



Cooperative Learning Improves Social Skills and Knowledge of Science Topics in Pre-adolescent Children in Iran

**Mohammad Ahmadpanah¹, Saeed Soheili², Leila Jahangard¹,
Hafez Bajoghli^{3,4}, Mohammad Haghighi¹, Edith Holsboer-Trachsler⁵,
Daniela Conrad⁶, Serge Brand^{5,7*} and Sattar Keikhavandi⁸**

¹Research Center for Behavioral Disorders and Substances Abuse; Hamadan University of
Medical Sciences, Hamadan, Iran.

²Department of Psychology, Faculty of Social Sciences, Islamic Azad University, Hamadan
Branch, Iran.

³Psychiatry and Psychology Research Center (PPRC), Roozbeh Hospital, Tehran University
of Medical Sciences, Tehran, Iran.

⁴ASEAN Institute for Health Development, Mahidol University, Salaya, Thailand.

⁵Psychiatric Clinics of the University of Basel, Center for Affective-, Stress- and Sleep
Disorders (ZASS), Basel, Switzerland.

⁶Department of Psychology, University of Basel, Basel, Switzerland.

⁷Department of Sport and Health Science, Division of Sport Science, University of Basel,
Basel, Switzerland.

⁸Department of Clinical Psychology, Ilam University of Medical Sciences, Ilam, Iran.

Authors' contributions

*This work was carried out in collaboration between all authors. Authors MA, SS, LJ, HB, MH,
and SK designed the study, wrote the protocol and wrote the first draft of the manuscript.
Authors DC, EHT and SB performed the statistical analyses and wrote the Result section.
Authors SB and DC managed the revision of the manuscript; author DC integrated the
Reviewers' comments and addressed all issues raised by the Reviewers. All authors read
and approved the final manuscript.*

Original Research Article

**Received 29th November 2013
Accepted 23rd March 2014
Published 5th April 2014**

ABSTRACT

Aims: In educational and vocational settings, people are asked to work in teams. This
requires social skills but also promotes time-efficient knowledge enhancement. Aiming to

*Corresponding author: Email: serge.brand@upkbs.ch;

support the acquisition of both, many studies investigated new teaching methods for schools, emphasising cooperation and centrality of students in the learning process. However, research in non-western countries on this topic remains scarce. Therefore, the present study wants to investigate the effects of cooperative learning on (a) children's social skills and (b) knowledge acquisition in a non-western country, Iran.

Place and Duration of the Study: The study was conducted in an elementary school in Ilam city (Iran) between October and December 2012.

Study Design: One hundred twenty male fifth graders were randomly assigned to intervention and control group. Two raters independently assessed students' educational attainment in experimental science and social skills before and 2 month after implementation.

Methods: Students in the control group learned the text material independently, whereas students in the intervention group were taught cooperatively, using the Jigsaw method.

Results: Compared to the control group, the intervention group showed significantly more improvement of social skills over time ($F(1,58)=29.37$, $P<.001$, $\eta^2=.34$). Though, both groups increased their knowledge, the intervention group achieved a significantly broader and deeper understanding of the topics ($F(1,58)=33.27$, $P<.001$, $\eta^2=.365$) over time.

Conclusions: The results suggest that cooperative learning methods enhance both, social skills and knowledge acquisition at elementary school level in non-western countries such as Iran.

Keywords: Cooperative learning; social skills; educational achievement; jigsaw.

1. INTRODUCTION

Today, in both higher educational and vocational settings, people are asked to work together in teams. Aiming to prepare children for this essential requirement in later working life, many studies within the last years, focused on how to implement cooperative learning already in school [e.g., 1-3]. In educational settings, cooperative learning is understood as students working together in small groups to accomplish a common goal and to maximize both, their individual knowledge and the knowledge of the entire group [4]. According to Johnson, Johnson, and Smith [5] cooperative learning needs to include the following five elements to be useful: positive interdependence, individual accountability, face-to-face interaction, appropriate use of collaborative skills and group processing. Last one includes periodically assessment of group functioning and continuously improvement.

Cooperative learning models experienced increasing use during the last three decades and have been continuously advanced. Nowadays, even computer-supported cooperative learning approaches exist [6]. A well established cooperative learning method, is the Jigsaw model, first introduced by Aronson, Blaney, Stepin, Sikes, and Snapp [7]. In a first step, the whole class will be divided into smaller subgroups with the same amount of team members (4 or 5 students maximum). All subgroups are working on the same assignment, which will be split into more specific topics. Each topic will be at first, individually processed by only one member of each subgroup. Afterwards, all students that worked on the same topic meet in expert groups to exchange their results and enhance their knowledge. Finally, all experts return to their subgroups and present their specific topics, while their teammates can ask questions. Thereby, each team member finally knows about the entire assignment. Jigsaw has already been successfully used in the context of higher order reading comprehension [8].

Many studies support the effectiveness of collaborative learning methods, showing greater knowledge acquisition relative to traditional learning approaches, e.g. teacher-centered lectures. Additionally, cooperative learning improves high-level reasoning as well as critical thinking skills and provides a deeper understanding of the learned material [3,9].

There are several reasons for the effectiveness of cooperative learning. For instance, students learn more by actively deal with a subject rather than simply watching and listening to their teacher. Another advantage concerns weaker students, who are likely to give up when they get stuck; being responsible for the success of a whole group keeps them going. Stronger students can also profit by explaining and clarifying material to their team members. This enables them to find gaps in their own knowledge and fill them [10]. Cooperative learning also allows students to put themselves in the position of others and thereby plays an important role for the development of social skills [9]. Furthermore cooperative learning is related to more positive and supportive relationships with peers [3], lower levels of loneliness, social anxiety and stress as well as increased levels of happiness [11]. Additionally, greater intrinsic motivation to learn and achieve [12] as well as positive attitudes toward subject areas [e.g.,1] have been observed. Even prospective teachers show positive attitudes towards group work, as the cooperative learning approach makes it easier to maintain social communication with learners [13]. When testing cooperative learning on their own, teachers especially appreciated the chance to interact with their classmates as well as help and learn from each other. Moreover, they reported increased self-confidence and consciousness due to the repeatedly experience of speaking in front of a society. This experience seemed to be especially valuable as it prepared them for future job requirements. Sepehr [14] conducted a study about teaching cooperation in organizations, mainly within a group and team development framework. His results indicate, that teaching and developing cooperative behaviour is not an educational process far removed from other processes and experiences. Instead, it is an element closely integrated with organizational development and improvement in general. Furthermore, the development of cooperative behaviour is related to improvement in self-organization and group organization.

To conclude, there is evidence that cooperative learning improves both social skills and knowledge. However, most studies have been carried out in western countries. Research on this topic in non-western countries, such as the Islamic Republic of Iran (henceforth Iran), is scarce. For this reason, one aim of the present study was to address this gap in the literature.

Based on the presented findings, the following two hypotheses were formulated. First, we expected higher scores for social skills in the intervention (cooperative learning using Jigsaw) than in the control group (individual learning). Second, we anticipated greater knowledge acquisition in the intervention (cooperative learning using Jigsaw) than in the control group (individual learning).

2. METHODOLOGY

2.1 Participants

Participants belonged to the lower middle class and were recruited using multi-stage random sampling. From 13 elementary boys' schools in Ilam city (Iran) five have been selected by lot. From the remaining classes of fifth graders, seven were selected by chance and formed the final sample of 120 students. Finally, 60 of them were randomly allocated to the

experimental group and matched with another 60 of the same age and socio-economical status, serving as control group. Mean age of the final sample was $M_{age}=11.03$ years ($SD=0.45$). All participants and their parents were fully informed about the aims and scope of the study and gave their written informed consent. The entire study was approved by the ethics committee of the University of Medical Sciences, Hamadan, Iran.

2.2 Procedure and Study Design

Data collection took place from October to December 2012. The study used a quasi-experimental design with repeated measurement (pre- and post-assessment), comparing intervention and control group. Social skills and educational attainment were the outcomes of interest and have been independently assessed by two researchers at the beginning and the end of the study. Both researchers were blind for students' group membership. Cohen's kappa was calculated with $K=.89$, indicating a satisfying interrater reliability, ranging from +1 (perfect agreement) to -1 (total disagreement).

2.3 Research Tools

2.3.1 Assessing social skills

Social skills were assessed with a questionnaire, including subscales of the Personality Inventory for Children [15] as selected by Truscott [16]. The questionnaire only existed in English and had to be translated into Persian/Farsi. Translation was done by five independent researchers, following a process of translation and back-translation [17]. The final version was also cross-validated with an existing, self-administered questionnaire, used for intra-moral evaluations at Iranian schools. The final social skills questionnaire contained 56 items (sample-items: "This child hardly ever smiles", "this child has a good sense of humour", "This child has little confidence"). Response alternatives for each item were yes (1) or no (0), with higher total-scores reflecting better social skills.

2.3.2 Assessing knowledge

All participants had to learn five chapters of an experimental science book, which was not part of their regular curriculum. The chapters were covered in 24 lessons. Topics included: building materials (3 sessions), change material (4 sessions), cars and machines (5 sessions), light and colours (6 sessions), and history of the earth (6 sessions). Both groups met twice a week for 45 minutes over a period of 2 months. Students' knowledge of each topic was assessed via a written test, including 20 items with multiple choice or open answering format.

2.3.3 Interventions

2.3.3.1 Control group

Participants in the control group were traditionally taught by a teacher, who explained the content of each chapter first. Afterwards, students were expected to individually prepare themselves for the written test at school or at home. Meanwhile, they always had the opportunity to ask the teacher in case of issues.

2.3.3.2 Intervention group

Students in the intervention group learned the same material, using Jigsaw [7] as cooperative learning approach. Students didn't know this method before and were instructed by a teacher, who has read appropriate literature and was trained by other teachers already using this method. In a first step, all students were subdivided into five "home groups" with six members each. Similarly, each chapter mentioned above, was split into six smaller topics. Afterwards, each student within a subgroup received another topic of the current chapter. In a first step, each student learned about his specific topic individually. Next, students who studied the same topic aligned with each other in "expert groups" to exchange knowledge and discuss what remains to be resolved. Then, all students returned to their "home groups" and everyone imparts his teammates what he has learned about his specific topic. This way, all students gained expertise in all topics; even in those they didn't initially cover themselves, see Fig. 1. Finally, students' knowledge in all of the five topics was individually tested via the written test.

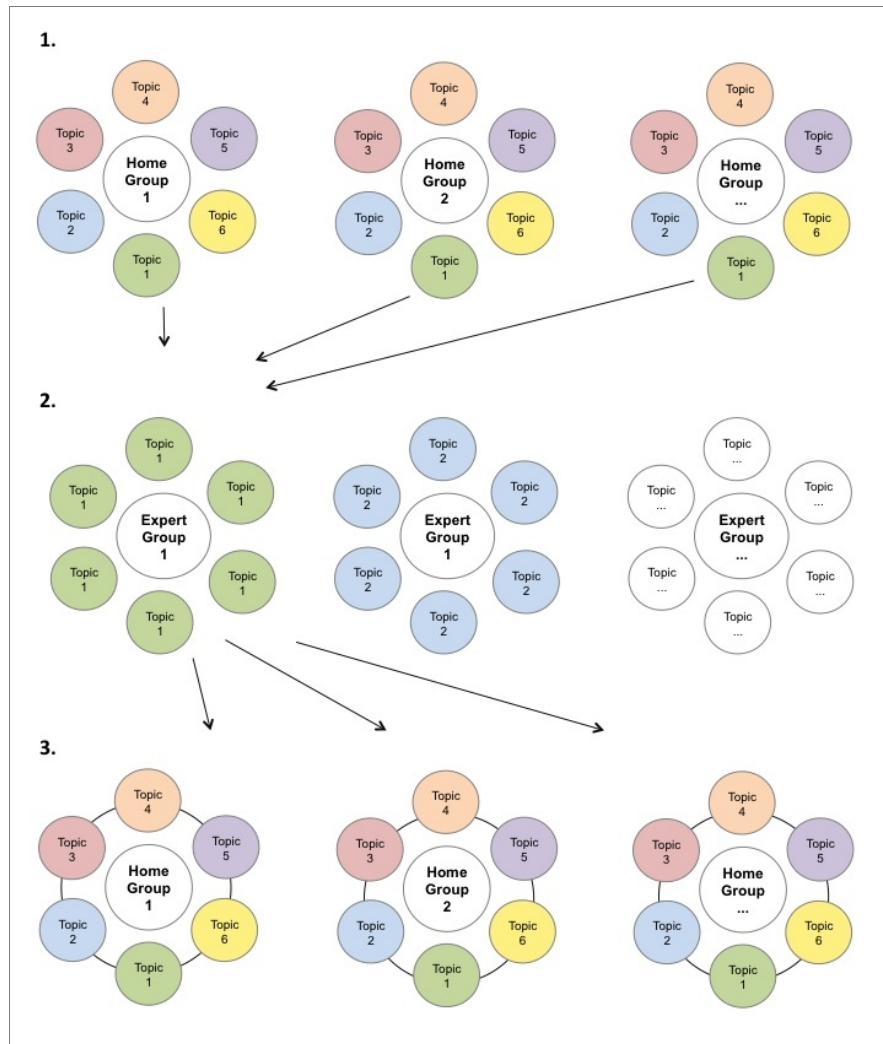


Fig. 1. Procedure and implementation of Jigsaw

2.4 Statistical Analysis

We performed a two-way repeated measures analysis of variances (ANOVA) including time (pre- vs. post-assessment) and group (control group vs. intervention group) as factors. Social skills and knowledge were included as dependent variables. Additionally, the time by group interaction was calculated. The level of significance was set at $\alpha < .05$. We also calculated effect sizes (partial eta squared, η^2) and interpreted $0.059 > \eta^2 > 0.01$ as small (negligible practical importance), $0.139 > \eta^2 > 0.06$ as medium (moderate practical importance), and $\eta^2 > 0.14$ as large (crucial practical importance) effect sizes [18].

3. RESULT

The descriptive statistics presented in Table 1., show equality of groups in pre-test mean scores for knowledge and social skills.

Table 1. Descriptive statistics (means and standard deviations) of knowledge and social skills scores

	Intervention group		Control group	
	Pre	Post	Pre	Post
Social skills	12.93 (6.73)	20.90 (3.53)	12.90 (6.90)	14.77 (6.34)
Knowledge	5.77 (2.11)	22.47 (4.88)	5.63 (2.36)	16.50 (3.59)

3.1 Social Skills

Social skills significantly improved from pre- to post-assessment in both groups. Relative to the control group, the intervention group showed a significantly higher increase over time. Effect sizes range from moderate to high [18] and are listed in Table 2.

3.2 Knowledge Acquisition

Both groups showed a significant improvement of knowledge from pre- to post-assessment. Compared with the control group, the intervention group acquired significantly more knowledge over time. According to Cohen [18] effect sizes can be interpreted as high, see Table 2.

Table 2. Inferential statistics

	Statistics		
	Group	Time	Group x Time interaction
Social skills	$F(1,58) = 4.51$, $P = .03$, $\eta^2 = .072$	$F(1,58) = 76.31$, $P < .001$, $\eta^2 = .57$	$F(1,58) = 29.37$, $P < .001$, $\eta^2 = .34$
Knowledge	$F(1,58) = 17.78$, $P < .001$, $\eta^2 = .235$	$F(1,58) = 743.04$, $P < .001$, $\eta^2 = .928$	$F(1,58) = 33.27$, $P < .001$, $\eta^2 = .365$

4. DISCUSSION

Using the Jigsaw method [7] as cooperative learning approach, we found significantly better social skills and knowledge acquisition in cooperatively taught students than traditionally taught male fifth graders. Thus, both our hypothesis have been confirmed and are consistent

with previous findings, showing better social skills [e.g., 19,9] and cognitive improvement [e.g.,1,3] through cooperative learning approaches relative to traditional teaching. Furthermore, we proved Aronson's Jigsaw method as successful cooperative learning technique in the context of experimental science. Thereby, our results extend previous areas of application, such as higher reading comprehension [8].

Anyway, despite increasing research and proven advantages of cooperative learning, traditional teaching approaches still predominate and remain the principle method of learning in most schools. One reason might be an inadequate training or poor implementation, e.g. missing structure within a collaborative learning group [12]. Some might believe, that simply placing students in groups and telling them to work together will improve their cognitive and social skills. In fact, cooperative learning demands careful, gradual and appropriate preparation of students, materials and teachers [20]. Felder and Brent [10] also recommended, that methods should not be implemented all at once. Instead, teachers should become familiar with some of them first and implement others when they got used to current ones. Of course, even students will react suspiciously when implementing cooperative learning the first time, especially those who did great as passive listeners so far. Occasionally, bright students get the feeling to be held back by slower teammates and unassertive students might fear ignorance during group sessions. Resentment might arise due to pre-assigned groups with different interests, backgrounds, values and abilities of team members. Therefore, a knowledgeable teacher is required to soothe their concerns by stating the benefits of cooperative learning (e.g., preparation for later job requirements) and exactly defines what the students are asked to do. Nevertheless, cooperative learning methods are flexible and should be adapted depending on students' needs and interests [2]. Anyway, individualistic predisposition is not a criterion for exclusion. According to Choi [21] cooperativeness can be learned, due to frequently implemented cooperative experiences, which reduce individualistic predisposition and increase pro social behaviour. Another concern, raised by Slavin [22] is social loafing: the possibility that some individuals would profit from the knowledge and efforts of other group members without themselves making any active contribution to the solution of a given task. Therefore, cooperative learning methods have to be selected carefully and should include the five components mentioned by Johnson, Johnson, and Smith [5]. Brand and Opwis [23] successfully used a cooperative learning method that systematically avoids social loafing. In their study adult students worked in pairs to solve the Tower-of-Hanoi problem. Both team members were required to discuss how to proceed each step. Participant A verbally formulated the first step solution, whereas participant B applied the solution. For the following step, after joint discussion, participant B formulated the answer, while participant A made the moves. The procedure ensured, that both partners actively contributed to the problem solving and had the same amount of verbal and motoric efforts.

Of course, cooperative learning is not applicable for every topic and should be avoided, if assignments could be easily solved alone [10]. Generally, the more conceptual the task, the more problem solving and decision making is required and the more creative the answers need to be, the greater is the superiority of cooperative methods over competitive and individualistic learning [24].

Several limitations also argue against an overgeneralization of the study results. First of all, the sampling only included male fifth graders. As schools are separated for boys and girls in Iran and we only had access to schools visited by males, it remains uncertain whether the same effects would have been found for girls as well. Further research is also needed to investigate the effects of cooperative learning in other non-western countries, different

grades and subjects. Additionally, it would be interesting to see if other cooperative learning approaches lead to similar or even better results. Second, the results might reflect other, unassessed variables. For example, being part of a study itself could have had an effect on the results (Hawthorne effect). Third, only children who were willing to participate and whose parents gave their consent as well, were included in the study. Thereby, a systematic sample bias cannot be ruled out in total. Finally, the sample size was rather small, though we did have large effect sizes.

Despite these limitations, we believe that our findings substantially contribute to the previous gap in research literature as we investigated the effects of cooperative learning approaches on social skills and knowledge acquisition in a non-western country (Iran). Thereby, our results not only replicate previous studies in western countries, but also replicate the findings of another non-western study conducted with elementary female students in Kuwait [3].

5. CONCLUSION

Our results clearly indicate that cooperative learning improves social skills and knowledge acquisition relative to traditional teaching approaches. Particularly, the Jigsaw method was confirmed as valuable, efficient and successful cooperative learning technique at elementary school level in a non-western country. Nevertheless, cooperative learning doesn't work automatically and needs adequate implementation and further development. Future research is also needed to replicate our results in other non-western countries, different grades and with a female sample.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Zakaria E, Chin LC, Daud MY. The Effects of cooperative learning on students' Mathematics achievement and attitude towards Mathematics. *J Soc Sci.* 2010;6(2):272–75. Doi:10.3844/jssp.2010.272.275.
2. Whicker KM, Bol L, Nunnery JA. Cooperative learning in the secondary Mathematics classroom. *J Educ Res.* 1997;91(1):42–48. DOI:10.1080/00220679709597519
3. Ebrahim A. The effect of cooperative learning strategies on elementary students' science achievement and social skills in Kuwait. *ZDM.* 2012;10(2):293–314. Doi:10.1007/s10763-011-9293-0.
4. Hartman H, editor. *Scaffolding and Cooperative Learning. Human Learning and Instruction.* New York: City College of City University of New York; 2002.
5. Johnson DW, Johnson R, Smith KA, editors. *Active learning: Cooperation in the college classroom.* 2nd ed. Edina: Interaction Book Company; 1998.
6. Gómez F, Nussbaum M, Weitz JF, Lopez X, Mena J, Torres A. Co-located single display collaborative learning for early childhood education. *IJCSSL.* 2013;8:225–44. DOI:10.1007/s11412-013-9168-1
7. Aronson E, Blaney N, Stephin C, Sikes J, Snapp M, editors. *The jigsaw classroom.* 1st ed. Beverly Hills: Sage Publishing Company; 1978.
8. Ghaith G, El-Malak MA. Effect of Jigsaw II on literal and higher order EFL reading comprehension. *Educ Res Eval.* 2004;10(2):105–15. DOI:10.1076/edre.10.2.105.27906.

9. Keramati M. The effect of cooperative learning on social skills and educational achievement of male students in fifth-grade science classes. *J Psychol Educ.* 2007;37:39-55. Persian.
10. Felder RM, Brent R. Cooperative Learning. In: Mabrouk PA, editor. *Active Learning: Models from the Analytical Sciences.* Washington: American Chemical Society; 2007.
11. Koçak R. The effects of cooperative learning on psychological and social traits among undergraduate students. *J Soc Behav Pers.* 2008;36(6):771–82. DOI:10.2224/sbp.2008.36.6.771.
12. Gillies RM. The effects of cooperative learning on junior high school students during small group learning. *Learn Instr.* 2004;14(2):197–213. Doi:10.1016/S0959-4752(03)00068-9.
13. Erdem A. Preservice teachers' attitudes towards cooperative learning in Mathematics course. *Procedia Soc Behav Sci.* 2009;1(1):1668–72. DOI:10.1016/j.sbspro.2009.01.295.
14. Sepehr H. Learning cooperation. The collection of papers for the first national conference on cooperation, employment and development. Yazd: Yazd University Publications; 2004.
15. Lachar D, Gdowski CL, Snyder DK. Broad band dimensions of psychopathology: Factor scales for the personality inventory for children. *J Consult Clin Psychol.* 1982;50(5):634–42. DOI:10.1037/0022-006X.50.5.634
16. Truscott J. A comparison of social skills among second grade children with varying levels of reading achievement (Thesis). Texas Tech University; 1989.
17. Brislin RW. Back-translation for cross-cultural research. *J Cross Cult Psychol.* 1970;1(3):185–216. DOI:10.1177/135910457000100301.
18. Cohen J. The earth is round ($p < .05$). *Am Psychol.* 1994;49(12):997-1003. Retrieved from: http://www.ics.uci.edu/~sternh/courses/210/cohen94_pval.pdf.
19. Tolmie AK, Topping KJ, Christie D, Donaldson C, Howe C, Jessiman E, et al. Social effects of collaborative learning in primary schools. *Learn Instr.* 2010;20(3):177-91. Doi:10.1016/j.learninstruc.2009.01.005.
20. Sharan Y. Cooperative learning for academic and social gains: Valued pedagogy, problematic practice. *Eur J Educ.* 2010;45(2):300–13. Doi:10.1111/j.1465-3435.2010.01430.x.
21. Choi J, Johnson DW, Johnson R. Relationships among cooperative learning experiences, social interdependence, children's aggression, victimization, and prosocial behaviors. *J. Appl. Soc. Psychol.* 2011;41(4):976–1003. DOI:10.1111/j.1559-1816.2011.00744.x.
22. Slavin RE. Translating research into widespread practice: The case of success for all. In: Constan M, Sternberg R, editors. *Translating theory and research into educational practice.* Mahwah: Erlbaum; 2006.
23. Brand S, Opwis K. Effects of mood and problem solving in dyads on transfer. *Swiss J Psychol.* 2007;66(1):51–65. DOI:10.1024/1421-0185.66.1.51.
24. Johnson, DW, Johnson RT, Holubec EJ, editors. *Circles of learning: Cooperation in the classroom.* 5th ed. Edina: Interaction Book Company; 1991.

© 2014 Ahmadpanah et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:

<http://www.sciencedomain.org/review-history.php?iid=484&id=21&aid=4243>