Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.4, No.13, 2013

Developing an Authentic Assessment Model in Elementary School Science Teaching

Siti Fatonah [1], PujiatiSuyata [2], Zuhdan Kun Prasetyo [2]
1.State Islamic University "Sunan Kalijaga" Yogyakarta
2.Yogyakarta State University

Abstract

This study aims at developing a model of authentic assessment, which can reveal the students' creativity and the potential , develop their character and fulfill the requirements of a good assessment. The developed assessment model instrument consists of three kinds: (1) performance assessment, which consists of tasks and assessment rubrics; (2) assessment of the character of the students and its assessment criteria; and (3) assessment questionnaire of the scientific attitude. The problems formulated in this study are: (1) What is the procedure in developing authentic learning assessment model of SD/MI grades IV and V in this study? (2) What is the quality of the product?

The Authentic Assessment Model (AAM) in teaching science at elementary schools (SD/MI) in this study was developed by using the Research and Development method based on the model of learning development by Borg & Gall, which was modified. The procedure was divided into three stages of development, namely the planning stage, development stage and trial stage. The subjects of the try out were student of grades IV and V in eight elementary schools (SD / MI) in Sleman and Magelang. The data analysis techniques used were qualitative and quantitative. The qualitative approach was used to analyze the input from experts and teachers and, the quantitative approach was used to analyze the results of experts' validation using Aikends validity, inter-rater reliability using Kappa formula, and reliability of the instrument using the Alpha formula , and factor analysis using SPSS and Lisrel.

Conclusions of this study are as follows: (1) The procedure of the authentic assessment model development follows the stages of research and development. The stages include presurvey research, problem analysis, analysis of curriculum, research studies, experts' consultation, and drafting a model. The stages of development include experts' validation, reliability test, materialized test, teacher training, limited trials, and expanded trials. The try out testing was carried out in eight elementary schools in Sleman and Magelang (2) The quality of the developed products (a) the developed authentic assessment model has a valid criterion as a model, in terms of aspects of the task, rubrics, authentic assessment principles, learning activities, and teaching implementation, and all these aspects meet a very good criterion and can be used without revision. (b) The instruments of AAM in teaching science classes IV and V have met the criteria as a valid, reliable, objective, systematic, and practical instrument.

Keywords: authentic assessment, teaching science, elementary schools

A. INTRODUCTION

Traditional assessment in this case written test (paper and pencil test) which has been widely used in science learning becomes very narrow meaning, because it is just to get the value or score that is almost entirely based on the results of completed multiple choicetests. Research has shown that there is very little relationship between the test scores to measure students' ability to use knowledge and skills in practical the context of laboratory work or performative work. Therefore the written test has been widely criticized for emphasizing only on memory and routine calculations or reasoning form of the more complex skills that actually used in the search for knowledge (learning), so that the written test (paper and pencil test) can be called "non-authentic"(http://academik.brooklyn.cuny.edu/education/ jlemke/courses /alt.asmt/htm from the article" Issues in Testing and Assessment: Science Education", accessed on March 22, 2012).

The written test produces relatively reliable individual values (steady). The traditional assessment methods generate standardized tests norms in a large test population. Format items tend to be very similar (eg, multiple choice tests) on the given standard conditions (alloted time, the rules which prohibitstudents from communicating each other, taking notes or bringing other aids, etc.). Athough this approach can produce a reliable value on other subjects, but it can only produce a superficial assessment, compared to the capabilities in real life or with what is done by scientists (http://academik.brooklyn.cuny.edu/education /jlemke /courses /alt.asmt/htm).

In 1989 the journal Phi Delta Kappanpublished P.Grant Wiggins' writing that talks about authentic assessment. Since then, education experts and practitioners began busily talking about the new alternative measurement of learning outcomes. What is meant by alternative test is the alternative test of standardized testing. The experts in teaching and designing curriculum actively participate in such discussions. Gronlund

(1998:2) also argues that in recent years (the 1990s) there was a reaction against the over-emphasis on the written test. There were some criticisms againstto the written test, it was necessary to put more emphasis on authentic assessmentin the form of real life tasks.

Competency-based assessment is an assessment conducted to determine the person's ability, competence is the individual attributes of learners, thereforeit is an individualized competency-based assessment. To ensure that the access is actually real individual competencies (the learner), then the assessment should be done in an authentic (as real as everyday life). Authentic assessment isan on-going or continuous process, therefore, this assessment should be carried out simultaneously when the learning process takes place. Thus the competency-based assessment is authentic , ongoing, and individual. ZainulAzmawi defines authentic assessment as performance assessment processwhich are multidimensional to behavior in the real situations (like-life performance behavior).

Myron Attkin, et al (2001: 4) differentiate the assessment into 3, i.e assessment for learning (formative), assessment of learning (summative) and assessment as learning (self and peer assessment). Based on the above opinion assessment is not only to measure the learning process and learning outcomes, but it is also to improve the learning process, to motivate students and to diagnose students' weaknesses. Assessment for learning is implemented integratedlyin the learning process and it is used to assess anything related to the learning process, including to facilitate students to learn. Formative assessment is conducted periodically in the overall instructional unit and become an integral part of learning .Formative assessment produces feedback to students on their learning progress so that they can plan their further learning activities. Formative assessment also generates feedback for teachers related to the effectiveness of their teaching.

Most teachers are not interested in the authentic assessment or the performance assessment and do not want to use it. In general, they argue that to conduct an authentic assessment spends more time and energy and it is too expensive. Moreover, authentic assessments need to be designed properly. The opinion is not correct (Nuryani, 2009:2). Assessing the performancethrough writtentest is invalid because it does not measure what should be measured. If the performance assessment is done to some students and not designed well then the result can not be justified, because it is inconsistent. Thus perhaps it will be unfair to assess the students' performance. According to Wiggins (1995:2-3) designing and implementing performance assessment is very efficient, because it is steady or consistent (reliable), not expensive and do not waste time. Standards can not be made without doing performance-based assessment.

Based on preliminary research data (SitiFatonah, 2011:18), in various districts (Muntilan, Salam, and Dukun) Magelang district, the assessment was done in science learning SD/MI using written tests, such as the late replay subjects, general tests and home assignments (100%), while the performance assessment and self-assessment has not been done (0%). Likewise for project assessment and portfolio assessment, all teachers has never used the authentic assessment. The preliminary results showed that the assessment system developed in SD/MI in Magelang district was not in accordance with the assessment system in the Competency-Based Curriculum. Performance assessment and self-assessment had not been done by the teachers, but the curriculum for science subjects demandsteachers to conduct performance assessment, especially in laboratory activities. Without conducting performance assessment, itis difficult for teachers to evaluate students'basic competence, especially concerning the ability of science skills process and scientific attitudes. It also shows that the teaching methods used are still dominated by lecturing , question and answer, questions and exercises, while the method of demonstration, laboratory work (lab) get a little portion.The result can be used as a reference for developing alternative learning strategies and authentic assessment models in teaching science , especially at the level of SD/MI.

In practice it seems that there is an incompatibility between teaching science at the elementary school and the assessment used. The common assessment process conducted by the teachers is only to describe the students' mastery of concept , as the result, the goals of Science Subjects are not achieved yet and are not portrayed as a whole (SitiFatonah, 2011:179). Therefore, it is necessary to have an evaluation technique that is able to cover all aspects of the product and the process, i.e by applying authentic assessment. Although authentic assessment is very important, but it is based on field observations (SitiFatonah, 2011: 43), the teachers of MI/SD find it difficult because they do not have a model of authentic assessment with its usage guidelines,. Therefore, it is necessary to develope an authentic assessment models with its guidelines. The objectives of this research and development are : 1) to develop a product in the form of a model of authentic assessment in teaching science to students of elementary schools (SD/MI) grade IV and V, which met the requirements of a good assessment, completed with its guidelines, 2) to describe the procedure ofdeveloping authentic assessment in teaching science to students of elementary schools (SD/MI) grade IV and V and 3) to describe the characteristics of the final product of authentic assessment models in teaching science to students of elementary schools (SD/MI) grade IV and V as informative report. Based onthe three research objectives above there are seven research questions, namely: 1) What is the objective conditions of the implementation of

assessment in teaching science to students of elementary schools (SD/MI) grade IV and V recently? 2) How to develop authentic assessment model in teaching science to students of elementary schools (SD/MI) grade IV and V? 3) How is the quality of authentic assessment models in teaching science as productthis research snd development? 4) What are the characteristicsof authentic assessment model as the product of this research and development in teaching science at elementary schools ? 5) How is the effectiveness of the model of authentic assessment in teaching science as the product ofthis research and development? 6) Does the usage of authentic assessment models influence students' character building? 7) What are the factors inhibiting and supporting the successful implementation of authentic assessment models in teaching science to students of elementary schools (SD/MI) grsde IV and V?

B. Research Methods

The procedures to conduct this Research and Developmentwere divided into three stages, i.e: planning, design & development, and try-out modeling. The procedureof AAMdevelopment in teaching science in SD/MI was done through the following steps.

1. Planning

At the planning stage, there are 5 steps, namely: a) analyzing the needs in the development of authentic assessment models in teaching science SD/MI, with the objective condition assessment study conducted by the science teachers MI/SD for this, b) identifying the characteristics of learners (identify learner characteritics), c) creating the planning documents (produce a planning document) regarding materials and other things required to make the product, d) determining and collecting resources (determine and collect resources) such as from books, internet, school, photos, videos, etc., and e) brainstorming (conduct initial brainstorming) is holding discussions with teachers of SD/MI.

2. Design & Development

At the design stage, the activities undertaken included authentic assessment modelling, validation experts and users (teachers), readability test, teacher training, testing and evaluation models.

a. Preparation of Authentic Assessment Model (AAM)

AAM preparation included modeling, validation specialists, and train teachers. The model consisted of instruments: lesson plans, student work sheets, assessment of performance for class IV, observation sheets of scientific attitude to class IV and V, science process observation sheet of science process skills for class V, observation sheet of teachers' activities in the classroom, and the effectiveness of AAM questionnaire. In addition, scoring guidelineswas also arranged for each instrument as well as the use of AAM guide books in the classroom.The next stepwas the validation of AAM activities which had been arranged in the previous stage by involving the experts of education science, measurement and testing , and experienced science teachers (senior teacher). The revised model validationwas re-validated by experts. Validation activities by the experts and revision activities by the researcher continued until the AAM prototype was ready to be tested in the classroom. Once the prototype models validated by experts, the next activity is to train teachers to use AAM in the classroom.In order to practice it the teachers should use guidebooksto conduct an authentic assessment.

b. Readability Test

Legibility trial conducted in three forms : seminar, informal discussion, and practices in the classroom. Seminar was held on Saturday, May 26, 2012 and it was attended by MI science teachers, lecturers, and students. Informal discussion with MI science teachers was held on Saturday, June 2, 2012. Practices in classroom activities were carried out 2 times,i.ein the class of Science and Teaching Science at Islamic Elementary School Teachers Study Program of Tarbiyah and Teaching Faculty in UIN Sunan Kalijaga Yogyakarta, on Monday, June 4, 2012. The practice of students activities is conducted to determine the legibility of the scenarios that have been designed. Based on the results of this practice there was some revision on the learning scenario in order to make a lesson plan. The result of readability test obtained that the lesson plan can be put into practice, duties/ tasks within performance can be implemented in a specific time.

The second legibility test was conducted at MI Darul Huda Sirahan Sleman and SDN, this was done to re-check the readability of the learning scenarios, lesson plans and instruments of authentic assessment. The result of this readability test showed that not all of lesson plans has not been all practicable, tasks/task performance could be done only by a few students. Observation sheets of students performance were only some completed,because it was too many items, so they needed to be revised.

c. Validation Experts and Users

Validation experts and practitioners in this study was conducted by the Focus Group Discussion (FGD) and it was conducted in 2 phases, namely pre-limited trial and after/post limited trial. The number of experts and users involved in this activity was based on the needs of research. Validation is done to provide assessment, advice and improvement on models that made by the researchers through using evaluation sheets. The experts consisted of 5 people with science education background, and the users consisted of 12 science teachers.

d. Train the Teacher

There were 12 science teachers trained in this program.They were from MI Darul Huda, MI MaarifSirahan, SD Muh. Sapen, SDN Sirahan II , SDN Sedayu I, MIN I Tempel, SDIT Zaid bin Tsabit, and MI Tempel. This training program was carried out in 1 day.The researcher explained the procedures and principles of conducting AAM to those teachers before they implemented and tested the usage of AAM to teach science in their classrooms.

e. Try-out/Testing the product

Testing the product was conducted in oreder to determine the suitability or the relevance between theoretical concepts and the empirical data which discussed separately in the following testing product..

f. Evaluation

Evaluation of activities was carried out in two stages, i.e evaluation during the process of testing product and evaluation after the testing product. Evaluation during the process of testing product was done to get better improvement of the model and in the effort to help students by giving them feedback. In regard to the information obtained from instruments like lesson plan, performance tasks, observation sheets, and student self-assessment became the main reference.The teacher should arouse students' responsibility,awareness and motivation in learning by giving assistance based on their needs.

Evaluation after testing product was done to determine if there was an increase in the quality of student learning. For this purpose, the reseracher used the data during the testing process,i.e the results of repeated measures .Based on the description of the stages in the development of methods Borg and Gall, it is known that the development of this model is practical and easy to implement in the context of the classroom, according to the underlying principles of authentic assessment, and efficient in terms of saving the time.

3. Phase of Testing Model

Testing model or product according to Borg and Gall is a very important part in the Research and Development, which is performed after the designing of the product finished. Testing model or product aims to determine whether the product is fit to use or not. Testing model / product also served to what extent the product can achieve the learning goals and objectives. Good models or products should meet two criteria: the criteria of learning (instructional criteria) and performance criteria (presentation criteria). The tests were done 3 times: (1) Test-specialists (2) limited test conducted on a small group of users of the product, (3) field testing to test the quality of the developed model or product which is empirically valid .

Designing the development of assessment model generated during the development stage of a prototype model of the semi-perfect . The prototype is a reference for the establishment of an advanced stage of development of the prototype of designed product.

Testing model phase included testing which was continued with the evaluation, revision, testing experts and users. The goal of this stage is to validate the stabilized prototype and the authentic assessment model in teaching science. Therefore, there were some instruments and a variety of devices to develop in this research. . The flow model of research and development on the authentic assessment in teaching science is shown in the conceptual schema in Figure 1.

The figure 1 shows that the pre-development phase required needs analysis which was done in the preliminary research to obtain information on the assessment of teaching science as the basis for determining the development of authentic assessment model. Stage of development obtained tentative assessment model to develop, and the test phase of the development model of the final product obtained authentic assessment model of teaching science. In the testing model phase, it will be described more detail in the testing product.

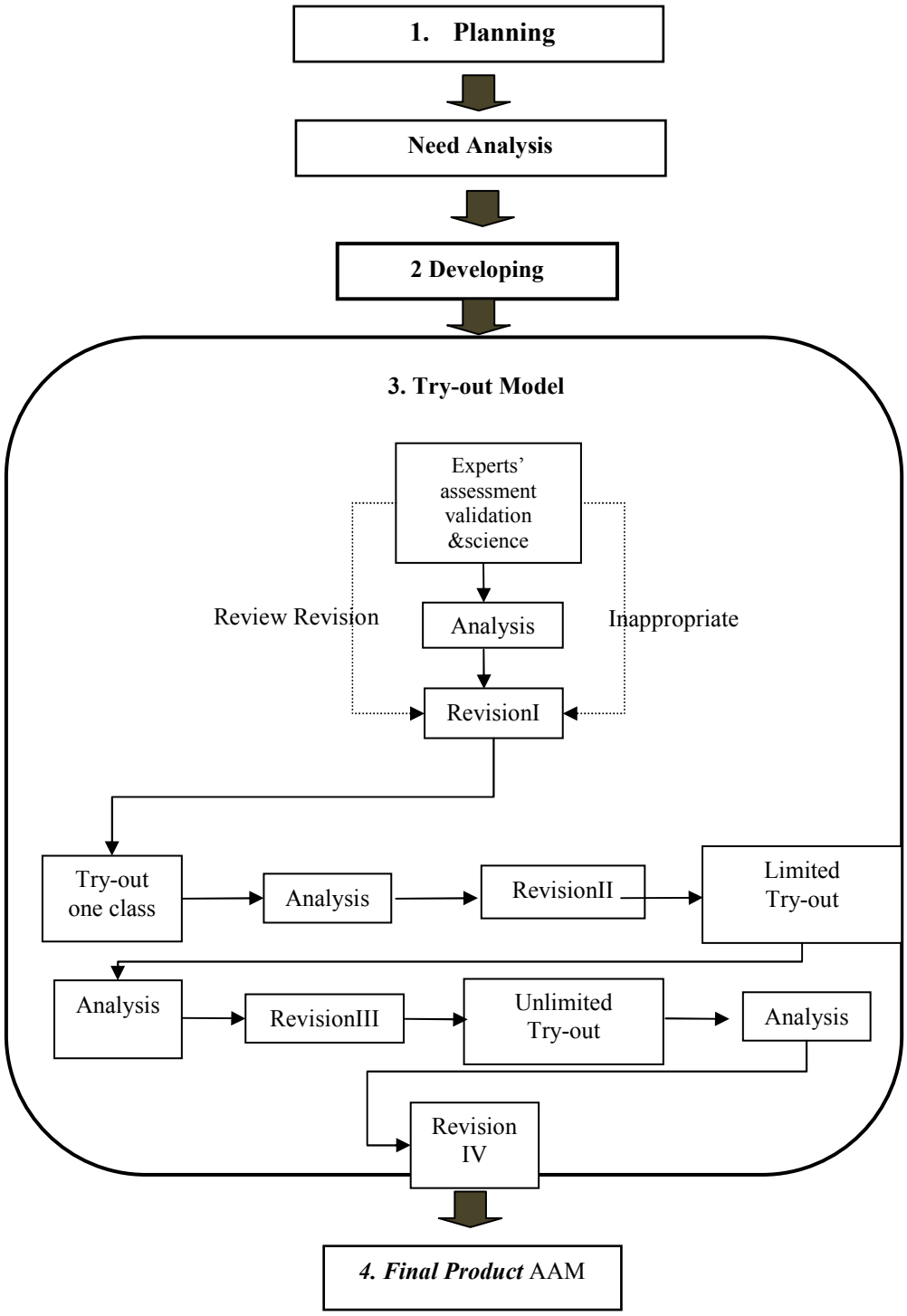


Figure Developing Procedure AAM
Adapted from Dick & Carey (2005) and Borg & Gall (2003)

C. Results and Discussion

Try-out data presented in this chapter is the data obtained after the research stage i.e the stage of development , a series of procedures in bith stages which can answer the first formulation of the problems. For pre-development activities, the researcher has developed a model of assessment sheets which were validated by experts in education and science assessment. As the result, the assessment sheets were valid and applicable used with a litlle revision.

Then,the assessment sheet is used by the experts to assess/validate AAM. Expert validation in this study was conducted through Focus Group Discussion (FGD) and it was conducted in 2 phases, namely pre-limited trial and after/post s limited trial. Assessment of each instrument models was done by the same person to get consistency and to facilitate expert in evaluating it. Assessment was conducted qualitatively and quantitatively. Qualitative assessment was done by providing input/comment in the form of a note directlyy, while the quantitative assessment was done by using the score with the scale of (1, 2, 3, and 4) for each item. Assessment was done by 3 people who had educational background in science education and educational evaluation.

Instruments sheets that were evaluated by experts then were revised . Pre-limited trial performed by an expert and measurement science education. After limited trial/testing, the results were analyzed by the expert of assessment, and carried out repair/revision based on input which was provided by the expert. These assessed aspects are duties/tasks, rubrics/assessment criteria, principles of authentic assessment, learning activities, the implementation of AAM in the classroom, and the general assessment of AAM. The assessment criteria used were: bad , fairly good, good and very good . The summary of the results of the assessment done by rater (assessor),were presented in Table 1. Shown at the table it appears that the pre-limited trial , and after/post - limited trial, the three assessments showed good results in all aspects . In the general assessment instrument evaluation models on a limited trial/testing can be used with slight revisions, and, it can be used without revisions after limited testing/trial.

Table 1
Authentic Assessment Model Result

No	Aspect assessed	Validation Result	
		Pre-limited Try-out	After Limited Try-out
1	Task	Good	Good
2	Assessment Criteria	Good	Good
3	Assessment Authentic	Good	Good
4	Learning Activity	Good	Good
5	Implementation AAM in Classroom	Good	Good
6	General Assessment	B	A

Explanation:

A = can be used without revision
B = can be used with slight revision
C = can be used with a lot of revisions
D = can not be used

Validity of the data analysis by experts was conducted by using the formula Aikend (Anwar, 2012:34). This analysis was used to determine content validity. The summary of the results of the validity analysis Aikend was shown in Table 2 below. In conclusion, according to the experts , this authentic assessment models had the calculation validity Aikend which ranged from 0.666 to 1. There were 4 items that have validity under 0.7 so that they can be considered invalid. The summary of results of validation treated by experts was shown in Table 2, while the inter-rater reliability assessment by experts was displayed in Table 3.

Table 2
Treatment Instrument Validation Result by Expert

NO	V Aikends	AAM	Lesson Plan	AAM Affectivity
1	Before Try-out	4 invalid 25 valid	2 invalid 7 valid	2 invalid 8 valid
2	After Try-out	2 invalid 27 valid	0 invalid 9 valid	2 invalid 8 invalid

Table 3
Treatment Instrument Reliability by Expert

NO	KappaCoefficient	AAM	Lesson Plan	AAM Affectivity
1	Before Try-out	0.615	0.65	0.615
2	After Try-out	0.737	0.835	0.737

Instruments in addition to validation by experts, was also validated by the teacher. Based on the results of teacher assessment in science learning AAM has been developed to meet the requirements of a good instrument, that is valid, reliable, objective, systematic and practical, so that it can be said AAM is effective for using. The results validate the effectiveness of AAM by the teacher can be seen in Table 4, whereas the validity of the results by teacher lesson plans can be seen in Table 5.

Table 4
AMM Affectivity Validation Result by Teacher

Aspects assessed	Assessment Result Mean	Explanation
Validitas	3.416	Valid
Reliability	2.68	Reliable
Objective	3.75	Objective
Systematic	4	Systematic
Practical	3.81	Practical
Totality	3.53	Effective

Table 5
Lesson Plan Validation Result by Teacher

No	Aspects assessed	Validation Result			
		Limited Try-out		Extensive Try-out	
		Mean Assessment	Explanation	Mean Assessment	Explanation
2	Lesson Plan	3.2	Good	3.6	Very Good
3	Language	3.4	Good	3.7	Very Good
5	General Assessment	B		A	

To determine the feasibilityof AMM-class observation was done by two observers. The Implementation of the observation can be seen in Table6, while the inter-observer reliabilitycan be seen inTable7.

Table 6
Extensive Try-out Materialize Observation Result

Try-out Place	% Materialize	Inter-rater reliability		Explanation
		Pert 1	Pert 2	
SD MuhSapen	100	1	0.93	Materialize and Reliable
MI MaarifSirahan	93	1	0.93	Materialize and Reliable
SDN Sedayu	93	1	0.93	Materialize and Reliable

Table 7
AAM Materialize Inter-rater Reliability on Classroom

Try-out Place	% Materialize	Inter-rater reliability					Explanation
		Meeting					
		1	2	3	4	5	
MIN Tempel	99	1	1	0.93	1	1	Materialize and Reliable
SD IT	94	1	0,93	0.87	0.93	0.87	Materialize and Reliable
MI Tempel	99.6	1	1	0.93	1	1	Materialize and Reliable

Based on the implementation of AAM in teaching science inextensive testing, reliability analysis of each data collection instrument consisted of a performance assessment instrument for class IV, instrument performance observation sheet for class V, scientific attitude questionnaires and character observation instruments. The results of the calculation of the reliability of each instrument were shown in Table 8.

Tabel 8
Data Collecting Instrument Reliability Result

No	Instrument Name	Alpha Reliability
1	Performance Instrument for material classIV about heat	0.832
2	Observation sheet Instruments for performance material in testing vitamin C	0.794
3	Scientific Attitudes Questionnaire Instruments	0.832
4	Character Observation Instruments	0.789

Based on the objectives and research questions and the study to the results and the discussion of research regarding the development models authentic assessment in teaching science at eementary schools (SD/MI), then the findings of research are:

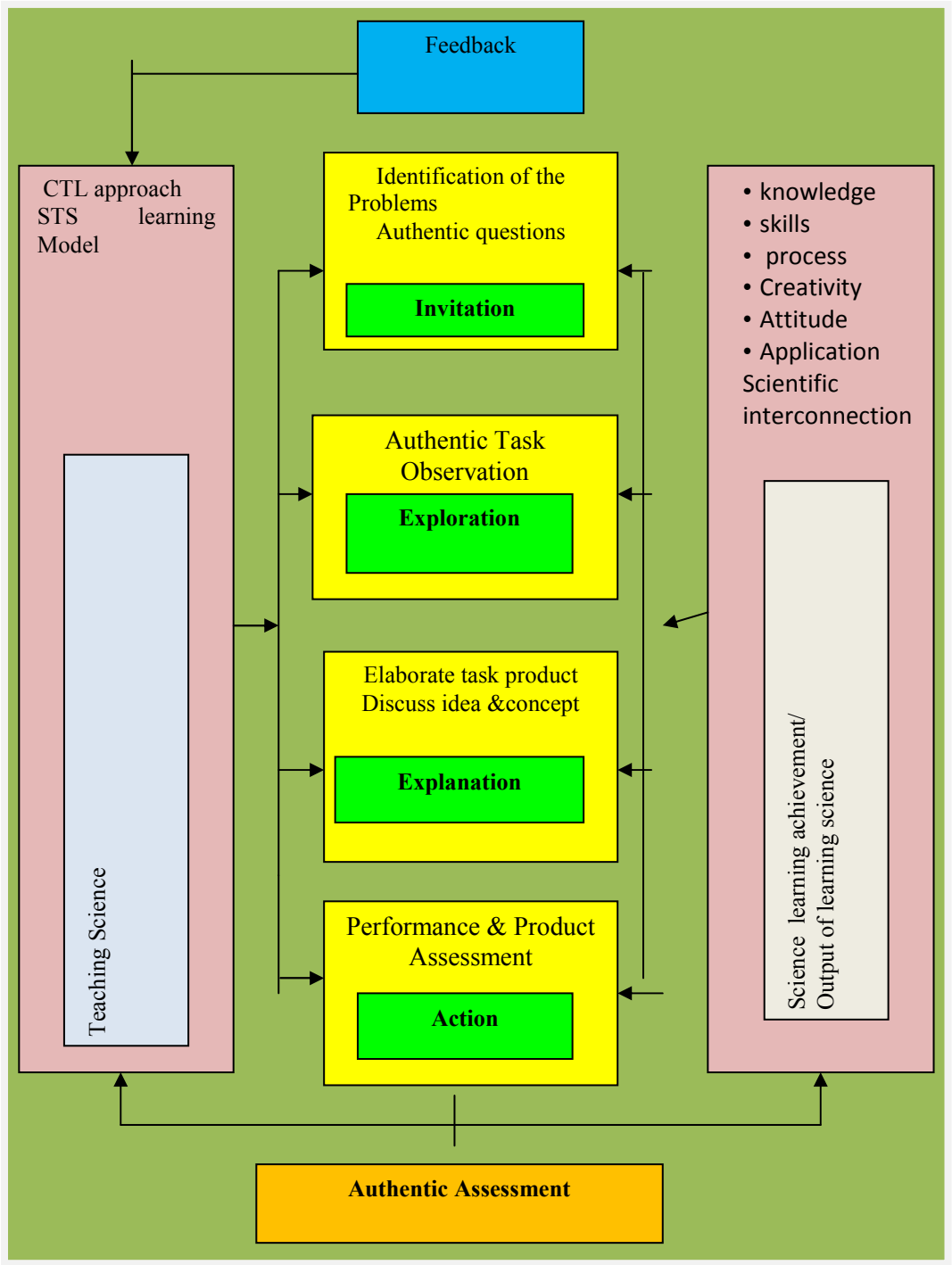
1. Objective conditions of teaching science at elementary schools (SD/ MI) :

a. The condition of teaching science at elementary schools (SD/MI) used the conventional approach. There was one direction communication which was dominated by the teacher. The lesson plans have not become reference in implementation of teaching and learning process. The learning assessment was still dominated with cognitive aspects. The assessment was conducted by written test/ paper test. Only a few teachers who carry out the learning process assessment.

b. Teachers' perception toward assessment in teaching science is very good and they have high motivation to perform innovation to the implementation of teaching science and assessment, and supported with students'

high learning interest who use assistive devices nature tangibly which exist in the students' environment .

Figure 1



Authentic Assessment Model

2. Development Process Model

Authentic Assessment Model (AAM) in teaching science at elementary schools (SD/MI) in this study was developed by using the method of Research and Development, based on the model of learning development Borg & Gall. The stages include pre-survey research, problem analysis, analysis of curriculum, research studies, expert consultations, preparation of prototype models. Stages of development include expert validation, readability test, materialize test , teacher training, limited trials, and trials expanded.

3. Quality AAM

a. Based on the model validity test conducted by experts, AAM in teaching science to students of elementary schools (SD/MI) has developed criteria as valid model, in terms of aspects of the task/assignment, rubrics, principles of authentic assessment , learning activities and implementation of learning. All of these aspects have a very good criteria and they can be used without revision.
b. Based on test validity which was done, all instruments of AAM in teaching science met the criteria as a good instrument. To test the performance of classroom observation instruments IV, the results of the content validity of this instrument is valid. To test the performance of classroom observation instrument V is based on the validity of the test is valid. For the attitude scale assessment questionnaire instrument validity test is considered invalid by the 22 attitude statements. For character observation instruments, 8 statements were invalid.
c. Based on the results of the reliability test, all of AAM instruments in teaching science to students of SD/MI developed in this study met the criteria as a good instrument in terms of reliability. The classroom observation instrument for grade IV performance has reliability 0.794. This instrument is considered reliable category. The classroom observation instrument for grade V performance has a reliability of 0.834, It is also considered reliable category. For students of character observation instruments, had a reliability of 0.82, including reliable. For scientific attitude questionnaire instrument,it had a reliability of 0.94, so it is said reliable criteria.
d. Based on observations of AAM feasibility to implementation in the classroom, during the limited testing and extensive testing, the results obtained enforceability of the average greater than 90%, the inter-observer reliability ranged from 0.87 to 1. Therefore AAM in teaching science at elementary schools (SD/MI) can be well performed , for each test.

4. The main characteristics of AAM

Characteristics of AAM in teaching science at elementary schools(SD/M), which was developed in this study are:

a. To build a harmonious relationship, sharing responsibility between teachers and students
b. To implement the assesssment integratedly with the learning process
c. To put emphasis on “how to learn” in oder to make learning become more meaningful and realistic for students and teachers

The benefits of implementing AAM in teaching science :

a. To develop a scientific attitude and performance of students.
b. To diagnose learning difficulties or students’misconceptions towards learning, so that they can be given help and guidance.
c. To obtain sufficient information which is in accordance with the real problems faced by students and teachers.
d. To establish good communication between teachers and students, and students with students, build awareness and responsibility in a professional teacher through reflection on the outcome of each meeting, developing the potential, creativity, motivation, self-confidence and independence.
e. To encourage teachers and students to make continuous improvement to and i.e to improve the quality of teaching and learning continuously.
f. Foster mutual trust between teachers and students in the assessment.

AAM weaknesses in teaching science :

AAM is designed based on the principles of learning assessment for, but there are some principles that have not been done in this model. The limitations of this assessment model are as follows :

a. Application of peer assessment was not done, so the obtained information only came from the students and the teachers.
b. This model can only be successfully used by teachers who have good preparations , and who were trained well on AAM.
c. Subjectivity possibly occurs in this assessments.
d. It takes a lot of time for teachers to put underlying principles and strategies into practice.

5. The Effectiveness of AAM

Based on the analysis of questionnaires filled out by teachers and the implementation of AAM in teaching science, this assessment model is considered effective because it is valid, reliable, objective, systematic and practical.

6. The influence of implementing AAM to students' character building

Implementation of AAM in science learning provide a positive and significant influence on the students' character building, evidenced by the significant differences of the student's character in the class using AAM and the students'character on the class using conventional assessment.

7. The supporting and inhibiting factors that may affect the implementation of authentic assessment models in teaching science are as follows:

a. Supporting factors: (1) the ability of teachers to create a conducive,democratic,fun learning environment and to consider students as a subject of study, and the teacher acts as a facilitator, (2) the willingness and motivation of the teachers to change their views and ways of teaching in which the conventional assessment implemented in teaching science, (3) the willingness of teachers to use their time optimally for desing lesson plans and assessments, and to implement this model seriously, so that every step of learning that has been designed, especially in terms of delivering competencies, motivating students and guiding students to have experiment and to conduct group discussions or class discussions, (4) Teachers' skills in stimulating teacher and encouraging students to express opinions, ideas, or asking questions, explaining the findings, and providing empirical facts, formulate conclusions and find relationships between problem aspects. (5) positive attitudes of the students towards science subjects (6) high students' enthusiasm to the AAM learning process because the climate created by the teacher in the classroom is more integrative and contextually related to the real-life environment from day-to-day, (7) high students' motivation toward AAM because this model was developed in accordance with the characteristics of the student's age (SD/MI), (8) the active participation of students in each stage of AAM in teaching science, because this model allows students to do activities which are real and unforgettable.

b. Inhibiting factors: (1) It is difficult to adapt to the AAM in teaching science using STS learning models, and it was hard to leave the conventional model of learning when the mastery of learning concept is not good. (2) Teachers still dominated classroom activities so that students did not have the opportunity to construct their own knowledge, (3) Teachers made the teaching and learning program only to fulfill administrative requirements so it doesn't serve its function in the classsroom (5) It is hard to change teachers' habits which view students' learning achievement is only determined by the mastery of subject matter, not by the learning process, such as the ability of students in conducting experiments, discussion, conclusions, discipline, creativity and scientific attitude.(1) Students are not ready to build their prior/background knowledge, so that they are not ready to participate in the learning process, (2) Students are not accustomed to do science learning process ctivities such as doing experiment in the science lab, conducting discussions in the early meeting of AAM implementation in teaching science .

The development research was conducted in accordance with the study procedures and rules that were determined, but the obtained results d can not be said as a perfect model of authentic assessment, because there are some limitations in the AAM development of research in teaching science at (SD/MI).The limitations are as follows:

1. This model is only applied in teaching science at SD/MI grade IV and V, because its effectiveness is not yet known if it is applied in the lower classes, namely class I-III, or class VI.
2. This model has not developed the peer assessment, so that the information about learning outcomes is only obtained from the students and teachers themselves.
3. To implement the AAM in teaching science at elementary schools (SD/MI) requires initial training for teachers to develop knowledge and skills in the planning, implementation of the learning process, and assessment/ assessment of learning as a model for the assessment of learning and as a new inovation in teaching science.

D. Conclusions

Conclusions of this study are as follows. (1) Procedures to develop authentic assessment model were done through the stages of Research and Development. The stages include pre- survey research, problem analysis, analysis of curriculum, research studies, expert consultations, the drafting of the model. Stages of development include expert validation, readability test, t feasibilitytest, teacher training, limited trials, and expanded trials . Tests were conducted at eight elementary schools and madrasah in Sleman and Magelang (2) Quality of the research products (a) the authentic assessment model met valid criteria, including all aspects like the task, rubrics, authentic assessment principles, learning activities and teaching practices,.All of these aspects have very good criteria and they can be used without revision, (b) all instruments of AAM in teaching science at class IV and V met the criteria as valid , reliable, objective, systematic, and practical instruments.

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