IOSR Journal of Research & Method in Education (IOSR-JRME)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 10, Issue 3 Ser. III (May - June 2020), PP 58-65
www.iosrjournals.org

Implementation of Discovery Learning Model Assisted by Manipulative Teaching Aids to Improve Mathematical Imagination CapabilitiesStudents with Hearing Impairment in Special Education

Sugiman[1], Ziyana Endah Khairun Nisa'[2], E.Pujiastuti[3], [4]SLW.Handayani
[1](Department of Mathematics, Semarang State University, Indonesia)
[2](Department of Mathematics, Semarang State University, Indonesia)
[3](Department of Mathematics, Semarang State University, Indonesia)
[4](Teacher, SLBN Salatiga, Indonesia)

Abstract:
Background*: Mathematical imagination capabilities are important to be studied more deeply, mathematical imagination is important because it is directly related to life around. Children with discapabilitiesneed to get guidance to improve their mathematical imagination capabilities. Students with hearing impairment one of of children with discapabilities. One of the efforts to improve mathematical capabilities students with hearing impairment is apply a learning model assisted by manipulative teaching aids. Purpose of this research are to (1) improve the mathematical imagination capabilities of students with hearing impairment through the discovery learning models assisted by manipulative teaching aids (2) describe the increase in mathematical imagination of students with hearing impairment through the discovery learning models assisted by manipulative teaching aids.*
Materials and Methods*: This research is a mixed study that uses a sequential exploratory design that is one group initial test and final test combained with observation, documentation, tests, and interviews. . The population of this research is Students inSMPLB Negeri Salatiga with a sample of class VIII-B students.*
Results*: Quantitative test shows that the final test results of mathematical imagination is better than the result of initial test.In other hand according qualitativedata analysis a description of mathematical imagination that includes aspects of scientific sensitivity, scientific creativity, and scientific productivity.*
Conclusion:*Analysis of quantitative and qualitativedata shows that the discovery learning models assisted by the teaching aid model was able to improve the mathematical imagination capabilities of students with hearing impairment in special education.*
Key Word*:MathematicalImagination, DiscoveryLearning, ManipulativeTeachingAids, Students with Hearing Impairment.*

Date of Submission: 21-05-2020 Date of Acceptance: 08-06-2020

I. Introduction

Nelson Mandela said that the most powerful weapon to change the world is education. Educationcan improve humans and even improve the quality of their lives which will immediately affect positively the surrounding environment (BPS, 2016). According to Arifin, education is a fundamental right (fundamental right) for all children, even in any situation, without discrimination, is no exception for special children or disabilities (Aziz, 2015: 1). The word without discrimination is the basis that education does not discriminate, must be given to all citizens, both normal children and children with discapabilities. Children with special needs (student with special needs) are children who have abnormalities, both physical, mental, and emotional disorders(Dewi&Murdanu, 2017). The right to education for children with special needs in Indonesia has also been regulated in UU no. 20 tahun 2003 concerning Sistem Pendidikan Nasional clausal 32. It is stated in the law that, special education is education intended for students who have difficulty participating in the learning process due to physical, emotional, mental, and social disorders and / or have potential special intelligence and talent. The statement stressed that proper education is a right for all citizens, including Children with Discapabilities(CwD). For example, related to identity, autonomy, intimacy, integrity, and so on (Sugiman *et al*., 2018).

The need to recognize and utilize relationships in mathematics is very important for one's success in mathematics (Blatto, *et al.,* 2007). Therefore mathematics is one of the subjects that must be given at all levels of formal education. No exception to learning in special education (SLB) which provide services for children

with special needs such as hearing impairment. Hearing impairment children can be interpreted as a state of hearing loss that results in a person unable to capture stimuli through the sense of hearing (Rahmi, 2012). Children with hearing impairment think visually and prefer visual code for learning, therefore they do better tasks that are presented spatially (Gupta & Martin, 2013). To support the educational success of students with hearing impaired special needs, it is necessary to have facilities and infrastructure both basic and supporting. This is because they have to consider the conditions that exist in students who are hearing impairment, namely both their physical, mental, emotional and social conditions. Students with hearing impairment need more special education and services. According to (Gupta&Martin, 2013) in his writing stated that special education is needed for all children. All children learn differently, learning "verbal calculation strings" is quite easy for children. But it is difficult for children with hearing impairment. Bull et alstate that students with hearing impairment observing mathematical difficulties are not a consequence of the absence of basic numerical skills (Bull, *etal.*, 2006).

The capabilities of children with special needs, especially hearing impairment in mathematics, needs the power / capabilities of imagination that is important to be guided and directed. Therefore, the capabilities of mathematical imagination in hearing impairment students is important to be studied and then improved. One of the materials in mathematics taught at school is the subject of geometry. The study of geometry is still a difficult subject because of its abstract nature and needs to be helped using learning media such as teaching aids. According to (Pujiastuti&Mashuri, 2017) suggested that teaching aids can help in planting concepts, understanding concepts, proving formulas, and training skills. In addition, students motivation icreased by using theacing aids. However, school facilities related to the provision of teaching aids are still very limited, including in mathematics. With the visual aids visual aids can be presented in the form of models in the form of concrete objects that can be seen, manipulated, manipulated so that they are easily understood by students (Linawati, 2012).

Based on observations, interviews, and opinions of some experts shows that learning mathematics for students with hearing impairment requires learning media as well as the selection of learning models that can create a comfortable and exciting learning atmosphere to foster mathematical imagination of students with hearing impairment. In addition, based on the observations of researchers in the SLB Negeri Salatiga during the learning of students with hearing impairment, the researcher found that while learning mathematics took place, students with hearing impairment showed behavioral characteristics such as students paying attention to the teacher's explanation, there were students who were silent and inactive, so that sometimes it makes the classroom atmosphere less lively. The problem arises because of the lack of variation in the learning process such as the minimal use of teaching aids, especially in mathematics. Therefore, the use of instructional media such as teaching aids and the selection of appropriate learning models can create a more lively classroom atmosphere and increase student motivation to learn mathematics and can improve the mathematical capabilities of students with hearing impairment.

Because of this, so researchers examine more deeply about "Implementation of Discovery Learning Model Assisted by Manipulative Teaching Aids to Improve the Mathematical Imagination Capailities of Students with hearing impairment in Special Education". Learning media in the form of manipulative teaching aids and the application of discovery learning models are expected to help teachers deliver the material, and can attract students' attention. In addition, student with hearing impairment learning models that depend on the sense of sight, the teaching aids are also expected to facilitate students in understanding the material.

Table 1. Indicators of Mathematical Imagination Capabilities

Aspect	Indicator
Scientific Sensitivity (SS)	Emotional Understanding (EU)
	The Experience of Imagination (EI)
Scientific Creativity (SC)	Diversity (D)
	Originality (O)
Scientific Productivity (SP)	Creation and Reproduction (CR)
	Scientific Sense of Reality (SSR)

Purpose of the research are (1) improve the mathematical imagination capabilities of students with hearing impairment in special education through manipulative teaching aids discovery models,
(2) describe the increase in mathematical imagination of students with hearing impairment in special education through discovery learning models assisted with manipulative teaching aids.

II. Material And Methods

This type of research is a combination of research or mixed methods. Combined research using a sequential explanatory strategy, begins with the collection and analysis of data with quantitative research in the first stage, and then continues to use qualitative research in the second stage, which is built based on the results of the first stage of quantitative data. The research population is the students of SMPLB Negeri Salatigacategory B (hearing impairment) academic year 2019/2020with samples taken are five students of class VIII-B (hearing impairment).

Study Design: The research design used was Pre-Experiment Design and the strategy model used was a sequential explanatory strategy.

Study Location:State Extraordinary Junior High School of Salatiga inHasanudinStrate, III (Cakra), Mangunsari,
Sidomukti, SalatigaCity,Central Java, Indonesia.

Study Duration: August05, 2019 to March 11, 2020.

Sample size: 5students.

Procedure methodology

Before conducting research, researchers first determine the material to be given, namely the area of a triangle, rectangle, and square. Furthermore, compiling a learning plan that is integrated with the discovery learning models assisted by manipulative teaching aids, then proceed with compiling research instruments in the form of written tests, observation sheets, and interviews. Tis research used observation, interviews, tests of mathematical capabilities, and documentation mtehod. Analysis quantitive test using normality test is then continued with tests that aim to find out whether the final results of the mathematical imagination abilities of a students with hearing impairment by implementation of a discovery learning model assisted by manipulative teaching aids are better than initial tests of mathematical imagination capabilities.

Qualitative data analysis was used to compairinga initial and final test results about the mathematical imagination cabilities of the hearing impairment through the implementation of discovery learning models assisted by manipulative teaching aids. Furthermore, the qualitative data analysis in this study is to obtain descriptive data, so that, it can describe completely and clearly the characteristics of the difficulty of mathematical imagination capabilities of hearing impairment students in mathematics learning material in the area of triangles, long rectangles, and squares. In addition, to find the factors causing the difficulties of mathematical imagination capabilities, and to find out the description of the increase in mathematical imagination capabilities of the hearing impairment students at SMPLB Negeri Salatiga.

In addition, steps for qualitative data analysis are data reduction, data display, and drawing conclusions. Qualitative data analysis aims to describe the capabilities of mathematical imagination and increase of mathematical imagination capabilities through theimplementation of discovery learning models assisted with manipulative teaching aids. In addition to re-testing the data about in-creasing the mathematical imagination capabilities quantitative data analysis is done through the gain test to determine the category of increasing test results through the gain score.

Statistical analysis

Data was analyzed using SPSS version 24, normality test using non-parametric liliefors test, and the hypothesis test using the average difference test of the right side, the increase test uses the gain test.

The normality test criteria is to accept H_0jika$L_{hitung} \leq L_{tabel}$ with a value of $a = 0.05$. Followed by a t-test with the test criteria rejecting H_0if$t \geq \frac{w_1 t_1 + w_2 t_2}{w_1 + w_2}$

III. Result

The study began by observing and interviewing in August 2019 to find out the learning activities implemented in SLB Negeri Salatiga and the characteristics of their students specially students hearing impairment.Afterobservations, the next step is to do a preliminary test of students' mathematical imagination abilities and inter-views to confirm answers based on the initial tests that have been done. Then, the researchers conducted a study by applying model discovery learning assisted by manipulative teaching aids with material area of triangles, rectangles, and squares. After the material is given, the researcher gives the final test of mathematical imagination capabilities and interviews.

Quantitative Data Analysis

Normality Test

Normality test in this reseacrhusingscore of the final test of mathematical imagination capabilities. Normality test uses Liliefors test. The normality test results can be seen in table 2.

Table 2: Normality Test

Data	L_0	L_{table}
The Result of Imagination Capabilities Final Test	0,190	0,337

From the data, it is obtained that $L_0 = 0.190 \leq L_{table} = 0.337$ then H_0 is accepted. So, the data comes from the normal distribution.

Hypothesis Test

Hypothesis testing is done by comparing the results of the initial test score with the final test of mathematical imagination capabilities using t-test. Hypothesis test results can be seen in table 3.

Table 3: Hypothesis Test

Data	t'	$\frac{w_1 t_1 + w_2 t_2}{w_1 + w_2}$
The result of initial and final test of imagination capabilities	2,758	2,132

From the data obtained that t = 2,758 $\geq \frac{w_1 t_1 + w_2 t_2}{w_1 + w_2}$ = 2,132, so H_0 is rejected. So that the final test results of mathematical imagination capabilities more than the initial test results of mathematical imagination capabilities.

Increase Test

The increase test in the research uses the gain test. Gain test was conducted to test the improvement of the mathematical imagination capabilities of students with hearing impairment with discovery learning models assisted by manipulative teaching aids on the material area of triangles, rectangles, and squares. The gain test results can be seen in table 4.

Table 4: Gain Tests for Mathematical Imagination Capabilities

Subject	**N-gain skor**	**Category**
B-01	0,800	High
B-02	0,657	Medium
B-03	0,705	High
B-04	0,694	Medium
B-05	1,000	High

Qualitative Data Analysis

Based on the score of the mathematical imagination capabilities initial testsclarified by interviews on subjects B-01 and B-04, it was found that aspects of scientific sensitivity, scientific creativity, and scientific productivity were achieved poorly. Subject B-02 and B-03 the results show that the aspects of scientific sensitivity and scientific productivity, while scientific creativity has been achieved quite well. Further-more, on the subject B-05 the results show that the aspects of scientific sensitivity, and scientific creativity has been achieved quite well, and scientific productivity has been achieved very well.

The final test results of the mathematical imagination capabilities of subject B-01 showed that the scientific sensitivity and scientific productivity aspects were very good, while the scientific creativity aspect was

achieved quite well. Subject B-02 showed the results that the aspects of scientific sensitivity and scientific creativity was very good, while the aspects of scientific productivity were achieved well. Subject B-03 showed the results that the scientific sensitivity and scientific creativity aspects were achieved well, while the scientific productivity aspects were achieved very well. On subject B-04 the results are shown that the scientific sensitivity and scientific productivity aspects were achieved well, while the scientific creativity aspects were achieved quite well. Subject B-05 showed the results that the aspects of scientific sensitivity, scientific creativity, and scientific productivity were achieved very well.

IV. Discussion

Results Test for Student Imagination

Based on initial and final test scores of mathematical imagination capabilities, the results of the test after applying the discovery learning model assisted by manipulative teaching aids are better than initial tests of mathematical imagination abilities. In other words, it can be said that students' mathematical imagination capabilities has increased.

Description of Mathematical Imagination

Based on the results of tests and inter-views, subject B-01 shows that subject B-01 already has the mathematical imagination capabilities of the emotional understanding (EU) and originality (O) type. Then subject B-01 is a student who is able to explore the difficulties of mathematical problems in given problems and is able to develop new strategies that are found to be applied in solving similar problems. On the other hand, subject B-01 does not yet have the mathematical imagination capabilities of the experience of imagination (EI) type, it means that subject B-01 has not been able to solve the problems gained from experience / recall a solution to the settlement without making new solutions or modifying it a little. The capabilities of the mathematical imagination of the creation and reproduction type is also not yet possessed by subject B-01, meaning that subject B-01 has not been able to come up with a new strategy in solving the given problem. In addition, the subject also has not been able to find new ideas / steps in solving the given problem, so the mathematical imagination of diversity (D) type is not yet possessed by subject B-01 and does not yet have the mathematical imagination capabilities of the scientific sense of reality (SSR) type it means that subject B-01 is also not able to express / transfer mathematical problems into concrete examples and vice versa.

Subject B-02 showed that subject B-02 already possessed the mathematical imagination capabilities of emotional understanding (EU), creation and reproduction (CR), diversity (D), and originality (O) types. Thus subject B-02 is a student who is able to explore the difficulties of mathematical problems in given problems, bring up new strategies to solve given problems, find new ideas / steps in solving problems, and be able to develop new strategies found to be applied in solving similar problem. On the other hand, subject B-02 does not yet have the mathematical imagination capabilities of the type of experience of imagination (EI), meaning that the subject has not been able to explore the difficulties of mathematical problems in the given problem. In addition, subject B-02 also does not have the mathematical imagination capabilities of the scientific sense of reality (SSR) type, meaning that subject B-02 has not been able to express or transfer mathematical problems inward from abstract to concrete.

Subject B-03 shows that subject B-01 has the mathematical imagination capabilities of diversity (D) and originality (O) types. Thus subject B-03 is a student who is able to find new ideas / steps in solving a given problem and is able to devise a new strategy he found to be applied in solving similar problems. As for the mathematical imagination capabilities of the experience of imagination (EI) type, it does not yet have the subject of B-03, meaning that the subject B-03 is a student who has not been able to explore the difficulties of mathematical problems in the given problem. In addition, the mathematical imagination capabilities of emotional understanding (EU) type also has not yet appeared on subject B-03, meaning that subject B-03 has not been able to solve the problems gained from experience / recalling a settlement rule without making new solutions or modifying it a little. On the other hand, the mathematical imagination capabilities of the types of creation and reproduction and scientific sense of reality (SSR) also has not yet emerged, meaning that the subject B-03 is a student who has not been able to come up with a new strategy in solving given problems, and also the subject of the B-03 has not been able express or transfer abstract math problems to be more concrete.

Subject B-04 shows that subject B-04 already has the capabilities to mathematical imagination originality (O). Thus, that subject B-04 has been able to devise new strategies found to be applied in solving similar problems. However, the capabilities of emotional understanding (EU) and the experience of imagination (EI) imagination has not yet emerged, meaning that subject B-04 has not been able to explore the difficulties of mathematical problems in the given problem and subject B-04 has also not been able to solve the problems gained from experience / recalls a completion rule without making a new solution or modifying it a little. In addition, the subject of B-04 also does not have the mathematical imagination diversity (D), meaning that subject B-04 has not been able to find new ideas / steps in completion. Subject B-04 also has not been able to

come up with new strategies in solving given problems and have not been able to express or transfer abstract mathematical problems into a more concrete form so that mathematical imagination creation and reproduction (CR) and scientific sense of reality (SSR) have not appeared.

Subject B-05 shows that subject B-05 has almost all the mathematical imagination abilities. Only the mathematical imagination of the experience of imagination (EI) has not yet appeared on subject B-05, meaning that subject B-05 has not been able / still confused in solving problems gained from experience / recalling a settlement rule without making new solutions or modifying it a little. On the other hand, the capabilities of emotional understanding (EU) imagination has emerged well, meaning that subject B-05 has been able to explore the difficulties of mathematical problems in the given problem. Besides the capabilities of mathematical imagination creation and reproduction (CR) and scientific sense of reality (SSR) have emerged well, meaning that the subject B-05 has been able to come up with a new strategy in solving the given problem and subject B-05 has also been able to express or transfer abstract mathematical problems into a more concrete form.

Increased of Mathematical Imagination

The mathematical imagination capabilities of hearing impairment students based on aspects of imagination according to JiyeongMun, et al. after applying the discovery learning models assisted by manipulative teaching aids shows that the final test results of the mathematical capabilities of subject B-01 are Emotional Understanding (EU), The Experience of Imagination (EI), Diversity (D), Originality (O), Creation and Re-production (CR), and Scientific Sense of Reality (SSR), aspects of mathematical imagination that emerge are. Subject B-02 has met the indicators of Emotional Under-standing (EU), The Experience of Imagination (EI), Diversity (D), Originality (O), Creation and Reproduction (CR), and Scientific Sense of Reality (SSR). Subject B-03 has met the indicators of Emotional Under-standing (EU), The Experience of Imagination (EI), Diversity (D), Originality (O), Creation and Reproduction (CR), and Scientific Sense of Reality (SSR). Subject B-04 has fulfilled the indicators of Emotional Understanding (EU), The Experience of Imagination (EI), Diversity (D), Originality (O), Creation and Reproduction (CR), and Scientific Sense of Reality (SSR). Subject B-05 has fulfilled all indicators of Emotional Understanding (EU), The Experience of Imagination (EI), Diversity (D), Originality (O), Creation and Reproduction (CR), and Scientific Sense of Reality (SSR).

Based on the final test it was found that the dominant indicators of mathematical imagination appearing well were Emotional Understanding (EU), The Experience of Imagination (EI), Diversity (D), Creation and Reproduction (CR), and Scientific sense of Reality (SSR) and aspects The dominant imagination appears is good scientific sensitivity, scientific creativity is quite good, and scientific productivity is good.

Table 5: Data Capabilities of Initial and Final Mathematic Imagination

Subject	Initial Test	Imagination tipe	Final Test	Imagination tipe
B-01	Emotional Understanding (EU) and Originality (O)	Scientific sensitivity low, and scientific creativity low.	The Experience of Imagination (EI), Emotional Understanding (EU), Diversity (D), Originality (O), Creation and Reproduction (CR) and Scientific Sense of Reality (SSR)	Scientific Sensitivity very good, Scientific Creativity enough, dan Scientific Productivity very good.
B-02	Emotional Understanding (EU), Creation and Reproduction (CR), Diversity (D), and Originality (O).	Scientific sensitivity low, scientific creativity enough, and scientific productivity low.	The Experience of Imagination (EI), Emotional Understanding (EU), Diversity (D), Originality (O), Creation and Reproduction (CR) and Scientific Sense of Reality (SSR)	Scientific Sensitivity very good, Scientific Creativity very good, and Scientific Productivity good.
B-03	Diversity (D) and Originality (O)	Scientific creativity enough.	The Experience of Imagination (EI), Emotional Understanding (EU), Diversity (D), Originality (O), Creation and Reproduction (CR) and Scientific Sense of Reality (SSR)	Scientific Sensitivity good, Scientific Creativity good, and Scientific Productivity very good.
B-04	Originality (O)	Scientific creativity low.	The Experience of Imagination (EI), Emotional Understanding (EU), Diversity (D), Originality. (O), Creation and Reproduction (CR) and Scientific Sense of Reality	Scientific Sensitivity good, Scientific Creativity enough, and Scientific Productivity good.

			(SSR)	
B-05	Emotional Understanding (EU), Creation and Reproduction (CR), Diversity (D), Originality (O), and Scientific Sense of Reality (SSR).	Scientific sensitivity enough, scientific creativity enough, and scientific productivity very good.	The Experience of Imagination (EI), Emotional Understanding (EU), Diversity (D), Originality (O), Creation and Reproduction (CR) and Scientific Sense of Reality (SSR).	Scientific Sensitivity very good, Scientific Creativity very good, and Scientific Productivity very good.

Table 5 shows that there was an increase in mathematical imagination capabilities after the implementation of discovery learning aids assisted by flat shape wide teaching aids when compared to the implementation of discovery learning models assisted by a wide build props flat on the subject. Subject B-01 initially has the mathematical imagination capabilities of emotional understanding (EU) and originality (O) type of mathematical imagination, scientific sensitivity and scientific creativity are low, then the final test has reached the mathematical capabilities of emotional understanding (mathematical), the experience of imagination (EU) EI), diversity (D), originality (O), creation and reproduction (CR), and scientific sense of reality (SSR) type of scientific sensitivity are very good, scientific creativity is enough, and scientific productivity is very good. Subject B-02 initially had the mathematical imagination capabilities of emotional understanding (EU), diversity (D), originality (O), and creation and reproduction (CR) type of mathematical imagination, scientific sensitivity and scientific productivity were low and scientific creativity was enough, then the final test has reached the mathematical imagination capabilities of emotional understanding (EU), the experience of imagination (EI), diversity (D), originality (O), creation and reproduction (CR), and scientific sense of reality (SSR) type of imagination scientific sensitivity very good, scientific creativity is very good, and scientific productivity is good. Subject B-03 initially had the mathematical imagination capabilities of diversity (D) and originality (O) type of mathematical imagination of scientific creativity enough, then the final test had reached the mathematical imagination capabilities of emotional understanding (EU), the experience of imagination (EI), diversity (D), originality (O), creation and reproduction (CR), and scientific sense of reality (SSR) types of imagination are good scientific sensitivity, good scientific creativity, and scientific productivity are very good. Subject B-04 initially had mathematical imagination capabilities originality (O) type of mathematical imagination scientific creativity is not good, then the final test has reached the capabilities of mathematical imagination emotional understanding (EU), the experience of imagination (EI), diversity (D), originality (O), creation and reproduction (CR), and scientific sense of reality (SSR) types of imagination are good scientific sensitivity, scientific creativity is enough, and scientific productivity is good. Subject B-05 initially had the mathematical imagination capabilities of emotional understanding (EU), diversity (D), originality (O), creation and reproduction (CR), and scientific sense of reality (SSR) type of mathematical imagination scientific sensitivity and scientific creativity sufficient good, and scientific productivity is very good, then the final test has reached the mathematical imagination capabilities of emotional understanding (EU), the experience of imagination (EI), diversity (D), originality (O), creation and reproduction (CR), and scientific sense of reality (SSR) the type of imagination is very good scientific sensitivity, scientific creativity is very good, and scientific productivity is very good.

V. Conclusion

Based on the implemetation of discovery learning models assisted by manipulative teaching aids to improvemathematical imagination capabilitiesstudents with hearing impairment in class VIII-B SMPLB Negeri Salatiga in the academic year 2019/2020. It can be concluded that (1) the results of the final test of mathematical capabilities of students with hearing impairment with discovery learning models assisted with manipulative teaching aids are better than the initial tests of mathematical capabilities of imagination. (2) Description of mathematical imagination of students of class VIII-B in State Extraordinary Junior High School of Salatiga is that aspects of scientific sensitivity both indicated by emotional understanding (EU) and the experience of imagination (EI) are achieved; aspects of scientific creativity both shown by diversity (D) and originality (O) have been achieved; and scientific productivity aspects both demonstrated by creation and reproduction (CR) and functional sense of reality (SSR) have been achieved.

References

[1]. Anggoro, B. S. (2016). MeningkatkanKemampuanGeneralisasiMatematisMelalui DiscoveryLearning dan Model Pembelajaran Peer Led Guided Inquiry. *Al-Jabar: JurnalPendidikanMatematika, 7*(1), 11-20.

[2]. Aziz, A. N., Sugiman, S., & Prabowo, A. (2016). Analisis Proses PembelajaranMatematikapadaAnakBerkebutuhanKhusus (ABK) Slow Learner di KelasInklusif. *Kreano, JurnalMatematikaKreatif-Inovatif, 6*(2), 111-120.

[3]. BadanPusatStatistik (BPS) accesed from http://www.bps.go.id/, on November 05, 2018.
[4]. Blatto-Vallee, G., Kelly, R. R., Gaustad, M. G., Porter, J., &Fonzi, J. (2007). Visual–spatial representation in mathematical problem solving by hearing impairment and hearing students. *Journal of Hearing impairment Studies and Hearing impairment Education*, *12*(4), 432-448.
[5]. Bull, R., Blatto-Vallee, G., &Fabich, M. (2006). Subitizing, magnitude representation, and magnitude retrieval in deaf and hearing adults. *Journal of Deaf Studies and Deaf Education*, *11*(3), 289-302.
[6]. Creswell, John W. (2014). *Research Design*PendekatanKualitatif, Kuantitatif, dan*Mixed*. EdisiKetiga. Yogyakarta: PustakaPelajar.
[7]. Dewi, E. N. (2017). PengembanganAlatPeragaMateriKelipatan Persekutuan Terkecil (Kpk) BagiAnakTunarunguKelas Vii SlbNegeri 1 BantulTahunAjaran 2015/2016. *JurnalPendidikan Matematika-S1*, *6*(3), 9-20.
[8]. Gupta, P. K., & Martin, P. M. (2013, October). Comprehension of basic mathematics among children with hearing impairment using multimedia in accessible and non-accessible format a comparative study. In *2013 IEEE 63rd Annual Conference International Council for Education Media (ICEM)* (pp. 1-11). IEEE.
[9]. Liang, C., & Chang, C. C. (2014). Predicting scientific imagination from the joint influences of intrinsic motivation, self-efficacy, agreeableness, and extraversion. *Learning and Individual Differences*, *31*, 36-42.
[10]. Liang, C., Chang, C. C., & Hsu, Y. (2014). Differential effects of personality traits and environmental predictors on reproductive and creative imagination. *The Journal of Creative Behavior*, *48*(4), 237-253.
[11]. Liang, C., Chang, C. C., Liang, C. T., & Liu, Y. C. (2017). Imagining future success: Imaginative capacity on the perceived performance of potential agrisocio entrepreneurs. *Thinking Skills and Creativity*, *23*, 161-174.
[12]. Linawati, R. (2012). Penerapanmetodemathernalreflektifdalampembelajaranberbahasapadaanaktunarungu di kelaspersiapan SLB Negeri Semarang. *BELIA: Early Childhood Education Papers*, *1*(2).
[13]. Makalunsenge, F. (2015). DeskripsiAktivitasPembelajaranMatematikaPadaAnakBerkebutuhanKhusus (Tunarungu) PadaMateriGeometri. *Skripsi*, *1*(411411038).
[14]. Mawaddah, S., &Maryanti, R. (2016). KemampuanPemahamanKonsepMatematisSiswa SMP dalamPembelajaranMenggunakan Model PenemuanTerbimbing (Discovery Learning). *Edu-Mat: JurnalPendidikanMatematika*, *4*(1).
[15]. Mun, J., Mun, K., & Kim, S. W. (2015). Exploration of Korean students' scientific imagination using the scientific imagination inventory. *International Journal of Science Education*, *37*(13), 2091-2112.
[16]. Ni'mah, Lailatun. (2019). *The Growth Of Mathematical Imagination Towards The Students Of The Hearing impairment School In Learning Method Problem Based Learning Assisted By Manipulative Teaching Aids. Final Project, Mathematics Department, Faculty of Mathematic and Science*, Universitas Negeri Semarang. Advisor Drs. Sugiman, M.Sc.
[17]. Pujiastuti, E. (2017). Making a Math Teaching Aids of Junior High School Based on Scientific Approach Through an Integrated and Sustainable Training. In *Journal of Physics: Conference Series* (Vol. 824, No. 1, p. 012053). IOP Publishing.
[18]. Rahmi, H. (2012). MeningkatkanKemampuanPengoperasianPerkalianMelaluiMetode Horizontal BagiAnakTunarungu. *JurnalIlmiahPendidikanKhusus*, *1*.
[19]. Republik Indonesia. (2014). PermendikbudNomor 157 tentangKurikulumPendidikanKhusus. SekretariatKabinet RI. Jakarta.
[20]. SeptyNurvian, l. I. N. A. R. I. A. (2018). Model Discovery Learning dalamPenguasaanKonsepPecahanSederhanapadaSiswaTunarungu Kelas III SDLB. *JurnalPendidikanKhusus*, *11*(1).
[21]. Sugiman, S., Suyitno, H., &Mulyono, M. (2018, February). ProfilKemampuanMatematisSiswa SLB di Jawa Tengah BerdasarkanHasilUjianNasionalMatematika. In *PRISMA, Prosiding Seminar NasionalMatematika* (Vol. 1, pp. 647-655).
[22]. Sugiyono. 2015. MetodePenelitianPendidikan. Bandung: Alfabeta.
[23]. Sugiyono. 2017. StatistikaUntukPenelitian. Bandung: Alfabeta.
[24]. Undang-UndangRepublik Indonesia Nomor 20 Tahun 2003. SistemPendidikanNasional. Jakarta: Depdiknas

Sugiman, et. al. "Implementation of Discovery Learning Model Assisted by Manipulative Teaching Aids to Improve Mathematical Imagination CapabilitiesStudents with Hearing Impairment in Special Education." *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 10(3), (2020): pp. 58-65.