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EVALUATION OF THE IMPLEMENTATION OF FORMATIVE ASSESSMENT OF SCIENCE SUBJECTS IN JUNIOR HIGH SCHOOLS

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ABSTRACT

The use of formative assessment in learning is a way that can be done to improve the quality of students. This study aims to describe the evaluation of the application of formative assessment in Natural Sciences (IPA) subjects. The research method used is a mixture using the explanatory sequential design. The population used includes all students and science teachers of Junior High Schools (SMP) in Surabaya. The sample used in this study was science teachers and students in grades 7 to 9 of SMP Negeri 62 Surabaya. Data were collected through documentation, observation, and questionnaires. The results of this study indicate, among others: (1) at the information collection stage, it is included in the sufficient category, (2) information processing and interpretation are included in the sufficient category, and (3) action taking is included in the high category. So it can be concluded that formative assessment evaluation has been implemented at SMP Negeri 62 Surabaya, which is indicated by teachers and students who are able to apply feedback, peer assessment, and self-assessment well.

Keywords: Formative assessment; junior high school; natural sciences

INTRODUCTION

Assessment is a substantial part of the curriculum in the form of a series of sequential and ongoing activities. This assessment is used to assess development in education. Diagnostic, formative, and summative assessments are part of the series in independent curriculum learning (Natasari *et al*., 2023; Ramadhan, 2023). Formative assessment is an assessment that does not provide a score, but emphasizes feedback that focuses on improving learning (Wicaksono *et al*., 2022).

Formative assessment aims to monitor student learning progress and provide input for improving the learning process (Rodrigues & Oliveira, 2014).Overall, formative assessment is used by teachers to improve the quality of their teaching, by evaluating methods, models, or strategies that improve learning outcomes (Guskey & Jung, 2013).

In the independent curriculum, formative assessments are in the form of assessments at the beginning and during learning (Mujiburrahman *et al*., 2023). Supporting assessments at the beginning of learning use differentiated learning so that students receive what they need. Formative assessments during learning can be presented with reflections which can later be used as a reference for learning planning and corrections if needed. An explanation of the function of formative assessments in improving attitudes, knowledge, and skills is described in the Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 104 of 2014.

In studying science, it is not uncommon for students to encounter difficulties. There are external and internal

factors that cause students to have difficulty learning (Haqiqi, 2018). Some internal elements that make students experience difficulties in learning include talent, interest, motivation, and intelligence. Meanwhile, educational facilities, teachers, facilities and infrastructure, and student activities are external elements. In line with research (Wahyuni, 2018) which describes that the factors causing students to experience difficulties in learning science are due to interest, motivation, concentration, learning habits and intelligence. These factors become obstacles to students' difficulties in working of science questions from the habit of cheating and resulting in a decrease in their learning ability. Students need to get used to thinking at a high level, so that all kinds of confusing, difficult, and boring problems can be overcome.

Based on the results of (Marsandi et al., 2016) of science learning, especially in formative assessment, it has not been optimally realized, due to: (1) planning and implementation of formative assessments that require skills, (2) instrument development, application and data analysis that require time, (3) the number of classes and students, (4) in the implementation of formative assessments there is no standard instrument, and (5) there is no data processing tool to analyze assessment data. In contrast to the results of research conducted (Ramadhani et al., 2021) which shows that formative tests can improve mastery, self-regulation, science literacy and critical thinking, learning motivation, learning achievement, and skills in overcoming problems that arise. The application of this assessment is more widely used at the high school level compared to the junior high school level.

For teachers and students, formative assessment plays an important role in learning. Formative assessment diagnoses components that are still lacking in learning, continued using feedback and reflective and corrective processes in providing direction so that learning completion is realized (Jang & Wagner, 2013). Formative assessment aims to improve learning activities and obtain feedback (Owen, 2016). In order for learning to be effective, training is needed for formative assessment that is given to students continuously and consistently, applied theoretically or practically to recognize the difficulties of a topic being discussed.

The problems described above can be overcome by implementing formative assessment implemented of science learning. This study will focus on the assessment used in the learning process or formative assessment. The researcher hopes that research that focuses on the application of formative assessment of science subjects can be an alternative choice for teachers to monitor the development of student learning in the learning process and understand the social development of students.

METHODS

The research implemented is a descriptive type with mixed methods. This research is a mixture of qualitative and quantitative research (Creswell, 2018). The mixed methods research design used in this study is the explanatory sequential.

This research was conducted at State Junior High School 62 Surabaya, East Java Province. The population used included all students in grades 7 to 9 and science

teachers of State Junior High Schools in Surabaya. The sample used in this study were science teachers and students in grades 7 to 9 of State Junior High School 62 Surabaya. The method used in this study to determine the sample was carried out using the Purposive Sampling technique.

Data collection techniques were obtained from the results of documentation studies, observations, and questionnaires. Documentation studies were obtained from the 7th grade science teaching module related to the material on the nature of science (science laboratory). Observation instrument grids regarding the implementation of formative assessments, the ability to understand to design of science subjects, and the form of formative assessments. Meanwhile, the questionnaire used was closed and was made based on the evaluation indicators for the implementation of formative assessments by the Center for Educational Research Team, Formative Assessment Model, (Pendidikan, 2019) which included information collection, processing, and interpretation of information and taking action.

The teacher questionnaire contains 28 questions and the student questionnaire contains 22 positive and negative questions that must be answered by respondents using a Likert scale consisting of five answer choices, namely: from always to never, with a score range referring to (Widoyoko, 2016).

The questionnaire was analyzed with the steps used referring to pedman according to (Riduwan, 2012): (1) calculating the respondent's score for each aspect or sub variable; (2) summarizing the values obtained; (3) calculating the average value and percentage with the specified formula:

DP = n / N x 100%

Description:

DP = Descriptive Percentage (%)

n = Empirical score (Score obtained)

N = Ideal score for each question item

The average results of the calculated data are then interpreted with the score interpretation criteria. The score interpretation criteria according to Riduwan can be seen in Table 1.

Table 1. Score interpretation criteria

No.	Percentage (%)	Category
1.	0 – 20	Very Low
2.	21 – 40	Low
3.	41 – 60	Sufficient
4.	61 – 80	High
5.	81 - 100	Very High

RESULTS AND DISCUSSION

Results

The questionnaire in this study measures the success of the evaluation of formative assessment in the form of tests filled out by students and teachers of SMP Negeri 62 Surabaya. The following data from teacher and student questionnaires related to the implementation of formative assessment evaluation of science subjects can be seen in Table 2.

Table 2. Results of the Questionnaire on the Implementation of Formative Assessment Evaluation by Science Teachers at State Junior High School 62 Surabaya

Subvariable 1	Subvariable 2	Subvariable 3	Category
Pecsentage (%)			
93,33	91,67	86,67	Very High

*) Note:

Indicator 1: information collection
Indicator 2: information processing and interpretation
Indicator 3: action taking

The implementation of formative research shows different achievement figures and categories. The following student questionnaire data related to the implementation of formative assessment evaluation of science subjects can be seen in Table 3.

Table 3. Questionnaire Results of the Implementation of Formative Assessment Evaluation by Students at State Junioe High School 62 Surabaya

Subvariable 1 Percentage (%)	Subvariable 2	Category
70.33	70.74	High

*) Note:
Indicator 1: information gathering
Indicator 2: action taking

Before the assessment is carried out, the teacher first prepares a teaching module as a learning plan. The teaching module contains content, such as identity, competency, infrastructure, targets, and learning models. The teacher prepares formative tools by creating indicators that are the basis for deciding which assessment tools will be used. Each learning objective can be further developed into two or more indicators.

Accurate competency achievement data is obtained from the instruments that have been created. The following is an example of a formative assessment indicator at State Junior High School 62 Surabaya in grade 7 science subjects.

Table 4. Science Formative Assessment Indicators

Learning Outcomes	Learning Indicators
Students understand the process of identifying living things according to their characteristics; properties and characteristics of substances, physical and chemical changes, separation of simple mixtures; life organization systems, functions, and abnormalities or disorders that appear in organ systems; interactions between living things and their environment in designing efforts to prevent and overcome climate change; and inheritance of traits and application of biotechnology in the external environment.	Describe the meaning of mixture Identifying methods of separating mixtures Analyzing the working principles of mixture separation methods Performing simple mixture separation using filtration method

The determination of indicators is adjusted to the teaching module created by the teacher and approved by the principal. In Table 4, the formative assessment indicators for grade 7 science subjects contain learning achievements that are developed into learning indicators. There are limitations in the formulation of indicators that are developed into assessment instruments, grids, and rubrics. The grids are developed from indicators that create the form of questions, cognitive levels, items, and weights of questions.

In addition to analyzing aspects of learning success, teachers also analyze learning objectives and use instruments to measure student learning success. Instruments are developed according to the characteristics of the subjects to be tested. In addition, teachers must also pay attention to the breadth of the material.

The results of the document show that teachers prepare character assessments,

critical reasoning, project assessment rubrics, presentations, poster products, and video product assessment assessments. Table 5 is an example of a rubric that contains values from predetermined criteria. The scores contained in the rubric are a development of the values in each criterion.

Table 5. Poster Assessment Rubric

	Developing (1)
Poster Contents	The poster does not contain all the required elements such as the title of the activity, photos of the activity, and results of the activity.
Appearance	The posters created have unoriginal and unattractive designs.

The preparation of rubrics carried out by teachers must pay attention to learning objectives and describe the indicators of objectives or criteria. Indicators in the assessment are evidence of student performance that can be observed and given a score for an assessment. In addition, teachers need to create categories or scales of achievement, so that from these results the description of the achievement can be determined.

Based on the results of observations and documents, it can be concluded that teachers use formative assessments to assess the performance of practical activities and presentations to achieve learning objectives. In addition, teachers also provide evaluations at the end of learning in the form of multiple choices. In addition to observation data, researchers found alignment with the results of documentation, namely as follows:


Lembar Evaluasi

Perhatikan gambar perbandingan kondisi air berikut !

1. Dibeberapa daerah tempat tinggal di Indonesia dan terutama yang berada di daerah pegunungan untuk mendapatkan air yang bersih cukup menyulitkan. Karena kandungan kapur dalam air tanah pegunungan termasuk sangat tinggi untuk di jadikan konsumsi ataupun digunakan untuk kehidupan sehari-hari.
Sumber : Kompasiana.com
Bahan alam yang cocok yang digunakan dalam pembuatan filter air untuk mengurangi kandungan zat kapur adalah .....
A. Arang
B. Pasir zeolite
C. Spons
D. Ijuk

2. Jika kamu diberikan projek untuk membuat filter air sederhana dan disediakan alat dan bahan seperti gambar disamping.
Urutan bahan yang tepat dari atas kebawah adalah .....
A. Spons -arang- pasir zeolite – sabut kelapa – kain.
B. Pasir zeolite – sabut kelapa – Arang – Spons.
C. Spons – kain- arang- pasir zeolite - sabut kelapa.
D. kain - Spons -arang- pasir zeolite - sabut kelapa.

3. Musim kemarau banyak orang yang sulit mendapatkan air sehingga memutuskan untuk mengebor sumurnya agar lebih dalam. Namun air yang dihasilkan setelah proses pengeboran biasanya keruh dan banyak mengandung tanah, pasir dan lumpur. Cara yang mungkin dilakukan agar air tersebut lernih dan dapat digunakan

Figure 1. Evidence of evaluation questions in multiple choice form

From the discussion above, it can be concluded that the results of the questionnaire on the implementation of formative assessment evaluation by science teachers at SMP 62 Surabaya from the information collection stage obtained (93.33%), information processing and interpretation (91.67%), and action taking (86.67%). While the results of the questionnaire on the implementation of formative assessment by students at the information collection stage (70.33%) and action taking (70.74%).

Discusssion

The implementation of formative assessment begins with the design of a learning module which is one of the learning tools that contains a Learning Implementation Plan (RPP) to help achieve Learning Outcomes (CP). This learning aid is a Learning Objective Flow (ATP) format developed from Learning Outcomes (CP) and includes learning steps, assessment plans, and means to organize learning better (Basarrudin, 2024; Nadiroh *et al*., 2023).

Based on the results of observations and documentation review of the 7th grade

science module, it was found that teachers conducted formative assessments in the early learning process, namely by starting with assessment planning contained in the module and reviewing learning objectives. Then, teachers compiled modules based on the assessments that had been carried out previously by analyzing students' strengths and weaknesses and compiling strategies in the form of modules, media, and methods. The results of compiling these strategies are contained in the module.

Teachers also plan formative assessments by analyzing learning outcomes (CP), learning objectives (TP), and analyzing the flow of learning objectives (ATP). Material analysis is also carried out by developing scientific materials and preparing written, oral, practical, and project questions related to the nature of SCIENCE in the science laboratory. The materials that students must master include: (1) distinguishing the function of the laboratory from other rooms, (2) identifying laboratory equipment that is commonly used based on its use, and (3) stating regulations for maintaining safety in the science laboratory.

In learning assessment activities, clear and structured learning objectives serve as a reference in developing assessment tools. Learning assessments must be designed to measure the extent to which students have achieved the learning objectives that have been set (Sadler, 2016).Effective learning assessments must provide information that helps them evaluate the effectiveness of the learning strategies and methods used and provide direct feedback to students (Andayani & Madani, 2023; Golding & Adam, 2016).

Clear and measurable learning objectives can help teachers develop a learning objective flow (ATP). ATP preparation activities play an important role in supporting the achievement of clear and measurable learning objectives. ATP makes it easier for students and teachers to achieve the learning objectives that have been set (Utami *et al*., 2023). ATP can also help teachers plan learning in a more structured and targeted manner, so that it can accelerate the achievement of learning objectives (Bertram *et al*., 2021; Marbella et al., 2023).

In addition, ATP also helps teachers assess the achievement of learning objectives and provide more valid feedback (Casmudi & Waskitoningtyas, 2024). Teachers conduct formative assessments which are carried out when learning objectives in one objective have been achieved. There is a good impact on the implementation of evaluation and the learning process from planning, process, and assessment results (Bahri, 2023; Lutfiana, 2022). Learning will be much more effective and students will easily understand the material being taught, so that learning objectives can be achieved appropriately and optimally.

Different learning objectives and success criteria are strategies teachers use to explain learning objectives and success criteria in language that students can understand (Johnson *et al*., 2019). This can include multiple examples of students' previous work and asking students to evaluate the quality of these examples before they complete similar tasks (Hendry *et al*., 2016) and develop a shared commitment to academic goals (Alghamdi, 2024).

At the information gathering stage, it has been found that teachers design evaluations on learning outcomes, namely cognitive, psychomotor, and affective domains. Formative assessment materials that have been designed previously can help teachers in realizing increasing the possibility of implementing formative assessments (Hondrich *et al*., 2015).

This is evident from the results of the teacher and student questionnaires included in the high category at State Junior High School 62 Surabaya, meaning that formative assessment evaluation has been implemented, especially regarding the collection of information in learning. In the cognitive domain, teachers provide trigger questions in the hope that students can understand the material. The trigger questions aim to train a student's cognitive abilities and develop a higher level of thinking (Orru *et al*., 2018). Meanwhile, peer evaluation with attitude assessments referring to journals is implemented to measure the affective domain. In the psychomotor domain, teachers carry out learning evaluation activities in the form of written tests, practices, and simulations according to the design in the teaching module.

At the information processing and interpretation stage, researchers process the assessment data that has been obtained and interpret the information. Based on the results of the teacher questionnaire, it is included in the high category at State Junior High School 62 Surabaya, meaning that formative assessment evaluation has been implemented, especially regarding the processing and interpretation of information in learning. Formative assessment in this study was obtained from performance assessments carried out by students in the form of essay/descriptive tests, practicums, and presentations. Teachers carry out assessments using the results of descriptive tests carried out by students. In addition, based on the results of observations and documentation reviews, it was found that teachers carried out evaluations on learning outcomes starting from the cognitive, psychomotor, and affective domains.

Measurement of cognitive learning outcomes starts from the concrete to the abstract which is accumulated in the form of a score. Meanwhile, the way to measure in the affective domain is by using an affective assessment instrument, namely the Likert scale. In the psychomotor aspect assessment section, it is related to skills after students carry out learning activities in class and receive learning.

Engaging students in learning enables them to become self-regulated learners who control their own learning and are ready to become lifelong learners (Öz & Şen, 2021). The impact of various activities that support cognitive, affective, and psychomotor aspects can increase students' sense of understanding of the material (Abbasi *et al*., 2023). If evaluation activities are carried out using activities that improve skills such as practice, it will help instill a strong memory related to the material taught (Cowan, 2014).

At the action-taking stage, researchers conducted the following: (1) implementing peer assessment, (2) self-assessment, and (3) providing feedback. Based on the results of the questionnaire, students and teachers were included in the high category at Junior High School N 62 Surabaya, meaning that formative

assessment evaluation had been implemented, especially related to action-taking in learning. The results showed results that were in accordance with the study (Bjork *et al*., 2013), namely that 75% of students felt comfortable if their friends evaluated their performance and 25% felt the opposite. Students learn to monitor their own progress. This depends on student engagement with the information received to generate feedback and become more reflective learners.

Meanwhile, students were also able to read the assessment rubric carefully and understand the steps of peer assessment. In addition, all students involved in the study at State Junior High School 62 Surabaya carried out the evaluation seriously. Another factor, the class used in the study was the class with the highest quality of students and some of them had completed peer assessments before.

In line with what Sriyati et al., 2016, stated that through peer assessment, students are trained to communicate, write, and express what they want to express. Consistent with the research findings of Kartono, 2011,which states the benefits of peer assessment include: it can improve learning collaboration through feedback and students can comment on their friends' performance. Another important role causes the level of student desire to assess friends to be very high and has a positive impact on learning in achieving learning objectives (Stan & Manea, 2015).

Meanwhile, the results of student performance during self-assessment showed that all statements were in the high category. Students find it easier to carry out self-assessment using the scientific attitude rubric and to self-assess their performance. Self-assessment aims to provide users with the opportunity to evaluate their own understanding (Hadeli *et al*., 2020). This allows teachers to easily monitor which users understand the material. The results of the teacher's assessment showed a high category at State Junior High School 62 Surabaya. The teacher asked students to self-reflect using the demonstration assessment rubric. Students understand the demonstration assessment criteria from the rubric used to evaluate themselves of science learning. However, there are several obstacles in its implementation. Some students rated themselves high and stated that their performance results almost met all aspects of the assessment.

In the final stage of taking action, teachers and peers provide feedback on students' work to encourage higher-order thinking and provide support, structure, and time for students to correlate to become effective formative assessment strategies. The results of student performance during the evaluation of the implementation of feedback showed a high category. Feedback activities can help students and teachers to share opinions about things that need to be improved with follow-up actions to achieve optimal learning quality.

Overall, some teachers have not shown the use of effective strategies in the domain of formative assessment. This is in accordance with the results of teacher assessments showing a sufficient category at State Junior High School 62 Surabaya. In traditional teaching practices, only some teachers develop in sharing practices and only provide good feedback in the form of instructions. This finding is in line with previous research showing that despite training, tools and support, competent

teachers on formative assessment struggle to translate their knowledge into classroom practice (Box *et al*., 2015).

Previous research has identified several possible explanations for the underuse of feedback in formative assessment, including the multitude of formative assessment practices available and the difficulty in selecting which practices to use (Kyaruzi *et al*., 2019; Leahy *et al*., 2005), pressure to use class time to prepare for exams, and difficulties in perceiving formative assessment practices as a component of everyday teaching practice (Johnson *et al*., 2019).

CONCLUSION

Based on the results of the study, it can be concluded that the use of formative assessment in the science learning process is very important. The results of this study indicate that among others, at the information collection stage, it is included in the sufficient category, meaning that teachers are able to plan formative assessments by analyzing learning outcomes (CP), learning objectives (TP), and analyzing the flow of learning objectives (ATP) and students are able to provide responses related to mastery of the material. In the processing and interpretation of information, it is included in the sufficient category, meaning that teachers are able to process assessment data and interpret information based on the results of processing assessment data. In the action-taking section, it is included in the high category indicated by teachers and students who are able to apply feedback, peer assessment, and self-assessment well. So it can be concluded that formative assessment evaluation has been implemented at State Junior High School 62 Surabaya, but it still needs improvement so that it runs more optimally.

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