HYDROGEN
JURNAL KEPENDIDIKAN KIMIA
https://e-journal.undikma.ac.id/index.php/hydrogen/index

April 2023. 11(2)
e-ISSN: 2656-3061
p-ISSN: 2338-6487
pp. 129-138.

Improving Students' Basic Chemistry Competences Through Implementation of Class-Based Assessments in Inquiry-Based Chemistry Learning

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Article History
Received: 22-03-2023
Revised: 09-04-2023
Published:16-04-2023

Keywords: Basic competencies, Classroom-based assessment, Inquiry-Based Learning

Abstract
This study aims to improve students' basic competencies in Chemistry subjects on Compound Polarity by implementing Authentic Assessment assessments in inquiry-based Chemistry learning. This type of research is classroom action research, which consists of two cycles. Each cycle consists of four stages: action plan, implementation, observation/evaluation, and reflection. This research was carried out in the 11th grade of science (IA) 2 class, state senior high school (SMAN) 2 Dompu involving 36 students in 2021. Data on students' cognitive competence are collected by the test method, data on students' affective competence are collected by observation method, and data on students' psychomotor competence are collected by observation method. Furthermore, the three data were analyzed descriptively. The findings of this study showed that (1) there was an increase in students' cognitive competence from an average score of 67.72 with classical learning completeness of 52.84% in cycle I to an average score of 77.60 with classical learning completeness of 87.29% in cycle II, (2) there was an increase in students' affective competence from an average score of 81.40 with a suitable category in cycle I to an average score of 86.80 with an excellent category in cycle II, and (3) there was an increase in students' psychomotor competence from an average score of 67.43 with good category in cycle I to an average score of 78.25 with good category in cycle II. Thus, it can be concluded that there is an increase in students' basic competencies in chemistry through the implementation of classroom-based assessment in inquiry learning.

How to Cite: Suherman, S. (2023). Improving Students' Basic Chemistry Competences Through Implementation of Class-Based Assessments in Inquiry-Based Chemistry Learning. *Hydrogen: Jurnal Kependidikan Kimia, 11*(2), 129-138. doi:https://doi.org/10.33394/hjkk.v11i2.7448

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INTRODUCTION

The quality of education is primarily determined by the school's ability to manage the learning process, especially competency-based classroom learning. Competency-based learning can be interpreted as a learning system where learning outcomes are in the form of competencies that must be mastered by students, including cognitive, affective and psychomotor (Feladi & Puspitasari, 2019). Learning and assessment strategies need to be understood and implemented in the Competency-Based Curriculum (Khumaeroh & Sumarni, 2019). Assessment in the 2013 Curriculum is integrated with teaching and learning activities, so it is called Authentic Assessment. Authentic Assessment is carried out to provide balance in cognitive aspects (knowledge), affective aspects (attitudes) and psychomotor aspects (skills) (Iswantiningtyas & Wulansari, 2018) & (Yotiani, Kasmadi & Nuswowati, 2016). In the 2013 Curriculum, these three aspects are a form of the bill on student report cards.

Based on the author's observations and experiences in chemistry learning conducted at SMA Negeri 2 Dompu, it was found that most chemistry teachers still apply conventional

assessments where student learning outcomes are assessed based on the student's ability to master the material tested in the form of objective tests or description tests without providing feedback from student test results. Students' reaction to the assessment applied by the teacher is that students tend to learn solely oriented to mastering the material cognitively only and pay less attention to affective and psychomotor aspects. This is evidenced when students are asked questions about specific tools, their uses and how to use them; students need to explain carefully and use them correctly. Laboratory equipment students need to treat these tools better; even students use laboratory equipment as toys. Cognitive mastery of the material causes students to view chemistry lessons negatively. Most students at SMA Negeri 2 Dompu view chemistry as a lesson that is identical to formulas and calculations that have no application in everyday life, so chemistry lessons become uninteresting, unpleasant and even hated by students. In learning activities, the learning methods used tend to have nuances of lectures, learning activities in order to master chemical concepts very rarely facilitate students with experiments or experiments to train students' thinking processes, so chemistry learning becomes boring. The impact of mechanistic learning can be seen from the results of student learning in student subjects are still low, and students still have a lot to be modified to achieve learning completeness. The completeness of students' classical learning in two classes, 11th grade of science (IA).1 and science (IA).2, in fisrst semester of 2021 is still below 86% (Wakasek Data for the Curriculum of SMAN 2 Dompu).

In implementing the Education Unit Level Curriculum 2013 (2021), most teachers need help interpreting the depth of the basic competencies in question. No clear criteria for achieving competencies make it difficult to assess (Andriani & Dewi, 2019). The primary problem teachers face integrating assessment into learning, which teachers have seen as separate activities (Apriyani & Dewi, 2015). Based on all the problems above, this study seems necessary to apply a new assessment perspective, namely authentic assessment applied in inquiry-based learning as an effort to improve students' basic competencies.

This Authentic Assessment is expected to help obtain a picture (profile) of student achievement and learning progress. Authentic Assessment is carried out by collecting student work (portfolio), work (product), assignment (project), performance (performance), and written test (paper and pen) (Rambe & Yarni, 2019). Authentic Assessment results are helpful: 1) as feedback for students to find out their abilities and shortcomings, thus increasing motivation to improve their learning outcomes; 2) monitor progress and diagnose students' learning abilities to enable enrichment and remediation; 3) provide input to teachers to improve their learning programs in the classroom, 4) enable students to achieve predetermined competencies even with different precision, 5) provide more communicative information to the public about the effectiveness of education (Temuningsih, Peniati, & Marianti, 2017).

One of the lessons that are suitable for applying Authentic Assessment assessment is inquiry learning. Inquiry learning provides the same opportunities as Authentic Assessment assessments that are oriented towards student-centred classroom activities and allow students to learn to utilize a variety of learning resources that do not only make the teacher the only source of learning (Dewi, 2019). Through an inquiry-based learning model, students will actively engage in their mental processes through observation, measurement, and data collection activities (Pahriah & Hendrawani, 2018). In inquiry learning, teachers are facilitators of learning and managers of the learning environment. Teaching by inquiry is characterized by the following:: 1) use of science process skills, 2) the answers sought are not known in advance, 3) the spirit of solving problems is very high, 4) learning activities centre on "why" and "how we know", 5) students formulate hypotheses for investigation, 6) data collection is done by experimentation, making observations, reading, and other sources, 7) all proposals are assessed jointly, 8) students conduct individual research in groups to obtain the

data necessary to test hypotheses, and 9) The students collect data and provide conclusions scientifically (Annafi, Ashadi, & Mulyani, 2015) & (Fahrurrozi, Hulyadi, & Pahriah, 2018).

Based on the research results above, the novelty of this study is to implement inquiry-based classroom assessments to improve students' basic competencies in chemistry. The objective to be achieved in this study is to improve students' basic competence in chemistry subjects through the implementation of Authentic Assessment assessment in inquiry-based Chemistry learning. In this study, problems will be developed, especially regarding the Assessment of Authentic Assessment in inquiry-based Chemistry learning as an effort to improve the basic competence of Chemistry students of SMA Negeri 2 Dompu, with the formulation of the problem "Can the implementation of Authentic Assessment assessment in inquiry-based learning improve students' basic competence in Chemistry subjects?".

METHOD

This research is classified as classroom action research, which aims to improve the learning process of Chemistry in 11th grade of science (IA).2 class of SMAN 2 Dompu to improve students' basic competencies in Chemistry. This research involved 39 students of 11th grade science (IA).2 of SMAN 2 Dompu in first semester of 2021. The object of this study is 1) the Authentic Assessment model in Inquiri-based learning and 2) the basic competence of Chemistry students, which includes cognitive, affective and psychomotor aspects. To the problems and objectives of this study, data on students' cognitive aspects were collected using learning outcomes tests at the end of cycle I and II. Data on students' affective aspects (attitudes) were collected using observation sheets containing students' attitudes toward learning. Data on students' psychomotor aspects were collected using observation sheets related to students' skills in using tools or conducting experiments.

This research is carried out in two cycles, each consisting of stages of planning, action, observation/evaluation, and reflection (Kemmis, McTaggart, & Nixon, 2014). By the established cycle, the stages of implementing this action research are as follows.

Planning Phase

The things done in the planning process are as follows: 1) develop a Chemistry lesson plan (RPP) for the subject of Elasticity with Authentic Assessment assessment through the Inquiry model, 2) design learning tools such as student worksheets (LKS), quizzes, homework, daily test tests, observation sheets of affective and psychomotor aspects, and practicum report formats, 3) dividing students into several groups, each group will consist of 4 to 5 people, in determining the group members are tried to be heterogeneous. Each group is named using the names of chemists, 4) compile assessment rubrics for each cognitive, psychomotor and affective aspect.

Action Stage

The things carried out in the implementation of the action are as follows: 1) orient the inquiry learning model and the Authentic Assessment assessment to be applied, the form of billing in the Authentic Assessment assessment, and what students do, 2) prepare the facilities and infrastructure needed in the learning process, such as a map to put student portfolios, tools and materials used in conducting practicum, 3) conduct learning activities by applying the inquiry learning model with Authentic assessment. The steps correspond to the syntax of the inquiry-based learning model. In each meeting, students conduct an investigation preceded by designing experiments outlined in student worksheets. At the end of the activity, students compile a report on practicum results to be presented or discussed between groups (class

discussion). During the learning activities, the affective and psychomotor aspects of students are assessed authentically, 4) give daily repetitions at the end of the cycle.

Observation/Evaluation Phase

The things to be observed/evaluated are as follows: 1) an action process that includes conformity of actions with planning or changes to action plans in the execution of actions, and 2) influence of actions, both intentional and unintentional. The influence of actions is seen in student behaviour or student activities and student achievement in the learning process. Student achievement in the learning process includes cognitive, affective and psychomotor aspects; 3) Action constraints, namely how these obstacles hinder the actions carried out and the problems arising from the actions taken; 4) conditions favouring the execution of actions.

Reflection Stage

Some things that will be a matter of reflection at the end of the cycle, among others: 1) Summary of the obstacles experienced during the implementation of the action, 2) opportunities or possible implementation of following cycle actions, 3) Overview of student achievement and successful action cycles, 4) consequences arising from the implementation of actions in each cycle, 5) recommendations as a basis for drawing up planning and implementation of actions in the next cycle.

RESULTS AND DISCUSSION

Description of the First Cycle Learning Process

This action research in 11th grade science (IA).2 of SMAN 2 Dompu with 39 students. The subject matter that students learn is packaged in two learning cycles. Each cycle is broken down into four meetings. A week consists of two meetings with an allocation of 2 hours of face-to-face lessons. At the beginning of the activity, the teacher first conveys to the students that learning activities in class on Elasticity and Harmonic Motion are carried out using an Authentic Assessment assessment with an Inquiri-based learning model. The teacher conveyed the assessment that will be carried out during the learning process covering all three aspects of assessment by the demands of the 2013 curriculum (KTSP, 2013), i.e. assessment of cognitive, affective and psychomotor competencies. The teacher then provides an overview of the Authentic Assessment assessment and the types of bills. The bill will be used to assess cognitive aspects, namely in the form of reports on the results of working on LKS, reports on the results of practicum/experimental activities, homework, quizzes and learning outcomes tests. Bills for affective aspect competencies are in the form of teacher observations on student effectiveness (attitudes) during the learning process. The learning activities carried out are adjusted to the steps of inquiry learning.

In the pre-inquiry step, students are motivated and directed to the concept to be discussed by asking about problems related to the concept in everyday life. In the inquiry step, students design experiments outlined in the worksheet and students and researchers establish hypotheses tested in the experiments. In the post-inquiry step, students are allowed to discuss the results obtained and problems found during practicum in their respective groups, and then class discussions are carried out. Students apply the concepts studied in a practicum in new situations through the problems presented. The end of this post-inquiry step is for students to make conclusions about their observations and make accountability in the form of practicum reports. This practicum report is collected at the next meeting before the lesson begins.

In each learning activity in each cycle, students learn to design experiments in the form of worksheets facilitated by the teacher. The worksheet guides students in carrying out practicum/experiments in class. The teacher then conveys the learning model used during the learning process, namely the inquiry learning model with Authentic Assessment assessment, using a cooperative group setting. The teacher helps students form groups of 5 people because the number of students is 36 people; there are seven groups with five members each and one group with four members.

Researchers act as facilitators around students while observing aspects of students' attitudes and skills in learning, assisted by two teachers. Facilitators guide students in formulating hypotheses, designing experiments, conducting experiments and discussing with group members. In the first cycle learning process, students' attitudes toward learning are generally in the excellent category; namely, in the learning process, students are present on time which means students' enthusiasm for learning is good, and students respect and are polite to the teacher. However, cognitive and psychomotor aspects of students in learning are still in the category of sufficient. Some students play around in conducting experiments; it can interfere with the learning process. Some of the obstacles faced in cycle one learning, among others: 1) In formulating hypotheses, it turns out that students still need a lot of teacher guidance, 2) Only a few students play an active role in answering the teacher's questions and very rarely students can raise the questions/problems faced, 3) when invited to carry out practicum, there are still many students who seem less skilled in using and tidying up practicum tools, 4) taking experimental/observational data in most groups is not careful, how to determine the reference for measuring spring length is still a lot wrong, 5) there are still many students confused in writing the data of observations into data tables and 6) The ability of students to solve and answer problems, which are submitted orally is still not as expected, students have not been able to express reasons for the answers presented. The interaction between students and facilitators in learning in the first cycle is still not going well; students are still reluctant to ask about the problems experienced unless asked directly by the facilitator.

The results of the research reported in the first cycle contain the basic competencies of Chemistry students, which include cognitive, affective and psychomotor competencies, which are as follows presented in Table 1.

Table 1. Data on student learning outcomes cycle I

Learning Outcomes Cycle 1	**Acquisition**
Class average	69,8
Number of students who have not completed their studies	15
Number of students who completed their studies	21
Percentage of learning completeness	58,3
Incomplete percentage	41,7

The results of cognitive competence research, based on data analysis of students' average scores, including worksheets, practicum reports, homework, quizzes and final learning outcomes tests of a system I, obtained students' cognitive average scores on a scale of one hundred, with scores moving from 13.3 to 9.2 obtained students' cognitive average scores of 69.8 and classical completeness of 54.83%.Based on success criteria, research is said to be successful if the average score of students is greater than or equal to 71, and classical completeness is greater or equal to 86%. By the data on the cognitive aspects of the cycle I, students' cognitive competence has not met the success criteria in this study.

Table 2. Affective Assessment Data of Cycle I Students

Average Criteria	Score	Value	Cycle I		Information
			Number of Students	Percentage	
Excellent	52-65	85-100	12	9,5	Complete
Good	46-51	75-84	20	80,3	
Enough	39-45	65-64	8	10,2	Incomplete
Less	33-38	55-64			
Very lacking	≤ 33	≤ 54			

From the analysis of students' attitudes after actions in cycle I, the average value of students' attitudes was 80.30. Based on the criteria for classifying students' attitudes that have been set, the average score of 11th grade science (IA).2 students' attitudes is in the excellent category.

Table 3. Psychomotor assessment data of cycle I students

No	Student Code Number	Observed aspect/score				Skor Max
		I	II	III	IV	16
1-36	Sum					2425,00
	Average					67,42

From the results of the psychomotor analysis of students after actions in cycle I, the average psychomotor score of students was 67.42. Based on the criteria for the psychomotor classification of students that have been set, the average score of skills of 11th grade science (IA).2 of SMAN 2 Dompu students is in a suitable category. In general, the average psychomotor score of students is in a suitable category, with an average score of 66.40. The average value of psychomotor in cycle I have not reached the category of good according to the criteria set in the success of the study.

Description of the Learning Process Cycle II

The implementation of actions in cycle II is adjusted to the results of reflection on activities in cycle I. While facilitating students in learning, researchers form a teaching team with Real PPL students so that at each meeting, three facilitators facilitate students; facilitators directly enter each group to provide guidance more effectively. The interaction between students and students and between students and facilitators seems more conducive. The research results reported in the second cycle contain the basic competencies of Chemistry students, which include cognitive, affective, and psychomotor aspects. Data on the acquisition of students' cognitive scores in cycle II are as follows.

Table 4. Data on student learning outcomes cycle II

Learning outcomes cycle II	Acquisition
Class average	77,4
Number of students who have not completed their studies	4
Number of students who completed their studies	32
Percentage of learning completeness	89
Incomplete percentage	11,00

Based on the analysis of students' cognitive data on a scale of one hundred, with test result scores moving from 49.4 to 89.4, the average cognitive score of students was 77.4, and classical completeness was 87.18%. Based on the success criteria this study has met the success criteria, with the achievement of average scores and completeness in the cognitive aspects of students.

Table 5. Affective assessment data of cycle II students

Average Criteria	Score	Value	Cycle II		Information
			Number of Students	Percentage	
Excellent	52-65	85-100	31	86,1	Complete
Good	46-51	75-84	3	8,3	
Enough	39-45	65-64	2	5,6	Incomplete
Less	33-38	55-64			
Very lacking	≤ 33	≤ 54			

From the analysis of student attitudes after the action in cycle II, the average value of student attitudes was 84.90. Based on the criteria for classifying student attitudes that have been set, the average score of 11th grade science (IA).2 of SMAN 2 Dompu students' attitudes is in an outstanding category. Based on the success criteria this study has met the success criteria, with the achievement of the average score of student attitudes and excellent categories.

Tabel 6. Students Psychomotor Performance on Cycle II

No.	Student Code Number	Observed aspect/score				Skor Max
		I	II	III	IV	16
1 -36	Sum					2775,00
	Average					77,18

From the results of the psychomotor analysis of students after the action in cycle II, the average psychomotor score was 77.18. Based on the criteria for classifying psychomotor students that have been set, the average psychomotor score of 11th grade science (IA).2 of SMAN 2 Dompu students is in a good category. Based on the success criteria, this study has met the success criteria, with the achievement of the average psychomotor score of students and is categorized as good.

Discussions

Qualitatively, students' basic competence in cognitive, affective, and psychomotor aspects in the following lessons still needs to be improved during initial reflection. Data analysis found that applying inquiry-based learning models with Authentic Assessment assessments can improve students' basic competencies in chemistry in cognitive, affective, and psychomotor aspects, especially on the subject of Elasticity and Harmonic Motion. The student's cognitive scores for cycle I and II were 69.80 and 77.40, respectively. The classical completeness was 54.83% and 87.18%. This shows an increase in cognitive competence of 7.6 or an increase of 10.89%. In the affective aspect, the average score of students for cycle I and cycle II, respectively, is 80.30 with suitable qualifications and 84.90 with excellent qualifications. On the psychomotor aspect, the average score of students for Cycle I and Cycle II, respectively, was 67.42 and 77.18, with qualifications being good enough.

In general, when viewed from the comparison of results obtained from initial reflection, cycle I, and cycle II, implementing the actions taken has succeeded in improving students' basic cognitive, affective, and psychomotor competencies. This happens because implementing inquiry-based learning models with Authentic Assessment assessments can improve students' scientific work and awaken their reasoning power so that their thinking creativity develops, which eventually they can think logically and critically. The implementation of this model focuses on the presentation and process of discovering Chemistry concepts through the formulation of hypotheses, designing experiments/experiments, conducting experiments, and concluding experimental results to find Chemistry concepts that start from Chemistry problems related to everyday life and are easy for students to imagine. Thus the chemical concepts presented are not abstract but are born from science process skills (scientific work).

In addition, students are allowed to develop attitudes and skills in learning so that with optimal mastery of the process can build the concepts learned.

Overall the learning process can be successful, but in the first cycle, the classical completeness has yet to reach 86%. This is because students need to get used to a way of learning that is new to them. One indication is that students need help establishing hypotheses as quick answers to problems. In addition, the obstacles that cause learning outcomes in the first cycle to be incomplete are: 1) students are still reluctant to interact with group mates or teachers in discussing things that cannot be understood, and 2) There are still many students who cannot use the tools to get along properly so they have more teacher guidance and the time needed becomes longer. These obstacles become obstacles for students in the following learning so that in the first cycle, students have not achieved learning results by the demands of Minimum Completeness Criteria (KKM).

Based on the results of the reflection of the cycle I, the implementation of actions in cycle II refers to improvements and improvements to actions that have occurred in cycle I. Improvement efforts in cycle II include: 1) resocializing the way and implementation of learning with an inquiry-based learning model with Authentic Assessment assessments, 2) when students in their groups design teacher guidance experiments more intensified so that the experimental design outlined in the form of LKS can be used in conducting experiments and students can prepare everything better, and 3) Researchers form a teaching team, which collaborates with two fellow students. The results of the second cycle of research showed promising results. Basic competence in the cognitive aspect of classical completeness is greater than 86%, namely 87.18%, with a grade average of 77.40, while student absorption is 77.40%. Likewise, affective competence is outstanding, with an average of 84.90. In the psychomotor aspect, there was an increase from sufficient qualifications to sound, with an average value of 77.18 in this second cycle; generally, there are no more obstacles as encountered in the previous cycle. Students have adapted and trained to learn with inquiry-based learning models. This can be seen from the preparation that students have when attending lessons. Students actively carry out learning activities from the beginning to the end of the lesson. Training students to learn with an inquiry-based learning model involves improving students' basic competencies in Chemistry in cognitive, affective, and psychomotor aspects. This finding is consistent with previous research that the application of inquiry-based learning can improve student learning outcomes in learning (Wardani, 2013) & (Annafi et al., 2015).

Based on the results obtained, in general, this action research can answer the problems that have been formulated and achieve the expected goals. This can be seen from the fulfilment of several established criteria, namely: can improve students' basic competencies in chemistry both in cognitive, affective, and psychomotor aspects of students. From these explanations and reflections, Authentic Assessment assessments in inquiry-based learning have several virtues. The virtues are as follows: 1) learning becomes student-centred, 2) Authentic assessment as feedback for students to find out their abilities and shortcomings, thus increasing motivation to improve their learning outcomes, 3) authentic assessments monitor progress and diagnose student learning abilities, enabling enrichment and remediation, 4) authentic assessment gives teachers feedback to improve their learning programs in the classroom, 5) authentic assessment enables students to achieve predetermined competencies albeit with different precision, 6) authentic assessment provides more communicative information to the public about the effectiveness of education, 7) Inquiry-based learning provides opportunities for students to develop their attitudes and skills in learning so that optimal mastery of the process can help students in building the Chemistry concepts they learn (Dewi, Erna, Haris, & Kundera, 2021) & (Andriani & Dewi, 2019). The balance

between process and product is two sides that support learning science (Vilardo, 2017) & (Dewi & Gazali, 2020).

CONCLUSION

Based on the problems formulated and the results obtained from this study, it can be concluded that implementing Authentic Assessment assessment in inquiry-based learning can improve the basic competence of Chemistry students in 11th grade science (IA).2 of SMAN 2 Dompu in cognitive, affective, and psychomotor aspects. This can be seen from the improvements that occur in each of these aspects. The average score of students' cognitive aspects in cycle I was obtained at 69.80 and classical completeness at 54.83%, then in cycle II increased by an average of 77.40 and classical completeness at 87.18%. The average effective score of students in the first cycle was 80.30, which was in the excellent category. In the second cycle, it increased to 84.90, which was in the outstanding category. The average psychomotor score of students in cycle I was 67.42, which was in the sufficient category, and cycle II, it increased to 77.18, which was in the excellent category.

RECOMMENDATIONS

Based on the results obtained in this study, the following suggestions were proposed: 1) In Chemistry learning that requires practicum activities, it will be very suitable to apply Authentic Assessment assessment in inquiry-based learning; 2) Teachers should act as facilitators as well as learning companions, to spur student creativity in learning and students are no longer reluctant to ask questions from teachers.

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