THE DESIGN OF MATHEMATICS LEARNING SOFT SKILLS BASED ON GENERATIVE MODELS TO IMPROVE STUDENTS' MATHEMATICAL COMMUNICATION SKILLS

Yulianto[1], Sugeng Sutiarso[2], Asmiati[3]

FKIP, University of Lampung, Indonesia
Yuliantoyulianto2@yahoo.com

ABSTRACT: The purpose of this study was to determine the influence of the design of mathematics learning soft skills based on generative models in improving mathematical communication skills. This quasi experimental study uses pretest and posttest control group. The instrument used to measure mathematical communication skills is in the form of 5 questions. Hypothesis test data using t-test by testing the prerequisites for normality and homogeneity testing. The results of this study are the design of mathematics learning soft skills based on generative models influencing the improvement of mathematical communication skills.

Keywords: soft skills, generative, mathematical communication.

1. INTRODUCTION

Education is one of the rights citizens as a necessity that must be fulfilled. Education has an important role in developing human resources in the era of globalization. The current era of globalization in people's lives is strongly influenced by the development of science and technology. Humans are highly required to always follow these developments and changes. Along with the times, competition between individuals is also getting tighter. Competition in skills, work, and creating new innovations that are useful becomes very important and must be prepared maximally for each individual. Individuals who are ready to be competent in the global world with all the challenges that exist can be formed and prepared by the world of education.

Mathematics is an important subject in education. The importance of mathematics lessons contained in Ministerial Regulation No. 22 of 2006 concerning content standards for elementary and secondary education units that mathematics needs to be given to all students starting from elementary school to equip students with the ability to think logically, analytically, systematically, critically, and creatively as well as the ability to work together. Besides National Research Council (1989) states that "Mathematics is the key to opportunity". This means that mathematics is the key to success. Besides that mathematics is also used throughout the world in various fields, including natural sciences, engineering, medicine, and social sciences such as economics and psychology. The importance of mathematics in life causes mathematics lessons to be taught at every level of education in school. The importance of learning mathematics requires students to be able to master mathematics well. Mastery of mathematics can be seen from the achievements or student learning outcomes that are achieved. Good mathematics learning outcomes will be achieved if the learning held in the classroom is truly effective.
Mathematical learning emphasizes on students to be active and able to develop their potential to the fullest. Mathematics learning must be student-centered, where students actively build

knowledge, attitudes and skills independently. The success of students in building knowledge, attitudes, and skills independently will give a deep meaning to the mathematical ability they have. Mathematical ability is the ability to deal with problems, both in mathematics and real life. One of the most important mathematical abilities of students to develop is mathematical communication skills. Mathematical communication ability is the ability to convey something that is known by reflecting, making, delivering, reading, composing, and explaining about mathematics. One of the objectives is the mathematics courses students have the ability to communicate ideas with symbols, tables, diagrams, or other media to clarify the circumstances in solving problems.

The importance of communication skills in mathematical also claimed by NCTM National Council of Teacher Mathematic (2000) states that one of the standards that must be owned by the students in learning mathematics are communication skills (communication). According to Sumarmo (2017) that mathematical communication skills are abilities that include and contain various opportunities to communicate in the form of (1) reflecting and explaining students' thoughts about mathematical ideas and relationships, (2) formulating mathematical definitions and generalizing, (3) reading discourse with understanding, (4) classifying and broadening the mathematical questions learned, (5) appreciating the beauty and strength of mathematical notation and its role and the development of mathematical ideas. The details of the indicators of mathematical communication skills are as follows: a) written text, which is giving answers using their own language, making a situation or problem model using verbal, written, concrete, graphic and algebraic, explaining and making questions about mathematics that are learned, listened to, discussed, writing about mathematics, making conclusions, inviting arguments and generalization, b) drawing , which is reflecting real objects, images, and diagrams into mathematical ideas, c) mathematical expression, ie express mathematical concepts with everyday events in language and mathematics symbol.

Improvement of students' mathematical communication skills can be done in various ways between the application of a design or learning model that matches the characteristics and subject matter. The application of mathematics learning soft skills design based on generative models is one way to improve students' mathematical communication skills. Generative learning model is a learning model that allows students to remember concepts that they have known and use them to find out new concepts. In line with what was stated by Wena (2016) that the generative learning model is a learning model in which students are able to have the knowledge, ability and skills to construct or build knowledge independently and emphasize actively integrating new knowledge with the use of knowledge already possessed. The new knowledge will be tested by using it to answer related problems or symptoms. If the new knowledge answers the problem at hand, then the new knowledge will be stored in long-term memory.

Generative learning models designed with integrated soft skills means that there is an activity or soft skills development skills that are added to the learning. Soft skills can be defined as abilities beyond technical and academic abilities, which prioritize intrapersonal skills (the ability to self-regulate) and interpersonal skills (skills related to others). Sutiarso (2014) states that soft skills are related and have a very large influence on one's performance and learning outcomes. In line with this statement (Alex, 2014) revealed that " soft skills play a significant role in one's success in life, especially in one's professional". Soft skills play an important role in one's success in life, especially in a person.
Soft skills appear on the person's behavior, both when interacting in social situations, language, habits themselves, or important attributes to support the optimistic behavior and personal development. Soft skills as a person's ability to motivate themselves and use their initiatives,

have an understanding of what is needed to be done and can be done well, useful to overcome problems that arise suddenly and continue to survive if the problem has not been resolved. Thus, soft skills are self-changing strengths or overcoming various problems to achieve success. Skill builders/attitudes must be done from the beginning through the process of habituation in learning. Soft skills can be honed and improved along with the experience gained. Widarto (2011) states that to develop soft skills requires three important things, namely hard work, independence, and teamwork.

The design of mathematics learning soft skills based on generative models in this study is a generative learning model in the learning syntax added with the stimulant in developing soft learning support skills. The soft skills developed are hard work, independence, and teamwork. The development stimulants are in the form of additional activities including:

1. Whispering the formula , an activity that is done (a) representative students are asked to memorize the formulas/concepts that have been provided, (b) while alternating students in groups whispering to each other's formulas, (c) a member of the last group writes the formula on the board, (c) jointly make corrections to answers (d) determine and reward the winners,
2. Images together, an activity that is done (a) student in the group in turn asked to draw or write a formula in accordance with the subject matter in everyday life on the board in turn each member of the group (b) teacher with students judging from the pictures with consideration pa l ing the most precise and neat,
3. Throw a formula, an activity that is done (a) every student is asked to reflect for a moment on the concept / formula of mathematical material known (b) or the student is appointed to convey the concept / formula what he knows. (c) after the first student finishes presenting the concept alternately appoints another student according to his choice to convey the concepts / formulas he knows (concepts / formulas must be different), and so on until there are students who are appointed but cannot deliver concepts / formulas what he knows ,
4. Throw the formula, an activity that is done (a) every student is asked to write down what he knows about the subject matter that has been studied in a paper (b) after the teacher has gathered, then the teacher randomly asks the students to convey verbally what they wrote, students who finished delivering alternately pointed out other students to submit their writing (c) giving rewards for those who were in accordance with what was written.

This study aims to determine whether there is influence the design of mathematical learning soft skills generative model based on improvement of students' mathematical communication abilities.

2. RESEARCH METHODS

This research is a quasi experimental study with pretest and posttest control group design. The population in this study were all eighth grade students of SMP Negeri 2 Bunga Mayang in the academic year 2017/2018 and the sample was taken using simple random sampling technique. This study took class VIII 4 as the experimental class and VIII 2 as the control class. Data collection techniques are used in the form of test and questionnaire methods. Instruments essay test form with five questions used to measure the ability of mathematical communications. Test instrument was conducted in class IX 3 with 30 students respondents to find out the validity, reliability, differentiation and level of difficulty. F or the analysis of the data used in this study is a t-test with SPSS 20 and test n-gain with the classification Hake (1999), namely (1) high criteria when n-gain ≥ 0.70, (2) the criteria being if $0.30 <$ n-gain > 0.70, (3) lower criteria when n-gain ≤ 0.30.

3. DISCUSSION AND ANALYSIS OF RESULTS

Preliminary analysis is done to find out whether the data is normally distributed and has homogeneous variance. Normality test using SPSS 20 obtained that both the experimental class and the control class have a value of Sig > 0.05, this means that the data is normally distributed. Homogeneity test is done using SPSS 20 obtained that Based On Trimmed Mean has a value of Sig > 0.05 thus it is concluded that the two classes have homogeneous variants. Because the data is normally distributed and homogeneous, the next test is the t test. The results of the t test use SPSS 20 as in Table 1. as follows:

Table 1. T-Test Using SPSS

		Leneve'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
Learning outcomes	Equal variances assumed	1,868	.177	-2	56	.039	-4,686	2,220	-9,133	-.238
	Equal variances not assumed			-2	50.105	.042	-4,686	2,242	-9,188	-.183

From the calculation using SPSS above, it can be seen that the value of t count = - 2 is then compared with the value of t table for df = 56, t table = 0.6789 , obtained that t count < t table, because t counts negative means there is a difference mean of both groups. Furthermore, the probability value of Sig. (2-tailed) that is less than 0.05 this means that it can be concluded that there is a difference between students' mathematical communication skills that use soft skills design generative model based learning with students using conventional learning. To determine whether the difference is higher or lace h then do a comparison the average score posttest experimental class and control class. The results of data analysis obtained an average posttest experimental class obtained 78.79 and control class 74.10. For the n-gain test the following data is obtained:

Table 2. N-Gain Index of Students' Mathematical Communication Ability

Research Group	Many students	Pretest average	Posttest average	SMI	Index N-Gain
Experiment	28	15.05	78.79	100	0.75
Control	30	16.90	74.10	100	0.69

Based on Table 2. it can be seen that the average n-gain index of students' mathematical communication skills using the design of mathematics learning soft skills based on generative models is higher than the average n-gain index using conventional learning. The n-gain index of the experimental class is 0.75, this means that the improvement of students' mathematical communication skills using the design of mathematics learning soft skills based on generative models is included in the improvement with high criteria. While the improvement of

mathematical communication skills using conventional learning is included in the medium criteria when viewed from the average n-gain index of the control class that is equal to 0.69.

The findings and studies the results of research during the study, namely the soft skill design of mathematics learning based on generative models can effectively improve the learning outcomes of students' mathematical communication skills. Based on the results of data analysis and testing, it is known that the improvement of students' mathematical communication skills using model based soft skills learning mathematics design is more effective than the communication speed of students who use conventional learning. Thus means that the soft skill of the design of mathematical models of generative models is effective in improving students' mathematical communication skills. Furthermore, one of the indicators used in this study is students who use the soft skill design of mathematics learning based on different generative models before learning.

Other findings in this research show that there is a link between soft skills developed in learning with generative models and learning outcomes. Based on the observations at the first meeting with the soft skills developed, namely teamwork, the mathematics learning soft skills activities carried out were "Whispering Formulas". This activity lasts for about 10 minutes. Activities provide stimulants before they learn in groups. Giving understanding that group assignments are a shared task thus when group learning takes place they have realized that in each group member must cooperate in solving problems. When one member cannot solve the problem, it means the responsibility of the other members in a team, thus indirectly they will help each other in increasing mathematical abilities. In addition, in this activity they are required to remember a formula/concept, thus they indirectly get a concept that can be used as material for further learning.

The second meeting of mathematics learning soft skills activities carried out was a "Joint Drawing". This activity provides an understanding that group assignment is a joint task so when group learning takes place they have realized that in each group member must cooperate in solving problems. When one member cannot solve the problem, it means the responsibility of the other members in a team, thus indirectly they will help each other in improving mathematical abilities. In addition, in this activity they are required to compete between teams so that it encourages enthusiasm and mutual respect. The mathematical concepts contained in this activity also indirectly give meaning to learning.

The third meeting of the mathematics learning soft skills activities carried out was to "Throw The Formula". Activities carried out are individual tasks. The benefits of soft skills in mathematics learning activities (throwing formula) is to provide stimulants so that students are able to convey ideas and ideas well without shame and fear of being wrong. Besides that it gives other students the opportunity to respect each other's opinions and ideas. With the mathematical concepts that are integrated into activities, indirectly they get a meaningful learning and remember the concepts that have been given.

The fourth meeting of the mathematics learning soft skills activities conducted at this meeting was "My Writing Remembrance". The benefits of soft skills activities in mathematics learning (Remembering My Writing) is to provide stimulants so that students are able to convey ideas and ideas well and are responsible for what they do. Besides giving other students the opportunity to respect each other's opinions and ideas from others as well as the mathematical concepts that are integrated in the activities, they indirectly get a meaningful mathematics learning. The link between the development of soft skills in learning and learning outcomes is

very large. The development of soft skills triggers the effectiveness of applied learning designs, thus students' learning outcomes will also increase in line with increasing soft skills.

Other findings are students' mathematical communication skills that use the design of mathematics learning soft skills based on generative models better than those using conventional learning because each stage in learning provides opportunities for students to develop mathematical communication skills, stimuli for active learning in class, situations comfortable and enjoyable learning, the stimulation to explore their ideas and ideas and develop supporting soft skills in students during learning. Based on this, integrated soft skills in generative learning models can increase student learning outcomes. Agree with the opinion of Sutiarso (2014) that soft skills are related and have a very large influence on one's performance and learning outcomes. In line with Alex, (2014) that soft skills play an important role in one's success in life.

4. CONCLUSIONS AND SUGGESTIONS

Conclusion of the results of this study is the application of the design of mathematics learning soft skills based on generative models can effectively improve students' mathematical communication skills. In this study there are also several findings, namely (1) stimulant development of soft skills that are integrated in the generative model stage makes learning more enjoyable and stimulating to learn (2) stimulant development of soft skills activities that relate to the subject matter makes learning more meaningful for students. (3) there is a connection between increasing the ability of soft skills and learning outcomes.

Some suggestions that can be considered are the teacher in implementing the design of mathematics learning soft skills based on generative models, namely (1) considering planning in managing learning time (2 adjusting stimulant development activities soft skills of mathematics learning with teaching material (3) to adjust soft skills that will be developed with the characteristics of the students.

5. REFERENCES

Alex, K. 2014. Soft Skill Know Yourself A\and Know the Word. New Delhi: Rajendra Ravindra Printers.

Amin, Muhammad. 2017. A Model Of Soft Skill Instruction Based On The Local Culture For Vocational Teacher Candidates In North Sumatra. Jurnal Pendidikan Vokasi.7:129-138.

Brungardt, Christie. 2011. The Intersection Between Soft Skill Development And Leadership Education. Journal Of Leadership Education. 10: 1-22.

Darmadi. 2017. Pengembangan Model dan Metode Pembelajaran Dalam Dinamika Belajar Siswa. Yogyakarta : Deepublish Budi Utama.

Grugulis, I. 2016. Skill, Training and Human Resource Development. England: Palgrave Macmilan.

Hake, R.R. 1999. Analyzing Change/Gain Scores. [Online]. Tersedia http:// www.physics.indiana.edu/sdi.AnalizingCgange-Gain.pdf/. [20 Desember 2017].

Hasyim, Adelina. 2016. Metode Penelitian dan Pengembangan Disekolah. Yogyakarta : Media Akademik.

Inra, Azwar. 2016. Developing A Model Of Soft-Skill Teaching For Civil Engineering Students. J. of Research And Evaluation In Education. 02: 122-134.

Moma, La. 2014. Peningkatan Kemampuan Berpikir Kreatif Matematis, Self-Efficacy, dan Soft Skills Siswa SMP Melalui Pembelajaran Generatif. Tesis PPS UPI.

NCTM. 2000. Curriculum and Evaluation Standards for Scool Mathematics. [online] http:// www.nctm.org /standards/content.aspx? Id (6 Desember 2017).

Pereira, Orlando Petiz., Carlos Alberto Atcosta. 2017. The Importance Of Soft Skill In Univercity Academic Curriculum: The Perception Of Students In The New Society Of Knowledge. International Journal Of Business And Social Research. 07: 25-34.

Putri, L. 2017. Analysis of Mathematical Communication Skills and Confidence of 10th Grader of SMK in Geometry Material Viewed from Cognitive Style. Unnes Journal Of Mathematics Education. 6: 98-107

Sailah, Illah. 2008. Pengembangan Soft Skill Perguruan Tinggi. Bandung : Ditektorat Jenderal Pendidikan Tinggi.

Sarjiati. 2014. Model Pengembangan Soft Skill Dalam Pembelajaran Praktik Untuk Kesiapan Kerja Siswa Paket Keahlian Administrasi Perkantoran Di SMK Negeri 1 Purwodadi. Tesis PPS UNS.

Sumar, Warni Tune., Intan, Abdul Razak. 2016. Strategi Pembelajaran Dalam Implementasi Kurikulum Berbasis Soft Skill. Yogyakarta : Deepublish.

Sumarmo, Utari. 2017. Hard Skill Dan Soft Skill Matematik Siswa.. Bandung: Refika Aditama.

Sutiarso, Sugeng 2014. Implementasi Lesson Study Melalui Metode Inkuiri Untuk Meningkatkan Soft Skill Mahasiswa Calon Guru. Jurnal Pendidikan MIPA. 5: 9-14.

S, M. J Dewiyani. 2015. Improving Student Soft Skills Using Thingking Proses Profile Base On Personality Types. Internasional Journal Of Evaluation And Research In Education. 04: 118-129.

Tulgan, Bruce. 2015. Bridging The Soft Skills Gab. New Jersey: John Wiley & Sons. Inc.

Widarto, 2011. Pengembangan soft skills mahasiswa pendidikan vokasi melalui clop-work. Yogyakarta : Paramitra.

Wena, Made. 2016. Strategi Pembelajaran Inovatif Kontemporer. Jakarta: Bumi Aksara