AUTHENTIC ASSESMENT IN MATHEMATICS INSTRUCTION MODEL BASED ON CONCEPTUAL CONFLICT

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Abstract. Piaget (1985) states that in order to know whether children understood a concept we need to bring them into the situation where they can find a conflict of understanding, involving problem solving process. Asdar (2012) has developed a conceptual conflicts learning model in problem solving, *Koncama*. Koncama is a learning model based on conceptual conflict from the theory of cognitive conflict. As a model that has been developed in mathematics, implementing Koncama needs a support by authentic assessment to assess students' performance in the class. Assessment in the learning model based cognitive conflict asses (1) understanding of concepts, (2) mathematics skill, (3) problem solving ability in mathematics, and (4) attitudes and beliefs. Therefore, three main components in the performance assessment developed, namely the performance task, the rubric of performance, and the method of assessment (scoring guidance). The developing task performance are collected in the portfolio of students' performance that includes mathematics project tasks, investigation report (inquiry and problem solving), and a quiz. Evaluation is based on the developed performance rubric including: (1) a holistic scoring, (2) analytic scoring, and (3) primary traits scoring.

Keywords : Conceptual conflict learning model, authentic Assessment, performance task, rubric of performance, method of assessment

INTRODUCTION

Assessment is one of the important aspects in learning mathematics. Assessment must support learning. If a teacher is still putting assessment as a result of activities provided a score for a student learning the results of this assessment will help teachers to reflect on their learning. The National Council of Teachers of Mathematics (NCTM, 2000) outlined that "when assessment is an integral part of mathematics instruction, it significantly contributes to students' mathematics learning. Assessment should inform and guide teachers as they make instructional decisions. Assessment is an integral part of mathematics learning, contributing significantly to mathematics learning. Assessment should inform and guide the teacher in making instructional decisions, including determination of appropriate learning strategies that immediately should be taken based on the assessment in the learning process. Assessment should be understood by teachers in an effort to streamline the teaching and learning process in order to achieve the learning objectives. For the attainment of competency in mathematics learning process, students must build competencies attitudes, knowledge, and skills embodied in a performance. Therefore, the use of authentic assessment is a must for teachers.

The application of authentic assessment of learning means applying good student data collection process carried out during the learning process, as well as the learning outcomes that asked students to perform real tasks that represent or demonstrate meaningful application of knowledge and skills they have. The data collected is then analyzed and the results of this analysis serves as feedback to learning, as well as a decision on the status of students. Wiggins (1993) says that authentic assessment is a problem or question that is meaningful and involves the student uses his knowledge to conduct performance effectively and creatively. Basically, authentic assessment has the properties (1) based on competency, (2) the individual, (3) centered on the learner, (4) non-structured and open-

ended, (5) Authentic (real, real like ordinary life day), (5) is integrated with the learning process, (6) on-going or sustained, (7) the nature of learner-centered, integrated with learning, authentic, sustainable, and individual.

LITERATURE REVIEW

Learning Model Conceptual Conflict in Mathematical Problem Solving

Asdar, et al. (2012) has developed a Conflict Conceptual Learning Model in Mathematical Problem Solving (KONCAMA), the learning model which refers to the development of the theory of learning model proposed by Joyce, Weil, and Showers (1992: 14). Instructional design is based on the theory of cognitive conflict is a learning model that consists of five essential elements. These five elements are: (1) syntax, which is a sequence of activities is usually called a phase, (2) social system, the role of teachers and students as well as the types of rules required, (3) the principles of reaction, which gives an idea to the teachers about how to view or respond to student questions, (4) support system, i.e., the condition required by the model, and (5) the impact of instructional and companion. Instructional impact the learning outcomes are achieved directly by directing students to the expected goal, while the impact of other companion is learning outcomes produced by a process of learning, as a result of the creation of a learning environment that directly experienced by students without direct guidance from the teacher. KONCAMA learning model that has been developed by Asdar (2012) contains six essential elements as a valid model of learning, practical, and effective, i.e. the syntax learning, social systems, reaction principle, support systems, instructional impact, and the impact of accompaniment.

1. Syntax Learning, the stages of learning in KONCAMA as the following syntax:
   a. Preconception,
   b. Orientation concept-based Conflicts
   c. Organize students to study and resolve the conflict,
   d. Development of cognition,
   e. Develop and present the results of problem solving.
   f. Analyze and evaluate the process of solving the problem.
2. Social systems, learning tasks developed based conflicts can occur maximize discussion among students and between groups because of differences in conception to a given mathematical problem.
3. Reaction principle, the implementation of the model KONCAMA based on constructivist theory and values of cooperation (cooperative), interaction and communication emphasis centered learning activities of students in the form of group learning and self-contained so that the function of the teacher as facilitator, consultant and mediator in students' learning.
4. Support system, the support system is meant KONCAMA supporting theories KONCAMA, and component-supporting learning KONCAMA models, namely lesson plans, books Student, Teacher's Manual and Student Activity Sheet.
5. Impact Instructional, instructional expected impact achieved from the application of KONCAMA is student learning outcomes in the achievement of objectives / expected competencies which include aspects of attitudes, aspects of knowledge and skills aspects.
6. Impact accompanist. As for the impact expected Bridesmaids formed from the implementation of the model is the formation of character KONCAMA cooperation, communication, critical thinking, respect their opinions, and can solve the problem

Authentic Assessment Implementation in KONCAMA Model

Application of Authentic Assessment conducted in mathematics on the topic Statistics class X SMA Negeri 1 Sungguminasa by using model KONCAMA. Authentic assessment in KONCAMA needs to be done programmatically and systematically. Therefore, needs to be prepared by the steps clear and precise. Here are the steps the implementation of authentic assessment:

1. Establish indicators of achievement of learning outcomes. Indicators formulated by using the operational work that can be measured and observed during ongoing learning with cognitive conflict strategies, such as: identifying, resolving, differentiate, conclude, retell, practice, demonstrate and describe. Indicators of achievement should be developed by teachers with regard to the development and the ability of each learner. Each basic competencies can be developed into two or more indicators of achievement of learning outcomes, it is in accordance with the breadth and depth of the basic competencies. Indicators of

achievement of learning outcomes of each basic competence is a reference that is used to make an assessment.

2. Setting the Standard of Competence/core competencies, basic competencies and Technical Assessment. Competence standards, basic competence and indicator done to facilitate teachers in determining the valuation technique will be used by teachers to measure the achievement of competence of learners. In selecting assessment techniques, teachers consider the material characteristics (characteristic indicator), for example: if demand indicators do something, then the valuation technique is the performance (performance) and when the demands of indicators related to the discussion of the concept, the engineering assessment is a written test. Meanwhile, if the demands of the material or competence is the result, then the valuation technique is the product or result.

3. Develop assessment tools. Some things to consider in the process of making the device, namely:
   a. the size of the instrument. The great task can measure more than the basic competencies and generally takes a long time. Small tasks can be either open-ended questions by members of the solution of a problem explaining their reasoning.
   b. skills in starting the assessment. For new teachers who use one type of authentic assessment, we recommend using a small manual first. If you're not sure whether manual tasks for learners are unclear can be revised so it is ready for use.
   c. Instruments Authentic and Interesting. Given task should involve students in situations that are familiar with them so they are trying to complete the task as well as possible. Students tend to be more attracted to situations that resemble tasks of everyday life. Teachers should also be able to understand the characteristics of learners so authentic assessment tools are made to keep students interested and engaged in completing the task.
   d. Ratings individuals. Design assessments should be aimed at groups and individuals. For example, a group of students were given the data and asked to analyze. For individual assessment, each student was asked to give a summary and interpretation of what is indicated by the data.
   e. The directions were clear. The device assessment must contain clear instructions, complete, unambiguous and not confusing. Instructions must also include what will be done by students will be assessed. For example, if one of the assessment criteria include the organization of information, then students should be required to display the information that is obtained in the form of regular.

Here's a technique details and assessment tools used for each aspect assessed along with the time of implementation.

TABLE 1. Techniques and Tools for Assessing

Competence	Technic	Assessment Tool	Actor	Time Frame
Attitude	Self Assesment	Self-assessment sheet	Student	Each time before the daily test
	Rate among Students	Sheets ratings among learners	Student	Each time before the daily test
	Observation	Guidelines for observation Check list and grading scale accompanied rubric	Teacher	Sustainable
	Journal	Sheets journal	Teacher	Sustainable
	Interview	A list of questions	Teacher	Integrated with the learning process
Knowledge	Writing test	MC, stuffing, short answer, matching, true false, description	Student	Integrated with the learning process
	Oral test	A list of questions	Student	Integrated with the learning process
	Assignment	Sheets assignment (PR, clipping)	Student	Integrated with the learning process
Skill	Project	Check list, the scale of assessment	Student	The end of each chapter
	performance	Check list, the scale of assessment	Student	The end of each chapter
	Portfolio	Check list, the scale of assessment	Student	Sustainable

RESULT AND DISCUSSION

Assessing students' attitude in KONCAMA

Aspects of attitude in KONCAMA focused on (1) Confidence (PD), (2) Respect for the opinion (HP), (3) Responsibility (TJ), (4) Honestly (Jr.), (5) Discipline (Di), and (6) Spiritual (Spi) as grateful, pray, and believe in the power of God Almighty. Here is outlined in the valuation model valuation techniques attitudes of students in learning..

No.	Name	PD	HP	TJ	Jr	Di	Spi	
1.	XXX	19	17	19	15	17	18	
Maximum Score		20	20	20	16	20	20	
$\dfrac{score\ obtained}{maximum\ score} \times 100$		95	85	95	75	85	90	
Score Converse $= \dfrac{Final\ Score}{Score\ max} \times 4$		3.8	3.4	3.8	3	3.4	3.6	
Average of Self Assessment								3,5
For example in the same way gained an average rating Inter Friends (PAT) = 3.5 and Observation (Ob) = 3.77								
Final Score $= \dfrac{1 \times PD + 1 \times PAT + 2 \times Ob}{4}$								3,64
Conversion Score Attitude								**SB**

Evaluation techniques for attitude in KONCAMA implemented in mathematics class X SMA Negeri 1 Sungguminasa produce a description of the assessment results attitude depicted in the bar chart below.
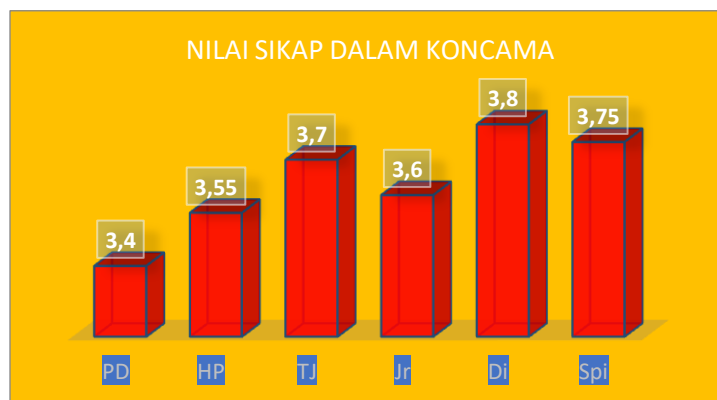

FIGURE 1. Attitude of the Students.

In the diagram above it appears that the discipline progressed very well, but the attitude of confidence is not as high as with other aspects of the attitude of the learning model KONCAMA class X SMA Negeri 1 Sungguminasa.

Assessing students' Knowledge in KONCAMA

During the process of learning to cognitive conflict strategies, teachers observe students' understandings both conceptually and procedural understanding. Efforts to conflict student understanding is a strategy for obtaining a condition in which the students understand the subject matter in a state of mental equilibrium. It is necessary for the acquisition of an understanding of the measurement of competencies students the knowledge that will be achieved

by using valuation techniques. Knowledge assessment techniques which can be used during the learning process is a quiz at each meeting the learning and achievement test in the middle and the end of the allocation of instructional time.

Here is an engineering assess and give a score of knowledge achieved by students during the learning process by giving a quiz-1 (K-1), a quiz-2 (K-2) and Test Results Learning (THB)

No.	Name	K-1	K-2	THB
1.	xxx	5	4	8
Maximum Score		6	6	10
$\dfrac{Obtained\ score}{maximum\ score} \times 100$		83,33	66,67	80
Test score		83,33	66,67	160
Final score $= \dfrac{1 \times Kuis-1 + 1 \times Kuis-2 + 2 \times THB}{4} = 77,5$				
Score conversion $= \dfrac{Final\ score}{\max score} \times 4 = 3,1$				
Conversion of the knowledge score = B+				

Implementation of knowledge in learning KONCAMA assessment conducted in SMA Negeri 1 Sungguminasa on the material Statistics. The indicators of learning outcomes developed by the teacher in the learning Statistics include: (1) determining the mean of single data (GPA-1), (2) determine the median and quartiles of single data (CPI-2), (3) determine the mode of single data (CPI-3), (4) determining deciles of single data (CPI-4), (5) Determine the standard deviation of a single data (GPA-5), (6) Determine the mean of the data groups (CPI-6) , (7) Determine the median and quartiles of the data group (CPI-7), (8) Determine the mode of the data group (GPA-8), (9) Determine deciles of the data group (CPI-9) and (10) Specifies the range of the data group (CPI-10). Minimum completeness criteria (KKM) is 75% of students reached a value of 70. The results of the analysis of the average score of the learning outcomes in each GPA illustrated below.
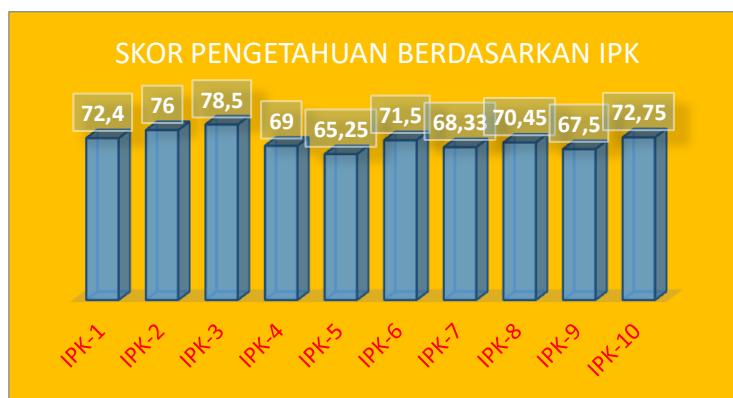

FIGURE 2. Student Achievement Scores Knowledge Based on IPK

Based on analysis of the achievement scores of knowledge class X SMA Negeri 1 Sungguminasa indicate that there are four CPI is not reached KKM which determines the deciles of single data (CPI-4), determines the standard deviation of a single data (GPA-5) Determine the median and quartiles of the data group (CPI-7), and determines the deciles of the data group (CPI-9). The classical completeness assessment results are presented in the table below.

No	Indicators of Competence Achievement	Percentage (%)
1.	IPK-1	78,45
2.	IPK-2	83,15
3.	IPK-3	80,05
4	IPK-4	52,78
5.	IPK-5	60,12
6.	IPK-6	75,75
7.	IPK-7	64,45
8.	IPK-8	76,15
9.	IPK-9	58,00
10.	IPK-10	82,15

Traditionally, class X SMA Negeri 1 Sungguminasa not reach KKM on IPK-4, IPK-5, IPK-7, and IPK-9.

Assessing Students' Skills in KONCAMA

Assessing KONCAMA math skills in learning can be performed on a mathematical problem-solving activity or project activity mathematics. Based on the scoring rubric used, scoring the math skills in mathematics project activity as defined below.

No	Name	Preparation stage (20%)		Implementation stage (30%)		Report stage (50%)		Mean of preparation stage	Mean of implementation stage	Mean of report stage
		Exp	Attitude	Exp.	Attitude	Exp.	Attitude			
1.	XXX	8	9	11	9	12	12			
Maximum score		20		24		28				
$\frac{Obtained\ score}{Max\ score} \times 100$		85		83		86				
Score for every stage								17	24,9	43
Final score = (20% x mean of preparation stage) + (30% x mean of implementation stage) + (50% x mean of report stage)								84,9		
Score conversion = $\frac{Final\ Score}{Max\ score} \times 4$								3,40		
Conversion of Skill score								**A**		

CONCLUSION

The achievement level of competence of learners should be assessed by the proper and accurate assessment. Assessment tools used to assess the competence of learners should be in accordance with what is to be assessed, ie in accordance with the characteristics of the material it covers aspects of attitudes, aspects of knowledge and skills aspects. Results competency assessment for learners to provide correct information about the achievement level of competence of learners. Therefore, teachers or prospective teachers must understand the different techniques according to the needs assessment.

Assessment techniques which can be used to measure the learning outcomes of students is diverse. Here are a variety of assessment techniques which can be used to measure or assess the achievement of competence of learners.

1. Assessment of competence attitude. Educators do attitude competency assessment through observation (observation attitude), self-assessment, assessment of students between all or journal. The instrument used for observation, self-assessment and assessment between all students is a list checks or accompanied rubric grading scale, while in journals such as notes educators.

2. Knowledge competence. Educators assess the competence of knowledge through written tests, oral tests, and assignments. Board test instruments in the form of multiple choice questions, stuffing, short answer, true-false, and description match. The instrument descriptions include scoring guidelines. Oral test instruments in the form of a list of questions. Instruments such as homework assignments / and or the project is done individually or in groups according to the characteristics of the task.

3. Competency skills. Educators assess competency skills through the performance appraisal, the appraisal that requires learners to demonstrate a certain competence by using the practice test, project, and portfolio assessment. Instruments used in the form of a check list or rubric grading scale equipped.

REFERENCE

1. Anderson, L. W. and David R. Krathwohl, D. R., et al (Eds..) 2001. *A Taxonomy for Learning, Teaching, and Assessing*: A Revision of Bloom's Taxonomy of Educational Objectives. Allyn & Bacon. Boston, MA (Pearson Education Group)

2. Arends, Richar I., 1997. *Classrom Instruction and Management.* New York: Mc Graw Hill.

3. Asdar. 2008. *Pendekatan Problem Open-Ended Dalam Meningkatkan Kemampuan Koneksi Matematika Siswa.* Makalah dalam Seminar Nasional Hasil-hasil Penelitian Matematika dan Pendidikan Matematika FMIPA Universitas Negeri Surabaya.

4. Asdar. 2009. *Konflik Kognitif dan Pseudo Pemahaman Konsep Matematika Mahasiswa Jurusan Matematika FMIPA UNM.* Makalah dalam Seminar Nasional Pendidikan Matematika FMIPA Universitas Negeri Surabaya.

5. Bell, F.H. 1978. *Teaching and Learning Mathematics (In Secondary Schools).* Iowa: Wm. C. Brown Company Publishers.

6. Bodrakova, W.V. 1988. *The Role of Eksternal and Cognitive Conflict in Children's Conservation Learning.* City University of New York.

7. Branca, N.A. 1980. Problem solving as a goal, process and basic skills. In S. Krulik and R.E. Reys (Eds.). *Problem Solving in School Mathematics.* Washintong, DC: NCTM.

8. Dahar, R.W. 1989. *Teori-teori Belajar.* Jakarta : Erlangga.

9. Depdiknas. 2003. *Kurikulum Berbasis Kompetensi Mata Pelajaran Matematika SMU.* Jakarta: Puskur, Depdiknas.

10. Depdiknas. 2006. Kurikulum Satuan Tingkat Pendidikan Tahun 2006. *Silabus Matapelajaran Matematika Kelas X.* Jakarta : Pusat Kurikulum Nasional.

11. Ernest, Paul. 1991. *The Philoshophy of Mathematics Education. UK, USA:* The Falmer Press.

12. Hiebert, J., & Carpenter, T. 1992. *Learning and teaching with understanding.* In D. Grouws (Ed.), Handbook of research on mathematics research and teaching. (pp. 65-100). New York: MacMillan.

13. Joyce, Bruce; Weil, Marsha; & Showers, B. 1992. *Models of Teaching.* Fourth Edition. Boston: Allyn & Bacon.

14. Kanginan, Marthen. 2004. *Matematika Unntuk SMA Kelas X Semester 1.* Jilid 2A. Jakarta: Grafindo Media Pratama.

15. Kemp, Jerrold.E, Morisson, Gary.R, dan Ross, Steven. M. 1994. *Designing Effective Instruction.* New York: Macmillan College Publishing, Inc.

16. Kemp, Jerrold.E, Morisson, Gary.R, dan Ross, Steven. M. 1985. *The Instructional Desain Process.* New York: Harper & Row, Publisher, Inc.

17. Kwon, Jaessol & Lee, Gyoungho. 2001. *What Do We Know about Student's Cognitive Conflict in Science Clasroom: A Theoretical Model of Cognitive Conflict Process.* Korea: EDRS.

18. Lee, Gyoungho.,et.al. 2003. Developmen of an Instrument for Measuring Cognitive Conflict in Secondary-Level Sciences Classes. *Research in Science Teaching.40 No.6.* 585-603. Wiley Interscience.

19. Lovitt, C. & Lowe, I. 1992. Problem solving in mathematics: Chance and data. In M. Horne and M. Supple (Eds.). *Mathematics Meeting the Challenge.* . Melbourne: The Mathematical Association of Victoria.

20. McGivney, J. M. & DeFranco, T. C. 1995. Geometry proof writing: A problem solving approach a la Polya. *The Mathematics Teacher Journal.* 88(7), 552-555.

21. Michell, Rebecca, et.al., 2007. The Impact of Cognitive Conflict on Team Performance. *Proceeding of the 13th Asia Pacific Management Conference*, Melbourne, Australia.

22. Nieveen, Nienke. 1999. *Prototyping to Reach Product Quality*. In Jan Van den Akker, R.M. Branch, K. Gustafson, N. Nieveen & Tj. Plomp (Eds). *Design Approaches and Tools in Education and Training* (pp 125 – 135) Kluwer Academic Publishers, Dordrecht, the Nederlands.

23. Piaget, J. 1985. *The Equilibration of Cognitive Structure: The Central Problem of Intellectual Development*. The University of Chicago Press, Chicago.

24. Plomp, Tjeerd., 1997. *Educational and Training System Design*. Enschede, The Netherlands: Univercity of Twente.

25. Polya, 1973. *How To Solve It (A New Aspect of Mathematical Method),* Second Edition. Pricenton, New Jersey: Pricenton University Press.

26. Reigeluth, Charles M. 1999. *Instructional-Design Theories and Models*. Volume II. New Jersey: Lawrence Erlbaum Associates, Publishers.

27. Sela, Hagit & Zaslavsky, Orit. 2007. *Resolving Cognititive Conflict With Peers – Is There A Difference Between Two and Four?* Proceeding of the 31st Conference Of International Group for the Psychology of Mathematics Education. Seoul-PME.

28. Skemp,R. 1987. *Psychology of Learning Mathematics*. Mahwah, NJ: Lawrence Erlbaum Associates Inc.

29. Soedjadi, R., 2000. *Kiat Pendidikan Matematika di Indonesia.* Jakarta: Dirjen Dikti Depdikbud.

30. Springer, Carol. W. & Borthick, A. Faye. 2007. Improving Performance in Accounting: Evidence for Insisting on Cognitive Conflict Tasks. *Issues in Accounting Education, 22, 1. 1-19.*

31. Swadener, M; 1985. *Teaching Problem Solving In Mathematics*, Associate Professor School of Education, University of Colorado-Boulder.

32. Tambunan G; 1987. *Materi Pokok Pengajaran Matematika*. Jakarta: Penerbit Kurnia,

33. Tuckman, B. W. 1972. *Conducting Educational Research.* New York : Marcourt Brace Jovanovish, Inc.

34. Wadsworth, B.J. 1996. *Piaget's Theory of Cognitive and Affective Development.* N.Y: Longman.