

Description of Introduction to Geometry Concepts for Children with Special Needs in Yogyakarta Inclusion Kindergarten

Arip Prehatiningsih
 Yogyakarta State University
 Yogyakarta, Indonesia
 aripp16.2017@student.uny.ac.id

Suparno
 Yogyakarta State University
 Yogyakarta, Indonesia
 suparno_plb@uny.ac.id

Abstract— **Mathematical ability determines the success of children in school, because mathematics is one component in children's academic achievement. Geometry is one of the concepts of mathematical abilities that are very important to be given to early childhood, especially for children with special needs. The purpose of this study is to reveal pedagogical considerations on the introduction of the concept of geometry in the inclusion class. Geometry is a less noticed part of the preschool curriculum, especially for children with special needs in early childhood education programs. This study of the consideration of pedagogy Introduction to the Geometry Concept is important due to increasing the teacher's insight in giving introduction to children with special needs. Research with this qualitative approach uses interview data to obtain information on knowledge and strategies used for the introduction of geometry of children with special needs in inclusion kindergarten. Interviews were conducted on inclusive class teachers, 49 years old female with 16 years' work experience. The inclusive class consisted of 10 children with special needs, seven children with ADHD, three children speech delay and one child with Down syndrome with a vulnerable age of 5.7 years. 3D media that can facilitate educators in providing Introduction to geometry, namely 3D puzzles. The use of 3D geometric puzzle shapes trains concentration and independence**

Keywords— *geometry concepts, children with special needs, inclusion, kindergarten.*

I. INTRODUCTION

Mathematical abilities determine the success of children in school, because mathematics is one of the components in children's academic achievement. Mathematics is a field of important content in the preschool curriculum [1]. Introduction to mathematical abilities only focus on numbers such as number symbols and counting. The focus of mathematical abilities has been identified for special emphasis in early education, namely: numeracy, measurement, and geometry [2]. The geometry of one that can form a foundation that not only supports introduction in other mathematical fields but also predicts subsequent mathematical achievements [3]. Education in geometry can contribute to mathematical abilities and other developmental aspects, therefore the need to be given an introduction to geometric concepts in children with special needs. By Clements & Sarama in [4] the concept of geometry shows that it must be given high priority in the early childhood

classroom. Geometry is a less noticed part of the preschool curriculum, especially for children with special needs in early childhood education programs [5].

Some studies that examine mathematics focus on one of these five broad content fields are numbers and number operations [5]. Numbers and number operations for early childhood include the development of integer understanding, concept of response, calculation, cardinality, and comparison [6]. Preschool educators show that they have not reached the level of knowledge about geometric concepts for early childhood with special needs [4]. The study of mathematics, especially geometry for early childhood with special needs is very important because the initial mathematical ability is a determinant of children's achievement in the next stage. The study of mathematics, especially geometry for early childhood with special needs is very important because the initial mathematical ability is a determinant of children's achievement in the next phase [7].

Nevertheless, the study did not examine the views of educators on how and the importance of providing geometrical concepts to early childhood with special needs. This study examines the description of the introduction of the concept of geometry in children with special needs in inclusion kindergarten. Regarding the Introduction The concept of Geometry has been widely studied but geometry for children with special needs is still limited. This is because the concept of geometry is often ignored or minimized in early education.

Educators have a purpose for understanding children and then facilitating the growth of children towards that goal [8]. The concept of understanding pedagogy for teaching includes various types of knowledge needed by educators: knowledge of the content to be taught, pedagogies that are appropriate to specific content, and the ability to match content and strategies for abilities that arise in children. Early childhood mathematics achievement is predicted by pedagogical knowledge of educators to teach [9]. In early childhood with special needs, educators must also be prepared to adjust children's pedagogy with the characteristics and abilities of individual children [10]. However, little attention has been given to the experiences of preschoolers with special needs because children engage with geometry and concept materials in the classroom, or to educators because they support the introduction of the

concept of geometry in early childhood with special needs, [5].

Teacher policies and education undertaken for the quality of early childhood teaching must be provided so that an understanding of how early childhood teachers think about what to do and why teachers do it. Given the increasing number of children with special needs but not a lot of early childhood education that provides services for the education of children with special needs. The focus is on teaching and introducing geometry to early childhood, and the principle of access and participation in the general curriculum for all normal and special needs children. This qualitative research seeks to explore how pedagogical considerations in introductions provided by educators in the class of inclusion in interactions are directed towards the introduction of geometry. Based on the concept of pedagogical knowledge for teaching, the research question for this study is as follows: how do pedagogical considerations that teachers describe when planning and engaging in teaching.

The rest of this paper is organized as follow: Section II describes the concept of geometry. Section III describes the proposed methodology. Section IV presents the obtained results and following by discussion. Finally, Section V concludes this work.

II. INTRODUCTION TO THE CONCEPT OF GEOMETRY

This preoperational stage is the stage of the child's transition from the sensorimotor stage to the concrete operational stage. Piaget describes that at this stage the child has not shown an operation, namely internalization actions that enable the child to mentally do what they previously could only do physically or can be called a mental action reversible. At this stage preoperational thoughts are the beginning of the ability to rearrange in thinking things that have been formed in behavior. In this stage too, children begin to represent their world with words, shadows and images. Symbolic thoughts begin to emerge because they run with simple connections of sensory information and physical action. When the concept begins to stabilize, mental thoughts begin to emerge, egocentricity grows, and beliefs begin to be constructed to produce sub-stages in preoperational thinking.

Sub-stages of Intuitive Thinking, this sub-stage occurs between the ages of 4 years to 6 years. In this sub-stage, children begin to use primitive thinking and want answers to all questions (Sant for example children begin to often ask for an explanation of the question "Why?" Because at this stage the intuitive children seem very confident in their knowledge and understanding but are not aware of how they know what they know. That is, they know something but gain that knowledge without using rational thinking. The disadvantages of preoperational thinking are centralization, namely focusing attention on one characteristic and ignoring other characteristics. This is evidenced by the lack of conservation, namely the awareness that changes in the appearance of an object do not change its basic nature (number, volume and weight). For example, experiments with children about the volume of water from several bottles. Children have not been able to distinguish that if

water in a bottle is transferred to another bottle, the volume of water will remain unchanged.

Children with special needs in the study are included in the vulnerable age 4-6 years so that they enter the preoperative stage described above. There are children with special needs with ADHD, speech delay. Child ADHD (Attention Deficit Hyperactivity Disorder) or Attention and Hyperactivity (ADHD) Concentration Disorders. ADHD is a psychiatric term used to refer to behavioral disorders found in children. Manifestations of this disorder are, (1) inertia, namely the behavior of loss or change of attention, and the difficulty of organizing tasks. This initiation is also often called ADD (Attention Deficit Disorder). (2) Hyperactivity-impulsive, which is uncontrolled behavior, and excessive impulsive or rushed attitudes by V. Mark Durand & David H. Barlow in [11].

Delay in speaking has a different type from one another which is indicated by the interference experienced by the child. The types of delays in speaking to these early childhood children by Tsuraya in [12] include: (1) Specific Language Impairment; (2) Speech and Language Expressive Disorder; (3) Centrum Auditory Processing Disorder; (4) Pure Dysphasic Development; (5) Gifted Visual Spatial Learner; (6) Dyssynchronous Developmental. From the type of Speech Delay above, it can be understood that children experience speech disorders and language disorders other than caused by child development factors, also caused by sensory disorders, neurological disorders, intelligence, personality and imbalances in internal development and imbalances in the child's external development. This background of language development and speaking in early childhood becomes too late.

Jackman in [13] mathematics for early childhood, namely: (1) number and number operations including counting, one correspondence, classifying and classifying, relationships, comparison, recognizing and writing numbers, and place values; (2) patterns, functions and algebra including the use of symbols and ordering; 3) geometry and spatial including analyzing, exploring, and analyzing shapes and structures; (4) measurements include recognizing and comparing the length of objects, volume, weight, and time; (5) data analysis and probability including collecting and organizing individuals and the environment; (6) problem solving including reasoning, communication, connection, and representation.

Geometry is a mathematical sphere that involves form, size, space, position, direction, and movement. Objects have a basic shape. The shape or shape of a flat geometry are circles, triangles and rectangles (two-dimensional shapes of shapes). While building space includes blocks, cubes and balls. How to introduce various forms of flat build and build space in kindergarten children is by example showing the shape of a flat shape and building the space around the child and grouping the geometry's shapes. Activities that can be carried out include: (a) Grouping geometric shapes, (b) Solving geometry problems, (c) Drawing geometric shapes, (d) Completing geometrical drawings, (e) Communicating geometric shapes, (f) Knowing geometrical shapes (See Table I).

In line with research conducted that preschoolers with special needs increase their value in assessment in mathematics after the intervention of integrating mathematics and children's literature. This study adds little to the intervention literature in mathematical research for children with special needs. Although it is still unclear how the emergence of literacy, language, and preliminary calculations affect each other by Purpura, *et al* in [14], this research adds to the literature that supports the integration of literacy and mathematical content fields. The results of this study indicate that children with special needs can benefit from mathematical interventions and underline the potential for teaching and focus on early days for children with special needs.

TABLE I. TOPICS FOR GEOMETRY FOR EARLY CHILDHOOD [4]

Topics	Concept and examples of skills
<ul style="list-style-type: none"> Form: geometric shapes can be used to represent and understand objects in the world around us. Forms form: shapes can be decomposed and consist of core shapes and other structures. Transformation and symmetry: symmetry can be used to analyze, understand, and shape in geometry and art. Location and direction: mathematics can determine directions, routes and locations in the world. 	<ul style="list-style-type: none"> Children recognize the shapes and names of circles, squares, triangles and rectangles of a certain size or state (various triangular and rectangular shapes). Children can draw various geometric shapes without seeing the original picture. Children identify and create shapes that have symmetry or symmetrical rotation. Children place toys in their place and are able to create class maps

Building geometrical concepts in children begins with identifying forms and investigating buildings and separating ordinary images such as rectangles, circles, and triangles. Most research on mathematics for children with disabilities uses direct and explicit teaching methodologies. Early child inclusion education uses a lot of naturalistic introduction, especially for children with special needs. Naturalistic instruction is varied among early childhood literature. The definition of naturalistic instruction varies between early childhood literature by Wolery & Hemmeter in [15]. By Green, *et al.* in [16] the method used in the naturalistic approach is through the integration of mathematics and children's literature, but it can also use puzzles. Scaffolding strategies are effective when there is responsibility from adults to children, whether in an interactive session or in a recurring session [5].

Children aged 3 years to 5 years are observed to construct 21 pieces of wooden puzzles, 3 dimensions with educators. These puzzles are designed to be interesting but beyond the ability of children to complete themselves, while also having repetitive components and features that children can learn and apply for further efforts in construction. The role of educators is to enable children to do it independently,

if assistance is needed educators will start with the least amount of support orally. Children 3 years old cannot complete most of their own tasks, so educators are involved in selecting and placing puzzle pieces with children. Conversely, once the 5-year-olds understand the purpose, the child makes a puzzle independently. The tutor's role is marked by confirming the child's actions and examining the construction. Based on the research of Yorde & McCollum in [5] namely attracting attention and interest in the task and setting common goals; (2) simplifying or regulating tasks into sub-tasks that can be carried out by children with special needs; (3) maintaining interest in what has been achieved and what has not been achieved in achieving goals; (4) mark relevant features and provide information about discrepancies between children's actions and required task requirements; (5) controlling frustration without creating dependence on adults; and (6) shows a successful solution for the task.

The principles that can be used in the introduction of children with special needs according to UNESCO (2009) principle 1: can be used by everyone. a design must be useful and beneficial for all people including people with disabilities. Provision of accessibility for all children in schools and in school facilities and infrastructure can be realized through simple and cost-effective steps. Principle 2: flexible in its use a design must be able to accommodate various choices of comfort and needs in its use. Principle 3: easy to use, a design must be easy to understand for all users as individuals who have different backgrounds, knowledge, language skills and concentration levels. Principle 4: clear usage information a design must be able to provide information that is clearly needed for its users who have differences in the level of function and condition of the sensory devices. Principle 5: tolerance for errors, a design must minimize the level of danger and the consequences of losses if there is a mistake or error in its use. Principle 6: does not require a lot of physical energy in its use, a design must be used efficiently, comfortably, and not cause fatigue to its users. Principle 7: the right size and space the appropriate size and width in a design is intended to make it easier for users to reach, approach, develop and use in terms of the size, posture and mobility capabilities of different users.

III. METHODOLOGY

This study uses a qualitative approach that explores the introduction of the concept of geometry in children with special needs in Inclusion Kindergarten. Children with needs who become objects are children with ADHD, Speech delay, and Down syndrome. Qualitative approach is to describe the process or event that is currently being applied in the field that is used as the object of research, then the data or information is analyzed so that a problem solving is obtained by the researcher using descriptive method. The data were obtained by semi-structured interviews to find information about the introduction of the concept of geometry that was done in the Inclusive Kindergarten in Yogyakarta both about teaching strategies and the media used to facilitate children in understanding geometrical concepts. Interviews were conducted on inclusion

kindergarten teachers who were 49 years old and experienced teaching for 16 years. Inclusive Kindergarten Yogyakarta there are 10 children with special needs, seven ADHD children, three speech delay children, one down syndrome child. The results of interviews in the form of audio are then transcribed into descriptive data for analysis.

IV. RESULTS AND DISCUSSION

This section presents the results obtained and following by discussion.

A. Results

of early childhood education with inclusion classes in the Yogyakarta inclusion kindergarten had four classes with two classes of class A and two with group B. these four classes have 10 children with special needs, seven ADHD children, three speech delay children, one down syndrome child. Every child with special needs gets different treatment according to the needs and character of his child. Speech delay is easier given an introduction to the concept of geometry than children with ADHD and DS. This is because children with ADHD cannot concentrate, before the introduction is given activities that can reduce child labor. After the child is getting tired, educating begins to provide learning material. ADHD children cannot work in class Together with regular friends, they are given a special room to study or adapted to the wishes of the child will do their work inside or outside the room. Teachers must provide special assistance for DS children, because DS children cannot be given Direct Introduction like other children. Provide toys related to the material to be studied.

An introduction for children with special needs using the approach to play while learning, because children with special needs cannot be given an introduction with a focus on the eyes. The most important children with special needs are to make children adapt to the environment and socialize in the community. Cognitive is not developed like a normal child because there are no curricula and policies regarding inclusive education, even though academically it cannot develop but for mentoring can develop well. Inclusive education can work with fingerprint tests. The results of fingerprint tests show the abilities of children. Educators can provide an introduction in accordance with the results of the diagnosis in the fingerprint test. Children with special needs during the introduction must be accompanied by a 1: 3 ratio until the child can adjust, for some children who need special assistance with a 1: 1 ratio.

The media used for special needs children is objects that can be held by the child but not those with rough textures, because children with special needs mostly have high sensitivity. By Green, *et al.* in [16] the method used in the naturalistic approach is through the integration of mathematics and children's literature, but it can also use puzzles. Scaffolding strategies are effective when there is responsibility from adults to children, whether in an interactive session or in a recurring session [5]. Use of puzzle and stick to paper. Examples of activities carried out when introducing the concept of sticking geometry are making a house that is used in any form using colorful paper. Seeing attention, children begin to recognize

instructions. Puzzles that are used with complexity can help children concentrate and independence of children. Children will learn to focus on activities provided by educators. What pedagogical considerations do teachers describe when planning and engaging in teaching. The relationship between teacher's ideas about teaching and their perception of the specific abilities and characteristics of children with special needs. As described above, educators can use fingerprint tests to determine the characteristics and abilities of children. then the educator identifies the child whether they need special assistance or assistance with a ratio of one educator: three children with special needs. Children with ADHD can be given activities that can reduce their energy so that children can follow the introduction calmly. Recognition for children with special needs is not focused in the classroom but adapted to the child's situation.

B. Discussion

Discussion on the introduction of the concept of geometry in children with special needs using objects that can be held and felt texture. The use of 3D puzzles can make it easier for educators to provide an understanding of the concept of geometry. Geometric shape 3D puzzles used are made for children with special needs with a lot of complexity and number of puzzle components. Children are trained to focus and use independently with puzzles, because children with special needs lack in eye focus. Even though the child lacks focus but the child can receive instruction. The first thing that educators do is to provide assistance to children for behavior or social children with the environment. Then children who have well-developed behavior and social will be developed cognitively in children, especially regarding the geometrical concept of mathematics.

Educators understand different abilities and needs by adjusting goals, materials and strategies with children's characteristics. Even though children have the same disadvantages, speech delay is not necessarily that children have the same needs in learning. by Yorde & McCollumn in [5] describe in his research that educators also anticipate the scaffolding that children need, based on the cognitive characteristics and motivations of individual children, and develop task requirements and interactions with these thoughts. Modifications are generally in line with the teacher's assessment of children's abilities as measured by the ability index so that children are able to increase their level of independence in learning. every child identified as having a developmental delay in one or several areas, it is possible that some modifications in content, material, or adult support will be needed to ensure full participation in the goal-directed introduction by each child.

V. CONCLUSION

Giving introduction to special needs children must be adjusted to the characteristics of the child. Educators do fingerprint tests before giving an introduction to children with special needs, in order to use fingerprint tests to determine the characteristics and abilities of children.

Diagnosis results can be seen the ability of children and educators can provide treatment tailored to the lack of children. The introduction of geometry in children with special needs is not a major focus in inclusive education. Giving introduction to geometry for children whose social and child concentration is good. Educators use 3D objects so that children can feel the texture and hold of the child. However, the media used is not rough textured because children with special needs have high sensitivity. 3D media that can facilitate educators in providing Introduction to geometry, namely 3D puzzles. The use of 3D geometric puzzle shapes trains concentration and independence. Subsequent research that will examine the same theme is the introduction of geometry in children with special needs in the inclusion kindergarten to add theories. This is because in this study the lack of theories regarding cognitive development, the introduction of mathematics of children with special needs and other theories concerning the development of children with special needs.

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