Cooperative Model and Interpersonal Intelligence in Learning Science

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Abstract: The purpose of this study was to explain (1) the activities of students in natural science learning with cooperative models (*think pair share* and *jigsaw*); (2) differences in student learning outcomes with characteristics of high interpersonal intelligence (HII) and low interpersonal intelligence (LII); (3) interaction of cooperative models and interpersonal intelligence on student activities and learning outcomes of science. The study was conducted at the Teugoh Gampong MIN in Langsa City. Results obtained (1) Average value (•x = 79.25) of science learning outcomes using *jigsaw* is higher than the average value (•x = 78.29) learning outcomes of science using *think pair share*; (2) the average value (•x = 79.84) of the learning activities of students with HII character is higher than the average value (•x = 77.70) students with LII character; (3) there is an interaction between cooperative models and interpersonal intelligence in science learning. It is suggested to MIN teachers that the selection of learning models for science considers the interpersonal characteristics of students.

Keywords: Model, Interpersonal Intelligence, Science Learning.

1. Introduction

The dualism of education in *Madrasah Ibtidaiyah* (MI) requires teachers to be able to provide learning that is fun and meaningful for students and to equip them with noble character in accordance with the guidance of the Koran and the *Sunnah*. Moreover, the release of the "*Aceh Carong*" program by the Regional Government is a form of educational concern, especially in Aceh, which is currently in the third (3) lowest level of the National level. It must be realized that to be a teacher especially teachers in low class is not easy. Because teachers are required to have quality and competent competency in order to bring their students to achieve the national education goals mandated by "Law No. 20 of 2003 that is to educate the life of the nation and develop Indonesian people as a whole, namely people who believe and are devoted to God Almighty and noble character, have knowledge and skills, physical and spiritual health, a steady and independent personality and social responsibility and nationality".Teacher competence can be seen from their ability to manipulate classroom learning models and understand the characteristics of their students. The choice of the learning model must of course be based on the learning conditions namely the objectives of the study area and the obstacles and the characteristics of students and the environment. Teachers have

ICONESS 2018, October 17-18, Banda Aceh, Indonesia

DOI 10.4108/eai.17-10-2018.2294079

not been able to develop students' reasoning because learning is carried out with conventional models that only dwell on giving as much knowledge to students as possible [1]. As a result students do not have the ability to solve real problems in real learning [2]. Natural Science (IPA) is one of the subjects in MI that has systematic characteristics and is formulated and related to all material phenomena is also emphasized in observation activities Fowler in [3]. That way it can be concluded that the WTP is arranged systematically and has scientific work because it is through a process of observation that involves students' visual, mental, oral, and physical activities. The full involvement of students in learning will certainly result in better learning experiences.The presence of students in the learning process in class certainly brings a number of experiences they have gained from previous learning [4]This is referred to as the process of student learning adaptation which consists of:

1. Assimilation, namely the process of integrating stimulus into the students' schemata. Assimilation occurs when students enter new knowledge into the knowledge they already have.
2. Accommodation is the process of creating a new scheme. Accommodation occurs when students adjust themselves to new information.
3. Inquibration is the process of maintaining the schema that students have. In this phase of inquibration, students get a balance of thought because students have been able to solve problems [5].

Piaget also divided the students' cognitive stages into four (4) stages, namely (Santrock, 2008):

1) Sensorimotor stage (0-2 years)
   In the sensorimotor stage, the child composes an understanding of the surrounding world through sensory experiences with motor motions (muscle), like when a baby feels hungry, he will cry, when the child wants to achieve something, he will reach, and so on.
2) Preoperational stage (2-7 years)
   At this preoperational stage, children begin to represent their world through oral (words) and visual (pictures). These two things illustrate the increase in students' symbolic thinking beyond the information connection (sensory) and action (motor). Preoperational thinking can be divided into two sub-stages.
   (a) Symbolic function (2-4 years old), In a symbolic, mentally, children begin to be able to represent objects that do not exist. The process of playing and the development of language is a sign that the child has begun to develop.
   (b) Intuitive function of thinking (ages 4-7 years), In this sub-stage, children begin to use primitive reasoning and want to know all the answers to the questions they ask. Children seem to be confident in their knowledge and understanding but they themselves do not realize how they can know what they want to know.
3) Concrete operational stages (7-11 years)
   In the concrete operational stage, intuitive reasoning is replaced by rational reasoning but only concrete situations. The ability of children to classify has emerged but cannot yet solve abstract problems.
4) Formal operational phase (7-15 years)
   At this stage of formal operations, children have begun to think of experiences beyond their concrete experience, and they begin to think in a more abstract, idealistic and logical manner.

Cognitive psychology contributes greatly to the world of education, especially learning. There are eight (8) cognitive themes for education, namely:

1) Learning is a constructive process rather than receptive.

This means that learning is not just the addition of knowledge and skills but also the process of forming meaning built by students.

2) Schemata is used for structuring and directing (thought) mind.
   Schemata or also called mental framework is used by students to organize their knowledge.
3) Practical exercises.
   Exercise is needed in achieving perfection and effectiveness of cognitive tasks such as attention, perception, memory, thinking, and problem solving.
4) Self-awareness and self-regulation development. Both of these are metacognitive that play an important role in the learning process. In general, metacognition gives two (2) dimensions of thinking, namely:
   a. What students know about their own thoughts;
   b. The ability of students to use self-awareness in managing cognitive processes, this will have an impact on (1) students are increasingly aware of the skills they have to remember, learn, and solve problems; (2) students have a unique strategy in managing their learning and they become more skilled at managing their own learning, thinking and solving problems.
5) Motivation and belief are integrated with cognition.
   This means that learning is not only a factor of cognition that determines the success of learning, but there are motivational factors and learning beliefs. Therefore it is important for teachers to foster student motivation and build confidence in themselves in the learning process.
6) Social interaction is the basis for cognitive development.
   Social support can help students' cognitive development. Many studies in cognitive psychology prove that social cognitive activities, such as good classroom management, cooperative learning, and class discussion can stimulate students in the process of identifying, elaborating, reorganizing, and conceptualizing information. So learning in groups will be able to help students to share information.
7) Knowledge, strategy and expertise must be contextual.
   The knowledge gained by students, the strategies used and the skills acquired must be contextual, meaning that they must relate to various things in the community.
8) The cognitive approach to learning applies a new approach to assessment.
   In learning the teacher should assess the process not only focusing on the assessment of results (knowledge) only. Assessment must be oriented to attitudes, self-confidence, goals, and motivation [6].

Students as learning objects or targets certainly also have distinctive characteristics called characteristics. One of these characteristics is intelligence. Intelligence is: A

a) person's ability to solve problems;
b) The ability to bring new problems to find solutions; and the
c) Ability to create something that can be appreciated (Surya, 2007).

So it can be understood that intelligence is the capacity of individuals to solve problems in a diverse and reasonable context. There are nine (9) types of intelligence known as multiple intelligences, namely (1) visual intelligence; (2) language intelligence; (3) logical intelligence; (4) physical intelligence; (5) music intelligence; (6) interpersonal intelligence; (7) intrapersonal intelligence; (8) naturalist intelligence; and (9) extentialist intelligence [7]. In this study only observed interpersonal intelligence or social intelligence. Interpersonal intelligence can be interpreted by the ability and individual skills to perceive and capture differences in mood, goals, motivation, and other people's feelings through three (3)

dimensions namely (1) *social sensitivity*; (2) *social insight*; and (3) *social communication* developed by Anderson. Based on the explanation, it does not rule out the possibility that in the Teugoh Gampong MIN, Langsa City also has the same problem. Some research results show that the understanding of elementary school teachers in science material is still low (Laksana, 2014). Teachers also have many difficulties when teaching science in relation to changing concepts in terms of the characteristics of new concepts [8]. It was also found that more than 60% of elementary school teacher candidates experienced misconceptions with various concepts of science at school (Laksana, 2016).

1.1 Learning Science

Learning is the process of giving a learning experience (stimulus) by the teacher to students (response) to achieve goals in the form of student competence measured through three (3) domains, namely (1) cognitive domain; (2) the affective domain; and (3) psychomotor domain. Learning is a deliberate, purposeful and controlled effort so that there is a behavior change that is relatively settled in a person.

Of course in the learning process involves student participation and its characteristic factors. Student participation can be done by managing learning to be interesting and fun so that it becomes effective. While student characteristics are the main factors that influence the learning process and student learning outcomes.

Effective learning is based on seven indicators, namely;

a. Organizing teaching materials well. Organizing teaching materials is well reflected in the formulation of teaching objectives, selection of teaching materials, class activities, assignments and assessments, teaching readiness and use of time;
b. Effective communication. Teaching skills, the ability to use teaching media to attract students' attention in learning. Communication skills include clarity of presentation of material, fluency of speech, interpretation of ideas and examples, good speech ability and ability to hear;
c. Mastery and enthusiasm in teaching; The teacher must master the teaching material well so that it can relate the content of the material to what students already know, are able to connect the content of the material with the development of the latest science and technology, and be able to take advantage of their scientific disciplines. The enthusiasm was marked by a willingness and enthusiasm to provide teaching materials to students;
d. Positive attitude towards students. This positive attitude is shown by giving attention to individual students and large groups, helping students' learning difficulties, encouraging students to express their ideas and opinions;
e. Fair examination and fair value. Apathy of exam questions and teaching materials and providing feedback on student work is one of the fairness in learning;
f. Flexibility in the teaching approach. Teachers must be able to manipulate various approaches to achieve various learning objectives; and
g. good student learning outcomes. Learning outcomes are not merely influenced by the teacher but can also be influenced by other factors such as ability and self-motivation (Miarso, 2004).

Natural Sciences learning is oriented towards developing scientific attitudes and developing process skills. So that the teacher in providing stimulus to students not only guides students to work scientifically such as collecting facts, building theories, involving mental processes, and manipulating skills alone, but more than that, the teacher must be able to cultivate students' attitudes to imagination. This is a challenge for teachers in inviting low grade students to "science". Giving experience with direct involvement and active students

certainly provides a priceless learning experience. So the teacher must continue to encourage himself to help students to have good learning skills.

1.2 Cooperative Model Cooperative

Model is a model derived from constructivist understanding. Because students will find it easier to find and understand concepts that are difficult if they can discuss the concept with their friends [9]. Cooperative learning occurs when students can work together and want to share in their study groups and help each other in learning [10].
So it can be concluded that the cooperative model is a learning process that requires:
(1) Participation and teamwork;
(2) Emphasize student activities;
(3) Utilizing the help of other students to improve understanding; and
(4) Mastering teaching materials.

Cooperative learning is developed to achieve at least three important things, namely (1) academic learning outcomes; (2) acceptance of individual differences; and (3) the development of social skills [11]. The results of research on cooperative learning explain that cooperative learning can be a very effective strategy in improving achievement, especially if these two conditions are met properly [9]:

1. Recognition and appreciation for groups so that group members understand that helping others aims to advance interests themselves.
2. Individual students are held accountable. So that teachers need to evaluate individual contributions, for example by conducting individual tests.

So it can be concluded that if the two things are fulfilled then cooperative learning can improve student achievement in different grades and can improve achievement in students' skills in solving problems. In the study group also students will usually increase their motivation to learn. Because positive interactions with friends and positive feelings towards friends become a motivating factor for students who are in a group learning situation. Cooperative learning also enlarges and improves relationships between students. In cooperative groups there are certainly students who teach their friends so that students who act as tutors tend to learn more deeply.

1.3 Think Pair Share

Think Pair Share (TPS) gives students the opportunity to work both individually and with others and optimize student participation [12]The classical method only allows one student to advance and share his work with the class, but TPS gives at least eight (8) times the opportunity for students to show their participation to others [13]. Explicitly, TPS gives students more time to think, answer, and help each other. Intention and tips from students are absolutely indispensable in the learning process. Each student must have the intention to work with other members, and have tips on how to interact and work with other students.

1.4 Jigsaw

Jigsaw encourages students to help each other in mastering the subject matter to achieve maximum results. The implementation procedure *Jigsaw* begins with the division of small groups so that they can work effectively [12]. So the teacher must pay attention to the students' schemata and activate the schematic so that the learning material becomes more meaningful. As well as students must be able to work in mutual cooperation and have the opportunity to process information and improve appropriate communication skills. *Jigsaw* assigns students to study certain material. Then represent the group with other group members and teach it.

Furthermore, every problem faced by students is discussed and studied so that all groups can master the material.

1.5 Interpersonal

Intelligence actually exists and is rooted in the human nerve, namely in the brain that is the center of human activity. With intelligence possessed, humans are able to direct the mind, change the actions needed, and be able to criticize themselves. The totality of an individual's ability to act with a specific goal, be rational and face the environment effectively is what is known as intelligence [14]. He added, In order for students to be able to start, develop, and maintain interpersonal relationships and communication that are familiar, warm, and productive with others, students need to be taught a number of basic communication skills, namely:

a) students must have mutual understanding obtained from several sub-abilities such as trust self, openness, self-awareness, and self-acceptance;
b) students must communicate their thoughts and feelings precisely and clearly;
c) students must demonstrate prosaically attitudes and support each other; Finally
d) students must be able to solve interpersonal conflicts in a constructive way [14].

Interpersonal intelligence has three dimensions, when (1) *social sensitivity*; (2) *social insigt*; and (3) *social communication*. *social sensitivity* is the ability to feel and observe reactions or changes in others that are shown both verbally and nonverbally. *social insigt* develops from self-awareness. This has an impact on the ability to understand one's own state. Finally, *social communication* is a process of communication in establishing and building healthy interpersonal relationships. The skills that must be possessed in this dimension are effective listening skills, effective speaking skills, *public speaking* skills, and effective writing skills. These three dimensions constitute a unified whole and complement each other. So if one dimension is unbalanced, it will weaken the other dimension.

2. Research Methods

Action reasearch is used as a research method with the Kemmis & Taggart model. *Action research design* is a systematic procedure carried out by the teacher to gather information and after that improve the way education, teaching and learning work in the classroom [15].

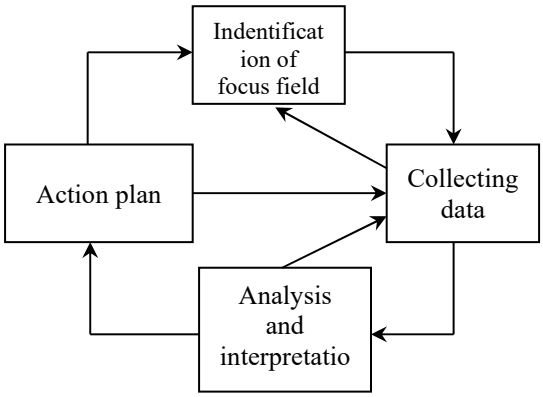

Fig.1 Spiral Research of Mills Dialectic Actions (2011)

From the picture above can be explained the procedure of this research:

1. Identification of focus fields
   At this stage reflection and description, reviewing the literature, and writing research plans action to guide research.
2. Collecting data
   Teachers and researchers collect data using observation and learning outcomes tests.
3. Analysis and interpretation
   The process carried out at this stage is identifying themes, observing the learning process, analyzing antecedents and consequences, and displaying findings. Interpretation involves extending the analysis by asking questions, connecting findings with personal experience, asking for suggestions, and conceptualizing findings.
4. Action plan
   In the action plan stage the summary of findings, recommended actions, and identification of teachers who handle students who still need guidance are carried out.

3. Research Results

3.1 Learning Activities

The results of research on student activities in learning are described as follows:

Table 1: Observing Student Learning Activities.

Activity	Cycle 1	Cycle 2	Cycle 3
Activities hear			
Hearing the explanation of the subject matter			√
Hearing friend presented the results of the activity of visual			√
Reading books			
Viewing images			
mental activity		√ √ √ √	√
Discussing		√ √ √ √	√
response to			
inquiry			√
Argues			√
motor activity			√
Shows section			√
Creating a simple model			
			√
			√

Based on the results of observations during the science learning process which consists of three (3) cycles, students' activities can be described as follows: in the first cycle, the activities that appear only:

a. Hearing the teacher's explanation of the material of the digestive organs;
b. Read student workbooks;
c. Observe the torso of the digestive organs;

d. Discuss with group / partner friends; and
e. Shows the parts of organs related to the digestive system of food.

In the second cycle, activities that have not yet appeared in the first cycle are planned to be improved in the second cycle, teachers and researchers design motivation and correct deficiencies in the implementation of *jigsaw* and TPS. So that then there appears to be an increase in student activity, namely:

a. Hearing an explanation of the subject matter;
b. Hearing a friend presenting the results of the discussion;
c. Reading textbooks;
d. Observe the torso of the digestive organs;
e. Discussion with groups;
f. students begin to dare to ask questions from friends or teachers;
g. students also began to dare to express their opinions;
h. and was very excited when asked to show the organs in the torso.

Finally in the third cycle, it is amazing that all observed activity has emerged. Students are very enthusiastic and enthusiastic in learning, they compete to become the best team. Although the condition of the class became noisier, it was indeed expected that students in the learning process would feel happy and comfortable so that they felt that what was done was beneficial for them.

3.2 Learning

Outcomes Student learning outcomes also experience an average increase. Both the class treated with *jigsaw* and the TPS. Table 2 below summarizes the results of the analysis of student learning outcomes.

Table 2: Science Learning Outcomes Data.

MPK / II	Jigsaw	TPS	Total
High	• $x_{11} = 80.85$ sd = 2.14 $n_{11} = 14$	• $x_{21} = 78.83$ sd = 2.50 $n_{21} = 17$	• $x_T = 79.84$ sd = 4.65 $n_T = 31$
Low	• $x_{12} = 77.65$ sd = 2.31 $n_{12} = 23$	• $x_{22} = 77.75$ sd = 2.68 $n_{11} = 21$	• $x_T = 77.70$ sd = 4.99 $n_{11} = 44$
Total	• $x_T = 79.25$ sd = 4.45 $n_T = 37$	• $x_T = 78.29$ sd = 5.19 $n_T = 38$	• $x_T = 78.77$ sd = 9.64 $n_T = 75$ It

It can be explained some of the things seen in the data in table 2 above:

1. The average student learning outcomes with HII characteristics in class *jigsaw* is 80.85 with standard deviation 2.14.
2. The average student learning outcomes with LII characteristics in the class *jigsaw* are 77.65 with a standard deviation of 2.31.
3. The average student learning outcomes with HII characteristics in TPS class is 75.83 with a standard deviation of 2.50.
4. The average student learning outcomes with LII characteristics in TPS class is 77.75 with a standard deviation of 2.68.

The increase in learning outcomes can also be visualized through Figure 2 below:

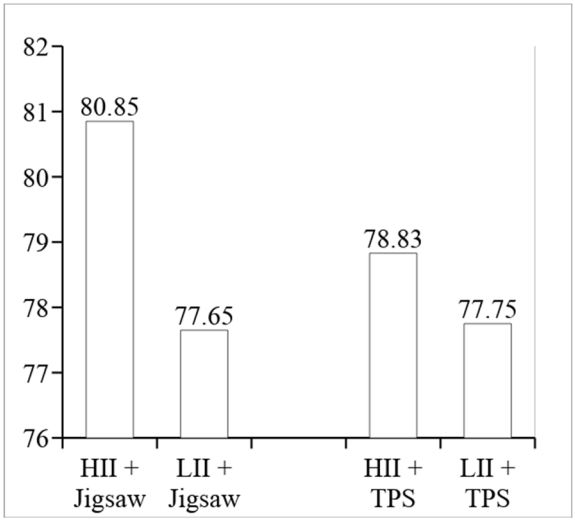

Fig.2 Average Improvement of Student Learning Outcomes

Some of the findings in this study are:

1. There is an increase in student activity in the learning process at each meeting.
2. There are differences in learning outcomes between students taught with TPS models and students taught with the model *Jigsaw* based on the characteristics of their interpersonal intelligence.
3. There is an interaction between cooperative models and interpersonal intelligence in increasing student activity and learning outcomes.

Learning activities with the implementation of *jigsaw* and TPS are focused on learning that takes place gradually from the simple to the complex. This learning activity can also add to the student learning experience. The teacher plays a role in providing stimuli to students to systematically, critically, analytically, reflectively and openly. By involving students directly in the teaching and learning process makes learning more interesting, fun and meaningful so that effectiveness can be achieved. Learning Natural Science is a vehicle to increase knowledge, skills, attitudes and values and responsibilities. That way students are expected to be able to apply the concepts and principles of science to solve problems in everyday life through scientific methods, preserve the environment and increase awareness of the power of God Almighty. Like the five (5) pillars of education that UNESCO launched; *learning to know*, *learning to do, learning, learning to live together, and learning to believe in God.*

So it is fitting that the learning done to students must activate all five senses in learning to explore knowledge and understand it, but if students find difficulties and cannot solve problems, students are taught to realize that there are other forces outside the human self that govern the universe. , namely God Almighty.

At *jigsaw*, the hallmark is the division of students in the origin group and expert groups. Students with high interpersonal intelligence (HII) more easily complete their learning tasks compared to students who have low interpersonal intelligence (LII). It is known that HII students have communication skills and maintain interaction in their study groups. They also have better attention, faster learning, being able to complete work with a set time, and able to draw conclusions. While students who have low interpersonal intelligence (LII) find difficulties in socializing with their friends, so they become difficult to express opinions, slow learning speed, requires repeated training, requires longer learning time, and less able to

conclude learning. At TPS, students are grouped heterogeneously with the characteristics of HII and LII. So that it does not cause jealousy or insecurity in students especially LII students. As a result they can interact better and more fun. Giving time to III also spurred them to be more enthusiastic in learning. Presentation of the material learned can be done by all groups of students well.

The benefits that can be felt from this interpersonal communication fabric are (1) helping students' intellectual and social development; (2) student identity can be formed in communication with themselves and with others; (3) students can also compare their social understanding of the reality around them; (4) a child's mental health is partly determined by the quality of communication, especially with those closest to him (Johnson, 1981).

So the teacher needs to teach a number of basic communication skills to students. Some ways that can be taught by the teacher are (1) students are taught to develop mutual understanding such as openness, self-awareness, self-acceptance, and attitude of trust, (2) students are invited to communicate their feelings and feelings accurately and clearly; (3) students are invited to be more prosocial and mutually supportive, and (4) students must be able to solve conflicts and forms of interpersonal problems in a constructive way [14].

So from the results of this study it is known that *jigsaw is* more appropriate to be used by HII students and TPS is more suitable to be used by LII students. However, both of these cooperative models provide positive results. It is proven that students have better problem solving skills, they can formulate alternative problem solving, learning atmosphere is also very conducive, students are more confident, open and relaxed among group members, they are able to be good listeners for their other friends and want receive input from friend corrections. Students also do not fight each other in speaking or refuting their friends' opinions. The attitude of mutual respect between students is intertwined and looks very amazing. So the choice of the best learning model is a model that is able to engage students in active (doing) in the practice of learning in class, because by doing so it can be said that students have understood what is the learning objectives [16].

By pretending to be a teacher for their peers means students have mastered the subject matter delivered by the teacher [17]. The basic assumptions are:

1) The student's ability to hear words only 50-100 words / minute, while the teacher is able to speak 100-200 words / minute, so the use of lecture methods that rely solely on hearing activity tends to make students forget what they have heard;
2) Learning models that only stimulate listening and viewing activities tend to be relatively small, while synergistically stimulating models between listening, seeing, asking, and discussing are relatively more successful in the learning process;
3) By using a learning model that involves student practice, automatically knowledge and skills can be mastered by students.

4. Conclusion

Conclusions of this study are (1) the average value (• x = 79.25) of the science learning outcomes using *jigsaw* is higher than the average value (• x = 78.29) learning outcomes of science using *think pair share*; (2) the average value (• x = 79.84) of the learning activities of students with HII character is higher than the average value (• x = 77.70) students with LII character; (3) there is an interaction between cooperative models and interpersonal intelligence in science learning. It is suggested to MIN teachers that the selection of learning models for science considers the interpersonal characteristics of students.

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