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ASYMMETRY IN THE PERCEPTION OF FRIENDSHIP IN STUDENTS GROUPS

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ABSTRACT

Several studies point out the link between sociability and academic results. In this paper, we highlight a phenomenon of asymmetry in the perception of friendship. This occurs when a student think he has more or less friends than he really has. We present an experimental method that allows us to analyze this question in relation with the academic performances of 15 groups of students. We show that students having a symmetric view of their friendship relations tend to have the better results. Furthermore, our study shows that the link between sociability and results improvement is stronger for lower grades (i.e younger students).

KEYWORDS

Friendship perception; Social networks; Learning analytics; interactions

1. INTRODUCTION

It has been known for a long time that friendship has positive effects in our everyday life. More recently, several studies in education sciences or in economy tend to show that friendship has also a positive effect on learning and on education performances. But, the common finding of all these studies is the complexity of this question due to the large amount of influence parameters. As very basic examples, it is obvious that the "quality of friends" can leads to good or bad outcomes that also strongly impact students behavior. A lot of other parameters (socioeconomics, parental context, ..) make forecasting education difficulties a hard challenge.

In this paper, we investigate a methodology aiming at having a better understanding of a class sociability context and at investigating the link that these features could have with the students' performances. In particular we analyze the phenomenon of friendship perception asymmetry that deals with the gap between the perception and the reality that an individual has of his friendship network. For example, a student can think that he has 4 close friends within his class but, finally, it may turn out that his feeling is not fully reciprocal. More globally, it appears that we can over or under estimate the strength of our social network. Depending on the point of view, this gap can also be expressed in terms of attention to others driven by social norms. This phenomenon can also be rooted in concepts such as cognitive heuristics and biases (Tversky and Kahneman, 1974) or in the theory of bounded rationality (Simon,1957).

Indeed, several studies show that asymmetries of perception are linked with cognitive biases. For example, Pronin and his colleagues studied the illusion of asymmetric insight that states that people perceive their knowledge of others as surpassing other people's knowledge of them (Pronin et al, 2001). In interpersonal interactions, this means that we think we find out more about other people than other people find out about us. As a second example, let us consider the mere ownership effect that is the observation that a seller tend to evaluate its own good more positively than a buyer. As we can imagine, this phenomenon has an important implication in trading and was widely studied in behavioral economy (Beggan, 1992). Apart from these perception biases that are supposed to be universal since they are rooted in the deep cognition, we will see in the state of the art other forms of asymmetries that are more caused by cultural factors.

Our goal is to investigate these concepts in relationships between students within small university classes. Our first results are descriptive aiming at responding to questions related to the friendship network of students. For example, how many friends have students in their class ? Is there a difference between younger

and older university students ? Moreover, we may wonder what extent the friendship perception is reciprocal and what the implications (scores, achievement, ect) of this asymmetry are ?

2. BACKGROUND

Several studies on the relations between friendship and school performances point out the role of individual and collective influences (Smith et al, 2007) (Sparrowe et al, 2001) (Hinshaw, 1992). Let us note that most of these works focus on primary or middle schools. Few of them address the university population. Our results tend to show that age and autonomy of students can make the difference. This is also true for adult learning.

Sometimes, surrounding bad behaviors can lead to delinquency or at least can interrupt learning progress. Except in these extreme cases, friendship has rather a positive effect in academic achievement. For example, Son Thierry Ly and his colleagues observed over four years the transition between junior high-school and high-school for 28 000 teenagers. On average, in France, 20 % of schoolchildren find themselves in the same high-school and only 5% in the same class. The authors find that grouping low-achieving freshmen who know each other tends to decrease their current repetition rate by around 13 percent, and raise their graduation rate by the same amount (Son et al, 2014).

Another study with 629 students of 18 years old also shows a strong positive link between friendship in school and grade results. Whatever the gender or the ethnicity, the more friends a student has in class the better his results. In order to obtain the data, the authors asked the students to fill in a form and maintain a journal in which they noted their activities and the time they take to study (Witkow et al, 2010). Another study shows that peer collaboration is an effective learning strategy for primary school children. Peer collaboration, where pairs of equally skilled partners work together in problem solving, has demonstrated immediate and long-term benefits on the cognitive development of children. One still open question is whether friends should be paired together or not. Indeed, results indicated that friends outperformed acquaintances in the collaboration, but not on the individual post-test (Webber et al, 2002). But, if a link exists, the question of causality is not simple. Xinyin Chen and his colleagues found that academic achievement predicted children's social competence and peer acceptance but, children's social functioning uniquely contributed to academic achievement (Chen et al, 1997).

If friendship has a link with academic results, one question remains: what is friendship ? On a range going from intimate friends to episodic contacts, the concept of friendship may widely vary. Verkuyten shows, for example, that gender and culture have a determinant influence on the perception of friendship. The allocentrism (versus idiocentrism) is a collectivistic personality attribute whereby people center their attention and actions on other people rather than themselves (Verkuyten, 1996). Since groups are sometimes composed of mixed people, it seems logical to find nuanced levels of friendship reciprocity. Social scientists have long suspected that friendship dyads are not always reciprocal but things are not clear. When connections are reciprocal, relations are likely to be more intimate. Asian-Americans and females are the most likely to have reciprocated friendships. Interracial friendships are less likely to be reciprocal than intra-racial friendships. Further, adolescents with reciprocal friendships report higher levels of school well-being. Friendship reciprocity is an important indicator of social support above and beyond the numbers of friends reported by youth (Vaquera et al, 2008). See also the theory of Granovetter on the influence of weak ties (Grannovetter, 1973).

Outside cultural or social reasons, the difference in perception may also come from cognitive biases. We evoked in the introduction the concept of bounded rationality popularized by H.A. Simon, Nobel laureate in economics. For example, (Pronin et al, 2007) showed that people see others as more conforming than themselves. This phenomenon is “rooted in people’s attention to introspective versus behavioral information when making conformity assessments. The participants displayed an introspection illusion, placing more

weight on introspective evidence of conformity (relative to behavioral evidence) when judging their own susceptibility to social influence as opposed to someone else's. ".

In mediated communication, this gap can be very different than in real life (i.e. face-to-face interactions) due to the size of groups and the limited non-verbal feature of the communication. In network science, reciprocity is a measure of the likelihood of vertices in a directed network to be mutually linked (Garlaschelli et al 2004). This minimal reciprocity is not present with Twitter since you can follow someone without being followed back. In contrast in Facebook, the equal reciprocity is the rule (Golder et al, 2010). There are also several works considering the relation between centrality in social networks and performances (Joksimović et al 2016).

3. STUDY METHODOLOGY

The most difficult and longest task in our study was data collection. We got, for each student, the level of friendship with each of their mates in his group (I.e a class of students). This step took 4 years (2013-2016) for 15 groups (278 students) composed of 7 groups of 2 years of university degree (called B groups) and 8 groups of 5 years Master university degree (called M groups). Students in B groups are 20 years old on average (23 years old in M groups). The groups, mostly composed by males (90%) have from 13 to 25 students (see table 1). All students are studying for a degree in computer science. All 15 groups are completely independent one from another (different year or degree).

Our methodology takes advantage of an online platform used in class for a practical exercise dedicated to the study of social networks. This platform helped us to collect data related to students' friendship networks that we confronted with their annual scores. Each student was requested to give a value of closeness in a list where all students of the group appear. This value corresponded to the perceived frequency of contacts with their colleagues, on a scale from 1 to 3. Very frequent contacts correspond to the level 1, less frequent (level 2) or very few interactions or not at all (level 3). Interactions, here, means public contacts in university life. For example, this can correspond to students who spend time together (lunch, more often discussing between classes,...). Thereby, we make the assumption that frequent contacts involve friendship. Of course this is an approximation since, if friendship often means frequent contacts, the reciprocal is not always true. Anyway, in the free context of universities, it seems difficult to have frequent contacts without trust, which is also a key for friendship (Lusher et al, 2014).

The following figure show a partial transcript of the user interface for the data collection. Then, a process anonymizes the data and provides a matrix (student I vs student J) that can be used for the class exercise.

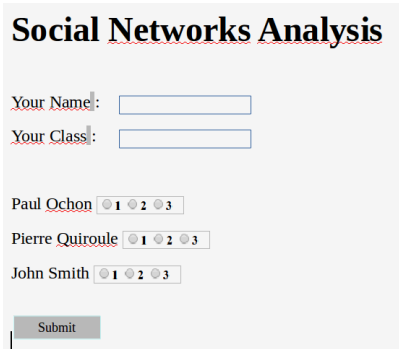

Fig 1: Look of the user interface for friendship data collection

The idea behind this exercise was to show to students how to compute and draw features of social networks (degree, centrality, ..etc). Of course, this kind of exercise could be done with artificial data but it was a good pretext to collecting real data for our study. As these data reflect public behaviors, we found no special difficulties in using them for research purposes. Anyway, in order to keep an ethical attitude, and avoid, as possible, bias effects, we clearly indicated to students that we introduced anonymity into the

exercise, so that, each student name was replaced with a user identifier and it was not possible to identify individual persons behind the data. These data allow us build the social network of each group. This reveals interesting individual and collective features.

In the second step, we collected the annual score of each student. This score was computed by averaging from 12 to 14 teaching units depending on the group type (B or M). For example, B group students are evaluated with 14 teaching units. So, at the end of the year each student gets a score from 0 to 20 that is the average of its 14 scores.

4. RESULTS

In this section, we present, first, the sociability features of each category of students as well as the relation linking the sociability level and the student annual score. Then, we investigate the concept of the friendship perception asymmetry and, again, we compare this level with the annual scores.

4.1 Sociability and Academics Results

First of all, we analyze the friendship context of our 15 groups. The following table presents these data for the B and M groups. We see that on average each student has 3.3 close friends (see table 1). We also note that, in our context with a group size from 13 to 25, the number of close friends is weakly linked to the number of students in the group (R^2 =0,2).

Table 1. Sociability level of each group of students

B groups	# stud per grp	Aver friend per stud	M groups	# stud per grp	Aver friend per stud
B1	16	3.30	M1	14	2.93
B2	13	4.08	M2	16	2.13
B3	13	4.31	M3	25	4.29
B4	13	2.46	M4	19	1.95
B5	22	3.23	M5	14	2.36
B6	24	3.46	M6	17	2.71
B7	25	4.92	M7	24	3.67
			M8	23	4.22
Average		3.68			3.03
Total	126			152	

The question of the number of friends raises a recent attention with social network platforms (Facebook, ..) suspected of causing anxiety when friends are too numerous. If several studies are dedicated to the quantification of friendship in social network platforms, we found few papers that investigate this question within small class groups. S.L Field reported an average value of 2.7 close friends per college student in his study (Feld, 1991). M. Ali in another study with a population of adolescents found a value of 2,54 (Ali, 2012). There may be a kind of social constant around the value of 3 friends per individual but we have not enough data to fully support this hypothesis. Anyway, some students are less sociable than others.

The two following tables show the difference between the average score for the less sociable and the more sociable students. These two categories are simply formed by observing how many friends each student has. In each group, this value is ranked by order of increasing number of friends. The subgroup of students who have fewer friends is considered as less sociable that which has more friends. This is of course an approximation.

In table 2 (B groups) and 3 (M groups), the first column indicates the group type. The second and third columns contain the average score of the group and the standard deviation. The three last columns contain the average score respectively for the less sociable subgroup and the more sociable one, as well as the score

difference in percentage between these 2 subgroups. For example, in the first row of table 2, we see that less sociable students of the B1 Group have an average score 17% lower than more sociable students.

Table 2. Score difference between high and low sociable students (B groups)

B Groups	Average	Std	Low Soc.	High Soc.	Diff (high-Low) %
B1	13.47	2.33	12.14	14.20	17.00
B2	11.79	2.14	11.56	11.99	3.72
B3	12.64	2.00	12.72	12.57	-1.16
B4	12.97	1.45	12.22	13.85	13.40
B5	12.74	1.72	12.83	12.65	-1.38
B6	13.53	1.84	12.74	14.31	12.29
B7	11.36	2.82	10.72	12.05	12.42
Averg.	12.64	2.04	12.13	13.09	8.04

Table 3. Score difference between high and low sociable students (M groups)

M Groups	Average	Std	Low Soc.	High Soc.	Diff (high-Low) %
M1	13.51	1.04	13.57	13.46	-0.78
M2	14.31	1.57	14.43	14.19	-1.66
M3	14.54	0.91	14.74	14.34	-2.72
M4	13.37	1.01	13.26	13.48	1.66
M5	14.01	0.79	13.91	14.11	1.40
M6	13.96	0.40	13.83	14.07	1.71
M7	13.59	1.24	13.68	13.51	-1.21
M8	14.06	1.05	13.65	14.44	5.78
Averg.	13.92	1.00	13.88	13.95	0.52

We see that students having the more friends have the better results. This is true for 9 groups on the 15 (5/7 on B groups and 4/8 on M groups). For all groups cumulated, the average difference represents + 4,4%. We can also see that this difference is higher for students of lower grade (8,04 % for B groups), who are also younger, than for higher grade (0,52%). As we saw in the background section, this result tends to confirm studies related to other educational contexts and also tend to show that our data are consistent. It is also important to say that even if both features are linked, we cannot say if there is any causality between friendship and academic results.

4.2 Asymmetry of Friendship Perception

Actually, the average number of friends by student we find in the previous section hides a perception asymmetry. An underestimation of this perception means that one student thinks he has fewer close friends than he really has (I.e what their friends declare). Table 4 shows that, globally, students tend, indeed, to underestimate their close social network. In this table, the first column reports the level of asymmetry as the difference between the number of friends declared by a student (out) and the number of reciprocal declarations from other students (in). For example, let us say that Paul declared John and Peter as friends (out=2), and that Peter, John and David declared Paul as a friend (in=3). This case corresponds to the sixth row (-1) of the first column. The other 3 columns represent respectively the percentage of all students, B groups and M groups, in each category of asymmetry. The last 3 rows summarize the table and show that 42.9 % of all students underestimate their friendship network, 24,1% have a realistic perception and 32,9 % overestimate it. We also see that this underestimation is more accentuated for younger students (47, 9% for B

groups vs 38,6 % for M groups). The B groups also show the lowest level of symmetric perception, near twice less than for M groups (17,8 % vs 30,6).

Table 4. Under and over perception of friendship in groups.

Diff. out -in	% All Stud	% B Stud	% M Stud
< = -6	0.34	0.68	0.00
-5	0.67	0.68	0.67
-4	2.01	2.05	2.00
-3	6.38	6.85	6.00
-2	11.74	13.01	10.67
-1	21.81	24.66	19.33
0	24.16	17.81	30.67
1	14.09	15.07	13.33
2	8.39	9.59	7.33
3	5.37	3.42	6.00
4	1.68	2.05	1.33
5	1.01	1.37	0.67
= > **6**	2.35	2.74	2.00
% underestimation (out-in < 0)	42.95	47.95	38.67
% equal (out-in = 0)	24.16	17.81	30.67
% overestimation (out-in > 0)	32.89	34.25	30.67

We may also wonder if there is a link between this asymmetry and the students scores. In order to investigate this question, we first ranked each student in his group according to his normalized annual score. The student normalized score is computed according to the following formula in order to obtain in each group a student rank value from 0 to 1.

$$Rank_{score\ stud} = \frac{\left(Score_{stud} - Min_{score\ group}\right)}{\left(Max_{score\ group} - Min_{score\ group}\right)}$$

This allows us to consider all students in the same range of rank, which is not possible without normalization since the ranges of annual scores are very different from one type of group to another (average 12,6 std 2 for B groups, 13,9 std 1 for M groups, see table 2 and 3)

Then, we computed the average score rank for students that underestimate, overestimate and who have a realistic view of the number of their friends. The average rank of each category is reported in the following table as well as the corresponding typical score. This score is computed assuming a typical group with a minimal and maximal score respectively equal to 7 and 18. For comparison, the minimum and maximum scores for the B and M groups are respectively of 1,6 to 18 and 10 to 17,2)

Table 5 shows that realistic students tend to have better scores than those who overestimate (+7.6%) or underestimate (+4.9%) the number of their close friends. The realistic students have up to 1 point more in their average score. This question needs further studies but our sample also seems to say that students who underestimate have better results than those who overestimate their friendship network.

Table 5. Score difference between high and low sociable students

	Number of stud.	Average rank	Typical score
Underestimation	64	0.47	12.2
Realist perception	72	0.52	12.8
Overestimation	56	0.45	11.9

These results can be explained by the hypothesis that underestimation is a sign of a lack of self-confidence that pushes these students to work more. In the same way overestimation could be a sign of overconfidence that leads students to rest on their laurels. Social sciences show that self-confidence is linked to autonomy and motivation that are known key factors for academic achievement (Govier, 1993).

5. DISCUSSION

We presented a work aiming at investigating the implications of relational features in groups of students. Obtaining unbiased data for this kind of study is very difficult. Having enough students and enough groups in a real teaching context is a way to optimize the reliability of data collection. The consistency of the results for similar types of group (B vs M) tends to show that this data collection was of decent quality.

If the positive links between friendship and academic results have already been observed, less obvious is the influence of the asymmetry of the friendship perception. We see that young students (B groups) largely underestimate the number of their friends. Furthermore, students who have a clear view of their friendship relation also tend to have the better results.

These questions are not only useful for understanding but they could also have practical implications in terms of pedagogy or class organization. For example, we can imagine grouping together friends for class work, specially for young students. Knowing that some groups are composed with more autonomous students can allow the teacher to concentrate his attention to other groups.

In the wider context of mediated teaching, we can also evoke the design of educational tools such as friendly computer interfaces. It was shown, for example, that humorous user interfaces have positive effects on user attention or increase the motivation or the trust of students in learning situations (Morkes et al, 1998) (Nijholt, 2001). From another perspective, it is important to consider how these questions could impact large scale computer mediated education. The MOOCS or social networks platforms oriented to education can amplify the effects we observe in real classes.

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REFERENCES

Ali, M. M. (2012). Social learning theory, cigarette taxes and adolescent smoking behavior. Jahrbücher für Nationalökonomie und Statistik, 232(6), 633-651.

Beggan, James K. (1992) "On the social nature of nonsocial perception: The mere ownership effect.". Journal of Personality and Social Psychology. Vol 62(2), Feb 1992, 229-237.62 (2): . doi:10.1037/0022-3514.62.2.229.

Chen, X., Rubin, K. H., and Li, D. (1997). Relation between academic achievement and social adjustment: Evidence from Chinese children. Developmental psychology, 33(3), 518.http://www.rubin-lab.umd.edu/pubs/Downloadable%20pdfs/kenneth_rubin/cross%20cultural/DevPych97adjustment.pdf

Feld, Scott L. (1991) Why Your Friends Have More Friends Than You Do; The American Journal of Sociology, Vol. 96, No. 6, pp. 1464-1477.

Garlaschelli, Diego, Loffredo, Maria I. (2004). "Patterns of Link Reciprocity in Directed Networks". Physical Review Letters. 93 (26). American Physical Society.

Govier, T. (1993). Self-Trust, Autonomy, and Self-Esteem. Hypatia, 8(1), 99-120.

Golder Scott A. and Yardi Sarita. (2010) “Structural Predictors of Tie Formation in Twitter: Transitivity and Mutuality.” Proceedings of the Second IEEE International Conference on Social Computing. August 20-22, 2010. Minneapolis, MN. http://www.redlog.net/papers/golder_yardi_2010.pdf

Granovetter, M. S. (1973). The strength of weak ties. American journal of sociology, 78(6), 1360-1380.

Hinshaw, S. P. (1992). Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms. Psychological Bulletin, 111, 127-155.

Joksimović, S., Manataki, A., Gašević, D., Dawson, S., Kovanović, V., and De Kereki, I. F. (2016). Translating network position into performance: importance of centrality in different network configurations. In Proceedings of the Sixth International Conference on Learning Analytics & Knowledge (pp. 314-323). ACM.

Lusher, D., Kremer, P., and Robins, G. (2014). Cooperative and competitive structures of trust relations in teams. Small group research, 45(1), 3-36.

Morkes, John, Kernal, Hadyn K. and Nass, (1998) Clifford. Humor in Task-Oriented Computer-Mediated Communication and Human-Computer Interaction. In:Proceedings of CHI98, 1998.

Nijholt, Anton. (2001) Agents, Believability and Embodiment in Advanced Learning Environments. In: Proc. IEEE International Conf. on Advanced Learning Technologies: Issues, Achievements, and Challenges (ICALT 2001), T. Okamto, R. Hartley, Kinshuk & J.P. Klus (eds).

Pronin, E., Kruger, J., Savitsky, K and Ross, L (2001). "You don't know me, but I know you: the illusion of asymmetric insight". Journal of Personality and Social Psychology. 81 (4): 639–656. doi:10.1037/0022-3514.81.4.639

Pronin, E., Berger, J., and Molouki, S. (2007). Alone in a crowd of sheep: asymmetric perceptions of conformity and their roots in an introspection illusion.Journal of personality and social psychology, 92(4), 585.

Simon, H. A. (1957), Models of Man: Social and Rational. Mathematical Essays on Rational Behavior in a Social Setting, New York, Wiley, 1957

Son Thierry Ly and Riegert Arnaud. (2014) Persistent Classmates: How Familiarity with Peers Protects from Disruptive School Transitions. PSE Working Papers n2013-21. 2014. https://halshs.archives-ouvertes.fr/halshs-00842265/document

Smith, R. A., and Peterson, B. L. (2007). “Psst … What Do You Think?” The Relationship between Advice Prestige, Type of Advice, and Academic Performance. Communication Education, 56(3), 278-291. doi:10.1080/03634520701364890

Sparrowe, R. T., Liden, R. C., Wayne, S. J., and Kraimer, M. L. (2001). Social Networks and the Performance of Individuals and Groups. The Academy of Management Journal, 44(2), 316-325. doi:10.2307/3069458

Tversky Amos and Kahneman Daniel(1974), Judgment under Uncertainty: Heuristics and Biases, Science, New Series, Vol. 185, No. 4157. , pp. 1124-1131.

Vaquera, E., and Kao, G. (2008). Do you like me as much as I like you? Friendship reciprocity and its effects on school outcomes among adolescents. Social Science Research, 37(1), 55-72. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2352147/

Verkuyten, M. (1996). Culture and gender differences in the perception of friendship by adolescents. International Journal of Psychology, 31(5), 207-217.

Webber Sean. R. and Robinson Julie (2002) The impact of friendship on primary school children's ability to effectively collaborate with peers: Learning outcomes on two scientific reasoning tasks ; Australian Association for research in Education (AARE) conference, 2002. http://www.aare.edu.au/data/publications/2002/web02411.pdf

Witkow Melissa R, and Fuligni Andrew J. (2010). In-School Versus Out-of-School Friendships and Academic Achievement Among an Ethnically Diverse Sample of Adolescents. Journal of Research on Adolescence