

# SMALL GROUP LEARNING METHODS AND THEIR EFFECT ON LEARNERS' RELATIONSHIPS

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## Abstract

*Building relationships in the classroom is an essential part of any teacher's career. Having healthy teacher-to-learner and learner-to-learner relationships is an effective way to help prevent pedagogical failure, social conflict and quarrelsome behavior. Many strategies are available that can be used to achieve good long-lasting relationships in the classroom setting. Successful teachers' pedagogical work in the classroom requires detailed knowledge of learners' relationships. Good understanding of the relationships is necessary, especially in the case of teenagers' class. This sensitive period of adolescence demands attention of all teachers who should deal with the problems of their learners. Special care should be focused on children that are out of their classmates' interest (so called isolated learners or isolates) in such class and on possibilities to integrate them into the class. Natural idea how to do it is that of using some modern non-traditional teaching/learning methods, especially the methods based on work in small groups involving learners' cooperation. Small group education (especially problem-based learning, project-based learning, cooperative learning, collaborative learning or inquire-based learning) as one of these methods involves a high degree of interaction. The effectiveness of learning groups is determined by the extent to which the interaction enables members to clarify their own understanding, build upon each other's contributions, sift out meanings, ask and answer questions. An influence of this kind of methods (especially cooperative learning (CL)) on learners' relationships was a subject of the further described research. Within the small group education, students work with their classmates to solve complex and authentic problems that help develop content knowledge as well as problem-solving, reasoning, communication, and self-assessment skills. The aim of the research was to answer the question: Can the cooperative learning methods help to integrate isolated learners into the class? The research was realized as a pre-test-post-test design for the sample of 207 learners of first, second and third grades of lower secondary school. Standardized sociometric questionnaire B-3 was used to determine the number of isolated learners before and after using the CL methods. Consequently, using the Wilcoxon statistic test of significance, the hypothesis was verified that the number of isolates after the CL methods is statistically significantly lower than that of the case before using the non-traditional teaching/learning method. Accordingly, the research results justify implementation CL methods into education.*

**Key words:** cooperative learning, isolated learners, learners' relationships, small group learning methods, sociometric methods.

## Introduction

The learner to learner relationships in a classroom is an important element of education. How can you learn and participate with others if you don't get along with them? Good knowledge of the relationships is necessary for all teachers, especially in the case of teenagers' class. Children can be isolated for very different reasons: their behaviors may turn other students off. They may cut in line, talk too much, interrupt conversations, make fun of others, and butt in during games. A child may lack an understanding of basic social skills so that he/she may not know what to say or do around his classmates. Rather than run the risk of trying to connect with a classmate and failing, he/she may withdraw from his/her peers and choose to spend time alone. Staying to himself/herself is often the less painful option. Not surprisingly, these students have trouble making and keeping friends. Beyond its effect on a child's self-esteem, isolation

from peers can have a marked impact on his school adjustment. Isolates may have difficulty focusing on schoolwork as their attention drifts to social concerns. Having limited relationships with peers also denies them a valuable learning experience. It is through these interactions that they learn the skills of developing and maintaining friendships. It is not surprising then that children who are isolated from their peers tend to have social problems later on. Frustrating feeling of an isolated learner receiving no choices in a group of classmates, especially in the sensitive period of adolescence, can have a significant negative effect on her or his future life. There are few things more painful to children than to have no friends. Just about all children need to feel a connection with their peers. For those on the social fringe, school brings frequent reminders of their unwanted status — being chosen last for a team, having trouble finding a partner for an activity, having few classmates to invite to their birthday party, not having anyone to play with during recess.

To eliminate this unpleasant feeling and trying to integrate the teenager back into the class team, there was tried to arrange some means, method or form of work which would contribute to the social interactions of classmates and find activities, where one can interact with other students successfully and be with peers who are likely to be accepting. After some previous experience with project-based learning (Emanovský & Štěpánková, 2013) and problem-based learning (Emanovský, 2015), the method of cooperative learning was chosen for this aim. Of course, the correctness of the assumption that this method could contribute to the integration of learners standing at the edge of class to the class group should be confirmed by serious research.

#### *Learner-to-Learner Relationships and their “Measurement”*

In order to determine the influence of the social climate of the classroom on the achievement of the students, it is first necessary to decide upon an effective method for measuring social acceptance or rejection of students by their classmates (Buck, 1952). A suitable quantitative method for measuring of learner-to-learner relationships in a classroom is *sociometry*. The method was developed by the psychotherapist J. L. Moreno in his studies of the relationship between social structures and psychological well-being (Moreno, 1953). One of essential means in sociometry is the *sociogram*, a systematic method for graphically representing individuals as points/nodes and the relationships between them as lines/arcs (McIntyre, 2003). Sociograms may be constructed in a variety of ways. The methods described here are ones which teachers have used and found not too difficult or time consuming. The graphically representing is based on special sociometric questionnaire detecting learners' positive and negative choices in the class. Sociometry and sociograms are very important tools for teacher's behaviour management in the class collective. They provide a wealth of information about classroom friendship and interaction patterns, and they can be very useful for the teacher when he/she is planning seating arrangements or work-group composition. A sociogram's value to a teacher is in its potential for developing greater understanding of group behavior so that he/she may operate more wisely in group management and curriculum development. In the classroom, many occasions occur where the class has to be split up into small groups, which will work on particular projects, and the particular activity involved will provide the criterion of choice (Evans, 1963). The results of sociometric research can be applied to help make positive changes in behaviour in a classroom setting (Sherman, 2002). The sociograms help identify various groups of learners. The pattern of choices can show a *star* (someone that receives the most choices), a *rejectee* (he or she that receives no positive choices and a number of negative choices) and an *isolate* (someone receiving no choices). Everyone else is a *member* (receiving some positive and perhaps some negative choices) (Chapin, 1950). Sociometry is based on the fact that people make choices in interpersonal relationships. Whenever people gather, they make choices where to sit or stand; choices about who is perceived as friendly and who not, who is central to the group, who is rejected, who is isolated (McIntyre, 2003). Sociometry can be seen as a way of measurement of the relationships between people in a social setting. It is undertaken to reveal information

about individuals in their relationship to groups, in the context of their mutual activities. In education, sociometric assessment is a valuable means by which the teacher can determine the relationships of individual learners to other ones within the class. It also allows the teacher to track the roles which the learners play in mutual relationship within the classroom, identifying for example the popular children who are the centre of attention, and the neglected children who are overlooked by the majority of their peers (Hoffman, 2001).

*Sociometric questionnaire* is the most important and basic technique giving sociometry information. The questionnaire is easy to administer and consist, basically, of simply asking each member of a group to indicate his or her choice of companions for some specified activity or occasion. Using the questionnaire can be found out the positive choices in the group, which are sympathy, preferences, attractions, and also the negative choice - rejection. The positive choices are detected more often. The sociometric questionnaire contains usually one or more questions that allow all members of a social group to vote of the partners for certain situations or joint activities. The sociometric questionnaire is set mostly in writing form. Content of the questions depends on the specific objectives of the sociometric research. The questionnaire B-3 by Richard Braun can be also included among the sociometric questionnaires (Braun, 2012). It uses a rating scale for two factors - influence and popularity, which are supplemented by verbal reasoning of the assessments. The questionnaire is professionally standardized for the population in the Czech Republic. The questionnaire B-3, which is designed for sociometric analysis of learners of 4<sup>th</sup> – 9<sup>th</sup> grade at basic school and which is also suitable for learners of lower secondary school, was used. The obtained data are usually processed in several ways – using matrix analysis, sociogram and calculation of sociometric indexes (Hoffman, 2001). Using the freeware “Sociogram” for creating the sociograms the number of isolates was determined (Table 1).

The sociometric results that have been obtained using the questionnaire represent very valuable source of information about learners' relationships. Sociometric stars, isolates as well as individuals at risk - potential victims of aggressors and aggressors themselves can be identified using the results. Class potential is also described by responses of learners connected with their positions in the class, so one can find out those, who are not comfortable in the classroom. Class positions hierarchy is built from several outputs of the questionnaire, and therefore it can be suitably used as a basis for intervention in the class. Sociometric stars have the largest radius in the classroom, their views are respected, and so they can streamline the educational intervention of the teacher. The rejected individuals can be also found out from the results of the questionnaire. They are the easiest victims of the class bullying and the teacher would be interested to know how they are satisfied in the class collective. The tendency to be victimized by bullies has been commonly associated with low self-esteem, shyness and feeling of isolation (O'Moore & Kirkham, 2001). In the case of negative feelings of the learner it is necessary to find out the cause and try to change his/her position. In the case of the isolates it is necessary to try to integrate them into the class collective.

The serious problem of sociometric methods is the question of their reliability and validity. One early review (Mouton et al. 1955) indicated some of the limitations of sociometric procedures from the point of view of the stability of measures. Among other problems, the stability of the measuring instrument is confounded with the stability of persons and social structures. Validity is especially difficult to assess in sociometry, since the sociometric indexes are so often seen as the criteria to be predicted. Intrinsically, sociometric information represents the objective depicting of the situation on the basis of the most relevant judges—those with whom one participates. Thus, there has been some tendency to emphasize the prediction of sociometric status on the basis of other characteristics rather than to use sociometric status to predict other variables (Gresham, F. M. & Stuart, D., 1992). Sociometric procedures have been incorporated into many different types of studies. For example, in small group research one of the common types of information collected in post-meeting questionnaires is the set of sociometric ratings on criteria relevant to the group participation. On this score, it should be emphasized that sociometric procedures

as classically defined have tended to merge with more general procedures for obtaining peer ratings and rankings. The structure of self-rankings and peer rankings has been systematically explored by various researchers, with some convergence on the types of content involved and some crystallization of information about the stability of measures (Borgatta, 1964). Content corresponding to that initially identified by Jennings (1947) with task and with social concerns has continued to be central, but other concepts have also been found to recur in analyses. Sociometric procedures have also been important to the development of several other research areas. An extensive review of this research literature (Glanzer & Glaser, 1961) has suggested the limitations of such approaches and has placed them in their historical context. Sociometric techniques remain pervasive in the social sciences, having relevance to personality research, small group research, analysis of networks of communication and group structures, and to special topics such as the reputational study of social status in the community and the study of segregation patterns.

### *Small Group Learning Methods as a Means of Improving Learners' Relationships*

By *small group learning* (SGL) is usually meant an organizational form of education based on work in small groups involving learners' cooperation. One can distinguish several specific modern non-traditional learning methods within SGL, namely problem-based learning (Kirschner, Sweller & Clark, 2006), project-based learning (Baranoková, 2012; Grecmanová & Urbanovská, 1997; Henry, 1994), cooperative learning (Cowie, H. & Rudduck, J., 1988; Kasíková, 1997; Trabalíková, 2011), collaborative learning (Kay, 1992; Hošek, 2001) or inquiry-based learning (Kirschner, Sweller & Clark, 2006). SGL can be considered as a common technique in collegiate instruction that has a plethora of benefits for learners and their relationships in the classroom.

According to Johnson, Johnson, and Holubeck (1994), small group learning can bring improvements in areas such as tolerance and positive interactions among students from different cultural backgrounds, the exchange and processing of information, academic achievement, ownership of new knowledge and skills, opportunities to solve real-world problems, positive attitudes toward the content, openness to new perspectives, motivation to learn, confidence in one's social skills, psychological health (e.g., social development, self-esteem) and attendance.

Fisher and Ellis (1990) emphasise that most of the definitions of a group indicate the sharing element among members as the key factor which defines the existence of a group. The sharing can be around perceptions, motivation or goals, as well as around tasks, such as in a scenario group session. This sharing element can be greatly influenced by the group dynamic or climate of the group. The structure of the group is another defining element – the roles, norms, values and power relationships that influence the behaviour of group members and tie them to the group, providing the 'glue' of group structure. The structure of a group can influence the level and success of interaction in a group. Studies have shown that when looking at long term retention, the ability to apply knowledge and solve problems, critical thinking and development of positive attitudes, results consistently favour small discussion classes (McKeachie & Kulik, 1975, McKeachie, 1994).

SGL is the learning method that places students at the centre of the learning process. It is widely used to replace the traditional teaching method in which the teacher, who is the centre, strictly follows the teaching plan and the teaching is mostly lecture-based. Teaching and learning in small groups has a valuable part to play in the all-round education of students. It allows them to negotiate meanings, to express themselves in the language of the subject, and to establish more intimate contact with academic staff than more formal methods permit. It also develops the more instrumental skills of listening, presenting ideas and persuading' (Jacques, 1991).

Collaborative problem-solving groups are a key feature of SGL. One assumption of SGL is that the small group structure helps distribute the cognitive load among the members of the



group, taking advantage of group members' distributed expertise by allowing the whole group to tackle problems that would normally be too difficult for each student alone (Pea, 1993; Salomon, 1993). At the beginning, the students meet the problem "cold", they do not know what the problem is until it is presented. They discuss the problem, generating hypotheses based on whatever experience or knowledge they have, identifying relevant facts in the case, and identifying learning/teaching issues. The learning issues are topics of any sort, which are deemed of potential relevance to this problem and which the group feels they do not understand as well as they should (Savery & Duffy, 2001). Note that there are no pre specified objectives presented to the students. The students generate the learning issues (objectives) based on their analysis of the problem. After the discussion, the students all engage in self-directed learning. There are no assigned texts. Rather the students are totally responsible for gathering the information from the available library and computer database resources.

Working in groups, learners identify what they already know, what they need to know, and how and where to access new information that may lead to solution of the problem. The role of the teacher (known as the tutor in SGL) is to facilitate learning by supporting, guiding, and monitoring the learning process. The tutor must build students' confidence to take on the problem, and encourage the students, while also stretching their understanding. The constructs for SGL are very different from traditional classroom/lecture teaching and learning. SGL is an instructional model that involves students in research of compelling problems that culminate in authentic problem solution (Hmelo-Silver, 2004). PBL, in contrast to the traditional frontal teaching, is more inductive: students learn the content as they try to address a problem. A further benefit of SGL is the increased collaboration amongst learners. This leads to less individualism and greater opportunities for peer learning. Barrett (2010) highlights, this method of group learning brings a shift from an individual's knowledge and control to group knowledge and group control. Due to the collaborative nature of a SGL environment, students are more likely to risk making contributions. This should lead to the development of increased self-esteem among learners and is a further argument in favour of this strategy. Cooperative learning refers to work done by student teams producing a product of some sort (such as a set of problem solutions, a laboratory or project report, or the design of a product or a process), under conditions that satisfy five criteria: (1) positive interdependence, (2) individual accountability, (3) face-to face interaction for at least part of the work, (4) appropriate use of interpersonal skills, and (5) regular self-assessment of team functioning. Extensive research has shown that relative to traditional individual and competitive modes of instruction, properly implemented cooperative learning leads to greater learning and superior development of communication and teamwork skills (e.g. leadership, project management, and conflict resolution skills) (Felder & Brent, 2007). The technique has been used with considerable success in all scientific disciplines, including mathematics. The described above attribute of SGL justify us to suppose that implementation SGL methods into education could have positive effect on learners' relationships.

The following research was focused on so-called cooperative learning (CL) and its effect on a number of isolated learners in a classroom. Of course, working in small groups does not mean cooperative learning automatically. According to Johnson, Johnson and Holubec (1994): *"Cooperative learning is an educational approach which aims to organize classroom activities into academic and social learning experiences. There is much more to Cooperative Learning than merely arranging students into groups, and it has been described as "structuring positive interdependence." Students must work in groups to complete tasks collectively toward academic goals. Unlike individual learning, which can be competitive in nature, students learning cooperatively can capitalize on one another's resources and skills (asking one another for information, evaluating one another's ideas, monitoring one another's work, etc.). Furthermore, the teacher's role changes from giving information to facilitating students' learning. Everyone succeeds when the group succeeds."*

Slavin (1990) describes cooperative learning as an approach to organize, arrange, systematize, assemble and classify classroom activities into academic learning experiences to

get maximum learning outcomes. So the main focus of the cooperative learning is “structuring positive interdependence” in teaching/learning process.

The type of CL suitable for mathematical education is so-called *formal CL*, particularly assignment that involves group problem solving and decision making. Formal cooperative learning consists of students working together, for one class period to several weeks, to achieve shared learning goals and complete jointly specific tasks and assignments (Johnson, Johnson and Holubec, 2008). In formal cooperative learning groups the teachers' role includes:

1. Making pre-instructional decisions. Teachers (a) formulate both academic and social skills objectives, (b) decide on the size of groups, (c) choose a method for assigning students to groups, (d) decide which roles to assign group members, (e) arrange the room, and (f) arrange the materials students need to complete the assignment. In these pre-instructional decisions, the social skills objectives specify the interpersonal and small group skills students are to learn. By assigning students roles, role interdependence is established. The way in which materials are distributed can create resource interdependence. The arrangement of the room can create environmental interdependence and provide the teacher with easy access to observe each group, which increases individual accountability and provides data for group processing.

2. Explaining the instructional task and cooperative structure, Teachers (a) explain the academic assignment to students, (b) explain the criteria for success, (c) structure positive interdependence, (d) structure individual accountability, (e) explain the behaviors (i.e., social skills) students are expected to use, and (f) emphasize intergroup cooperation (this eliminates the possibility of competition among students and extends positive goal interdependence to the class as a whole). Teachers may also teach the concepts and strategies required to complete the assignment. By explaining the social skills emphasized in the lesson, teachers operationalize (a) the social skill objectives of the lesson and (b) the interaction patterns (such as oral rehearsal and jointly building conceptual frameworks) teachers wish to create.

3. Monitoring students' learning and intervening to provide assistance in (a) completing the task successfully or (b) using the targeted interpersonal and group skills effectively. While conducting the lesson, teachers monitor each learning group and intervene when needed to improve task work and teamwork. Monitoring the learning groups creates individual accountability; whenever a teacher observes a group, members tend to feel accountable to be constructive members. In addition, teachers collect specific data on promotive interaction, the use of targeted social skills, and the engagement in the desired interaction patterns. This data is used to intervene in groups and to guide group processing.

4. Assessing students' learning and helping students process how well their groups functioned. Teachers (a) bring closure to the lesson, (b) assess and evaluate the quality and quantity of student achievement, (c) ensure students carefully discuss how effectively they worked together (i.e., process the effectiveness of their learning groups), (d) have students make a plan for improvement, and (e) have students celebrate the hard work of group members. The assessment of student achievement highlights individual and group accountability (i.e., how well each student performed) and indicates whether the group achieved its goals (i.e., focusing on positive goal interdependence). The group celebration is a form of reward interdependence. The feedback received during group processing is aimed at improving the use of social skills and is a form of individual accountability. Discussing the processes the group used to function, furthermore, emphasizes the continuous improvement of promotive interaction and the patterns of interaction need to maximize student learning and retention.

Ross and Smyth (1995) describe successful cooperative learning tasks as intellectually demanding, creative, open-ended, and involve higher order thinking tasks. Five essential elements are identified for the successful incorporation of cooperative learning in the classroom. The first and most important element is Positive Interdependence. The second element is individual and group accountability. The third element is (face to face) promotive interaction. The fourth element is teaching the students the required interpersonal and small group skills. The fifth element is group processing. According to Johnson and Johnson's meta-analysis,

students in cooperative learning settings compared to those in individualistic or competitive learning settings, achieve more, reason better, gain higher self-esteem, like classmates and the learning tasks more and have more perceived social support.

The benefits of cooperative learning are not automatic, however, and if imperfectly implemented, the method can create considerable difficulties for educators, most notably dysfunctional teams and student resistance or hostility to group work. One can consider a number of suggestions for forming teams, satisfying the five defining criteria of cooperative learning, and minimizing the problems. Educators who have never used the approach are advised to move into it gradually rather than attempting a full-scale implementation on their first try, and to increase the level of implementation in subsequent course offerings. To an increasing extent, they should see the learning benefits promised by the research, and as their expertise and confidence in implementing the method continue to grow, student evaluations of the team experience should improve concurrently. Most importantly, educators who are successful in using cooperative learning in their classes will have the satisfaction of knowing that they have significantly helped prepare their students for their professional careers.

### *Research Question and Hypotheses*

The research question was formulated as follows:

*Does the cooperative learning help isolated learners to integrate into the class collective?*

The research hypothesis was formulated according to the research question:

*The cooperative learning helps isolates with integration into the class more than the frontal teaching.*

Subsequently, the following null and alternative hypotheses were formulated to verify the research hypothesis:

$H_0$ : *There is no statistically significant difference between the number of isolates within the frontal teaching and within the cooperative learning.*

$H_A$ : *There is statistically significant difference between the number of isolates within the frontal teaching and within the cooperative learning.*

## **Methodology of Research**

### *General Research and Respondents Characteristic*

The research was conducted as a single-group pre-test-post-test design in standard conditions at lower secondary school. According to the current situation, the sample of 207 learners of first, second and third grades was available. Sociometric questionnaire B-3 was used to determine the number of isolates before using the cooperative learning. The first questionnaire was submitted to the learners of the research group at the end of October 2014 after the previous one-month period of using classical frontal learning without any CL methods in the classes. According to the initial sociometric results, working groups for CL containing approximately the same number of isolates were created. The same sociometric questionnaire was submitted to the learners after five-month application of CL method. Consequently, using the Wilcoxon statistic test of significance, the hypothesis about statistical significance of difference between the number of isolates before and after the cooperative learning was tested.

### *Instrument and Data Collection*

The professionally standardized sociometric questionnaire B-3 by Richard Braun (Braun, 2012) was used to determine the number of isolates before and after using the cooperative learning. This questionnaire was chosen because it allows an easy computer processing in the form of class hierarchy, where it is easy to recognize the names of children that represent the

isolates. Moreover, the sociogram of positive relations as well as the sociogram of negative relations is given. Special attention was paid to such isolates that were labelled with the same order number in the sociogram and in the class hierarchy. If a positive relation from an isolate to a learner of the rest of the class is found, these two learners will be assigned to one working group with the intention of strengthening of positive linkages.

Based on subsequent computer data processing of the first questionnaire, the working groups for the cooperative learning were created. The CL took place in such distributed classes in the following almost five-month period. The classes did not mix each other during this period and the learners worked in small groups containing approximately the same number of isolates. The sociometric questionnaire B-3 was done by the learners after the "CL period" again. The names of the isolated learners were obtained from the class hierarchy based on the following computer processing of the second questionnaire. The number that represents the position in the class hierarchy is obtained summing all positive options and subtracting all negative ones. The "sociometric stars" have the most points and the isolates have the fewest points.

### *Statistical Data Analysis*

The non-parametric statistical *Wilcoxon test* for two dependent small samples was used to test the null hypothesis. This test is appropriate for analysing the data from a repeated-measures design with two conditions. The advantage of the test is that it reveals small differences between the measurements (McMillan & Schumacher, 2010). The data processing was done using the software Statistica, version 12.

## **Results of Research**

### *Sociometric Findings*

The following table shows the sociometric results connected with the number of isolates in the classes obtained from the sociometric questionnaire.

**Table 1. Sociometric findings – number of isolated learners.**

	1.E	2.E	3.E	1.D	2.B	3.B	3.A	Σ
Number of learners in the class	30	31	29	22	31	32	32	207
Number of isolates before CL	6	2	7	3	4	6	5	33
Number of isolates after CL	2	2	4	3	2	4	3	20

### *Null Hypothesis Testing*

The difference between number of isolates before and after using CL methods is evident, but the crucial question about its statistical significance demands the statistical null hypothesis testing.



**Table 2. Data for Wilcoxon test.**

Class	Number of isolates		Differences	Differences order	+	-
	Before using CL	After using CL				
1. E	6	2	4	5	5	
2. E	2	2	0	-	-	-
3. E	7	4	3	4	4	
1. D	3	3	0	-	-	-
2. B	4	2	2	2	2	
3. B	6	4	2	2	2	
3. A	5	3	2	2	2	

Using the results from the Table 2, one can compute the value of Wilcoxon test criterion  $T = 0$ . Since the table value of the criterion  $T_{0.05}(5)$  for significance level  $\alpha = 0.05$  and for 5 pairs is equal to  $2 > 0$ , the null hypothesis  $H_0$  is rejected. The result can be confirmed by computing of  $p$ -value as well. Using software Statistica 12,  $p = 0.043115 < 0.05$  can be obtained. It means that, for this significance level, there exists statistically significant difference between the number of isolates after the frontal learning and that of after the cooperative learning.

## Discussion

Students at all ages have a strong need to belong to groups. The desire to fit in provides a major source of motivation and—at times—challenges to school rules. Students may feel conflicting desires to belong to an ethnic or cultural group, girls' or boys' athletic teams, or any one of a number of other groups. Learning to work positively within a social group is important to maturity. Hall (1994) stresses the importance of using effective group work practice as a method to improve social relational and emotional development, focusing attention not only on the content of the group work activity, but also on the process and interpersonal sensitivity gained through typical procedures (Bliss et al., 1995; Curry & Bromfield, 1998). A social relational approach necessarily focuses upon the interpersonal (as opposed to individual) development and uses the whole class as an inclusive site for development of group work. This approach is modelled on the development of close relationships such as attachment, within which trust, dependence and responsibility (Ainsworth, Stayton & Bell, 1974) establish the bases for further relationships, social and cognitive development. Studies presented by Hall and by Kutnick and Manson show that a social relational approach for children has positive effects not only on their social capacities, but also on their (cognitive) learning and motivation to work with others (Kutnick & Manson, 1998; Hall, 1994). Sainsbury and Walker (2009) have found a more complex relationship between friendship and productivity of collaboration. Members of the “friends” group demonstrated significantly greater competitive behaviours towards each other than members of the “acquaintances” group, with the result that their friendships began to deteriorate over the study period. Individuals within the “friends” group were primarily motivated by the need for personal achievement, particularly in examinations, which was manifest in a range of behaviours towards each other and in relation to the activities in which they participated. Individual and collective motivation thus mediated qualitative differences in the productivity of collaboration and extent of learning (Sainsbury & Walker, 2009). These findings contribute to a deeper understanding of the interactions between individual and collective behaviours, motivations and outcomes.

Especially, in mathematical education it has also been observed that, even when students are not in conflict, cooperative work may lead to a better solution than individual work (Beaudichon & Vandenplas-Holper, 1985). Uyemura-Stevenson (cited in De Avila, 1988, p. 113) found significant relationships between learner-learner consultation and performances or even mathematics conceptualization, more than when learner-learner consultation was replaced with teacher-learner consultation or when both consultations were combined. Work in small groups may also allow the exterization of various solving strategies and leads learners to a decentration of their point of view, because it pushes them to situate their solution among the various other ones. This ability of moving from one strategy to another one is particularly efficient for complex problems, which cannot be solved by routines or algorithms but require the combination of several approaches. The interpretation of the role of the diversity of points of view is supported by research findings from Hoyles, Healy and Pozzi (1993).

It should be mentioned that the functioning of the cooperative work in small groups has some limitations. Various immediate outcomes of SGL methods are possible even if the learners agree on a common solution. A better solution is found than a single learner would have produced, the agreement on a solution is based on authority arguments and the agreement is based on cognitive grounds, but not mathematically satisfying ones even in the case of a right solution (Laborde, 1994).

It is no surprise that the other modern non-traditional teaching/learning methods, especially the methods based on work in small groups involving learners' cooperation have similar effect on learners' relationships in the classroom. As appropriate methods with this positive effect seem to be also problem-based learning (Kirschner, Sweller & Clark, 2006), project-based learning (Baranoková, 2012; Grecmanová & Urbanovská, 1997; Henry, 1994), collaborative learning (Kay, 1992; Hošek, 2001) or inquiry-based learning (Kirschner, Sweller & Clark, 2006). The findings of researches focused on effect of project-based learning on learners' relationships were given by Emanovský & Štěpánková (2013) and for problem-based learning by Emanovský (2015).

## Conclusions

Learners' relationships represent a very important factor of educational process. Some possibilities how to investigate, describe and consequently try to improve the relationships are shown in this paper. Particularly, the findings showed that the numbers of isolated learners within the frontal teaching and cooperative learning are statistically significantly different. The number of isolates occurring in the class before implementation of the CL methods, i.e., within the classical frontal teaching, is higher than after using CL.

The mentioned above studies establish that the small group learning represents an effective means for integration of isolates to the class collective. Small group learning gets more positive, and therefore we consider it appropriate to implement into education. However, it is an illusion that SGL is the only way of including isolates into the class, but the results of the research have confirmed that it is very useful help for the marginalised children to be incorporated into their team.

## Acknowledgements

This work was supported by the Palacky University project "Mathematical Structures" IGA PrF 2016 010.

## References

- Baranoková, E. (2012). *Projektové vyučování jako pomoc dětem na okraji třídy [Project-based learning as help for children standing at the edge of class]*. Diploma Thesis, Palacký University Olomouc.
- Beaudichon, J., & Vandenplas-Holper, C. (1985). Analyse des interactions et de leurs effets dans la communication référentielle et la maîtrise de notions. In G. Mugny (Ed.), *Psychologie sociale du développement cognitive, Bern 1985* (pp. 125-149). Bern, Switzerland: Lang.
- Borgatta, E. F. (1964). The structure of personality characteristics. *Behavioral Science*, 9, 8-17.
- Braun, R. (2012). *Dotazníky B-3 a B-4, představení metody a vyhodnocování [Questionnaires B-3 and B-4, introduction to the method and evaluation]*. Retrieved from: <http://spp.ipp.cz/download/studijni-materialy/dotazniky-B3-B4.pdf>.
- Buck, J. V. (1952). The sociometric technique and the teaching of general science. *School Science and Mathematics*, 52, 456-461.
- Chapin, F. S. (1950). Sociometric stars and isolates. *American Journal of Sociology*, 56, 263-267.
- Cowie, H., & Rudduck, J. (1988). *Cooperative learning. Traditions and transitions*. London: Britannic House.
- Chráska, M. (2007). *Metody pedagogického výzkumu [Methods of pedagogical research]*. Praha: Grada.
- De Avila, E. (1988). Bilingualism, cognition and minorities. In R. Cocking, & J. Mestre (Eds.), *Linguistic and cultural influences on learning mathematics, 1998* (pp.101-122). Hillsdale, NJ: Erlbaum.
- Emanovský, P., & Štěpánková, B. (2013). Is the project-based learning a means of integration of isolates into class? In G. Lee (Ed.), *Advances in Education Research*, vol. 13, (pp. 194 – 200). Delaware: IERI.
- Emanovský, P. (2015). Problem-based learning and its effect on learners' relationships. *Problems of Education in the 21<sup>st</sup> Century*, 63, 53 – 61.
- Evans, K. M. (1963). Sociometry in school – I. Sociometric techniques. *Educational Research*, 6 (1), 50-58.
- Felder, R. M., & Brent, R. (2007). Cooperative learning. In P.A. Mabrouk (Ed.), *Active Learning: Models from the Analytical Sciences*. ACS Symposium Series 970, Chapter 4, (pp. 34–53). Washington, DC: American Chemical Society.
- Fisher, B. A., & Ellis, D. G. (1990). *Small group decision making*. New York: McGraw Hill, Publishing Co.
- Glanzer, M., & Glaser, R. (1961). Techniques for the study of group structure and behavior: 2. Empirical studies of the effects of structure in small groups. *Psychological Bulletin*, 58, 1-27.
- Grecmanová, H., & Urbanovská, E. (1997). Projektové vyučování a jeho význam v současné škole [Project-based learning at current school]. *Pedagogika*, 1, 37– 45.
- Gresham, F. M., & Stuart, D. (1992). Stability of sociometric assessment: Implication for uses as selection and outcome measures in social skills training. *Journal of School Psychology*, 30, 223–231.
- Hall, E. (1994). The social relational approach. In P. Kutnick, & C. Rogers (Eds.), *Groups in Schools*. London: Cassell.
- Henry, J. (1994). *Teaching through projects*. London: Kogan Page Limited.
- Hošek, D. (2001). *Kooperativní a kolaborativní učení [Cooperative and collaborative learning]*. Retrieved from: [http://it.pedf.cuni.cz/strstud/edutech/2001\\_Kolabor\\_Hosek/INDEX.HTM#KAY](http://it.pedf.cuni.cz/strstud/edutech/2001_Kolabor_Hosek/INDEX.HTM#KAY).
- Hoffman, C. (2001). *Introduction to sociometry*. Retrieved from: <http://www.hoopandtree.org/sociometry.htm>.
- Hoyles, C., Healy, L., & Pozzi, S. (1993). Telling a story about computers, groups and learning mathematics. *ESRC InterSeminar, Collaborative Learning*. Oxford.
- Jacques, D. (1991). *Learning in groups*. London: Kogan Page.
- Jennings, H. H. (1947). Sociometric differentiation of the psychogroup and the sociogroup. *Sociometry*, 10, 71-79.
- Johnson, D. W., Johnson, R. T., & Holubec, E. J. (1994). *Cooperative learning in the classroom*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Johnson, D. W., Johnson, R. T., & Stanne, M. E. (2000). *Cooperative learning methods: A meta-analysis*. University of Minnesota, Minneapolis: Cooperative Learning Center. Retrieved from: <http://www.cooperation.org/pages/cl-methods.html>
- Kay, A. R. (1992). *Collaborative learning through computer conferencing*. The Najaden Papers, New York: Springer-Verlag.

- Kasíková, H. (1997). *Kooperativní učení, kooperativní škola [Cooperative learning, cooperative school]*. Praha: Portál.
- Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist*, 41 (2), 75-86.
- Kutnick, P. (2005). *The effect of pupil grouping: Literature Review*. University of Brighton.
- Kutnick, P., & Manson, I. (1998). Social life in the classroom: Towards a relational concept of social skills for use in the classroom. In A. Campbell, & S. Muncer (Eds.). *The Social Child*. Hove: The Psychology Press.
- Laborde, C. (1994). Working in small groups: A learning situation? In R. Biehler, & comp. (Eds.), *Didactics of Mathematics as a Scientific Discipline*. Dordrecht, AH: Kluwer Academic Publishers, 147-158.
- McIntyre, T. (2003). *Sociograms*. Retrieved from: [http://maxweber.hunter.cuny.edu/pub/eres/EDSPC715\\_MCINTYRE/Sociogram.html](http://maxweber.hunter.cuny.edu/pub/eres/EDSPC715_MCINTYRE/Sociogram.html).
- McKeachie, W. J., & Kulik, J. A. (1975). Effective college teaching. In F. N. Kerlinger (Ed.), *Review of Research in Education*. Peacock: Itaska, Ill.
- McKeachie, W. J. (1994). *Teaching tips: Strategies, research and theory for college and university teachers*. (9th ed.) Lexington: Mass. Heath and Co.
- McMillan, J. M., & Schumacher, S. (2010). *Research in education*. New Jersey: Pearson Education.
- Moreno, J. L. (1953). *Who shall survive?* Beacon House, Inc.: Foundations of Sociometry, Group Psychotherapy and Sociodrama.
- Mouton, J. S., Blake, R. R., & Fruchter, B. (1955). The reliability of sociometric measures. *Sociometry*, 18, 7-48.
- O'Moore, M., & Kirkham, C. (2001). Self-esteem and its relationship to bullying behavior. *Aggressive Behavior*, 27, 269 – 283.
- Sainsbury, E., & Walker, R. (2009). Motivation, learning and group work – the effect of friendship on collaboration. In: *UniServe Science Proceedings*, (pp.118-124), University of Sydney.
- Salomon, G. (1993). No distribution without individual cognition: A dynamic interactional view. In G. Salomon, & D. Perkins (Eds.), *Distributed Cognitions: Psychological and Educational Considerations*, (pp.111–138). New York: Cambridge University Press.
- Sherman, L. (2002). *Sociometry in the classroom*. Retrieved from: [http://www.users.muohio.edu/shermalw/sociometryfiles/socio\\_arehtmlx#what](http://www.users.muohio.edu/shermalw/sociometryfiles/socio_arehtmlx#what).
- Slavin, R. E. (1990). *Cooperative learning*. New Jersey: Prentice-Hall.
- Ross, J., & Smyth, E. (1995). Differentiating cooperative learning to meet the needs of gifted learners: A case for transformational leadership. *Journal for the Education of the Gifted*, 19, 63-82.
- Sociogram*, freeware. Retrieved from: <http://www.phenotyping.com/sociogram/mSociogram.html>.
- Trabalíková, J. (2011). Kooperatívne vyučovanie a jeho vplyv na klímu triedy v 5. roč. ZŠ [Cooperative learning and its effect on class climate at 5<sup>th</sup> grade of basic school]. *PEDAGOGIKA.SK*, 2 (1), 36 – 52.

**Appendix. Sociometric Questionnaire B-3**

**Sociometric Questionnaire B-3**

NAME AND SURNAME \_\_\_\_\_ CLASS \_\_\_\_\_ DATE \_\_\_\_\_

**1. Among my friend in our class belong:**

1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_

**2. As a boyfriend/girlfriend I would not choose:**

1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_

**3. I evaluate myself as follows:**

a) I am always at center stage in the classroom.  
b) Sometimes I participate and I am usually informed of events in the classroom.  
c) A couple of times I participated in, but I do not use to be informed.  
d) It seems that the class does not care about my participation too much.  
e) I am not interested in the events in the classroom.

**4. Answer yes-no:**

In the classroom is at least one pupils who is unhappy.	yes	no
There is someone in the class that the others hurt him/her occasionally.	yes	no
It happens that I'm looking forward to school.	yes	no
Mostly I find someone who can help me with a problems.	yes	no
Comon problems we deal mostly in peace.	yes	no

**5. Circle the number in each row that best expresses the degree of your feelings in the classroom:**

feeling of security	1 2 3 4 5 6 7	feeling of threat
feeling of friendship	1 2 3 4 5 6 7	feeling of antagonism
atmosphere of cooperation	1 2 3 4 5 6 7	atmosphere of indifference
feeling of confidence	1 2 3 4 5 6 7	feeling of distrust
tolerance	1 2 3 4 5 6 7	intolerance

**6. Find someone in the class that is:**

righteous _____	offensive: _____
reliable _____	unjust: _____
witty _____	ungrateful: _____
at the center of the action _____	unreliable: _____
on good terms with all _____	alone: _____

*Thanks for cooperation!*



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Received: *March 05, 2016*

Accepted: *April 22, 2016*

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