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Authentic Assessment Based Showcase Portfolio on Learning of Mathematical Problem Solving in Senior High School

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Abstract. The purpose of this research was to develop authentic assessment model based on showcase portfolio on learning of mathematical problem solving. This research used research and development Method (R & D) which consists of four stages of development that: Phase I, conducting a preliminary study. Phase II, determining the purpose of developing and preparing the initial model. Phase III, trial test of instrument for the initial draft model and the initial product. The respondents of this research are the students of SMAN 8 and SMAN 20 Makassar. The collection of data was through observation, interviews, documentation, student questionnaire, and instrument tests mathematical solving abilities. The data were analyzed with descriptive and inferential statistics. The results of this research are authentic assessment model design based on showcase portfolio which involves: 1) Steps in implementing the authentic assessment based Showcase, assessment rubric of cognitive aspects, assessment rubric of affective aspects, and assessment rubric of skill aspect. 2) The average ability of the students' problem solving which is scored by using authentic assessment based on showcase portfolio was in high category and the students' response in good category.

INTRODUCTION

This the change of paradigm in learning mathematic was initiated by National Council of Teacher of Mathematics in 1989 which developed Curriculum and Evaluation Standards for School Mathematics, where problem solving and reasoning become one of the main objectives in teaching school mathematics program. The change of paradigm in learning mathematic was followed by the development of education curriculum in Indonesia since 2004. Problem solving becomes an important focus in learning mathematics school started from primary school up to high school level. Mastering of each competency is always completed with basic competence which relates with problem solving ability.

The ability of mathematics problem solving is the ability to find the combination of a number of rules or laws of mathematics and to apply in mathematics problem solving which are not routine, such as structured properly, fairly structured, and unstructured manner either through the stages of understanding and presenting the problem, choosing or planning the solution, solving the problem according to plan, and evaluating the results to draw conclusion.

Some researches, as reported by PISA (2009) and TIMSS (2011), the Indonesian students' ability in solving mathematics problems is still low. Students in Indonesia are still struggling in finishing the challenging and requiring higher thoughts' mathematics problem [1]. The low ability of students in solving mathematics problems caused by the lack of the mathematics learning in classroom to associate the material with everyday life and less developed the ability of high thoughts. Other factors which also caused the lack of students' ability in solving mathematics problems are evaluation process which is still widely used test items to evaluate the students' ability in solving mathematics problems are still at low level [1].The test which is used to measure the achievement of mathematics problem solving is less challenging, the students feel very easy to solve it. These tests are less develop

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the high thought ability. The results obtained from the test was not reflect on the abilities of the student have mastered learned of mathematics.

One of assessment model that can be applied by teachers in teaching mathematical problem solving is an authentic assessment models such as portfolios. Portfolio assessment can improve assessment process by showing a level of skill and students' comprehension, supporting the goal of teaching, reflecting the change and the growth on the certain time; encouraging the reflection of students, teachers, and parents, there may continuity in education through by the time.

According to Surapranata [2] showcase portfolio is a kind of portfolio used to choose the best evidence done by student or group of students. Cole [3] described this kind of portfolio was the one which can be used by the students to display their works, a group of works or selected documents which prepared to be performed in front of the audience. In showcase portfolio, the students present their works in front of the teachers and the other students. At this chance, the students could elaborate their knowledge. According to Slavin [4] one of the most effective elaboration way is to explain the materials to others. Those materials fossilize on the memory and the rearrangement happened on cognitive aspect.

Authentic assessment based on showcase portfolio emphasizes performance assessment toward the problem solving or complex achievement. The problem solving presented by the students was the problem which is solved by using some concepts according to the material that has been taught. According to Arifin [5] the assessed aspects in showcase portfolio were: material's significance, comprehension, argumentation, responsiveness, and group cooperation. Material's significance is whether the selected material is truly important material and meaningful to be known and solved. Comprehension aspect is how well the students' comprehension level toward the nature and scope of the problem, policy, formulated steps. Argumentation aspect is whether the students had been good enough, systematic, and relevant in defending their argumentation. The responsiveness is how big the adaptation level between the responses given with the questions.

Sukmawati [6] shows that the ability of mathematic problem solving which is assessed by show case higher than the kind of documentation portfolio and work portfolio. In the research, the design and assessment rubric of showcase portfolio has not been standardized validated yet. To follow up the result of this research, it needs to develop assessment model of showcase portfolio in learning mathematic problem solving.

METHOD

The method use in this study was research and development method. The research and development cycle of Gall and Borg [7] which modified into four steps in the outline as follow. **Step One**: Collecting information through literary study as a preliminary study to comprehend the authentic assessment model based on showcase portfolio. **Step Two:** Determine the objective of development, arrange the preliminary draft model, and validate the content of preliminary draft model by involving evaluation and mathematics education experts. **Step Three:** Conducting a limited and broader tryout. Limited tryout was conducted for one class and focused on the process evaluation of implementation model. The second trial is the one on the initial product which is done widely by choosing one class, namely XI IPA 1 class at SMA Negeri 9 Makassar. **Step Four:** Do the validation model test and dissemination. Validation model test was conducted to obtain empirical data about the effectiveness model. This validation test conducted during one semester through experimental research with Group within Treatment research design.

Population of the research was the students of state Senior High Schools in Makassar registered in 2016. There are 23 Senior High School in the state of Makassar. The population is large enough so that sampling occurs. Multi stage random sampling (three stages) is used as sampling technique. Phase 1, took at random one school in Makassar, that was SMAN 8 and SMAN 20 Makassar. Phase 2, purposively chose one class that was XI IPA in the chosen school in phase 1. Phase 3, took randomly 2 classes of XI IPA which was chosen in phase 2.

Data collection method used in the research were observation, interview, document analysis, questionnaire, and test. Observation was done on preliminary research and trial model to gain the information about the implementation of model developed, Interview was done to gain information about the needs and teachers' responses towards the implementation of authentic assessment based showcase portfolio. The questionnaire used was students' responses towards authentic assessment based showcase portfolio.

The data analysis used in this research is qualitative and quantitative analysis. The data obtained through observation, interview and document analysis was analyzed qualitatively with data reduction, data presentation and verification of data or conclusion. The quantitative data analysis used descriptive and inferential statistics.

Descriptive statistic aimed to describe the students' ability in problem solving and students' response to the implementation of authentic assessment based-portfolio showcase.

RESEARCH FINDINGS AND DEVELOPMENT

The result of model development of authentic assessment based showcase portfolio covers: 1) stages in implementing authentic assessment based showcase portfolio, 2) Assessment Rubric of cognitive aspect, 3) Assessment rubric of Affective aspect, and 4) assessment rubric of psychomotor aspect.

Stages of the Implementation Authentic Assessment Based Showcase Portfolio

Stages of the Implementation Authentic Assessment Based on showcase portfolio of the initial product is divided into four stages, namely the preparation stage, portfolios showcase development stage, presentation stage, and delivery stage. Activities for each step can be seen in Table 1.

TABLE 1. Stages of Implementation the Authentic Assessment Based on Showcase

Step	Activity
Preparation stage	Teacher explains the mechanism of the development of portfolio showcase Teachers with students determine the purpose of developing portfolio showcase The teacher explains the evaluation techniques of portfolio showcase
Portfolio Showcase Development Stage	Teachers group students heterogeneously consisting of 3-5 people Teachers assign each group to develop a portfolio showcase Each meeting of each group was given a homework assignment by selecting the appropriate math problems or basic competencies indicators to be dominated in the study. Each completed learning the basic competencies or decree, each group chooses one of the problems and solutions that earn highest value (from the previous step). Each group was given the task (homework) make a display that contains: 1) a problem that has chosen, 2) concepts related to solving the problem, 3) steps of problem solving, 4) Conclusion, 5) write comment impressions and obstacles encountered in the preparation of the portfolio.
Presentation stage	Each group is present and publish their work. The other group give feedback and input group of presenters Teachers assess each group presentations based on the Rubric Assessment.
Delivery stage	Displaying the work of each group for one week at Classroom During the display of the students can ask questions to other groups related to the contents of the group renderer displays (after hours of learning). During the display of group having questions from other groups required to answer (after hours of learning)

Assessment Rubric of Cognitive Aspects

Assessment rubric of learning outcomes of cognitive aspects cover indicators which related to knowledge in mathematical problems solving with the basic competencies should be reached on learning. Assessment rubric of learning outcomes of cognitive cover indicators which were assessed with the weight for each proficiency level of indicator.

Weightying the quality to each indicator based on the complexity and urgency of the indicator. The first indicator, the ability to understand and present the problems with identifying information or facts in issue can be observed through the display results and how students explain what things are known in the problem and what is the question of the issue. Based on this indicator, the indicator is weighted 10%. The second indicator, the ability to choose or plan a solution can be measured through how to determine concept or formula that will be used in problem solving. This can be observed through the display contents, concepts or formulas written on the display, as the issue completion. This indicator is weighted 25%. The third indicator, problem solving skills with systematic steps. This indicator can be measured by how to solve the problem according to plan. Solving problems with measures of systematic and complete look at the contents of the student displays and how the group describes

troubleshooting steps used to clear at the time of presentation. The indicator is weighted 30%. The fourth indicator, the ability to answer the question of problems with precision and clarity can be measured by observing the time the students answered questions from members of the other group and also can be seen from their work that exist in their display. The indicator is weighted 20%.

Assessment Rubric of Affective Aspects

Affective aspects of the assessment rubric to measure attitudes and behavior of students for completing the portfolio task. The development of attitude's aspect indicator that will be assessed by using this rubric refers to alumnus's competence at the level of SMA/MA/SMK/MAK/SMALB/Paket C which has competence qualification, i.e.: Behavior that reflects the faith attitude, noble, educated, confidence and responsible in interact effectively with social environment and nature and also able to adapt as nation reflection in world interaction.

Assesment rubric of affective (behavior) study result including seven primary indicators. Indivator development based on behaviors which is constructed through authentic assesment process based on showcase portfolio i.e: behavior that formed and observed through assignment giving namely responsibility, enthusiasm and discipline. Attitudes that are resulted and observed through group assignment giving are cooperation and respect. The attitudes that are resulted and observed in the result presentation namely confidence, well manner, respect others' opinion, and enthusiastic. Each indicator and its assesment score can be found in Table 2.

TABLE 2. Assessment Rubric of Showcase Portfolio in Affective Aspects

Depth Level	General Criteria
	Seven major attitude indicator: 1. Demonstrate high sense of responsibility. 2) Glad to cooperate with group member, 3)Shows high discipline, 4) Shows high confidence, 5)Respect the opinions of others, 6)Polite in conveying ideas, 7) Enthusiastic in completing task
Excellent (4)	Student in completing their tasks, presenting the result of their works, answering the questions, and responding to their friends opinion, the student have to be able to show all of the prioritized behavior indicators (main behavior indicators) and some other behavior indicators in developing their value toward those behavior as a characteristic of themselves in thinking, speaking, communicating, and taking action.
Good (3)	Student in accomplishing their task, presenting their works, answering questions, and responding to their friends opinions, implemented the behavioral value as a part of self value and shown some of the major attitude value
Fair (2)	Student in accomplishing their task, presenting their works, answering questions, and responding to their friends opinions, shows some of the major behavioral value but shows no consistency.
Less (1)	Student in accomplishing their task, presenting their works, answering questions, and responding to their friends opinions, shows none of the major behavioral yet.

Rubric Assessment of Psychomotor Aspect (skills)

Assesment rubric of psychomotor (skill) study result is divided into three aspects i.e: material significance, presentation and making display. Each aspect holds the indicators that developed based on skill through authentic assesment showcase portfolio. Significance material aspect including: 1) ability to choose problem which is suitable with basic competence or indicator, 2) ability to choose problem which is suitable with material learned and 3) ability to choose interesting problem, contextual and complex. Presentation indicator covers: 1) ability to present their work and 2) ability to respond question. Making display indicator includes 1) display completeness and 2) display creation. The rubric skill aspect assesment in showcase portfolio assesment could be found in Table 3.

TABLE 3. Assessment Rubric Portfolio Showcase Psychomotor Aspects

Rated aspect/ Indicator	Option	Score
The significance of material The ability to choose problem appropriate with basic competence or indicator	The problem appropriate with the basic competence and indicator The problem appropriate with the basic competencies and less in line with the indicator. The problem was unrelevant to the basic competence and less appropriate to the indicators The problem is unappropriate with the basic competence and unappropriate with the indicator	4 3 2 1
The ability to choose problem appropriate to the material they have learned.	The problem is very appropriate with the material that has been taught The problem in appropriate with the material that has been taught Problem less appropriate to the material that has been taught The problem is unappropriatewith the material that has been taught.	4 3 2 1
Presentation The ability present the display	The sound is clear and the presentation is very systematic. The sound is clear and the presentation is systematic The sound is clear and the presentation is less systematic Sounds less clear and systematic	4 3 2 1
The ability of responding the questions.	Answer questions correctly and very clearly Answer questions correctly and clearly Answer questions correctly and less very clear Answer questions with less precise and less clear	4 3 2 1
Making display Completeness of the display contents	Very complete display contents:1) issue, 2) concepts related with solving the problem, 3) steps of problem solving, 4) Conclusion, 5) write comment impressions and obstacles encountered in the preparation of portfolio The display contents: 1) problems that have been chosen, 2) concepts related with solving the problem, 3) steps of problem solving, 4)Conclusion, The display contents: containt only 3 following elements: 1) issue 2) concepts related with solving the problem, 3) steps of problem solving, 4) Conclusion, 5) write comment impressions and obstacles encountered in the preparation of portfolio The display contents: contain less than 3 following elements: 1) issue 2) concepts related with solving the problem, 3) steps of problem solving, 4) Conclusion, 5) write comment impressions and obstacles encountered in the preparation of portfolio.	4 3 2 1
Creating Display	Very attractive, color composition, letter type and placement of the images are very good Interesting, color composition fletter type and placement of images are good Interesting, color composition, letter type and obviously uncomplete with images Using of letter rather small and less color composition	4 3 2 1

The ability of Mathematics Problem Solving and Students' Response toward the Authentic Asessment based on Showcase Portfolio

The average ability of the students' problem solving which is scored by using authentic assessment based on showcase portfolio was 72.6 with the standard deviation 9.51 and 70% students who got score high and very high category. The attainment of high problem solving ability which is scored by Authentic Asessment based on Showcase Portfolio, supported by Widodo's research [8] that the learning which applies Showcase Portfolio trained the students dare to make decision which related to the concept that has been learned, skillful in formulating the steps which are used to solve the problem.

The students' response to the authentic assessment based-portfolio showcase, there were 85,3% of students who were agree and strongly agree to 23 positive statements in questionnaire. Students' response on authentic assessment based-portfolio showcase is very good. Every student is actively involved in the development or manufacture of displays. Each member collaborate and enthusiastic to contribute to their group. Slavin [4] elaborated the collaborative activities among the students boost behaviour development rather than the individualized students. Those who have artistic talent, were looking for the color combination and template to create the displays. Those who have high mathematics ability, were discussing to find the mathematics problems and associated it in daily life. They are looking for an interesting theme and deals with concepts that have been learned. One of the themes that are interesting is "Pabrik Gula Takalar". This theme associated the subject of Statistics with the mean score, median and mode. They are enthusiastic to show their best work. According to Jensen [9] the students get motivated when they demonstrate their power. The students with the higher motivation on the learning will get the optimal learning achievement.

CONCLUSIONS

Results of model development of the Authentic Assessment Based on Showcase Portfolio namely: Stages of the Implementation Authentic Assessment Based on Showcase Portfolio covers four stages, namely the preparation stage, portfolios showcase development stage, presentation stage, and delivery stage. Assessment Rubric of cognitive aspects covers five indicators of assessment, namely: 1) the ability to understand mathematical problems by identifying information is in trouble, 2) The ability to define the concept or formula to be used in solving the problem, 3) The ability to solve the problem with the systematically and complete steps, 4) Ability to answer questions on the issue appropriately, and 5) The ability to formulate conclusions of troubleshooting. Assessment Rubric of affective aspects have four levels of assessment, namely: excellent, good, fair, and less. Selection level this assessment is based on the level of practice of the seven indicators of the following manners: 1) show a sense of responsibility, 2) is pleased to work together with members of his group, 3) Shows high discipline, 4) show confidence, 5) respect the opinions of others, 6) Polite in conveying ideas, and 7) enthusiastic in completing the task. Assessment Rubric of psychomotor includes three aspects: 1) the significance of the material which the indicator is the ability to choose the issue in appropriate with the basic competence and suitable to the material, 2) presentation indicator is the ability to present the results of their work and ability to respond to questions, 3) create a display that the indicator is complete display contents and creations on display. The average ability of the students' problem solving which is scored by using authentic assessment based on showcase portfolio was in high category and the students' response in good category.

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