Publishers.

Zeggelink, E.P.H., Stokman, F.N. & Van de Bunt, G.G. (1996). "The emergence of groups in the evolution of friendship networks", *Journal of Mathematical Sociology* 21, 29-55.