

Learning Implementation ICARE Social Simulation to Improve The Ability of Mathematical Connection

Sri Ady Astuti^{1✉}, Scolastika Mariani² & Mulyono³

¹ Universitas PGRI Semarang, Indonesia

² Mathematics, Universitas Negeri Semarang, Indonesia

³ Mathematics Education, Universitas Negeri Semarang, Indonesia

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Abstract

In the PISA study, Indonesian students are still meet in solving questions focused on mathematical connections which is shown by the ability of students to use Mathematics that they learn to solve problems in everyday life. The research objectives were knowing the quality of mathematical connection skills and measuring the increase in mathematical connection ability after the model of ICARE social simulation was implemented. The type of research used is mixed methods with research designs concurrent embedded. The results of research on ICARE model learning through quality social simulation, showed the ability of mathematical connections has reached classical completeness more than 75% and students' mathematical connection ability in ICARE model learning through social simulation is higher than that of students with expository learning. Mathematical connection ability of students in the experimental class increased by 0.538 in the medium category, while students in the control class increased by 0.375 in the medium category.

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✉ Correspondence address:

Dokter Cipto Jl. Sidodadi Timur No.24, Karangtempel,
Semarang, Jawa Tengah, 50232
E-mail: bayuirawan90@gmail.com

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INTRODUCTION

In the results of PISA study, Indonesian students is weak in solving focused questions on mathematics connection shown by the low ability of students to use Mathematics equation to solve problems in everyday life. The expected basic abilities normally can be shown and improved trough learning mathematic activities like using ability mathematical connection. Using the mathematical connection, concept of thought and student insight about mathematic will be wider and not only focusing on the topic. Moreover, mathematic is helpful and needed in the field of study or other science.

Mathematical knowledge cannot be stand alone, but sometimes it is used singly. Otherwise, mathematics is an integrated field of study. When students connecting the mathematical ideas, the students understanding of mathematic are deep and lifelong, and students notice coherency the unity of mathematic. Through the instruction of emphasizing interrelation of math ideas, students do not study only mathematics but also the purpose of mathematic (NCTM, 2000). In the PISA study. Indonesian students are weak to solve questions focused using mathematics connection that proved the students ability using their mathematic study to solve daily problems. The ability mathematic connection is one of the important competencies to be mastered for the students (NCTM, 2003). The ability mathematic connection is knowing, using and creating correlations between others ideas mathematic and in the outside of mathematics to build the understanding mathematic itself (NCTM, 2003).

There are three aspects of mathematic connection; connections between mathematical topic, the connection between other science disciplines, and the connection between daily life (NCTM, 2000). According to Kutz and Redisel cited by Satriawati (2008) said that mathematics is related to internal and external connection. Internal connection is involving between connection internal and mathematic concepts while external connection is connection with the other subject study and connection in daily life. Riedel (1996) divided mathematic connection as

the connection between mathematical topics, between types of study with several representations, and mathematic connection with other curriculum. The result study of Ruspiani (2000) explains that the students' ability normally is weak with the mathematic connection method. The low students' ability of mathematic connection affects the students quality of learning and impacting to students learning achievement in the school. To solve the problems, learning process related to the mathematical ideas is needed to be selected learning method or model. The study of Saleh Haji (2017) proves that the ability of mathematic connection on the outside of the classroom is higher rather than conventional classroom method.

In the learning process, learning model plays as an important role and one of the main tool teachers in teaching classes. Learning model used by the teacher will affect how the student learns, therefore teacher needs a model to motivate student active in the class, students can understand what they taught.

One of the learning models can be had a strong connected with that problem is ICARE (Introduction, Connection, Application, Reflection, Extension). ICARE learning models have five steps; Introduction, Connection, Application, Reflection, Extension. The design of ICARE learning is learning process happened if students is able to process or self-construction about information/knowledge, it becomes a meaning following their frame of mind.

Based on the result of Maskur et al (2012) said that ICARE learning is practical and effective to be used. Whereas research results by Wahyudin (2010) indicates learning TIK model using model ICARE gives positive effect and can be developed to be more meaningful and fun. According to Wahyudin (2010) proves that learning the ICARE model give positive effect through mastering subject and proven more effective rather than other learning model has been tried in the class. Using CORE learning model nuanced constructivist produced by the support and motivation toward students mathematic connection ability (Azizah, 2012).

The ICARE learning mode can be combined with social simulation that expected students can be easy to understand and make the learning activity. Today students learning process are passive and teacher is active in the learning process. This social simulation, students are invited to be active this activity. Social simulation is a way to describe through pretended model or role play in the real condition (Ismail, 2008). Lateef (2010) makes a research on simulation method in the learning process in the health school. The result of Lateef research (2010) shows that using the social simulation method

can help students more understanding the condition of patience in the real situation or real life. This method can be said more effective and give a new way of teaching process in the health school.

Seeing with several concept research above, the researcher is interested to do the research about analytical and developing mathematic connection ability through VII junior high school students using ICARE learning model with social simulation approach. There is a syntax ICARE learning model through social simulation approach in Table 1.

Table 1. The Implementation of ICARE Learning Model through Social Simulation

Syntax		Activity
Introduction		Teacher opens the class meeting and communicate the subject material will be learnt also the aims of that learning.
Connection		Teacher shows the event, picture or showing a thing that correlate to the learning material Teacher stimulates student to asking a question.
Application	Orientasi	Teacher gives an information and correlated object to the subject learning point. Teacher divides a group and give an explanation dramatic technique as a role model each group.
	Student Exercise Simulation	Each group tries a short modeling.
Reflection	Re-calling	Each group plays role model following condition or a real event correlating the social arithmetic material. Each group asks a question about the result of play role model discussed. Teacher completes or give comment the student presentation result. teacher and student make a conclusion or summary.
Extend		Teacher give an information, link, website or other resources material with material learnt to the students learnt outside of the class. Teacher gives an assignment at home.

Based on that problems, researcher aims to know the quality of ICARE learning model using social simulation in the subject of arithmetic social and identifying the improvement and the difference connection mathematic ability through VII junior high school students.

METHODS

This research is kind of mix method using concurrent embedded model with quantitative mode as the primer method. The embedded model of mix research method is research method combining quantitative research method and qualitative together or opposite but the method is different, there is a primer and seconder method (Sugiyono, 2014). The researcher chooses mix combined method with concurrent embedded because according to Sugiyono (2014) explains this research method more interesting because

researcher collecting data like (quantitative and qualitative or opposite) simultaneously one phase of collecting data. Therefore the collected data is complete and more accurately.

This research, researcher does a direct research in VII class junior high school Askhabul Kahfi in the 2017/2018 to collect a concrete data about mathematic connection ability using ICARE learning (*Introduction, Connect, Apply, Reflect, and Extend*) through social simulation. The population in this research is students of class VII 2017/2018.

The sample takes two times which one of the class gets a treatment using ICARE learning model and the other class using a regular learning model. The amount of each class is 22 students and there are 44 students research sample. All classes chosen as a subject research do a competency test mathematic connection, nevertheless the experiment class gets a ICARE

learning model through social simulation whereas the control class using expository learning model.

Using a pre-test score mathematic social arithmetic is obtained from the first score determine that research comes from distributed a normal and homogeneous population condition. Afterwards researcher does the research plan.

The instrument used in this research is sheet of mathematic connection ability formed 13 description questions. The instrument test will be used as a collecting data instrument that firstly tested and then do a test through validity, reliability, difficulty level and different strength.

Instrument Test of Mathematic Connection Ability is used for collecting quantitative data two times; as pre-test and as pos test. A pre-test question and pos test have a same quality, the achievement indicator subject and mathematic connection indicator is used similarly. Instrument Test of Mathematic Connection Ability is used for collecting quantitative data and also qualitative data. The test is used to specify level of the ability mathematic connection following students' progress and ability mathematic connection indicator, sheet observation and interview guidelines.

The used of analysis technique is analysis techniques quantitative and qualitative. The analysis quantitative is consist of normality test, homogenous test, average similarity. Analysis qualitative uses interpretation from the result of mathematic connection ability that has been categorized as advanced, medium, and low.

RESULTS AND DISCUSSION

Before the two classes is given a ICARE learning model through social simulation, so the two class should be tested to decide the characteristic data having a similarity or do no have normality and homogenous test. Doing this pre-test, researcher will know the initial control student's ability dan before the learning experiment. The average result pre-test in the experiment class and class control presented in the Table 2.

Table 2. Average Results for Pre-test

Class	Average
Control	74.3
Experiment	74.9

Based on the table above can be concluded that the average mathematic connection ability is not clear. Hence, it will give a ICARE learning model through social simulation.

Before the two classes is given a ICARE learning model through social simulation, so the two class should be tested to decide the characteristic data having a similarity or do no have normality and homogenous test. The result of first data normality test will present in the Table 3.

Table 3. Result Normality First Data Test

	Class	Statistic	df	Sig.
Mathematic connection ability	Control	0.090	22	0.200*
	Experiment	0.091	22	0.200*

Based on the Normality Test with SPSS using the Test *Kolmogorov-smirnov*, with a significance level of 5% obtained avalue *significanceof* 0.200 in the control class and experimentation for mathematical connection ability pre-test scores . The significance value of $0.200 = 20\% > 5\%$ can be expressed H_0 accepted. This means that the initial data from pre-test result categorized normal distribution. Next, test conducted to decide the homogeneity data.

Homogeneity result first data test is obtained through pre-test presenting in the Table 4.

Table 4. Result Homogeneity First Data Test

Levene statistic	df ₁	df ₂	Sig.
0.656	1	42	0.421

Based on the homogeneity with SPSS using test *Leviene Test (Test of Homogeneity of Variances)* with real level 5% got a significantly score $0.421 = 42.1\% > 5\%$ so H_0 means based on the first data from pre-test students class control and experiment has a similar variant or categorized homogeny.

After doing similarity test. The result average similarity test presenting in the Table 5.

Tabel 5. Output SPSS Average Similarity Test

		Levene's test for equality of variances		t-test for equality of means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
									Lower	Upper
Mathematics connection ability	Equal variances assumed	0.656	.421	-0.310	42	0.758	-0.81991	2.64744	-6.10569	4.46587
	Equal variances not assumed			-0.308	63.466	0.759	0.81991	2.65859	-6.13191	4.49208

Based on similarity average test use independent sampe t-test using real level 5% obtained score significantly $0.741 = 74.1\% > 5\%$, means H_0 accepted. This show the difference average student ability in the ICARE learning mode through social simulation and student ability expository learning before treatment or can be said that the difference average ability the first class experiment and class control.

The completeness from mathematic connection ability can be used to know the student completeness taught using ICARE learning model social simulation to achieve completeness study if pass the score limit study if 75 % students achieve score completeness 70.

Based on the calculationwith the formula $z = \frac{\frac{x}{n} - \pi_0}{\sqrt{\frac{\pi_0(1-\pi_0)}{n}}}$ value of Z_{value} is 0.741 Price Z_{table} with $\alpha = 5\%$ chance $(0.5 - \alpha) = 0.270$. Because $Z_{\text{value}} \geq Z_{\text{table}}$ then H_0 is rejected and H_a is accepted. This means that the proportion of students who receive ICARE model learning through social simulation has achieved classical completeness of more than 75%.

The t test is influenced by the results of the variance similarity test between the experimental class and the control class. If the two variants are

the same, the formula used to do the t test is as follows.

$$t = \frac{x_1 - x_2}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad \text{with}$$

$$S^2 = \frac{(n_1 - 1) S_1^2 + (n_2 - 1) S_2^2}{n_1 + n_2 - 2}$$

Based on the calculation results it is known that the value of t_{value} is 2.654 while t_{table} is 2.018. Based on these two values, it is stated that $t_{\text{value}} > t_{\text{table}}$ so that it can be declared H_1 accepted. It can be concluded that the average mathematical connection ability of students who took ICARE Model learning through social simulation was higher than the average mathematical connection ability of students who took exposure exposures in the control class.

Learning arithmetic social subject uses ICARE learning model through social simulation to be stated quality. These following criteria has been set the researcher that learning can be called a good quality if the mathematic connection students complete classically, the average of mathematic connection ability experiment class is higher than expository, and the experiment class has been increased. This can be described in the Table 6.

Table 6. Comparasion of Mathematical Connection Capabilities Mathematical

Indicators of connections	Ability categories			
	Not good	Poor	Good	Very good
Identify representations equivalent to the same concept	Less able, long time	less able to be	able, longer time	Able, fast time
Recognize and understand the relationship of ideas between topics into linkages comprehensive	There is no ability	Less capable, there is an effort to understand	Ability, a longer time, strategy	Able, a strategy
Using and assessing the interrelationships between mathematical topics and those outside of mathematics.	Not yet demonstrate ability	ableable	To Being to assess	and
Using symbols , counting operations, and utilizing settlement strategies	Have not demonstrated the ability	to be able afford	to but longer	Able to use

The first mathematic connection indicator, identifying of representation equivalent from the similar concept to the student's mathematic connection concept is good. Students are able to recognize goodly the equivalent of representation concept, write what is known and questioned in mathematic symbol question and setting numbering strategy and the question model used to resolve the problems. Students do not need more time to spot the concept, idea and thought from the question as part of representation social clue in the daily life. A good students category are able to identify concept and idea, write what is known and questioned in the question sheet through symbol question and number and then give the explanation although need more time. Furthermore, students show the set of strategy ability and mathematic model to solve the problems. Students show the progress of mathematic connection ability from the first until the end of the meeting to the low student's category, showing the less understanding the concept and relation with each equivalent concept to be seen in the some of written questions, but trying to understand the relation and try to solve the problems. A bad students category, students do not show the ability progress understanding the idea or concept equivalent following mathematic concept proved the lacking ability to write symbol.

The second indicator is identifying ability and understanding the relation ideas in the mathematic topic thus link thorough with the concept and equivalent procedure known by student in the good mathematic connection category is able to present problems with written symbol and number but unwrite the explanation question. Students ability find the strategy and mathematic model to solve the appear problems after realizing the correlation each concept in the mathematic. Students with a good category, students are able to recognize concept and idea written what is known and questioned in the question through symbol and number giving explanation even though need more time. Moreover, students show the setting of strategy ability and mathematic model to solve the

problem. Students show the progress mathematic connection ability from the beginning to the end of the meeting. A low student category, students show less ability to identify concept and correlation between equivalent concept to be seen some of written question, but try to solve the problem. For a bad student, student do not show to recognize concept ability and between equivalent concept in the whole mathematic concept and connect with a proved equivalent concept from lacking writing symbol ability and decide the strategy that will be used to solve the problem.

The third indicator is ability to use and assess the correlation between mathematic topic and outside topic, students with a good mathematic connection ability. Students use and are able to asses through correlation between mathematic and outside mathematic with giving a clear explanation also evaluate the result. Students show ability to correlate context problem facing in the daily life with problem solving concept mathematical. Students are able to be a good mathematic connection showing to identify a various problem in the daily life following the idea and mathematical problem solving concept. Students with low category, students show lacking ability to identify problem in the daily life outside mathematic and correlate with concept and idea problem solving mathematic. Students have tried to show strategy and problem solving model mathematically but facing a difficult in the last step. Students with a bad category illustrate that student do not show an ability to correlate concept or equivalent ide in mathematic with problem solving concept in the daily life. Students are not able to write a strategy problem solving or to decide the result.

The fourth indicator is students use symbol mathematic and arithmetic operation following the advantage problem solving strategy in the clear mathematic and appropriate to solve mathematic question to be tried solving in the daily life. The use of strategy to solve any mathematic problems faced in real life is not optimal because require time to solve.

The student result of the proportion test reach completeness classically over 75% to implement ICARE learning mode through social simulation. This show a succeed a good implementation of ICARE learning model, following Mahroji and Rufi (2015) research result title Model Active Learning ICARE System Pada Pembelajaran Matematika untuk siswa kelas VII SMP Negeri 3 Sidoarjo that Model Active Learning ICARE System developed feasible, means learning model is effective implemented in the mathematic learning process student class VII SMP Negeri 3 Sidoarjo with Arithmetic Social. According to Nunung Anugrawati (2016) result research title Penggunaan Model ICARE dalam Pelaksanaan Pembelajaran Berbicara Bahasa Inggris (Speaking) to third semester English Department Muhammadiyah University Makassar shows that ICARE learning significantly can escalate a good spoken ability accuracy also fluency significantly. The research show that student speaking ability in English subject through students who get ICARE learning model is different result significantly with students who get conventional learning.

The achieved completeness mathematic connection ability is followed with learning activity. ICARE model learning through social simulation do the research use the real-life media and grouping. Students attend to dig the information and questioning, activity and finding, collecting data and analyst also make own result. Students have a freedom to construct thought and finding in the activity and student doing by their self without any burden, fun and high motivation.

Following the criteria has been decided by the researcher that learning had a good quality if the students mathematic connection is complete classically, the high average of experiment class control mathematic connection ability, and the progress increased significantly.

Students Mathematic connection ability VII class junior high school Askhabul Kahfi from the first research is low. This can be seen from the first test result mathematic connection before using ICARE learning model through social

simulation generally indicate the answering student is not able to pattern, apply, interpret question correlating daily life in mathematic.

13. Gina meminjam uang sebesar 2.000.000. dikoperasi. Bunga tunggal yang ditetapkan oleh koperasi adalah 1,5% / bulan. Jika Gina meminjam selama 10 bulan, maka berapaakah jumlah pinjaman dan bunga yg harus di bayar

Diket = Pinjaman = Rp 2.000.000. 3
 Bunga = 1,5% per bulan.

Ditanya = Berapa jumlah pinjaman dan bunga yg harus di bayar jika lama pinjaman 10 bulan

Jawab = bunga pinjaman = $L \times \text{lama pinj} \times \frac{\%}{100} / \text{Bulan} \times \text{Pinjaman}$
 $= 10 \times \frac{1,5}{100} \times 2.000.000$
 $= 300.000$ ✓

Total Pinjaman = Pinjaman + Bunga ✓
 $= 2.000.000 + 300.000$
 $= 2.300.000$

Figure 1. The Result of Work Sheet Group

In this research, students mathematic connection ability can be descript in to four components. From the post-test is shown that the students connection ability indicate improvement. The higher group and medium have higher ability to communicate problem, change the real problem into mathematic, presenting the right question, able to write the plan how to solve it. This is following research about using ICARE learning model where to show the result ICARE learning model is able to increase the accuracy of speaking ability class VIII B MTS Muallimin Muhammadiyah Makassar (Junaid, 2017). This is similar to Muhammad Amin Fauzi (2011) research title Peningkatan Kemampuan Koneksi Matematika Dan Kemandirian Belajar Siswa dengan Pendekatan Metakognitif di Sekolah Menengan Pertama di Kota Bandung

The higher group needs more time to solve the question, but the answer nearly true. The medium group needs more time to answer question but nearly false in some of the question. The bad group needs long time mostly false answering question, but there appears a capacity

building. Based on differences mathematic connection ability had every group, concluded that the higher students group and medium have a chance to increase a better mathematic connection ability than other group.

There is any difference students mathematic connection ability for two class in this research because the difference treatment in the learning process. The learning class is taught using ICARE learning model through social simulation more attractive because students learning is involved in the process, students also do an activity following the guideline and presenting the result.

The restraint using ICARE learning model through social simulation is a limited time, while subject material and simulation activity need more time. However, teacher has given a solution to collect assignment to students working in group at home.

Based on the science approach, every learning activity have a difference obstacle to face by teacher and tried to solve wisely to omit learning method ability, ICARE model through social simulation has applied in this research.

CONCLUSION

Students class VII SMP Askhabul Kahfi mathematic connection ability is discovered from the fist pre-test research followed a low category. This causes mathematic learning subject social arithmetic do not use ICARE learning model through social simulation. Students answering generally are not able to fulfill achievement component mathematic connection ability where is the students answering not able to formulate, applying, and interpreted question correlate in the daily life in mathematic form.

ICARE learning model through social simulation designed to emphasize finding a factual problem concept and correlating in mathematic. Result of applying ICARE learning model through social simulation can be seen the fulfillment each components ability as identifying representation of equivalent from the similar concept, identifying correlating mathematic procedure between mathematic topic and

correlation outside of mathematic and applying mathematic in the daily life.

A group student which has a higher mathematic connection ability means students are able to master each component. A group student which a medium mathematic connection ability to master each component, this can be seen the test score from the test ability mathematic connection that student get the score nearly maximum means, students are able to get nearly a maximum score with noted the ability each component should be increased.

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