

Cooperative Learning in Math Teaching for Students with Learning Difficulties

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Abstract: This study investigated the influence of cooperative learning approach on mathematics teaching to the students with learning difficulties. The study used experiment which was conducted using a one group pretest-posttest design. The samples were 31 students including 3 students with learning disabilities in 3rd grade elementary school at an inclusive school in Bandung. The result showed that cooperative learning approach was proven effective to enable students to construct mathematics instructional materials actively. The implementation of cooperative learning approach for students with learning disabilities increases the acquisition of learning outcomes. It improves math skills scores on students' learning disabilities for about 20% to 30%. Implications for learning mathematics using cooperative learning approaches, students are more motivated to participate actively and independently solve mathematical problems so that students form their own knowledge based on group experience.

1 INTRODUCTION

Each student is a unique individual which has different characteristics from one to another, including in the level of intelligences. Some students have above the average level of intelligences, while some others are below the average. Student who are below the average are students with special needs, and these students require an instructional approach that is truly specialized for their individual needs (Rotatori et al., 2005; Sahebamei et al., 2012). Individual differences in abilities in inclusive schools demand that the teacher designs a learning program that can accommodate all the needs of each student in the classroom (Marita and Hord, 2016). Therefore, teacher should prepare what-so-called individualized educational program or IEP (Vionea and Purcacu, 2015).

The use individualized educational program or IEP can accommodate students with learning disabilities in the classroom (Blackwell and Rossetti, 2014). Students with learning disabilities caused by the malfunctioning of neurologist and intangibles have a deficiency in one or more academic areas, both

in the subjects of reading, writing, math, and spelling; or in a range of more general skills such as listening, speaking, and thinking (Abdurahman, 2012). Sometimes people use the terms interchangeably. In general, though, a learning disability is a condition that affects learning and intelligence across all areas of life, whereas a learning difficulty is a condition that makes specific areas of learning difficult, but does not affect the overall intelligence of an individual. For example, dyscalculia affects only the processing of information (usually problems with perception and organising information) and not all other areas of life (Dagnan, Burke, and Davies, 2015).

Mathematics is one branch of science that is necessary in everyday life. To help students master mathematics constructs, a systematic learning process is required to be implemented at schools. In the view of constructivism, learning mathematics is a process where learners actively construct mathematical knowledge. Students not only receive information but also construct knowledge with a variety of learning activities. Thus, learning becomes meaningful and can be applied in the lives of learners. The curriculum and learning programs also require a learner-centered

learning where learning is more focused on the process of constructing the acquired knowledge and experience so as to produce new knowledge. The ability to construct knowledge can be obtained from the process of cooperative learning (Garcia-Carrion and Diez-Palomar, 2015; Liu and Xin, 2016).

The implementation of cooperative learning approach for learners with special needs has currently received significant attention from researchers. Cooperative learning provides an opportunity for learners to actively participate in the learning activities. It is shown with the involvement of each learner in the group, such as giving an opinion or idea, and having a discussion with their peers. (Lunenburg, 2011; Obradovic, Bjekic, and Zlatic, 2015; Serafin, 2016). This approach becomes one of alternative teaching methods for children with special needs in inclusive schools (Bryant and Bryant, 1998; Capodieci, Rivetti, and Cornoldi, 2016). Individuals' difficulties in understanding mathematics may lead some of them to a failure. Thus, cooperative learning can be useful if implemented for children learning disabilities in understanding mathematics. Using this approach, students with learning difficulties in inclusive schools can learn collaboratively with their peers. Cooperative learning is a small group of students who work as a team to solve the problem, complete a task, or do something to achieve a common goal. This enables them to construct information collaboratively in a group (Rowe, 2006; Ayaz and Sekerci, 2015).

Based on previous studies, cooperative learning is effective to help students' learning, particularly students with disabilities. However, studies related to the use of assessment in this context are limited. Thus, this current study examines the use of assessment and curriculum alignment in cooperative learning for inclusive school to develop students' potentials optimally.

This paper examines the implementation of cooperative learning approaches for learning disabilities in inclusive schools. Through experiments conducted on 31 students 3rd grade at elementary school using a pretest-posttest groups (one group pretest-posttest design). Cooperative approach succeeded in making learners construct mathematics instructional materials actively marked by a yield increase math skills as much as 20% -30%. This cooperative approach is expected to be implemented on learners construct learning disabilities in math knowledge through participation in study groups in inclusive schools. So that the influence of a cooperative approach to improvement math skills learners learning disabilities.

2 METHOD

Using a quantitative one group pretest-posttest pre-experimental design, this study was carried out at one of elementary inclusive schools in Bandung. The samples of this study were 31 students in 3rd grade elementary school at an inclusive school in Bandung. The purpose of this study was to find out the effectiveness of using cooperative learning approach in improving mathematics skills of students with learning difficulties. This study was conducted to measure the influence of the treatment (X) on the one group sample in question. First, a pretest (O1) was administered to measure initial mathematics knowledge of the students with learning difficulties. Afterward, the students were given treatment (X) in the form of the application of cooperative learning approach. Then, the posttest was administered to measure the mathematics skills of students having received the treatment. The data were collected from the written test and performance test of mathematics. If described in the flow chart of this research process as follows figure 1:

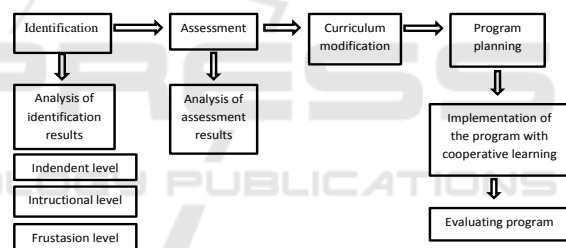


Figure 1: Cooperative learning research process.

3 RESULTS AND DISCUSSION

Mathematics teaching is a process of transferring learning experience to learners through a series of well-planned activities so that they become competent in mathematics. Mathematics is the study of computation and using reason or ability to think logically (Impeccoven-Lind and Foegen, 2010; Marcelino et al., 2012). The learning process in question is an activity undertaken by teachers to create classroom situations in such a way that learners can learn using a guided learning model.

Cooperative approach in mathematics learning can help learners improve positive attitude. Students build confidence in their ability to solve mathematical problems. The interaction within the group can enable students to humbly receive information from other students with different knowledge and backgrounds

(Dymond, Renzaglia, and Slagor, 2010; Mafra, 2015). This model can improve students' critical thinking and ability in problem solving. The application of cooperative learning approach to teaching mathematics can improve students' independent thinking ability (de Weerd, Desoete, and Roeyers, 2013). Cooperative learning is a small group of students who work as a team to solve the problem, complete a task, or do something to achieve a common goal.

Cooperative learning emphasizes the goals and the success of the group, which can only be achieved if all members of the group meet the desired goals or comprehend material. The main objective of a cooperative learning is to bring out the best in students in the effort to improve their academic achievement and understanding both individually and as a group. Teamwork can accommodate a wide variety of students' skills (Malekian and Nadi, 2012).

In a cooperative learning mode, there are six main phases (Suprijono, 2009). This model is suitable to actively engage students with learning disabilities. Figure 2 explains the phases of implementing a cooperative learning model. It can begin with stating the objectives, delivering material, organizing, working as a team, evaluating and reinforcing. These steps were applied to teaching mathematics to the third grade students with learning difficulties at one of inclusive schools in Bandung.

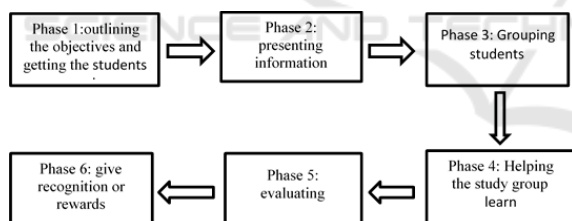


Figure 2: Phases in cooperative learning model. Source: Suprijono (2009; 65)

Figure 3 shows a classroom setting management at an inclusive school for third grade students with learning difficulties. Out of 31 students, 3 are those who have learning difficulties. The students were divided into five groups. In each group, there is a member who has learning difficulties. That way, students with learning difficulties can actively engage in the learning process. Teammates can serve as peer-tutors so that students can learn in a pleasant manner, and can understand mathematics learning materials directly so that they can construct their own knowledge through cooperative learning activities (Waiyakoon, Khlaisang, and Koraneekij, 2015).

Peer-to-peer learning is a student-centered learning, in which students learn from other students who have an age status, maturity / self-esteem that is not much different from itself. So the child does not feel so compelled to accept the ideas and attitudes of his "teacher" who is none other than his peers. In peer tutors, peers are smarter to provide learning assistance to their classmates at school. Studying assistance by peers can eliminate awkwardness. The language of peers is more easily understood, besides with peers there is no reluctance, low self-esteem, embarrassment, and so forth, so hopefully students who do not understand do not hesitate to express the difficulties that it faces.

The cooperative learning approach was applied to teaching mathematics in 6 meetings. The result proved that a student with learning difficulties could more actively engage in the learning activities. He became more confident in giving opinions and in completing questions provided by the teacher. He was made more quickly understand the learning material provided by the teacher.

For the pre-test we make the items that are tailored to the material already delivered in the class. Then from the results of the pre-test we categorize into 3 categories i.e. independent level, instruction level, and frustration level. Students who fall into our frustration-level tests are re-examined with different questions to confirm whether the student is right in the category of frustration level or not. Then after getting the students into the frustration level category, we and the teacher designed cooperative learning to help the students. After learning all students are given post-test to know the ability after the lesson is given.

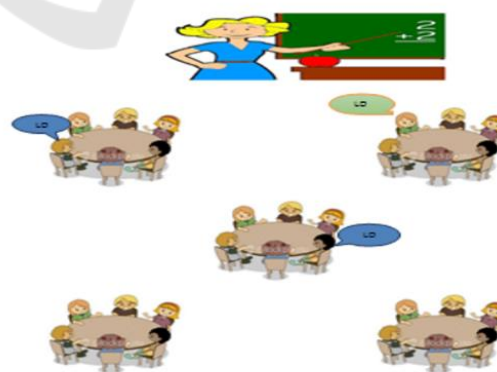


Figure 3: Classroom setting in cooperative learning for students with learning difficulties.

Figure 4 shows the comparison of the scores of all students before and after the implementation of cooperative learning. The improvement can be seen

in this chart. The average increase in the score ranges from 10% to 30% for group without student with learning difficulties and for students with learning difficulties have 20 to 30% increase in their scores indicating that cooperative learning approach can be an alternative approach to teaching students with learning difficulties in inclusive schools.

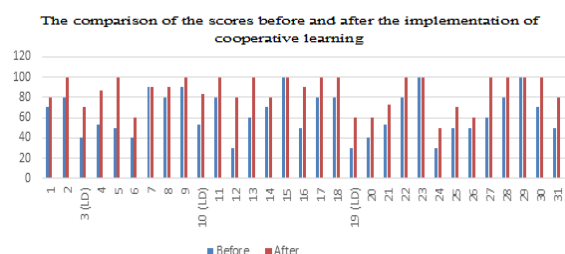


Figure 4: The comparison of the scores before and after the implementation of cooperative learning.

As educators should be in the learning process using methods tailored to the needs and characteristics of students, such as cooperative learning. This approach can be an alternative solution to help students in learning difficulties in building and understanding mathematical knowledge in addition to this it can also accommodate the needs of students with learning difficulties interacting with classmates so that the learning objectives can be achieved effectively and efficiently.

4 CONCLUSIONS

Cooperative learning approach can make learning mathematics fun for students because they are actively involved in the learning activities as members of groups. In addition, the contextualized instructional materials can encourage students to apply their acquired knowledge in everyday life. This approach can become an alternative solution to help students with learning difficulties in construct and understand mathematics knowledge. This approach can also accommodate the needs of students with learning difficulties to interact with their classmates so that the learning objectives can effectively and efficiently be achieved. Implications for mathematics learning using cooperative learning approach, students are more motivated to participate actively and independently solve math problems that students form their own knowledge based on experience in the group.

This study is expected to be a material consideration and reference for teachers who teach students having trouble learning math in primary

school. Each case would require a different solution, but with this research can be made one example of a solution in dealing with students' learning difficulties in math, especially at the primary school level.

REFERENCES

- Abdurrahman, M. 2012. *Anak berkesulitan belajar: teori, diagnosis, dan remediannya*. Jakarta: Rineka Cipta.
- Ayaz, M. F., and Şekerci, H. 2015. The effects of the constructivist learning approach on student's academic achievement: A meta-analysis study. *TOJET*, 14(4), 143-156.
- Blackwell, W. H., and Rossetti, Z. S. 2014. The development of individualized education programs: Where have we been and where should we go now?. *Sage Open*, 4(2), 1-15.
- Bryant, D. P., and Bryant, B. R. 1998. Using assistive technology adaptations to include students with learning disabilities in cooperative learning activities. *Journal of Learning Disabilities*, 31(1), 41-54.
- Capodieci, A., Rivetti, T., and Cornoldi, C. 2016. A cooperative learning classroom intervention for increasing peer's acceptance of children with ADHD. *Journal of Attention Disorders*, 21(8), 1-11.
- Dagnan, D., Burke, C., and Davies, J. 2015. *IAPT Learning Disabilities Positive Practice Guide*. Foundation for People with Learning Disabilities, London.
- De Weerd, F., Desoete, A., and Roeyers, H. 2013. Working memory in children with reading disabilities and/or mathematical disabilities. *Journal of learning disabilities*, 46(5), 461-472
- Dymond, S. K., Renzaglia, A., and Slagor, M. T. 2010. Trends in the use of service learning with students with disabilities. *Remedial and Special Education*. 219-229
- García-Carrión, R., and Díez-Palomar, J. 2015. Learning communities: Pathways for educational success and social transformation through interactive groups in mathematics. *European Educational Research Journal*, 14(2), 151-166.
- Impecoven-Lind, L. S., and Foegen, A. 2010. Teaching algebra to students with learning disabilities. *Intervention in School and Clinic*, 46(1), 31-37.
- Jones, E. D., Wilson, R., and Bhojwani, S. 1997. Mathematics instruction for secondary students with learning disabilities. *Journal of learning disabilities*, 30(2), 151-163.
- Liu, J., and Xin, Y. P. 2016. The effect of eliciting repair of mathematics explanations of students with learning disabilities. *Learning Disability Quarterly*, 0731948716657496.1-14
- Lunenburg, F. C. 2011. Critical thinking and constructivism techniques for improving student achievement. In *National Forum of Teacher Education Journal*, 21(3), 1-9.

- Mafra, H. 2015. Development of learning and social skills in children with learning disabilities: an educational intervention program. *Procedia-Social and Behavioral Sciences*, 20(9), 221-228.
- Malekian, F., and Nadi, M. 2012. The effect of program learning on learning and retention of mathematics among the fifth-step students affected with learning disabilities in kermanshah city. *Procedia-Social and Behavioral Sciences*, 4(6), 785-789.
- Marcelino, L., de Sousa, Ó., Cruz, V., and Lopes, A. 2012. Multi-Year Longitudinal Investigation of Children's Early Mathematics Development. *Procedia-Social and Behavioral Sciences*, 6(9), 1911-1920.
- Marita, S., and Hord, C. 2016. Review of mathematics interventions for secondary students with learning disabilities. *Learning Disability Quarterly*, 40(1), 29-40.
- Obradovic, S., Bjekic, D., and Zlatic, L. 2015. Creative teaching with ICT support for students with specific learning disabilities. *Procedia-Social and Behavioral Sciences*, 20(3), 291-296.
- Rotatori, A. F., and Wahlberg, T. 2005. Comprehensive assessment of students with learning disabilities. *Advances in Special Education*, 1(6), 133-155.
- Rowe, K. 2006. Effective teaching practices for students with and without learning difficulties: Constructivism as a legitimate theory of learning AND of teaching. *Australian Council for Educational Research*, 7, 1-24.
- Sahebjamei, S., and Mokhles, H. M. 2012. Educational designing based on assignment-process approach and investigation of its role on reduction learning disabilities of students having mathematics disorder. *Procedia-Social and Behavioral Sciences*, 4(6), 790-794.
- Serafin, C. 2016. The re-conceptualization of cooperative learning in an inquiry-oriented teaching. *Procedia-Social and Behavioral Sciences*, 21(7), 201-207.
- Suprijono, A. 2009. *Cooperative Learning*. Yogyakarta: Pustaka Pelajar.
- Voinea, M., and Purcaru, M. 2015. Individual Learning Plan in Teaching Mathematics for Children with SEN—A Constructivist Approach. *Procedia-Social and Behavioral Sciences*, 18(7), 190-195.
- Waiyakoon, S., Khlaisang, J., and Koraneekij, P. 2015. Development of an instructional learning object design model for tablets using game-based learning with scaffolding to enhance mathematical concepts for mathematic learning disability students. *Procedia-Social and Behavioral Sciences*, 17(4), 1489-1496.