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An empirical investigation of the students' academic behaviour using a group matrix methodology

Mihai PASCARU¹, Ioana TODOR²

Abstract

This study proposes taking into account *the group matrix* in the analysis of specific patterns of academic behaviour: the students' concern for an adequate preparation, reflected in their academic results, and their participation in didactic activities. The group matrix is defined as a *unitary system with three interrelated dimensions: inter-knowledge, communication and cooperation in a social group (formal or not), the system being at the basis of the entire dynamics of that group.* The three dimensions of the group matrix (*inter-knowledge, communication and cooperation*) correlate with the students' academic results and with their participation in learning activities. The practical relevance of this investigation consists in offering a new basis for the study of desirable academic behaviour and didactic group activities. The theory and practice of the group matrix has a broader applicability, potentially for every group where the *inter-knowledge, communication and cooperation* dimensions can be identified and assessed.

Keywords: community matrix; group matrix; inter-knowledge; communication and cooperation.

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Introduction

This study argues for a multidimensional investigation of the social groups, using a matrix of group processes. The starting point is the notion of community matrix, investigated by our research team several years ago (Pascaru, 2003). The concept of *community matrix* was defined as: *a system with three dimensions: inter-knowledge, communication and common action in a community (territorial or not), this system being at the basis of the collective behaviour and processes observed in the community* (Pascaru, 2003). Appropriate methods and techniques were selected for the investigation of the tree dimension of the community matrix. A questionnaire was especially constructed for this reason. A mathematical procedure was established to provide a numerical index for each dimension of the matrix (inter-knowledge, communication and common action). The mean value of these tree indices represents the global index of the community matrix (the numerical values of these indices ranges between 0 and 1). These theoretical and methodological frameworks were preceded by a large number of investigations, the main predictions of the matrix model being empirically tested. For example, in 1986, in Muşca (a small village in the North Carpathians mountains, Romania), the following indices were determined for the studied group: for inter-knowledge the index was 0.67, for communication: 0.42, and for common action: 0.20. The global index of the community matrix was 0.43 and it was calculated as the mean value of the inter-knowledge, communication and common action indices.

Using the same methodology, the same kind of investigations was replicated in the community of Muşca, forty years later (in 2000). Contrary to our initial expectations, at that time, the four indices had higher values. On one hand, these findings were explained as due to the reorientation of the workers from different branches of industry to agriculture, after 1989 (after the end of the communist regime in Romania, in 1989, the work places in industry were dramatically reduced and many people returned to agriculture and to their traditional life in small rural communities). On the other hand, the same findings might be due to the installation of the first phone centre in Muşca, which provides free of charge services in the village area. In 1999, the same theme was investigated in a new series of researches, conducted in several Romanian villages with different sizes (from 25 to 94 houses) (Horea, Alba County, Romania). The results obtained in these researches indicate a negative correlation between the size of the village (estimated through the number of houses) and the cohesion of the social relations (estimated through the global index of the community matrix): *the global index of the community matrix decreases as the number of the houses in the village increases*. In 2003, similar studies were conducted in a typical urban community, in a large building of apartments located in the city centre of Alba Iulia (Romania).

In this urban community, the index for inter-knowledge was calculated as 0.18, the index for communication was 0.12 and the index for the common action was 0.03. The value of the global index of the community matrix was 0.11. We appreciate that these results reflect the characteristics of the social relationships in any urban community, not only the size of the community (Pascaru, 2003).

Arguments for the application of the community matrix model in the study of groups

We emphasize two sets of arguments supporting the necessity and the advantages to apply the community matrix for the study of group dynamics: 1) the existence of some elements of intrinsic continuity in the literature about community and groups; 2) the presence of the main dimensions (inter-knowledge, communication and common action) both at the community and group levels. We emphasize the famous distinction made by Tönnies between *community* and *society* in *Gemeinschaft und Gesellschaft* (1887). According to Kornblum, a remarkable application of this distinction can be found in the theoretical perspective of C. H. Cooley regarding the *primary* and *secondary groups*. In Cooley's view, the primary groups are those groups characterized by *close face-to-face associations* and *cooperation*. The secondary groups are those groups where the affiliation is instrumentally motivated; the individuals who enter the group are motivated by the need to accomplish a task or a set of tasks. In secondary groups, passivity, indifference and lack of personal implication are ordinary symptoms (Kornblum, 1994). Cooley's distinction is integrated today in any theoretical perspective about groups, almost without exception. Therefore, based on Cooley's perspective, the social psychologist G. N. Fischer sustains that an essential characteristic of primary groups is the fact that the relationships between members are direct and interpersonal. As opposed to this, in the secondary group, the relationships between members are indirect and impersonal. The secondary group is a form of social organization where the relationships between members are determined by formal codes, and they may have or they may not have interpersonal relationships during the time when they are together (Fischer, 1997). The ideas we have just mentioned constitute arguments for the opportunity to translate the essential characteristics of communities towards the study of social groups, which at the disciplinary level indicate a transfer from sociology toward social psychology. We have the necessary arguments to justify the transfer of some theoretical ideas, techniques and methods, from the study of communities in the study of social groups, and the matrix theory is just an illustration of the unitary approach we aim at promoting (Pascaru & Poenar, 2007). Another set of arguments for this unitary

approach is given by the fact that the dynamics of communities as well as the dynamics of social groups can be defined through three dimensions: *knowledge (inter-knowledge)*, *communication* and *common action or cooperation*. According to Hare (1962), the central characteristic of a group is the social interaction between its members. The group members share a common collective identity, which implies a certain inter-knowledge or interrelation (Hare, 1962). From a psychosocial point of view, inter-knowledge represents a particular form of interaction between persons, being defined as the process through which the individuals know each other and know themselves (Cojocaru & Cojocaru, 2011). Bogdan-Tucicov observed that inter-knowledge was employed by Japan in 1957 in his *method of the objective evaluation of persons* (Bogdan-Tucicov, 1981). *Communication* is another central aspect of social interaction between the group members, significantly influencing their attitudes and behaviors (Kleinnijenhuis et al., 2007; Abrams & Maibach, 2009). Communication is impossible to avoid and it is almost permanent in the groups characterized by face-to-face interactions, because a simple observation of the behavior of others determines the social observer to make interpretations or to infer significations. From a psychosocial point of view, communication has an important formative value, reflecting social attitudes, shaping thinking, shaping knowledge representation and their cognitive organization (Hogg & Smith, 2007; Gonzales, Hancock. & Pennebacker., 2010). In 1981, Chelcea defined cooperation as *a form of psycho-social mutual interaction referring to the association and coordination of initiatives, knowledge and efforts of two or more persons, in order to accomplish a shared objective, which is difficult or even impossible to the accomplished individually* (Chelcea, 1981: 68). *Cooperation* may have positive results, in this case the group accomplishing the common goals. In general, in-group cooperation increases the group cohesion (Balliet, 2010; White, 2010). Having in mind the two sets of arguments, by analogy with the definition of the *community matrix*, we define the group matrix a system with three interrelated dimensions (inter-knowledge, communication and cooperation) in a social group, the system being at the basis of the entire dynamics of that group. Walker and other specialists highlights the fact that five predictor variables concerning student skills or behaviors related to overall success in school should also be taken into account. These are referred to as *academic enablers* and include (a) prior achievement, (b) interpersonal skills, (c) study skills, (d) motivation, and (e) engagement. Students who have positively developed skills in all these areas are the best prepared for school success (Walker, 2010). As it concerns our theme, we should also refer to interpersonal skills whose utility should be taken out from the analysis of the group matrix.

Methods and techniques used in the study of the group dynamics. The methodology of the group matrix

Historically, sociometry is one of the first experimental techniques used for the study of the group dynamics. It has been created by J. L. Moreno, in 1934. *Interactional Process Analysis* (IPA) is a sociometric technique that uses systemic observation in collecting the data. Originally elaborated by Bales, in 1950, this technique implies the registration of some observable dimensions of the relations/interactions between the group members; the frequency of each dimension is noted in an observation matrix. Bales suggests that any analysis of the communicative processes in groups, should take into account at least the following two dimensions: *task communication*, and *socio-emotional communication*. Researchers in the field emphasized that IPA has the advantage of allowing the comparison of frequencies for the studied dimensions - between members of the same group or between groups (Forsyth, 1999). Besides the observational matrices, many others instruments of collecting data have been developed in time. For example, *The Group Climate Questionnaire* has been used in a number of studies for the evaluation of the following dimensions of the group dynamics: cohesion, engagement, level of confidence (MacKenzie, 1983). Or, more recently, *The Groupwork Engagement Measure* allows the evaluation of active participation of the group members, their contribution in the accomplishment of collective tasks, their relations with other members, their engagement and effort in solving their own tasks or the others' tasks (MacGowan, 2000). Recent approaches from our perspective to the life of the group regard the relationship between the social capital and group cognition. (Curşeu, Janssen & Raab, 2011).

The researches we present in this study allow us to illustrate the main components of the group matrix. The investigations were performed on a group of students, with the following hypothesis: *the level of the group matrix with its different dimensions (inter-knowledge, communication, cooperation) positively correlates with some components of the students' academic behavior (the frequency of participation in academic activities and academic results)*. A strategic objective of the study was to develop, as a first step, a theoretical model (the group matrix with their dimensions) and a simple methodology for the study of the group dynamics. At this stage, we are aware of the inherent limits of the results.

The tool used for the identification and evaluation of the dimensions of the group matrix was *the questionnaire*. A first set of questions investigated the students' attitudes regarding the relevant dimensions of the group matrix: *inter-knowledge, communication and cooperation*. Thus, the first question investigated the first dimension, inter-knowledge ("Do you think that in general the students

from the same year should know each other very well?), with the following possible answers: a) Yes, it is good to know all about the other students; 2) Yes, it is good to know the others, but you have to know only the things that matter to you; 3) No, it is not good to be very interested about other students; 4) Other answer (which?); 5) NK/NA şDo not know / No answer. The second question investigated the second dimension, *communication* (“Do you think that in general it is a positive thing if the students from the same year discuss very often one with the others?”), with the following possible answers: a) Yes, at any occasion; b) Yes, but only when it is strictly necessary; c) No, everybody should mind his/her own problems; d) Other answer (which?); e) NK/NA. The third question investigated the third dimension, *cooperation* (“Do you think that in general the students from the same year should help each other?”), with the following possible answers: a) Yes, in any occasion when somebody needs help; b) Yes, but only when the help is rewarded; c) No, everybody should solve his/her own problems; d) Other answer (which?); e) NK/NA. The following questions were formulated in order to investigate the level of inter-knowledge, communication and cooperation between the students from the same year. Thus, for *inter-knowledge* the question was: “How much do you know...”, in the place of the points being: birth date, town of residence, occupation of the parents, mean grade of graduation for the previous year, *corresponding to three colleagues from the same year*, selected at random. The scores were the following: 1) knows exactly: 3 points; 2) knows approximately: 1.5 points; 3) do not know or can not identify the colleague: 0 points. The highest possible scores were 36 for the three *persons of reference*.

The level of *communication* was estimated in relation with the most recent date(s) when the subject had a discussion with each of the other three colleagues, considered as persons of reference. The answers had the following scores: 1) in the last week: 9 pts; 2) in the last month: 7 pts; 3) in the last three months: 5 pts; 4) in the last year: 3 pts; 5) in the last two years: 1p; 4) never or cannot identify the colleague: 0 pts. The interest was on the discussions about *personal problems*.

In order to establish the level of *cooperation*, the students were requested to remember the most recent date when they have been involved in a cooperative action with each of the three colleagues selected at random as persons of reference. For each possible answer, one the following scores was assigned: 1) in the last week: 9 pts; 2) in the last month: 7 pts; 3) in the last three months: 5 pts; 4) in the last year: 3 pts; 5) in the last three years: 1p; 4) never or cannot identify the colleague: 0 pts. The highest possible score was 27 points for three persons of reference and 18 points for two persons of reference.

For each dimension, we calculated an index as the rapport between the score we initially obtained and an ideal (maximal) score. The values of these indices are situated between 0 and 1. The role of these indices is to diminish the high differences between the scores. The index of the group matrix was calculated as

the arithmetic mean of the indices corresponding to the three dimensions of the matrix. It has values between 0 and 1.

In this study, the academic behavior is not understood beyond its ethical dimension, including other aspects of the students' academic life, such as the active implication in the academic life and the preoccupation for assiduous learning, reflected in the academic results. Thus, the students' academic behavior was initially appreciated on the basis of its representation and auto-evaluation, in absence of the objective data, because such data were missing (for example, the data about the students' frequency in academic activities), or because they were not available (for example, the data about the students' grades). The students' frequency in academic activities was evaluated through the question: "How often do you participate at the courses and other academic activities?", with the following possible answers: a) several times a semester; b) several times a month, c) several times a week, d) several times a day. The students' academic performance was appreciated through the mean of the grades obtained at the end of the year, using the following classes: 1) very good results (mean higher than 8.50), 2) good results (mean between 7.01 and 8.50) and 3) poor results (mean lower than 7). The participants in this study were 36 students in the third year, 27 girls and 9 boys. The mean value of their academic grades was 7.60, with a small difference between girls (7.59) and boys (7.71). The frequencies of their participation in academic activities had the following distribution: almost every day 44.1%, several times a week, 22.2%, several times a month 22.2%, and several times a semester 11.1%. 48.1% of the girls participated in academic activities almost every day, and 44.4% of the boys. 7.4% of the girls participated in academic activities several times in one semester, and 11.1% from the boys. The students who registered a frequency of participation in academic activities of several times a months or even more rare, they had the mean of the grades lower than the mean of the grades calculated for the whole group (7.08). The students who registered a frequency of participation in academic activities of several times a week or higher, they had the mean of the grades higher than the mean of the grades calculated for the whole group (7.87).

Results

The students' attitudes about inter-knowledge, communication and cooperation

As we mentioned earlier, a particular focus of this research was on the distribution of the students' attitudes concerning the in-group inter-knowledge, communication and cooperation. As we expected, the results were also relevant in understanding the other elements of the community matrix. Regarding the in-group inter-knowledge, the most part of the students from our group of investigation appreciated that *"It is good to know the others, but you have to know only the things that involve you"* (72.2%). 16.7% of the participants appreciated that *"it is good to know all about the other students"* and 8.3% of them expressed the opinion that *"it is not good to be very interested about other students"*. 50% from those who appreciated that *"it is good to know all about the other students"* had poor academic results and a low rate of participation in academic activities (once a month or less). None of the students with a very low rate of participation in academic activities expressed the opinion that *"it is good to know all about the other students"*. From the participants who appreciated that *"it is good to know all about the other students"*, 22.2% were boys and 14.8% were girls. All the participants who answered, *"it is not good to be very interested about other students"* were girls. Regarding the in-group communication, the most part of the students from the group expressed the opinion that they should discuss with their colleagues *"at any occasion"* (86.1%). At the same time, 11.1% of them appreciated that *"It is good to discuss with the colleagues, but only when it is strictly necessary"* and one student said that every person should remain with his/her own problems. The most part of these respondents had poor academic results (41.9). From the participants who appreciated that it is good to discuss with the colleagues *"at any occasion"*, 88.9% were boys, and 77.8% were girls. Regarding the in-group cooperation, 83.3% of the participants appreciated that they should help *"in any occasion when a colleague needs help"*, 11% of them appreciated that *"the help should be given only if it is rewarded"*, and one student answered that *"everybody should solve his/her own problems"*. One student offered an original response, saying that *"yes, it is a good thing to help a colleague, but not in a sense of taking his responsibilities or doing his job"*. From the participants who appreciated that they should help *"in any occasion when a colleague needs help"*, 43.3% had poor academic results, and 40% had good academic results. The most part of these students (63.3%), had a good rate of participation in academic activities (almost every day or at least once a week). The student who declared that *"everybody should solve his/her own problems"* also had a good rate of

participation in academic activities (almost every day). From the participants who appreciated that they should help “*in any occasion when a colleague needs help*”, 88.9% were boys and 66.7% were girls.

The relations between the students’ attitudes and their actual behavior were assessed through the inter-knowledge, communication and cooperation indices. The results we obtained lead to the following conclusions: 1). in the case of inter-knowledge, the students’ attitudes are reflected in their actual behavior; the participants who declared that “*it is good to know everything about the others*” had the inter-knowledge index 0.42, the participants who declared that “*it is good to know the others, but you have to know only the things that involve you*” had the inter-knowledge index 0.33, and those who declared that “*it is not good to be very interested about the other students*” had the inter-knowledge index 0.21 (Table 1); 2). in the case of communication, the participants who appreciated that they should discuss with their colleagues “*at any occasion*” had the communication index significantly smaller than those who declared that “*it is good to discuss with the colleagues, but only when it is strictly necessary*” (0.42 to 0.66), but two times higher than the students who responded that everybody should keep his/her own problems for himself/herself (0.20). 3) in the case of cooperation, the participants who appreciated that they should help “*in any occasion when a colleague needs help*” had a cooperation index smaller than those who appreciated that “*the help should be given only if it is rewarded*” (0.35 to 0.57), but significantly higher than the cooperation index calculated for the student who answered that “*everybody should solve his/her own problems*” (0.20).

As a synthetic conclusion, we might say that, at least for the group we investigated, the explicit attitudes are reflected in the actual behavior only for the inter-knowledge dimension (and not for communication and cooperation).

The dimensions of the community matrix and the academic behavior

Regarding the academic behavior, the most important observations were the following: 1) the students who participated in the academic activities several times a month or several times in one semester present higher community matrix indices, compared with the students who participated in academic activities more frequently; 2) the students with poor academic results have a lower inter-knowledge index, compared with those with good or very good academic results; 3) paradoxically, the highest communication index can be observed at the students with low participation in academic activities (several times a month or several times in one semester); 4) the students who participated in academic activities several times in one semester present the highest cooperation index; 5) the students with poor academic results have the lowest cooperation index; 6) the students with good academic results (grades between 7.01 and 8.50), those with a lower frequency of participation in academic activities and the boys, present higher indices (Table 2).

Table 1. *Attitudes and behavior*

ATTITUDES	GROUP MATRIX
Inter-knowledge	Inter-knowledge index
Yes, it is good to know all about the other students	0.42
Yes, it is good to know the others, but you have to know only the things that involve you	0.33
No, it is not good to be very interested about the other students	0.27
Mean value	0.33
Communication	Communication index
Yes, at any occasion	0.45
Yes, but only when it is strictly necessary	0.66
No, everybody should stay with his/her own problems	0.20
Mean value	0.47
Cooperation	Cooperation index
Yes, in any occasion when somebody needs help	0.35
Yes, but only when the help is rewarded	0.57
No, everybody should solve his/her own problems	0.20
Other answer (which)	0.20
Mean value	0.37

Table 2. *The group matrix and the students' academic behavior*

Academic behaviour dimensions	Scales	Inter-knowledge	Communication	Cooperation	Group matrix
Academic results	Poor	0.2973	0.5193	0.3213	0.3953
	Good	0.3362	0.4177	0.4431	0.4169
	Very good	0.3588	0.4575	0.3325	0.3837
	Total	0.3250	0.4689	0.3678	0.4006
Frequency of participation in academic activities	Several times a semester	0.2850	0.6025	0.4350	0.4400
	Several times a month	0.3113	0.5963	0.2963	0.4313
	Several times a week	0.3488	0.3900	0.3800	0.3725
	Almost every day	0.3300	0.4113	0.3806	0.3894
	Total	0.3250	0.4689	0.3678	0.4006

Discussions and conclusions

The matrix approach, proposed a new perspective in the study of communities and groups, has many advantages and several limits. One theoretical and methodological gain of this study is the introduction of the concept of group matrix, developed by analogy from the concept of community matrix. Another advantage is the possibility to define more precisely the cognitive, communicative and behavioral dimensions of groups and communities. The group matrix might be useful in estimating the distance between a primary and a secondary group. The theoretical consequences of these affirmations need further discussion. Some limits of our research consist in a limited exploration of the theory at the group level. The transference of the matrix model from the study of communities to the study of group dynamics needs future detailed analysis and integration in the theoretical and methodological frames of social psychology.

Further research is needed to identify the heuristic and practical implications of the matrix approach in the study of groups. In this regard, we appreciate that some ideas from social psychology might offer interesting suggestions for the future. For example, an idea of Hogg and Tindale, regarding the size of the group, stereotypes and distortions in the inter-knowledge process: “in the case of small groups, the frequent face-to-face contacts facilitate the inter-knowledge between members, which is mediated, limited and vulnerable to distortions in large groups. As the size of the group increases, the perceptions of the in-group members is more vulnerable to the sub-categorization processes (for example, from a class of students, the girls might be perceived as a subcategory, having associated stereotypical characteristics). The in-group bias is another cognitive distortion which influences the inter-knowledge.” (Hogg & Tindale, 2002: 56).

In this study, we investigated three dimensions of the group matrix; further research has to investigate a fourth dimension, which is the affective dimension. The studies we previously conducted on this affective dimension revealed insignificant results (Pasaru & Poenar, 2007). According to some previous researches, among the affective variable of the group dynamics, the interpersonal attraction has a significant influence on the group formation and cohesion. The interpersonal attraction is influenced by other variables: physical proximity, perceived similarity/ dissimilarity with the other members of the group, social acceptance and approval, compatibility with the others' expectancies, etc. (Forsyth, 1999). Researchers also showed that, besides the interpersonal attraction, the group cohesion is influenced by the following psycho-emotional variables: 1) accomplishment of the needs of affiliation, recognition or security of the group members; 2) resources and prestige expected by the members as a consequence of the affiliation to the group; 3) positive expectancies associated with the collective work in the group;

4) the retrospective positive comparisons regarding the personal experiences in group (Garvin, Gutierrez, & Galinsky, 2004).

Research on this issue may also be continued by using the technique of returning the results. We have successfully used this technique when studying the communities (Pascaru & Buțiu, 2009; Pascaru & Buțiu, 2010). By returning the results one may make a step towards intervention and change in the students' behavior. This may also be accomplished by improving the techniques of group communication. (Buțiu, 2003). Here we have a very important objective from the perspective of the skills students should acquire by the end of their courses. Educational European policies include social and civic skills among the key skills in education and continuous learning and they constitute a common European reference framework (Amara *et al.*, 2010).

Some practical implications of the matrix perspective consist in the possibility to identify different typologies of potential leaders from a community or a group (Pascaru, 2003). More exactly, the matrix perspective allows the identification of the inter-knowledge, communication or cooperation leaders in relation with the specific objectives of the social intervention in a community or in a group. We need a particular type of leader when we make a selection of the group or community members, we need another type of leader when we want to transmit a message very quickly, or we need another type of leader when we need to determine the members of a group or community to cooperate.

Other practical implications of the matrix perspective consist in promoting and offering theoretical justifications for the cooperative learning methods – the *student teams* and *jigsaw classroom* techniques, in particular (Alexitch, 2005). According to the researchers in the field, cooperation is a superior form of psychosocial interaction, based on tolerance and mutual support, involving the sustained effort of all the members of the group in order to accomplish a common objective (Jacob, 1999). In general, cooperation is influenced by the following variables: 1) the existence of a common objective of the group; 2) the belief in the maintenance in time of the group, and the anticipation of future collaborative interactions between the group members; 3) the anticipation of successful collaborative activities/the anticipation of personal benefits; 4). the need of a collective identity (Toseland *et al.*, 2004).

These investigations could have even a *militant orientation*, because in Romania and in other countries, at least in higher education, the promotion of cooperative learning is extremely poor (Jakob, 1999).

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