



### Improving the Understanding of the Geometric Shapes through Geoboard (Classroom Action Research in Group B TK Al-Wafa, Sawangan, Kota Depok, 2017)

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#### Abstrak

*Penelitian ini bertujuan untuk menjelaskan proses dan hasil penggunaan geoboard dalam meningkatkan pemahaman bentuk geometrik anak-anak di Kelompok B TK Islam Al-Wafa, Sawangan, Depok pada tahun 2017. Penelitian ini menggunakan metode penelitian tindakan. Metode penelitian yang digunakan adalah model penelitian tindakan Kemmis & Taggart yang terdiri dari: (a) perencanaan, (b) tindakan dan observasi, dan (c) refleksi. Instrumen yang digunakan dalam penelitian ini adalah observasi, wawancara, dan dokumentasi. Skor data pemahaman anak-anak dari bentuk geometris dianalisis menggunakan pendekatan kuantitatif dan kualitatif. Hasilnya menunjukkan bahwa pemahaman anak-anak tentang bentuk geometris telah meningkat. Dalam pra-uji pemahaman anak-anak terhadap bentuk geometri, secara signifikan meningkat dari 56,16% menjadi 66,33% pada siklus pertama. Skor pada siklus kedua meningkat sekitar 13,33% dan mendapat skor 79,66%. Dapat disimpulkan bahwa (1) proses penggunaan geoboard dapat meningkatkan pemahaman bentuk geometrik pada Kelompok B TK Islam Al-Wafa, Sawangan, Depok pada tahun 2017, (2) pemahaman skor geometri pada kelompok B TK Islam Al-Wafa, Sawangan, Depok pada tahun 2017 meningkat dari pra siklus menjadi siklus pertama dan siklus kedua.*

#### Abstract

This research aimed to explain the process and the result of using geoboard in improving the understanding of the geometric shapes of the children in Group B TK Islam Al-Wafa, Sawangan, Depok in 2017. This research used action research method. The research method used was Kemmis & Taggart action research model which consists of: (a) planning, (b) action and observation, and (c) reflection. The instruments used in this research were observation, interview, and documentation. The data scores of children's understanding of the geometric form were analyzed using quantitative and qualitative approaches. The results indicated that the children's understanding of the geometric shapes has increased. In the pre-test of the children's understanding to the geometry shapes, it significantly increased from 56.16% to 66.33% in the first cycle. The score on the second cycle increased approximately 13.33% and got a score of 79.66%. It can be concluded that (1) the process of using geoboard could increase the understanding of geometric shapes in Group B TK Islam Al-Wafa, Sawangan, Depok in 2017, (2) the understanding of geometry score on group B TK Islam Al-Wafa, Sawangan, Depok in 2017 increased from pre-cycle to first cycle and second cycle.

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## INTRODUCTION

Mathematics is a branch of science that studies the quantity, structure, space or quantity. All of these concepts are closely related to life. Mathematics is a basic science that can be used as a tool to solve problems in various fields of science. Based on the case, mathematics is science that has an important role in human life, because every act of mathematics is a concept of life. One aspect that needs to be developed in early childhood is math skills. Receding the research conducted by Frode Ronning, 2004 , he state that through a mathematical understanding of children, it is expected to improve the ability to think logically and the ability to solve problems of other varieties.

Understanding of mathematics is one of the important goals in the learning of mathematics for early childhood (sally Moomaw, 2015). This showed that the material conveyed to children not only memorizing but rather understanding the concept of concrete objects. Through mastery and understanding it will facilitate the child in learning mathematical concepts. This is similar to what was written by Frode

Ronning, 2004, explaining one of the mathematical components that are often found around is geometry. In geometry study, it is important to understand the concepts contained in it. Basic geometry is in mathematics and development. Many mathematical concepts can be demonstrated and explained with geometric representations. Then, Keiban Orbay, 2015, states that geometry is one of the fields in mathematical studies of shape, size, space, position and direction. This world is built with geometry. Almost in all fields of life such as in the fields of art, architecture, astronomy, robotics, and many other fields use the basis of understanding geometry. Every day activities , being realized or not use the concept of geometry. Geometry is a mathematical component that is often found in the environment, included in early childhood environments.

This is confirmed by the research conducted by Frode Ronning stating in the results of his research that students at an early stage can identify the nature of geometric objects, even though students cannot see all the characteristics of objects, and define

their objects (2004: 8). Sometimes students also cannot describe the geometric characteristics correctly. Based on the research, it can be said that the understanding of geometric concepts in early childhood is still in the early stage, that is the children can recognize already geometric shapes such as circles, squares, rectangles, and triangles, but just in the level of recognizing it, the visual and insubstantial characteristics.

Karina Luiza and Silva Fernandes, 2016 state that the notion of geometric shapes is introduced in early childhood with the aim of keeping children aware of basic forms and concepts of geometry. This is in line with the results of the research, Desi Wahyu Rustiyanti, 2015, stating that the actions that can increase the ability to know geometric shapes is to say geometric shapes, to give the names of geometry shapes, to give examples of body shapes similar to geometric shapes, to describe each of these geometric shapes, to draw geometric shapes, to arrange some geometric shapes into objects and to tell about objects they make from some geometric shapes of orders.

Learning geometry will be

meaningful in the process of acquiring knowledge that is done by involving children actively in the learning process and using concrete media which is certainly fun for children. Karina Luiza and Silva Fernandes, 2016, emphasize in the results of their research that the most fundamental thing for pedagogical practices used in the early childhood education phase is to consider interest in children by involving children's feelings and pleasures so as to cause interaction in games, experiments, findings, building relationships, and other opportunities (2016: 449). Based on this, it can be said that children are actively involved in learning an activity that allows them to gain in-depth experience of the material under study, and in the end the children will be able to improve the children's understanding of the material.

This is reaffirmed by Sally Moomaw, 2015, for the results of her research who state that in the transition period, the children understand the mathematical concepts about the need for manipulative media in improving geometry skills in a method using board game (2015). Based on the

results of the research, it showed that the use of geoboard into geometric learning media was able to stimulate children to recognize geometric shapes and proved to be effective in learning. With the effective results in geometry, it is known that the researcher wants to do similar research in introducing geometry by using nailing or geoboard.

With regard to geoboard, from the results of research, Hilary Scandrett (2008: 30) states that another advantage of geoboard is design, because it allows children, and people who may experience difficulties in drawing shapes, to build and investigate the nature of their forms. This shows that the medium allows geoboard to identify geometric forms and also observe the geometrical characteristics of the forms themselves. Of course with media, it can facilitate geoboard children in understanding various basic geometric shapes such as circles, squares, rectangles, and triangles.

Based on observations conducted in TK Islam Al-Wafa, Sawangan, Depok, especially in Group B, geometry learning was still low, based on observations and

interview data obtained from the results of learning activities in Group B in the age range of 5-6 years old, there were still seven children from 10 students in Group B who still had difficulty knowing the geometry. For example, children could not distinguish geometric shapes with rectangles and triangles, even some children said that the circle is round and there were still many children who only knew geometry based on memorizing only, as a result the ability of children to know geometric shapes was not controlled well. TK Islam Al-Wafa still used learning methods that are still not varied, using the lecture method more. When introducing the geometric shapes, the teacher just visually used a small flashcard or put it on the board. In the use of media, it was also less varied and the provision of book packages only gave a visual picture that is not clear. Of course, without an explanation of geometric forms, it certainly would not stimulate children's understanding of geometric shapes optimally.

The use of the provided textbook also requires the children to solve the problem in it, of course not being able to provide optimal

learning outcomes and motivate children well to recognize the concept of geometric forms. Only working on the activities provided by the teacher and follow what is conveyed by the teacher, children cannot explore directly with geometric forms and cannot see, touch, and feel directly geometric forms to identify characteristics. Classical learning applied in TK Islam Al-Wafa has proven that several children still cannot identify shapes and separate almost similar geometric shapes.

Based on the exposure to the problem, the researcher is interested in conducting research on the basic geometry of upgrading via geoboard. The researcher intends to contribute in efforts to improve basic geometry skills through geoboard in Group B in TK Islam Al-Wafa, Sawangan, Depok. Geoboard with games can train the ability to know children in the form of geometric forms in Group B, which is now less sharpened. It could be seen when looking at the forms shapes in the surrounding environment. Therefore, the researcher uses geoboard as a medium, learning that can be used when starting in the ability to

sharpen skills in knowing and understanding geometric shapes.

#### Geoboard

Geobord was created in 1950 in Egypt by a mathematician named Caleb Gattegno (1911-1988) in the book *Teaching Mathematics to Young Children through the Use of Concrete and Virtual Manipilatives*. He explains that Geoboard is a manipulative tool that can be used to teach geometry. According to D'Angelo, 1999, there was a concrete manipulative form which becomes a tool for early childhood teachers in learning mathematics in class to be presented to their students. The board, also known as nail geoboard, is made of rectangular boards. To use it, children can stretch the rubber on a geoboard board/nail to form a geometry. By using geoboard, the children are given the opportunity to build geometric shapes and learn the appropriate name.

In a study conducted by Rusliati Ningsih, 2009, she explains that Carol Seefeld and Barbara a. Wasik. Rudiyaat exposes geoboard as a props using a modified Microsoft Braille Board so that it can be used to help teachers deliver math material, by adding elements to the

Braille board, namely; some rubber straps, the board on the each corner of the braille board edge.

According to Sally Moomaw, 2015, a geoboard can be defined as the following, "geoboard is a wooden board on a number of half-hooved nails in a symmetrical box, a rubber bracelet is used to rotate the nail head to study the following geometric variors." Geoboard is usually made of wood with a row of spikes that can be used with rubber bands to form shapes. Geoboard is a part of a manipulative tool. Manipulatives often have limited possibilities in different and creative games. Some typical materials include board games, geoboard, pegboard, simple, card games, puzzles, decorative binding cards and beads. Manipulative tools can allow children to play different creative thinking. Material or tools including manipulatives from them are board games, geoboard, pegboard, simple card games, puzzles, cards and beading straps. The manipulative tool is one of the media that can be used as a teaching medium. Geometry Board is useful as a medium to teach the concepts of Mathematics (geometry and

attributes). According to the math board game using Moomaw, it can boost the development of the number of students for children from low socioeconomic level.

In accordance with the statement of the field of mathematical geoboard which can be used in the plan includes form, translation, rotation, reflection, similarity, coordination, calculation, right angle, pattern, classification, scaling, position, suitability, area, perimeter. Mathematical activities that can be developed with Board geometry of geometric shapes and including making patterns, calculating, classifying, and some other activities related to geometry. Geoboard is a manipulative mathematics game to explore the basic concepts of geometry as perimeter, area, size, characteristics and other shapes.

In Ferguson O Huges' book year 2010, Smith describes the geometry board as follows, Geoboard and rubber bands are very helpful tools for showing various forms, all created with the same rubber bands, in general, children need topology experience that many sizes of space for developing the

ability space. From the board, it means geometry include geometry board and rubber bands that can help tools to show various shapes, all created with the same rubber band. In general, children need a lot of experience related to size, shape, and space to develop special abilities. Geoboard is a tool for shaping children to build and analyze models and dimensions. This can be done on learning activities while playing.

In Rusli Yatiningsih's book, 2009, "Geoboard is a very useful tool to help children build and analyze tow dimensional shape models, after being explored, children can transfer concrete models to representation format on point paper. Use geoboard and ask children to make the shape shown below 'start', encourage the children to compare the number, length, and position of the side and the number and position of the side and the number and position of the node (angle).

According to Fergusen O Huges in his book Children Play and Development, 2010, playing geoboard can teach children to compare their numbers, lengths and side positions and numbers and position of node (angle) or angle.

Playing with geometry board will give children the opportunity to manipulate rubber bands to protect lines, shapes, images. After exploration, children can transfer the dimensions and shapes of the model into a format representation on dotted paper.

According to Sally Moomaw in 2015, Geoboard research is a part of a manipulative game tool that helps or simplifies abstract concepts into concrete. Geoboard as a manipulative tool can be used as a medium for simulisation (shape, color, size). The use of geoboard allows children to explore geometric shapes and develop geometric abilities. This happens when form or geoboard polishing. Geoboard can help develop geometry. This ability is used when forming or making other shapes or geometric shapes on a geometry board.

From the description above, the researcher concludes that the geoboard board/nails is a square shape of board with nails at the same distance. Geoboard board/nails is used to introduce geometry shapes in children. The way is by stretching the rubber on a geoboard /board nails to form geometry shapes arranged in

March using a rubber band that can be used to form other shapes or geometric geoboard as a means of fun and challenging games. In addition, geoboard is easy to use so that students can actively engage in concrete in terms of creativity, imagination, and cognitive abilities related to basic geometry.

### **Geometry Understanding**

According to Rosalind Charlesworth and Karen K.lind, 2011, geometry is a branch of mathematics that needs to be studied as early as possible, because of the many concepts contained in it. Geometry was first introduced by Thales (624-547 BC). Geometry was derived from Greece, namely geo, which means the size of the meaning of the Earth and the metro. Geometry can be described as the measuring science of the earth, which is a study of relationships in space. Continued by John W. Santrock in his book Educational Psychology, 2007, geometry is a science that deals with the shape and space dimension. In line with Jannah, geometry is the science that deals with forms, fields, and objects (especially area and volume). Based on the perspectives of geometry, it can be described as a

practical science that discusses form, field, and there is space around the human physical environment.

Described by Diane Trister Dodge, Laura Jean Colker and Cate Heroman, 2009, geometry is a branch of mathematics concerned with questions about the size, shape, position, and nature of space. This is reiterated by Jackman who argues that geometry is "an area of mathematics that involves form, size, space, position, direction and movement, and describes and classifies the world in which we live". Based on the opinion, it can be interpreted that geometry is a field of mathematics that involves form, size, space, position, direction, and motion, and describes and classifies the world in which humans live. This idea implies that geometry can explain and describe the world with space, position, direction of motion, and because every geometrical element has every element of life.

In his book, Tipps Kohson Kennedy, 2011, he states that geometry is the study of flat dimension or space dimension involving points, lines and fields. This is in line with Freudenthal's opinion in NCTM which suggests



"geometry, the study of forms in spatial space and relationships." Based on this opinion, it can be explained that geometry is the study of shapes in spatial space and relationships. The realization of spatial relationships is very important in developing before children begin to think mathematically using geometric concepts.

Based on the opinions of several descriptions of the definition of geometry, it can be concluded by the researcher that geometry is a branch of Mathematical Science that discusses the nature of lines, angles, spans, and space in life because the world is built with geometry. Geometry is to present abstraction of spatial and visual experiences from lines, angles, areas, and spaces.

## RESEARCH METHOD

The method used in this research was action research. Design of intervention/research action cycles used Kemmis and Taggart model 2013 and was carried out through two cycles which included planning, action and observation, and reflection.

Data collection techniques

carried out in this research are observation, interviews, and documentation. Data analysis was carried out with qualitative and quantitative approaches. The data in the form of observations contained in the Notes field were analyzed using the method, Miles and Huberman in Myrnawati Crie H's book 2012 with the components of data reduction, data presentation, and conclusions. Quantitative data analysis used descriptive statistical analysis, namely data analysis with observation describing the conceptual understanding of the number of children in the form of data tables and graphs or diagrams.

## RESULTS

The results showed that children's understanding of geometric shapes has increased. In the pre-test, children's understanding of geometric shapes increased significantly from 56.16% in the interpreting indicator, giving examples relating to geometric shapes, classifying, concluding, and giving explanations with geometric shapes increasing to 66.33% at the cycles. Scores in cycle II indicators interpreted, provided examples

relating to geometry, classified, concluded and provided explanations with geometric shapes increased by 13.33% and obtained a final score of 79.66%.

## CONCLUSION

Based on the results of the action, it can be concluded that the use of geoboard activities can improve understanding of children's geometry. The use of geoboard activities is given to attract children's interest in understanding geometric forms through activities that are directly carried out by children. This can help children to better understand geometrical concepts through fun activities. In addition, the use of geoboard activities also involves children to play an active role in the process of learning activities.

This is in line with what Anderson, et al's statement, A Taxonomi For Learning, Teaching, and Accessing in 2001 which states that several aspects that need to be considered and become the focus of increasing understanding of geometry shapes in children include aspects of comparing, classifying, and exemplifying. The first concept

that needs to be taught in early childhood as a basis for understanding geometry is space spatial awareness. Early childhood begin to study geometry with topology topics, namely a special part of geometry that investigates relationships. The intended relationship is the location or space relationship. Before introducing the geometric shapes, the teacher must first develop spatial awareness in children. Furthermore, children begin to be introduced to various basic geometric shapes in the form of a flat or spatial shapes, and recognize the names and characteristics of various basic geometric shapes.

## BIBLIOGRAPHY

- Agung Triharso, *Permainan Kreatif dan Edukatif Untuk Anak Usia Dini* (Yogyakarta: Andi Ofset, 2013).
- Anita Yus, *Perkembangan Perkembangan Belajar Anak Taman Kanak-Kanak* (Jakarta: PT.Kencana Prenada Media Group, 2011).
- Burung J, *Matematika Dasar Teori & Aplikasi* (Alih bahasa Refina Andriasari), (Jakarta, Erlangga, 2002).
- Claudia Eliason, *Loa Jenkins, Panduan Praktis Kurikulum Pendidikan Anak Usia Dini*, (Pearson, 2008).

- Carmen S. Brown, Mengajar Matematika Anak, April 2009, Volume 15, Edisi 8, h.474
- Carol Seefeldt & Barbara A Wasik, Pendidikan Anak Usia Dini Menyiapkan Anak Usia Tiga, Empat dan Lima Tahun Masuk Sekolah (Indeks 2006).
- Daitin Tarigan, Pembelajaran Matematika Realistik, (Jakarta: Departemen Pendidikan Nasional, Direktorat Jenderal Pendidikan Tinggi. Direktorat Pembinaan Pendidikan Tenaga Pendidikan & Ketenagaan Perguruan Tinggi, 2002).
- David Hopkins, Panduan Guru untuk Penelitian Kelas (Edisi Ketiga) (Philadelphia: Open University Press, 2002).
- Departemen Pendidikan Nasional. Kamus Besar Bahasa Indonesia. (Jakarta: Balai Pustaka, 2000).
- Diane Trister Dogde dan Laura J Chokker. Kurikulum Kreatif untuk Anak Usia Dini (Washington DC, 2000)
- Ekawarna, Penelitian Tindakan Kelas (Edisi Revisi) (Jakarta: Referensi GP Press Group, 2013).
- Ellen C. Frede dan W. Steven Barnett, Matematika dan Ilmu Pengetahuan Di Prasekolah "Institut Nasional untuk Penelitian Pendidikan Dini 2009/19.
- Ernest T. Stringer, Penelitian Tindakan-Edisi Ketiga (California: Sage Publication, Inc, 2007).
- Ferguson O Hughes, Bermain dan Pengembangan Anak (Edisi 4) (Usa; Sage Publication, 2010).
- Frank D'Angelo, Mengajar Matematika untuk Anak Muda Melalui Penggunaan Manipulatif Beton dan Virtual, Jurnal Pendidikan Matematika 03/12/2012.
- Geoffrey EMills, Action Research; Panduan untuk Peneliti Guru (New Jersey: Prentice-Hall Pearson Inc, 2000).
- George S. Morison, Dasar-dasar Pendidikan Anak Usia Dini.
- John G. Nicholls, Etos Kompetitif dan Pendidikan Demokratis (Amerika Serikat, Harvard Collage, 1989).
- Jo An Brewer, Pendidikan Dini Dini Preschool Thourh Primary Grades (A Pearson Education Inc, 2007)
- Josep N Payne, Matematika untuk Anak Muda (New York: The National Council of Theacher of Mathematics Inc, 1993).
- Ika Rifqiwati, Terampil Matematika (Surabaya Al Maktabah, 2011).
- Kenneth A. Lane, Mengembangkan Kecerdasan Motorik dan Kecakapan Visual Perceptual: Suatu Kegiatan Buku Wajan (New York: Slack Incorporated, 2005).
- Lestari KW, Matematika, (Jakarta. Departemen Pendidikan & Kebudayaan, Direktorat Jenderal Pendidikan AUD Nonformal & Informal,

- Direktorat Pembinaan AUD, 2011).
- Lexy. J. Moleong, *Metode Penelitian Kualitatif Edisi Revisi* (Bandung: Remaja Rosdakarya, 2010).
- Martini Jamaris, *Perkembangan dan Pengembangan Anak Usia Taman Kanak-Kanak*, (Jakarta: Grasindo, 2006).
- M. Ngalim Purwanto, *Prinsip-Prinsip dan Teknik Evaluasi Pengajaran* (Jakarta, Remaja Rosda Karya)
- MK Mandal, MB Bulman-Fleming, G. Tiwari, *Sisi Bias: Perspektif Neuropsikologis* (Dordrecht, Belanda: Kluwer Academic Publisher, 2000).
- Myrnawati Crie Handini, *Metodologi Penelitian Untuk Pemula* (Jakarta: FIP Press, 2012).
- Rika Izzaty, Siti Partini Suardiman, Yuli Ayriza, Purwandari, Hiryanto, & Rosita E.Kusmaryani (2008). *Perkembangan Peserta Didik*, Yogyakarta: UNY Press.
- Rosalind Charlesworth dan Karen K.lind. *Matematika & Sains untuk Anak Muda*, edisi ke 7 (Kanada: Cengage Learning, 2011).
- Rusli Yatiningsih dan Maryadi "Meningkatkan Prestasi Belajar Matematika Ada Pokok Bahasan Geometri Melalui Media Geoboard" *Jurnal Nasional FKIP UNS* 2010.
- Sally, Moomaw, 2015, *Menganggap Tingkat Kesulitan Permainan Dewan Matematika untuk Anak Muda*, *Jurnal Penelitian Pendidikan Anak*, Vol 29, hal. 492-509.
- Schandrett, H (2008). *Menggunakan Geoboards Dalam Matematika Primer: Going ... Going ... Gone?* *Australian Primary Mathematics Classroom*, 13 (2), 29-32.
- Slamet Suyato, *Konsep Dasar Pendidikan Anak Usia Dini* (Jakarta Departemen Pendidikan Nasional, Direktorat Jenderal Perguruan Tinggi, Direktorat Pembinaan Pendidikan Tenaga Kependidikan dan Ketenagaan Perguruan Tinggi, 2005).
- Stephen P.Robbins, Timothy A, Hakim, *Perilaku Organisasi* (Edisi 12) (New Jersey; Pearsson Education, 2008).
- Steven Tipps, Art Johnson, Leonard M. Kenndy, *Mempandu Pembelajaran Childeren tentang Matematika*, Ed ke-11 (Kanada: Cengage Learning, 2010).
- Susan Sperry Smith, *Matematika Anak Usia Dini* (Pearson Education 2009).
- Sugiyono, *Metode Penelitian Manajemen* (Bandung: PT Alfabeta, 2013)
- Soenardi Djiwandono, *Tes Bahasa Pegangan bagi Pengajar Bahasa Edisi 2* (Jakarta: PT.Indeks, 2011) h. 168.
- Sugiyono, *Statistika untuk Penelitian* (Bandung: Alfabeta, 2010).
- Suwarsih Madya, *Penelitian Tindakan (Action Research)*

(Bandung: Alfabeta, 2011).

diakses 2 november 2016.

Terry McMorris, *Akuisisi dan Kinerja Keterampilan Olahraga* (Sussex Barat, Inggris: John Wiley and Sons Ltd, 2004).

Tommy Suprpto, *Pengantar Teori & Manajemen Komunikasi* (Yogyakarta: MedPress, 2009).

Terry McMorris, *Akuisisi dan Kinerja Keterampilan Olahraga* (Sussex Barat, Inggris: John Wiley and Sons Ltd, 2004).

Wendy Koza dan Jonede Smith, *Mengelola Kelas Anak Usia Dini* (California: Shell Education, 2001).

Yudha M Saputra Dan Rudyanto, *Pembelajaran Kooperatif Untuk Meningkatkan Keterampilan Anak TK*, (Jakarta: Depdikbud, 2005)

Depi Dwi Winasis. (2012). *Alat Peraga Papan Berpaku*. Diakses dari <http://coretantangann.blogspot.com/2012/04/alat-peraga-papan-berpakugeoboard.html>. Pada tanggal 7 November 2016, Jam 13.00 WIB.

Standar Matematika DoDEA Pre-Kindergarten melalui Grade 8 dari [web http://www.dodea.edu/curriculum/mathematics/standards.cfm](http://www.dodea.edu/curriculum/mathematics/standards.cfm) diakses tanggal 9 oktober 2016.

Lisa Nolan, *Montesori & Manfaat Geoboard*, <http://montessoriconfesion.blogspot.com/2014/04/montessori-manfaatd-of-geoboard.html>