



Development of Differentiated Learning Model Based on Interests and Learning Styles on Problem Solving Abilities in The Kindergarten

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
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Abstract. This study aims to determine the level of need, design description, validity, practicality, and effectiveness of interest-based differentiated learning models and learning styles on problem-solving abilities in kindergarten. Data collection techniques are carried out through observation, interviews, and questionnaires. Data analysis techniques are carried out using descriptive and inferential data analysis. The research procedure uses 4D (Define, Design, Develop, and Disseminate) with the research subjects of teachers and learners. The description of the results of the needs analysis shows that teachers need a differentiated learning model based on interests and learning styles that are practical and effective. The design description in the form of a teaching model book has been improved based on input from expert validators and practitioners and produces differentiated learning models based on interests and learning styles in kindergarten that can be used in stimulating problem-solving skills in kindergarten. The average content and device validity test results of the category are "very valid," so the differentiated learning model based on interests and learning styles on problem-solving abilities in kindergarten is declared valid. The results of the practicality test through teacher response questionnaires and observation instruments of the average model implementation showed a very good category, with an average percentage of implementation of each aspect of 95% from five meetings so that the learning model differentiated based on interests and learning styles on problem-solving abilities in kindergarten was declared practical. The effectiveness test results began with an analysis of pretest and post-test score data, which showed an increase from the category "did not appear" to "appeared." The data obtained were then tested by Mcnemar, after which a hypothesis test was carried out, which showed that there was an influence of interest-based differentiated learning models and learning styles on problem-solving abilities in kindergarten, and then the results of the N Gain test showed that interest-based differentiated learning models and learning styles were "effective" to problem-solving abilities in kindergarten.

Keywords: Differentiated learning, interests, learning styles, problem solving.

1 Introduction

Kindergarten is the initial stage in the formal education system, which is the foundation phase in shaping cognitive, socioemotional, language, physical, motor, and moral religious development, as well as Pancasila values. Some of these developments are cognitive aspects, while problem-solving is one of several developmental spheres on cognitive aspects. Problem-solving ability is the ability of children to overcome all possible difficulties they face because children will face every problem in any condition and anywhere. According to Wortham et al., (2006) problem solving skills are used by children in formulating hypotheses, collecting data, making decisions on hypotheses, and formulating information. Every child will have their development potential well if stimulated properly. Problem-solving skills will be more easily mastered by children if they are stimulated by learning to think logically, critically, mathematically, and think carefully in everyday life (Syaodih et al., 2018).

Child problem-solving is using their knowledge, skills, and understanding to achieve a goal. The ability to solve problems begins with children's physical and psychological activity. (Utami & Pusari, 2018) explained that problem-solving is a thought directed directly to determine solutions or solutions to a particular problem. In line with (Setiasih, 2010) "problem-solving ability is the ability or potential learners have to solve problems and apply them in everyday life." Also conveyed by Oleu,  "Problem-solving is an effort to find a way out of a difficulty and achieve goals that cannot be achieved immediately. while (Novitasari, 2018) explaining that cognitive development occurs when children accumulate knowledge through exploration and active exploration of the physical and social environment in their environment, which is carried out directly by children. Children's ability to solve problems increases when children are given the widest opportunity to try without coercion or pressure from teachers and parents.

The ability to solve problems according to is a thought aimed directly at finding solutions or ways out of a particular problem. Early childhood stimulation to develop problem-solving skills is essential. It is possible to stimulate the development of problem abilities in children through educational activities whose main basis is problems (Kurniasih et al., 2020) , suggesting that problem-solving skills at an early age will develop and encourage self-determination capacity, namely the ability to act independently. The problem presented to the child should be open so that the child can find different answers or solutions. Based on some of the opinions above, it can be concluded that problem-solving is the process of finding and solving problems based on accurate data and information to draw accurate and comprehensive conclusions and the ability to use experience to find solutions. problems that arise to find solutions. Therefore, problem-solving requires the ability to process information to make decisions correctly.

Every child perceives information utilizing attention and learning style, because children are born different both physically and abilities. In this context, differentiated learning is crucial to provide and ensure that each child can get a learning experience that suits his or her interests and learning styles. This differentiated learning model emphasizes that each child is different from one another. Differentiated learning is

designed to examine every aspect of the learners' learning differences. Understanding the many differences among learners and treating those differences as teaching resources rather than shortcomings is a very powerful approach (Geelan et al., 2015). So, a learning model is needed to stimulate children's problem-solving abilities based on children's interests and learning styles.

Interest is a constant tendency to pay attention and reminisce about various activities (Slameto, 2013). If associated with learning, the intended activity is the learning process, while the learning process will be successful and enjoyable if there is a sense of liking or interest that arises by students in carrying out the learning process. Sardiman (Susanto, 2013: 57) suggests that "interest is a condition that occurs when someone sees characteristics or meanings while the situation is associated with his wants or needs." Another simple definition (Muhibbin, 2011: 152) states, "Interest means a high tendency and passion or great desire for something." Then, psychological interest is influenced by feelings of pleasure and displeasure formed in each phase of children's physical and psychological development.

According to the Big Dictionary of Indonesian, the word learning is trying to gain intelligence or knowledge. A person learns if in the person there is a process of activity that results in a behavior change. According to Gagne et al. (Suhada, 2014: 7), learning is a behavior change process arising from experience. Based on the opinion regarding the understanding of interest and learning above, it can be concluded that interest in learning is one of the motivational tools or reasons for students to carry out learning activities. Without an interest in students in what will be learned, students will be bored learning, which does not produce optimal learning results or as expected.

Interest can arise from within a person caused by several things within him and encouragement from his environment. According to Rosyida (Susanto, 2013: 60) the emergence of interest in a person in principle can be divided into two types: interest derived from innate and interest arising from external influences. First, interest that comes from nature arises by itself from each individual; this is usually influenced by heredity or natural talent. A person will be interested in learning when he can feel the benefits of what he learns, both for the present and in the future, and it is felt that there is a conformity with the needs being faced. Purwanto (Salim, 2010: 7) stated that many factors influence the growth of interest and vice versa turn off interest in learning: 1) Internal Factors (maturity, practice, and tests, 2) External factors (teacher factors, method factors, subject matter factors, and family factors, and 3) Environmental factors, such as feelings of pleasure, interest, and attention and involvement.

Some factors that affect the learning process are internal factors (physical and psychological factors) and external factors (family, school, and community factors). The success of the learning process is determined by many things, such as teacher competence, educational environment, student learning style, and many other factors. other. This study will be focused on students' learning styles. Learning style is how a person easily absorbs and processes information according to his abilities. A differentiated learning process is an effective learning process or philosophy that provides different ways of understanding new information for all students in their diverse classroom community, including ways to get content; process, build, or

reinforce ideas; and develop learning products and assessment measures so that all students in the classroom in diverse settings can learn effectively (Tomlinson, 2001).

Learning style preferences are how learners select, receive, process, and remember new information. The preferred learning style consists of visual, auditory, or kinesthetic learners. Teachers can choose different styles for different tasks or use a combination of teaching styles. Teachers need to think about how to present information and provide learning opportunities for students. In general, there are three learning styles, namely (1) visual learning style, (2) auditory learning style, and (3) kinesthetic learning styles. The characteristics of each of these learning styles are presented (Marlina, 2020).

The process of differentiation is a lesson that is carried out according to each student's learning needs, style or interests (Deporter & Hernacki, 1992) and argues that everyone learns/learns differently. There are three learning styles, often referred to as VAK: visual, audiotorial, and kinesthetic. Students with a tendency to visual learning styles can understand visual information well. They generally enjoy using visual aids such as images, charts, videos, posters, animations, concept maps, colors, symbols, and graphics to help them process information. To make learning easier, they must represent images differently and imagine each page differently in memory. They also replaced information suggestions using easy-to-understand symbols and initials. The symbol used may be a shape or color symbol to make it easier to remember. Compared to students with distinctive visual learning styles, students with auditory learning style tendencies can process information well while listening. Students listen to lectures, attend workshops/presentations, tell stories, and joke to understand information. They generally enjoy internal and external dialogue regarding information, such as discussing a topic with other students and presenting ideas or information to others out loud.

In teaching, they use tape recorders to replay lessons. lesson. During the learning process, students' recordings with a by-ear learning style can be less good because they prefer to listen. They save their lesson notes to tapes and then listen to them. In addition, they like a quiet environment so they can think. They don't like it when they study, it's crowded around them. And lastly, students with a kinesthetic learning style. Students with a kinesthetic learning style more easily assimilate information by practicing it directly. In class, they use all five senses to understand information, go to the laboratory for field visits, use the "trial and error" method, and listen and remember specific examples of what happened. Usually, they like physical movement in exercise. They are very enthusiastic about learning activities that can be physically draining, rather than just sitting quietly listening to theoretical lessons. Students assume that theory lessons will quickly make them bored in learning. In training, they need visual aids as a means to explain information. With the help of a study guide, students can easily explain the lesson's content, so the learning process becomes easy. Of course, these different learning styles must be combined with different learning models. In this case, we are talking about differentiated learning.

Differentiated education is of indisputable relevance. His presence is almost like a condition for good study. Previous research has shed light on this. A study by Dunn & Dunn (Berry & S, 2004) found that only 30% of students remember 75% of what they hear in class, 40% learn what they read or see, 15% learn from facts, and another 15%

is kinesthetic. Therefore, teachers need to know how students usually learn, and of course, students also need to be explained this learning style test. Understanding learning styles will lead to learning success. It is also useful to increase students' awareness of learning activities that are appropriate or not to the trends of their learning style. Finally, students can plan their learning goals, creating an efficient and effective learning process. (Rusman, 2010) stated that learning will be more meaningful if students can participate in various learning activities while teachers act as facilitators and mediators.

One of the learning models that can stimulate children's problem-solving abilities is a differentiated learning model based on children's interests and learning styles. This model is considered to be usable. It follows the characteristics of child development and age, especially in the foundation phase in kindergarten because it refers to the concept of early childhood learning, namely playing while and if it is related to the independent curriculum, learning emphasizes independent play activities, some research, and development conducted by (Ginsburg et al., 2007) Explain that play can improve aspects of child development. A good and supportive play experience can help children be more open and skilled (Whitebread et al., 2017). Therefore when children can express their feelings and needs, build healthy social relationships, assist children in understanding and mastering subject matter at school, prepare children for a competitive future and have a positive impact on the development of other aspects (Ebert, 2020; Gonzalez et al., 2022; Schachter et al., 2016; Spinrad et al., 2004; Teale et al., 2018). Differentiation aims to provide challenging learning experiences so that children enjoy learning and become independent learners (Platt, J.: 2018). Thus, this study concludes that a learning model is needed based on children's interests and learning styles. So researchers are interested in developing a differentiated learning model based on interests and learning styles in kindergarten to improve stimulating problem-solving abilities.

2 Methods

This research uses a research *and development* (R&D) development approach. This approach is used to produce certain products by testing product validity, practicality, and effectiveness. The product is in the form of developing differentiated learning models based on interests and learning styles on problem-solving abilities in kindergarten. while the type of research used is 4D design (*define, design, develop, and disseminate*). The research location is in Makassar City with research subjects of 21 students and 5 teachers. The data collection techniques used are documentation study guide techniques, questionnaire and test techniques, and documentation study techniques. Descriptive data analysis techniques and non-parametric statistics use Mc Nemar and N Gain tests. The development procedure can be seen in the following chart.

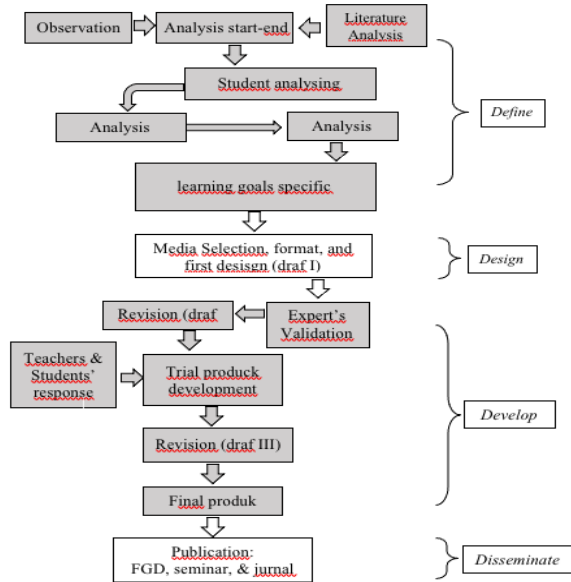


Chart 2. Learning tools development flow

3 Results and Discussion

This chapter describes the main things that refer to the development model (research & development) according to Thiagarajan, (1974). This development theory consists of four main stages, namely: define, design, develop, and disseminate, which is then abbreviated to 4D.

3.1. Needs Analysis Overview

The needs analysis stage is the initial analysis phase by conducting preliminary studies to obtain initial information and photograph objective conditions in the field related to the scope of implementation of differentiated learning models based on children's interests and learning styles in kindergartens, especially the city of Makassar to ensure that teachers explicitly see the importance of developing an interest-based differentiated learning model and child's learning style. The scope of aspects of implementation intended to be analyzed are (1) Implementation of interest-based differentiated learning models and learning styles in kindergarten, (2) Understanding of interest-based differentiated learning models and learning styles in kindergarten, and (3) differentiated learning models based on interests and learning styles in kindergarten. From the research conducted, data were found as described below:

Table 4.1. Data describing the need for differentiated learning models in kindergarten

No.	Measurable aspects	Average value	Category
1	Differentiated learning model based on children's interests and learning styles	4.1	High / Good
2	Differentiated learning model based on children's interests and learning styles towards problem solving	3.81	High / Good
3	Implementation of differentiated learning models based on children's interests and learning styles towards problem solving	2.10	Low/Less Good

The results of the research discussed earlier, the description of teacher needs for efforts to develop differentiated learning models based on children's interests and learning styles for solving thematic problems by the new paradigm in kindergarten, clearly show that teachers are in dire need or the category of need levels is very high for efforts to develop differentiated learning models based on the curriculum as a need for teachers to adapt to the development of early childhood education learning in the city of Makassar, especially in schools or Driving Kindergartens.

The conclusion is based on field data as a research fact related to the analysis of teacher needs in terms of the implementation of interest-based differentiated learning models and children's learning styles towards problem solving by teachers in schools, teachers' understanding of interest-based differentiated learning and children's learning styles applied in kindergarten, and the implementation of interest-based differentiated learning and children's learning styles in kindergarten, which in average value shows that for (1) the implementation of interest-based differentiated learning and children's learning styles are in the high / good category because the average score is 4.1, and (2) The understanding of differentiated learning based on interests and learning styles of children in kindergarten is in the high / good category because the average score is 3.81, while (3) The implementation of differentiated learning based on interests and learning styles of children in kindergarten is in the low / less good category Because the average score is 2.1. These findings are certainly counterproductive between the implementation aspects of interest-based differentiated learning and children's learning styles and differentiated learning based on children's interests and learning styles in kindergarten, with aspects of the implementation of interest-based differentiated learning and new children's learning styles in kindergarten, which should be the same, but the facts are different as a result of the absence of applicable guidelines for teachers so it is important to be realized through efforts to develop learning models Differentiating based on children's interests and learning styles to help teachers accelerate learning well, at the age of the times.

3.2. Product Overview

In the development of problem-solving skills in kindergartens, a differentiated learning model based on interests and learning styles has been developed consisting of 1) Introduction, containing rationales, names, goals, benefits, development foundations and user targets of interest-based differentiated learning models and learning styles on problem-solving abilities in kindergarten; 2) Theory of learning and learning; 3) The concept of firenized learning in kindergarten, containing: the definition of firenized learning in kindergarten, the characteristics of firenized learning in kindergarten, and the principles of the firenized learning learning model in kindergarten; 4) Planning of a learning model in kindergarten, containing learning outcomes, play activities, teaching modules and assessment design; 5) Implementation of users of interest-based differentiated learning models and learning styles on problem-solving abilities in kindergartens, containing steps for using interest-based differentiated learning models and learning styles on problem-solving abilities in kindergartens, social systems, reaction principles, instructional support systems and impacts and herding; and 6) Assessment of differentiated learning models based on interests and learning styles on problem-solving abilities in kindergarten, containing the main matters of concern in conducting assessments, and assessment instruments.

Syntactic Model

Syntax is a process of stages of learning activities designed based on the analysis of the needs: 1) Identification, 2) Management, 3) Material Adjustment, 4) Use of Teaching Tools, 5) Station Rotation, 6) Assessment and Feedback, and 7) Awards.

Table 4.3 Syntax of Differentiated Learning Model based on interests and learning styles

Syntax	Activity	Learning Activities
Identification	Identify the child's needs	Teachers identify children's needs, interests and level of learning readiness through observation, assessment, and evaluation (diagnostic assessment results). This can involve use of various assessment tools and techniques.
Grouping	Grouping based on interests and learning styles	Teachers group children based on certain characteristics such as level of readiness to learn, interests, or learning styles. This grouping can be flexible and can change according to the child's interests and learning style.
Material Adjustment	Customize learning materials	Teachers arrange learning materials with different levels of complexity. This may include adapting reading materials, activities, or projects to suit the child's ability level.
Use of Teaching Tools	Use of different teaching tools	Teachers select and use a variety of teaching tools to support children's different interests and learning styles, such as videos, pictures, educational games, or technology.

Station Rotation	Station rotation or activity	Teachers design various stations or activities that children choose from during learning sessions. Each station can offer a unique learning experience based on the child's learning style.
Ratings and Feedback	Rating and feedback	Teachers use assessments to understand a child's progress and provide appropriate and ongoing feedback to help adjust teaching further.
Appreciation	Giving	Giving rewards to young children is an effective way to provide positive encouragement, increase motivation, and build self-confidence. Appreciation in early childhood usually must be adjusted to their level of development.

Social Systems

The social system formed from the differentiated learning model based on interests and learning styles towards problem-solving is that children can recognize things that are different from themselves from others and can solve simple problems in everyday life in a flexible and socially acceptable way. This aims to make it easier for children to interact well with others at home, school, and in the community later.

Reaction Principles

The principle of reaction that arises from activities during the development of differentiated learning model books based on interests and learning styles towards problem-solving in kindergarten, is that children will be accustomed to choosing something based on their wishes, have high curiosity, and can share their learning experiences.

Support System

The support systems in this learning model are all facilities and infrastructure so that learning tools can support the implementation of differentiated learning based on interests and learning styles in kindergarten. so that one of the support systems needed is a learning model book covering concepts, gur guidelines in preparing a plan, and assessment tools.

Instructional and Herding Impact

The instructional impact of differentiated learning models based on interests and learning styles is how children can master material content related to developing knowledge and skills integrated with problem-solving abilities. The herding impact of this model is in the form of developing children's problem-solving abilities in terms of 1) children can show activities that are exploratory and probing, 2) able to solve simple problems in everyday life in a flexible and socially acceptable way, 3) children can

apply knowledge or experience in new contexts, and 4) show a creative attitude in solving problems (ideas outside the ordinary).

3.3. Validity of Model Product

The results of expert validation of teacher responses to differentiated learning model books based on children's interests and learning styles are presented based on product feasibility components, namely:

Table 4.4. Results of Expert Validation of the Teacher Response Questionnaire to the Practicality of the Model

No.	Aspect	Validator			X	Information
		1	2	3		
1	Iinstructions	3.5	3.5	3.5	3.5	Valid
2	Another	3.6	3.6	3.5	3.6	Valid
3	Language	3.6	3.7	3.3	3.6	Valid

Based on Table 4.4 above, the results of data analysis on the validity value of teacher responses to differentiated learning model books based on children's interests and learning styles, conducted by 3 validators with 3 components that became validation assessments for differentiated learning model books showed that they were in the 3.5-4.00 very valid category. This data shows that differentiated learning model books based on children's interests and learning styles have values that meet the validity requirements to be used as one of the research products that can be used.

3.4. Practicality of Model Products

To measure the level of practicality of the interest-based differentiated learning model and the child's learning style that has been developed, observations are made on valid learning tools, then the level of practicality of the learning model of the differentiated learning model based on children's interests and learning styles is measured through the implementation of trial implementation of learning tools in Makassar City. In addition to knowing the level of practicality, this trial also aims to obtain direct input from teachers on differentiated learning models based on children's interests and learning styles that have been prepared. In the trial stage, observations were made on teacher activities in implementing differentiated learning models based on children's interests and learning styles that had been designed before.

From the results of observer observations on teacher activities in implementing differentiated learning models based on children's interests and learning styles using teacher activity observation sheet instruments for 5 (five) meetings, practical data on differentiated learning models based on children's interests and learning styles were obtained, as follows:

Table 4.7. Results of Observation of the Implementation of the Learning Model

Aspect	Meeting					Average	Category
	I	II	III	IV	V		
Pre-Activity	4.0	4.0	4.0	4.0	4.0	4.0	Very practical
Opening	3.8	4.0	3.8	4.0	4.0	3.9	Very practical
Core	3.8	3.8	4.0	4.0	3.9	3.9	Very practical
Closing	4.0	4.0	4.0	4.0	4.0	4.0	Very practical

Based on the results of the lecturer's response questionnaire analysis, an average score of 4.0 was obtained on the aspects of the pre-learning activity process 4.0, aspects of the opening activity process, which were assessed at 3.9 and aspects of the core activity process of 4.0 and the next process, namely aspects of the closing activity process of 4.0. Based on the results of observations on teacher activities in managing learning by applying interest-based differentiated learning and children's learning styles in the PAUD Doa Ibu Park, it can be concluded that every aspect of observation has been "fully implemented" and is in the category of very well implemented with an average score of 3.9 which means that the learning model of differentiated learning based on children's interests and learning styles on problem-solving abilities in the Park The child has met the criteria of practicality to be implemented by the teacher.

3.5. The Effectiveness of the Model Product

At the final stage in the development of differentiated learning models based on interests and learning styles is the effectiveness test. The effectiveness of differentiated learning models based on interests and learning styles to improve problem-solving skills in kindergarten can be seen from the pretest and posttest results.

Table 4.4 Normality Test

	N	Statistics	df	Sig.	Information
Pretest	21	,957	21	,455	Normal
Posttest	21	,916	21	.071	Normal

Based on the data normality test, it shows that the data is normally distributed with a pretest value of 0.455 and a posttest value of 0.071; both data show greater than 0.05. So that the data can be processed further.

Table 4.5 Paired Sample Statistics

	Means	Minimum	Maximum	Std. Deviation	Std. Meaning of Error
Pretest	30.57	28	34	1,660	,362
Posttest	19.67	17	23	1,494	,326

Based on the results of the descriptive test, the mean posttest value is 30.57, and the mean pretest value is 19.67. This data shows that the mean value of posttest is greater than the pretest with a difference value of 10.9, so it can be concluded that differentiated learning models based on interests and learning styles can increase the mean value of children's problem-solving abilities.

Table 4.6 Hypothesis Test of Paired Sample t-test

	N	Mark		df	Sig.	Conclusion
		tcount	table			
Pair 1 Posttest - Pretest	21	20,417	2,091.	20	0.00	Significant

Based on the paired sample t-test, it shows that the calculated t value is 20.417, with a table t value of 2.091 and a P value of 0.00. Based on the results of this analysis show that the calculated t value is greater than the t table, so the H1 hypothesis states that the learning model is differentiated based on interests and learning styles and has an effect on improving children's problem-solving abilities. The following is a graph of the mean difference from before treatment and after the application of the model.

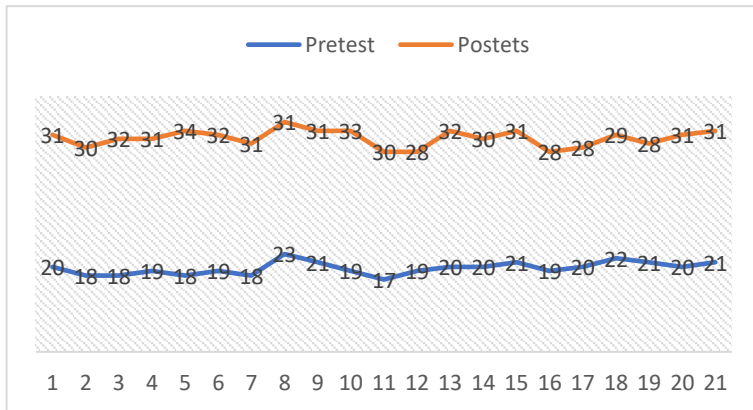


Diagram 1.1 Comparison of Pretest and Posttest Values

After testing the hypothesis and showing that there are differences in average scores and significant influences before and after the application of differentiated learning models based on interests and learning styles affect the improvement of children's problem-solving abilities. To see the effectiveness of the model, an N Gain test was carried out to see the effectiveness of the increase.

Table 4.34. Gain N Gain of Students

No. Sample	Pretest	Posttest	N Gains	Category
1	20	31	0.73	Tall
2	18	30	0.71	Tall
3	18	32	0.82	Tall
4	19	31	0.75	Tall
5	18	34	0.94	Tall
6	19	32	0.81	Tall
7	18	31	0.76	Tall
8	23	31	0.67	Keep
9	21	31	0.71	Tall
10	19	33	0.88	Tall
11	17	30	0.72	Tall
12	19	28	0.56	Keep
13	20	32	0.80	Tall
14	20	30	0.67	Keep
15	21	31	0.71	Tall
16	19	28	0.56	Keep
17	20	28	0.53	Keep
18	22	29	0.54	Keep
19	21	28	0.50	Keep
20	20	31	0.73	Tall
21	21	31	0.71	Tall
Average	19.7	30.6	0.71	Tall

From the table above, the Mean N Gain Score value is 0.71 based on dividing the gain score value category into the high category with a range value of $g > 0.7$ with the high category. From this data, it can be concluded that applying differentiated learning models based on interests and learning styles effectively improves children's problem-solving abilities.

4 Conclusion

Based on the results of research and discussion, it can be concluded that teachers need a differentiated learning model based on interests and learning styles on problem-solving abilities in kindergarten, so a learning model is developed that produces a product in the form of a model book that contains learning tools that have met the criteria of validity, practicality, and effectiveness so that the resulting product can be used for stimulate problem-solving skills in kindergarten.

Acknowledgements

Acknowledgments were conveyed to the Directorate General of Higher Education for granting. Furthermore, thanks were also conveyed to the Rector of UNM for his direction and guidance during research activities. Similarly, gratitude was conveyed to the Head of the UNM Institute for Research and Community Service (LP2M) who had provided facilities, monitored, and evaluated research activities to completion.

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