

Authentic Assessment Model in Problem Solving Learning for Kindergarten

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Abstract—This study aims to produce an authentic assessment model in problem-solving learning for children aged 5-6 years. Specifically, the purpose of this study is to find out: 1) the feasibility of the authentic assessment model, and 2) the results of the students' ability assessment in problem solving learning for children aged 5-6 years. The research and development used adopted the ADDIE model (Analyze, Design, Develop, Implement, and Evaluate). The research subjects consisted of eight teachers and 44 students. The number of research subjects using purposive sampling technique. The study was conducted in 4 schools of Kindergarten in Yogyakarta City. Validation of research instruments conducted by expert judgment. The data were collected using questionnaires and observation sheets. Questionnaires are used for data retrieval on aspects of practicality and effectiveness of authentic assessment models. Observation sheets are used for data retrieval on aspects of the implementation of the assessment process. The data analysis of the research was done by using descriptive statistic technique, inter-rater reliability, inter-item correlation, and intra-class correlation. The results of the research are: 1) the authentic assessment model developed is feasible to use because it meets the requirements of practicality, effectiveness and its implementation, and 2) the result of ability assessment from 44 students in problem solving learning are: 19 students (43,2%) get value with criterion growing very good, 16 students (36,5%) with growing up expectations, 8 students (18,3%) with start growing, and 1 student (2%) with not yet growing.

Keywords—*development model, authentic assessment, problem solving, 5-6 years.*

I. INTRODUCTION

Early childhood learning is crucial for the growth and development of children to become individuals with the character of having creative, innovative, and competitive competencies in a wider range. Early childhood learning should give students the opportunity to build their own knowledge through interaction with their environment, with parents, siblings, teachers, friends, and the environment. Therefore, learning in early childhood must be in accordance with the principles that include: 1) learning through play, 2) child-oriented development, 3) child-oriented, 4) active learning, 5) oriented to the development of character values, 6) oriented to the development of life skills, 7) a conducive environment, 8) democratic learning oriented, and 9) utilization of learning media and learning resources.

One approach that can facilitate students in providing opportunities for building their own knowledge through interaction with their environment is a problem-solving approach. It will be the most important part of learning because by discovering it yourself, that knowledge will be stored for a long time in the brains of students and students will be better at understanding it [1]. The method of problem solving is very potential to train students to think creatively in the face of various personal problems as well as group problems to be solved alone or together. For that reason, this approach is suitable to be applied in the learning process in Kindergarten [2].

The assessment instrument is one of the most important factors to ensure objectivity and fairness in assessing students' level of ability. Therefore, in every assessment activity required the right and qualified instruments. States that the assessment instrument is said to be good if it meets several criteria: 1) relevant in data collection in accordance with the purpose of assessment, 2) there is a balance of multidimensional proportion measurement, 3) can be used efficiently, 4) existence objectivity in scoring, 5) shows the consistency of measurement, 6) illustrates the honesty of the assessment (unbiased), 7) specifically measures the aspects studied, 8) describes the degree of difficulty directed by the skills, knowledge, and capabilities of the individuals assessed 9) can distinguish individual ability levels, and 10) do not measure individual speed [3]. Assessment is a process undertaken to measure the performance of students in the learning process, to find and improve student learning outcomes, and to arrange further learning activities [4].

Assessment in early childhood is done when students play, interact with friends or teachers, as well as when students communicate thoughts through their work. The important thing for teachers to understand is that the students' work is not to be considered good, but to analyse the progress that the students have achieved. The ability to observe student behaviour while performing meaningful play activities and mastery of a student's developmental stage should be the required skill for early childhood teachers. Careful observation when students play provides much of the information required for assessment activities. Assessment of learning outcomes in early childhood is not a number, but in the form of progress achievement. Authentic assessment is a process of gathering significant meaningful information on student learning outcomes in attitude, knowledge, and skills aspects by using actual fact-based measurement techniques.

Authentic assessment has a strong relevance to the scientific approach in learning in accordance with the Curriculum 2013. Authentic assessment can illustrate the improvement of student learning outcomes through a scientific approach that observes, asks, collects information, associates, and communicates. Assessment of learning outcomes in early childhood is not a number, but in the form of progress achievement. Identifying and determining the quality of educational programs for early childhood can be seen from assessments made by teachers to students in the learning process through play activities. That is, that student assessment is one of the benchmarks of the quality of early childhood programs [5]. Authentic assessment is required to demonstrate student ability, provide feedback and direction for its growth and development [6]. Authentic assessment is not only seen from the results of the task alone, but also of the quality of the educational process that involves students to become more humane [7].

Assessment of progress in early childhood is not a simple matter because of many factors that need to be considered at the time of fact collection, analysis of children's behaviour while playing, and analysis of children's work. The seriousness and thoroughness in observing, as well as objectivity in the management of facts, will serve as data capable of describing who and how the child really is. These data are then communicated to parents as a report to be followed up together, both in early childhood and home care.

The assessment instruments used to assess early childhood development are currently unstructured and detailed, not yet operational, not yet practical to use, and have not been standardized to see their validity and reliability. Therefore, it is very important to develop an authentic assessment model in problem-solving learning in children aged 5-6 years. The development of this authentic assessment model should refer to High Order Thinking Skill (HOTS) learning. The authentic assessment model in problem-solving learning in children aged 5-6 years developed should include the form of problem-solving activities, time allocations, assessment observation sheets, description of problem-solving abilities, and ability criteria in problem solving.

The problem solving stage for early childhood consisting of:

- 1) *Stage 1*, understand the problem (identify the problem)
- 2) *Stage 2*, plan solution
- 3) *Stage 3*, apply the solution
- 4) *Stage 4*, evaluation solution

5) *Stage 5*, conclusion

The advantages of the authentic assessment for some parties are students, teachers, schools, and parents. For students, to know the extent to which students have successfully followed an activity, what competencies have been achieved, and what competencies have not been achieved during the students activities in the learning process. For teachers, to know the eligible students and students who are not eligible to continue the activities in accordance with the achievement of achievement competencies, teachers also prepare activities for enrichment and improvement, and provide an overview of students who experience delays or disturbances and also follow-up is done by the teacher.

The purpose of authentic assessment of the school to find out the teacher's assessment is in accordance with the condition of the students and the school culture, as a reference to whether the school meets the National Education Standards (NES), and is used as a reference for developing educational programs. For parents, with an authentic assessment parents can monitor the development of children during the school when following the lesson. Parents can also compare children's abilities when at home and abilities when in school. If there is a delay or developmental deviation, then the parent along with the teacher can immediately provide the right service.

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

II. PROPOSED METHOD

This research is a research and development that adopt model of ADDIE development. Stages of research conducted is: (1) needs analysis and objective formulation; (2) product design; (3) product development; (4) product implementation; and (5) product evaluation [8].

The subjects consisted of eight teachers and 44 students. Determination of research subjects using purposive sampling technique. The study was conducted in 4 schools of Kindergarten in Yogyakarta. Validation of authentic assessment instruments is performed by expert judgment. Data collection techniques used questionnaires and observation sheets. Questionnaires are used to collect data on aspects of the practicality and effectiveness of the assessment model. While the observation sheet is used for data retrieval for the implementation aspect of the appraisal process. The outline of the research instrument used to assess the authentic assessment model developed can be seen in Table I below.

TABLE I. GRID INSTRUMENTS EVALUATION OF PRACTICALITY, EFFECTIVENESS, AND IMPLEMENTATION OF THE APPRAISAL

No	Indicators
A. The Practicality of the Authentic Assessment Model	
1.	Ease in using assessment model
2.	Simplicity of the format of the assessment model
3.	Clarity of problem-solving steps
4.	Clarity of authentic assessment characteristics
5.	Clarity of scores and criteria in tabulation of data
6.	Standard language and communicative
7.	Use of terms that are easy to understand
B. The effectiveness of the Authentic Assessment Model	
1.	Claims step-solving steps with age of 5-6 years
2.	Compliance with Basic Competence
3.	Compliance with problem-solving activities
4.	Representative characteristics of authentic assessment with problem
5.	Conformity characteristics of authentic assessment with age
6.	Representative characteristics of authentic assessment to describe the ability of students in solving activities
7.	Learning activities are presented in the form of problem
8.	Students understand the learning activities of the problem
9.	Solving activities using problem solving shortcuts
10.	The activities problem displayed fosters student's curiosity
11.	Suitability of the problem with daily life
12.	Compliance problems with Basic Competence
C. Implementation of the Assessment Process Using the Authentic Assessment Model	
1.	Preparing tools, materials, and places of learning activities
2.	Condition students to be ready to start learning problem solving activities
3.	Preparing an authentic assessment model
4.	Determine the sequence of problem-solving learning
5.	Determine the learning phase of problem solving
6.	Organize student activity activities in problem solving learning in accordance with the topic taken
7.	Describe the ability of problem solving steps on each student
8.	Make criteria of problem solving ability of each student
9.	Closing the problem-solving learning activities

Data analysis to determine the feasibility of an authentic assessment model developed using inter-rater reliability analysis, inter-item correlation, and intra-class correlation. Meanwhile, to know the level of practicality, effectiveness and implementation of the assessment process using the criteria as in Table II below.

TABLE II. CRITERIA OF PRACTICALITY, EFFECTIVENESS, AND IMPLEMENTATION OF AN AUTHENTIC ASSESSMENT MODEL

No	Interval Score	Criteria
1	$X > Xi + 1,5 SDI$	Very Good
2	$Xi + SDI < X \leq Xi + 1,5 SDI$	Good
3	$Xi - 0,5 SDI < X \leq Xi + SDI$	Moderate
4	$Xi - 1,5 SDI < X \leq Xi - 0,5 SDI$	Fair
5	$X \leq Xi - 1,5 SDI$	Poor

X = Total actual score
 Xi = Average ideal score = $1/2$ (ideal maximum score + minimum score ideal)
 SDI = standard deviation ideal score = $1/6$ (ideal maximum score - minimum score ideal)

III. RESULT

A. Description of Research Data

To determine the feasibility of an authentic assessment model that has been developed in terms of aspects of practicality, effectiveness, and implementation of the

authentic assessment process, model implementation is performed. Implementation of an authentic assessment model is performed after obtaining validation from the assessment expert. The implementation of an authentic assessment model was conducted in four classes with a total of eight teachers and 44 students.

The following is the description of the data of the teacher's assessment of the authentic assessment model developed both in the aspects of the practicality, effectiveness and implementation of the assessment process.

1) Aspect of Practicality

The data of the teacher's assessment on the practical aspect of the authentic assessment model can be seen in Table III below.

TABLE III. RESULTS OF MODEL PRACTICALITY ASSESSMENT

Respondent	Score	Criteria
Teacher 1	25	Very Good
Teacher 2	23	Very Good
Teacher 3	26	Very Good
Teacher 4	23	Very Good
Teacher 5	23	Very Good
Teacher 6	22	Very Good
Teacher 7	21	Very Good
Teacher 8	23	Very Good
Total Score of Research Result (ΣX)	116	
Average Total Score of Research Results (X)	29	
Ideal Total Score (ΣXi) = $8 \times 7 \times 4$	224	
Ideal Average (Xi)	17,5	
Standard Deviation Ideal (Sdi)	3,5	

Based on the data in the Table III above can be seen that all teachers who numbered eight people provide an assessment with very good criteria. This means that from the practical aspect, the teachers state that the authentic assessment model developed is excellent.

2) *Aspects of the effectiveness of the model*

A description of the teacher's assessment data on the effectiveness aspect of the authentic assessment model can be seen in Table IV below.

TABLE IV. SUMMARY OF RESULTS OF THE ASSESSMENT OF THE EFFECTIVENESS OF THE AUTHENTIC ASSESSMENT MODEL

Respondent	Score	Criteria
Teacher 1	25	Very Good
Teacher 2	23	Very Good
Teacher 3	26	Very Good
Teacher 4	23	Very Good
Teacher 5	23	Very Good
Teacher 6	22	Very Good
Teacher 7	21	Very Good
Teacher 8	23	Very Good
Total Score of Research Result (ΣX)	116	
Average Total Score of Research Results (X)	29	
Ideal Total Score (ΣXi) = $8 \times 7 \times 4$	224	
Ideal Average (Xi)	17,5	
Standard Deviation Ideal (SDI)	3,5	

Based on the teacher's assessment data, it can be seen that there are five teachers who gave excellent assessment, and three teachers gave good judgment. Thus it means that teachers generally state that the effectiveness of the developed authentic assessment model is good.

3) *Aspects of implementation*

The data of the teacher assessment on the aspects of the authentic assessment process that have been developed can be seen in Table V below.

TABLE V. SUMMARY OF RESULTS ASSESSMENT OF MODEL IMPLEMENTATION

Respondent	Score	Criteria
Teacher 1	25	Moderate
Teacher 2	29	Good
Teacher 3	25	Moderate
Teacher 4	26	Moderate
Teacher 5	31	Good
Teacher 6	28	Good
Teacher 7	27	Good
Teacher 8	27	Good
Total Score of Research Result (ΣX)	218	
Average Total Score of Research Results (X)	27,25	
Ideal Total Score (ΣXi) = $8 \times 7 \times 4$	288	
Ideal Average (Xi)	40,5	
Standard Deviation Ideal (SDI)	3,5	

Based on the results of the teacher's assessment, it can be seen that there are five teachers who gave good assessment, and three teachers gave a good enough assessment. Thus it means that teachers generally state that the level of implementation in the appraisal process using this developed authentic assessment model is good.

4) *Results of the students' ability assessment*

The result data of students' ability in problem solving learning by using authentic assessment model can be seen in Table VI and Figure 1 below.

TABLE VI. FREQUENCY OF STUDENT ABILITY

	Frequency	Percent	Valid Percent	Cumulative Percent
	1,00	1	2,3	2,3
	2,00	7	15,9	18,2
Valid	3,00	28	63,6	81,8
	4,00	8	18,2	100,0
Total	44	100,0	100,0	

Information:
 4 = Growing Very Good
 3 = Growing Up Expectations
 2 = Start Growing
 1 = Not Yet Growing

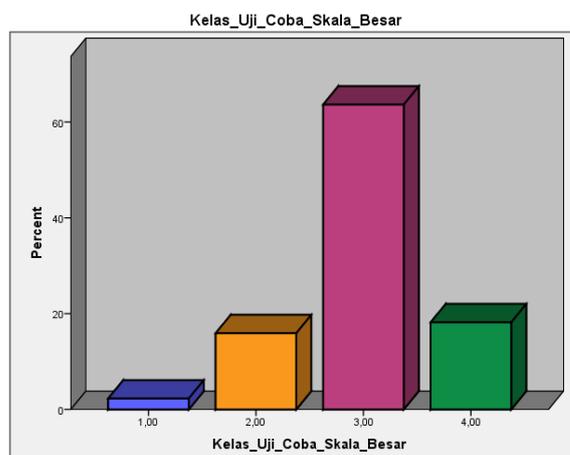


Fig. 1. Frequency Diagram of Student Ability Bar

B. *Reliability Analysis and Teacher Agreement Level In The Assessment of The Authentic Assessment Model*

The reliability of the developed authentic assessment model is analyzed based on the value of Cronbach's Alpha (α). The results of reliability analysis of authentic assessment model can be seen in Table VII below.

TABLE VII. RELIABILITY STATISTICS IMPLEMENTATION ASSESSMENT MODEL

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,978	,990	8

Based on the Reliability Statistics table, note that the value of Cronbach's Alpha (α) = 0.978. This suggests that the instruments developed in the authentic assessment model have a 'very reliable' reliability level. This is in accordance with the criteria of the reliability level of Cronbach's Alpha values [9], as in Table VIII below.

TABLE VIII. RELIABILITY LEVEL

Cronbach's Alpha Value	Reliability Level
0.0 – 0.20	Less reliable
> 0.20 – 0.40	Somewhat Reliable
> 0.40 – 0.60	Simply Reliable
> 0.60 – 0.80	Reliable
> 0.80 – 1,00	Very Reliable

Analysis of the level of agreement among teachers in the assessment of the developed model, using Inter-Item

Correlation and Intraclass Correlation Coefficient. The results of inter-item correlation analysis to find out the level of agreement of the teachers can be seen in Table IX below.

TABLE IX. INTER-ITEM CORRELATION MATRIX ON IMPLEMENTATION OF ASSESSMENT

	T 1	T 2	T 3	T 4	T 5	T 6	T 7	T 8
T 1	1,000	,866	1,000	1,000	,866	,866	,866	,866
T 2	,866	1,000	,866	,866	1,000	1,000	1,000	1,000
T 3	1,000	,866	1,000	1,000	,866	,866	,866	,866
T 4	1,000	,866	1,000	1,000	,866	,866	,866	,866
T 5	,866	1,000	,866	,866	1,000	1,000	1,000	1,000
T 6	,866	1,000	,866	,866	1,000	1,000	1,000	1,000
T 7	,866	1,000	,866	,866	1,000	1,000	1,000	1,000
T 8	,866	1,000	,866	,866	1,000	1,000	1,000	1,000

Based on the Inter-Item Correlation Matrix table on the implementation of the assessment model, it can be seen that the value of the kappa coefficient (κ) among all teachers > 0.81 . Thus means that the teachers have a very strong level of agreement on the model of authentic assessment that has been developed. This is in accordance with the criteria of agreement level or Kappa coefficient value (κ) [10], as in the following Table X.

TABLE X. LEVEL OF AGREEMENT STRENGTH VALUE OF KAPPA COEFFICIENT

Nilai Kappa	Strength of agreement
< 0.20	Poor
$0.21 - 0.40$	Fair
$0.41 - 0.60$	Moderate
$0.61 - 0.80$	Good
$0.81 - 1.00$	Very Good

To know the level of agreement both individually and inter-teacher conducted analysis of Intraclass Correlation Coefficient The result of interclass correlation coefficient analysis can be seen in Table XI below.

TABLE XI. INTRACLASS CORRELATION COEFFICIENT

	Intra-class Correlation ^b	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	,847 ^a	,510	,996	45,267	2	14	,000
Average Measures	,978 ^c	,893	,999	45,267	2	14	,000

Two-way mixed effects model where people effects are random and measures effects are fixed.
a. The estimator is the same, whether the interaction effect is present or not.
b. Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.
c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Based on the Intraclass Correlation Coefficient table in the test of the authentic assessment model implementation, it is known that:

1) Kappa Coefficient Value (κ) Individual

The calculation of the practicality, effectiveness, and effectiveness of each teacher on the authentic assessment model in the problem-solving learning developed has the Kappa Coefficient Value (κ) = 0.847, it can be said that each individual has a 'very high' degree of agreement strong'.

2) Kappa Coefficient Value (κ) Average

The calculation of the practicality, effectiveness, and effectiveness of the teacher to the authentic assessment model in the problem-solving learning developed has the Kappa Coefficient (κ) = 0.978, it can be said that all teachers have a 'very high' agreement level.

IV. DISCUSSION

The development of an authentic assessment model in problem solving learning for the age of 5-6 years refers to High Order Thinking Skill (HOTS) learning, one of which is problem solving learning. Learning problem-solving has many advantages for students that is, sharpening the ability to think [11], improving skills in solving social problems [12], [13], improving math skills [14], [15], [16], improving interpersonal skills [17], [18], and had an impact on student achievement [19].

Developing a reliable assessment is also an effective way of early detection of child development [20]. The authentic assessment model is often used by teachers for mathematics learning with various media [21]. Assessment policies in learning and curriculum are divided into three: assessment approach to development, assessment approach to development and learning, and assessment approach to learning. [22]. In this study using approach assessment on learning.

The authentic assessment model developed consists of problem-solving activities, time allocations, assessment observation sheets, problem solving abilities, problem-solving criteria with all the tools to assess the development of students aged 5-6 years or are in kindergarten class B. Authentic assessment can be used as a clear foundation for the practice of learning. Even assessments can also be used to assess learning abilities in toddlers [23].

The product quality of a development is based on 3 criteria. These three criteria according are validity (validity), practicality (effectiveness), effectiveness (effectiveness) [3]. A product of development is called valid when it reflects a knowledge-state (state-of-the-art knowledge), or referred to as content validity. Meanwhile, the components of the product must be consistent with each other (construct validity). Furthermore, a product is said to be practical if teachers and other experts claim that the product can be used easily by teachers and students as users. Then a product is said to be effective if it gives results in accordance with the goals set by the developer.

1) Validity

A product of development is called valid when the components of the material should be based on state-of-the-art knowledge (content validity) and all components should be consistently linked to each other (construct validity). If the product meets these requirements it is considered to be valid. It means that the product material must be based on the knowledge area (content validity) and all components must be consistently related to each other (construct validity). If the product meets the requirements it is deemed valid. Development results are said to meet the validity of the content if the components of the developed material is correct and in accordance with the reference taken. While the validity of the construct is related to the consistency and

interrelationship of one component with the other components. Furthermore, in this study valid criteria for product development based on expert opinion with the following criteria.

- a) The results of expert assessment states that the product development and its supporting aspects have strong theoretical aspects
- b) The results of the assessment of experts stated that the product development and its supporting components are consistently interrelated and have a valid rating level.

2) Practicality

Practicality is that teachers (and teachers) consider the materials to be usable and that they are largely compatible with the developers' intentions, it means that teachers (and other experts) say product development can be used and easy for teachers and students in a way that largely matches developer intentions. For that aspect of practicality is associated with 2 things is whether the user declared the product developed easy to use. Then the realities of learning using the tools developed are good category. For this purpose a teacher's assessment sheet is used, and an authentication assessment of the authentic assessment sheet in problem solving learning.

3) Effectiveness

An effective learning tool is a learning tool which, when used, can deliver students to achieve learning objectives within a predetermined time. A product of development is effective when it is appreciated that the program learns and that the desired learning takes place, meaning that students appreciate the planned learning and learning program implemented according to the learning target. Effective learning tools provide a rich learning experience and optimum student learning outcomes. Learning tools which in this form of an authentic assessment instrument developed are considered effective if the teacher can provide an assessment of student progress quickly and accurately.

The development of an authentic assessment model in problem solving learning for the age of 5-6 years refers to High Order Thinking Skill (HOTS) learning, one of which is problem solving learning. The authentic assessment model developed consists of problem-solving activities, time allocation, assessment observation sheet, problem solving description description, problem-solving criteria with all the tools to assess the development of students aged 5-6 years or in the kindergarten.

Based on the calculation of Reliability Statistics, Inter-Item Correlation Matrix, and Inter-Item Correlation Matrix against the authentic assessment model in problem solving learning can be seen that:

- The authentic assessment model in this problem-solving learning, from the practical aspect has very good criteria, from the aspect of effectiveness has very good criteria, and from the aspect of implementation, has good criteria. The reliability level of this authentic assessment model is excellent. This means that this developed authentic assessment model has strong consistency, stability, and stability to assess problem solving learning activities for children aged 5-6 years.

- Based on data analysis it can be seen that the level of agreement among teachers regarding the practicality, effectiveness, and implementation of this authentic assessment model, has a very strong level of agreement. This means that teachers have a very strong agreement that the authentic assessment model developed is very practical, highly effective and this authentic assessment model can be carried out easily to assess students' abilities in problem-solving learning.

V. CONCLUSIONS

The conclusions in the study of authentic assessment model in problem solving learning are as follows: (1) The authentic assessment model developed is worthy of use because it meets the requirements of its practicality, effectiveness and effectiveness. From the practical aspect of having very practical criteria, effectiveness aspect has very effective criteria, and from aspect of implementation have good criteria and with reliability level is very reliable (coefficient value of Cronbach's Alpha (α) = 0.978). The teacher agreement level in assessing the aspects of practicality, effectiveness and implementation of the authentic assessment model in problem solving learning is very good (Kappa coefficient value (κ) = 0.847, and Kappa coefficient (κ) = 0.978); (2) The result of the ability assessment from 44 students in problem solving learning are: 19 students (43,2%) get score with Growing Very Good (GVG) criteria, 16 students (36,5%) with Growing Up Expectations criteria, 8 students (18, 3) with Start Growing criterion, and 1 student (2%) with Not Yet Growing criterion.

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