

# **IDENTIFICATION OF TEACHERS' PRACTICES AND THEIR BARRIERS IN CHEMICAL COGNITIVE ASSESSMENT DURING THE EARLY PANDEMIC OF COVID-19**

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## **Abstract**

The occurrence of the Covid-19 pandemic affected the implementation of education, where learning which was originally carried out face-to-face in the classroom, now has to turn into an online system. Limited communication between students and teachers, limited time allocation, lack of facilities and internet access are obstacles that cause teaching and learning activities cannot be carried out optimally. Learning during the pandemic also raises various problems that hinder assessment activities. Therefore, the authors conducted a study that aimed to analyse teacher practices and barriers in chemical cognitive assessment during the Covid-19 pandemic. This study uses a qualitative descriptive research method with 4 research stages: preparation, data collection, data analysis, and drawing conclusions. The research subjects included 85 chemistry teachers from various districts/cities throughout East Java Province. Subject selection was carried out using criterion-based selection and sample determination using random sampling technique. Data were analyzed using descriptive statistical techniques. The instrument used consisted of an open and closed questionnaire via the Google Form platform. The results of the study show that learning during the pandemic creates various obstacles to cognitive assessment activities in chemistry subjects. The instrument used consisted of an open and closed questionnaire via the Google Form platform. The results of the study show that learning during the pandemic creates various obstacles to cognitive assessment activities in chemistry subjects. The instrument used consisted of an open and closed questionnaire via the Google Form platform. The results of the study show that learning during the pandemic creates various obstacles to cognitive

assessment activities in chemistry subjects. Obstacles in these assessment activities include the difficulty of fulfilling accurate and valid aspects and the similarity of answers between students. In addition, the lack of motivation to learn and barriers to internet access also trigger delays in assessment activities during the distance learning period.

**Keywords:** *Assessment; COVID-19; Cognitive; Pandemic; Chemistry*

## **I. Introduction**

The occurrence of the Covid-19 pandemic that has hit the whole world, including Indonesia, has brought changes to new habits (new normal). This has an impact on every aspect of life, including education. Based on the circular letter of the Minister of Education and Culture number 4 of 2020 regarding the implementation of education in the Covid-19 emergency period, then strengthened by Circular Letter Number 15 of 2020 concerning Guidelines for the Implementation of Learning From Home, since March 2020 schools have been closed and there is no face-to-face learning to prevent the spread of Covid-19. Learning that was originally carried out in the classroom, now must be carried out online by utilizing information technology. Then, various problems arise, such as the lack of facilities and inadequate internet access becoming obstacles in the implementation of learning. In addition, the lack of communication between teachers and students due to the limited time allocation resulted in the material being not delivered optimally. Asmuni (2020), in his research said that one of the problems of online learning is that students do not master the content of the material delivered by the teacher through the online platform. In addition, giving more assignments when compared to face-to-face learning also triggers student anxiety. The main thing to note is the communication between teachers and students. This communication barrier often occurs during online learning. Teachers must understand that indifferent students are also obstacles to teaching and learning [1]. Assessment is not only based on measuring the content of knowledge but also must meet targets which include literacy, numeracy, and character education [2].

In addition to material delivery, distance learning also hinders teachers from conducting evaluations (assessments) on students' learning achievement. Evaluation is an effort to make decisions about the level of student learning outcomes in accordance with learning objectives (Magdalena et al., 2020). Thus, the assessment is an important activity that must be carried out in order to determine the extent to which the achievement of students in learning activities. Through the assessment, the teacher can identify which parts have been understood and which have not been understood by students, so that it can be used as a reference for designing appropriate learning methods. However, distance learning does not allow teachers to directly supervise students. Thus, making it difficult for teachers to carry out assessment activities. When conducting online assessments, teachers cannot be sure whether

students actually take the test according to their abilities or not. The absence of supervision from the teacher causes students to have a great opportunity not to do an honest assessment. So that, the results obtained are not representative showing the achievement of students accurately. Therefore, this study aims to identify teacher practices and barriers in chemical cognitive assessment during the Covid-19 pandemic. From this research, it is hoped that information will be obtained about the techniques used by the teacher to obtain valid and reliable results, as well as the obstacles experienced in conducting the assessment.

### **Literature Review**

Indonesia reported its first case in early March 2020 [3]. This pandemic has brought a change in the order of life towards a new normal, impacting all fields, including the education sector. The advantage of online learning is that it is more practical and flexible. It is practical because you can give assignments at any time and are more flexible in doing them anytime and anywhere [4]. However, based on research conducted by [5] the pandemic has implications for implementing less-than-optimal learning. This less-than-optimal learning has an impact on educational assessment activities. This becomes a more complex problem for midwives in education because assessment plays an important role in assessing the extent to which the learning process is achieved [6]. States that assessment aims to obtain certainty about student learning success. Moreover, provide input to teachers about what they do in teaching activities. In other words, the teacher's assessment aims to determine whether the learning material delivered has been mastered by students. Based on research conducted by [7], the practice of assessment during the Covid-19 pandemic was more dominantly carried out online. However, the assessment results cannot describe students' actual abilities because the principles of valid, fair, reliable, and authentic assessment are difficult to fulfill. In line with this, [8] in his research stated that from the results of student learning evaluations, the reliability test of online learning, assessment instruments did not give consistent results because there were obstacles where not all students had online learning facilities, teachers had difficulty monitoring student learning progress, competency teachers are limited in the use of learning applications, and when the teacher gives assignments not all students submit assignments according to the deadlines that have been given. However, in this case, the teacher can make innovations in using learning media to attract the interest of students who are carrying out online learning, as in research by [9]. His research on game-based learning media that uses Wordwall gets a good response from students, as evidenced by the implementation test results of 81.75%, which means the media is feasible [9]. Also supported by similar research from [10], which explains the role of learning media through Instagram social media, which can effectively increase students' interest in learning group I and II cation analysis material, which is considered difficult and problematic.

## II. Method

This study uses a qualitative descriptive research method with four stages of research, namely preparation, data collection, data analysis, and concluding. The first stage includes the preparation of an instrument in the form of a questionnaire which is presented on the google form platform. The 10 questions represent three aspects of cognitive assessment practice and 1 question item represents the obstacles faced by chemistry teachers in assessing students during online learning due to COVID-19. The type of questionnaire used in the form of a closed questionnaire (5 questions) and open (6 questions). This questionnaire consists of several indicators which are constructed based on the pocket book of periodic diagnostic assessments and are presented in table 1.

Table 1. Diagnostic Assessment Indicator

No.	Aspect	Indicator
<b>Assessment Practice</b>		
1	Preparation	Create an instrument for measuring the achievement of learning outcomes
2	Implementation	Carry out regular assessments Using assessment techniques Assess objectively
3	Diagnosis and follow-up	Divide students into several groups
<b>Resistance</b>		
4	Resistance	Barriers to measuring student achievement during the COVID-19 pandemic

There are 85 chemistry teachers from various districts/cities throughout East Java Province who are the subjects of this research. In addition, the determination of the sample uses a random sampling technique which means that each sub-group is selected, which in this study is in the form of each district/city.[11]. The districts/cities that were targeted in this study were Malang, Surabaya, Malang City, Sidoarjo, Tulungagung and other districts outside the region. Most of the respondents came from Malang and regencies outside the region, which were the subjects of this study, so the total number of respondents was 85 chemistry teachers. The data analysis technique used in this research is descriptive statistical analysis of the questionnaire results and coding and categorizing them into themes by reviewing sentences with the highest frequency, with the aim of finding meaning and implications from the results of this study. In the questionnaire, results from open questions will be coded using the software atlas. ti 9.

### III. Results and Discussion

This study aims to identify the practices and obstacles experienced by teachers in cognitive assessment activities for chemistry subjects during the Covid-19 pandemic. This research starts from the reality that during the pandemic, education is also faced with various kinds of problems, one of which is in terms of assessment. Based on research using questionnaires, answers were obtained regarding assessment activities consisting of four indicators, namely the stages of preparation, implementation, diagnosis and follow-up, as well as obstacles.

#### Cognitive Assessment Preparation Stage

This study shows that in the cognitive assessment preparation stage, as many as 77% of the 85 chemistry teacher respondents in East Java, used tests as an assessment instrument, while 17.6% used portfolio assessment, and 4.8% used performance assessment (Figure 1). Thus, these results indicate that the cognitive assessment technique carried out by the chemistry teacher predominantly uses tests. This is in accordance with the statement[12], that the test is a measuring tool that is widely used in educational assessment. Through tests, teachers can obtain information about the level of understanding of students on the material that has been studied. In addition to tests, teachers can actually use performance, projects, and portfolios as assessment techniques. However, during the current Covid-19 pandemic, teachers do not use this technique much due to the limited time allocation for distance learning, while performance, project, and portfolio-based assessments require a longer period of work. In addition, the potential for students to experience misconceptions is greater because distance learning cannot control whether the student understands the material being studied [13].

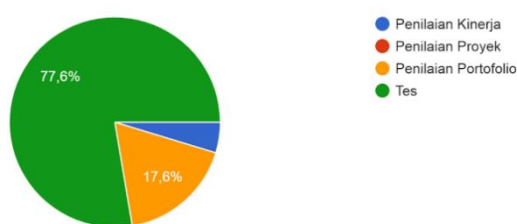


Figure 1. Assessment Techniques Form

The most widely used form of test by teachers, in the form of multiple choice questions, which is 69.4, as many as 25.9% of teacher respondents also use the form of description questions, while short entries, match, complete, and true and false are rarely used (Figure 2). During this distance learning period, apart from hindering teaching and learning activities, it also hampers assessment or assessment activities. Teachers must choose a form of test that is objective and can measure students' abilities as effectively as possible. Multiple choice tests have the advantage of time efficiency and can be used to measure large number of test takers and are easy in terms of scoring because they are objective.[14].

So, it is very natural that teachers use multiple choice more often because in addition to making it easier to score, it also makes it easier for students to work on it.

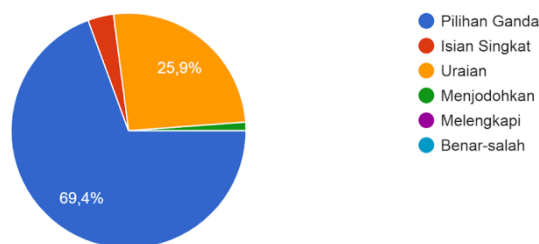


Figure 2. Use of The Question Form

The form of multiple choice questions most often used by chemistry teachers as an assessment instrument is dominated by ordinary multiple choice (ABC options), while complex multiple choice and causation are rarely used (Figure 3). The form of ordinary multiple choice questions is more often used because the level of difficulty of the questions is not too high. However, this type of multiple choice has a weakness where students who do not actually understand the material have the opportunity to answer the questions correctly. Meanwhile, in the form of complex multiple choice or association, it has high difficulty and the answers cannot be guessed, but must be analyzed, thus requiring students to master the material thoroughly. Thus, complex multiple choice questions are actually more recommended. In this study, teachers still tend to use ordinary multiple choice.[15], that time constraints are the main obstacle for teachers in modifying the various forms of tests, teachers find it difficult to make other forms of multiple choice tests such as association multiple choice, or causal multiple choice.

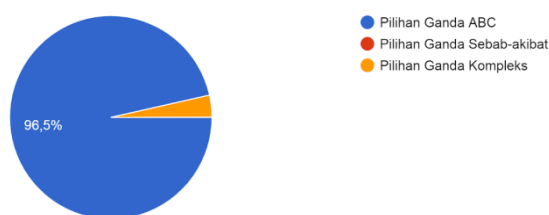


Figure 3. Multiple Choice Form

The description questions used by the respondent chemistry teacher are in the form of an objective description of 85% and a non-objective description of 20% (Figure 4). This shows that the form of objective description is used more than the form of non-objective description. In the objective description, it only uses two categories, namely true and false or a score of 1 for true and 0 if false, while the non-objective description of the range of scores is determined by the complexity of the answer.[16]. Based on this, it can be said that the objective description makes it easier for students to answer, because the form of the question is not too complex and makes it easier for the teacher to give scores.

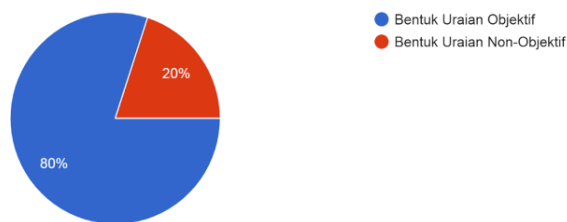


Figure 4. Question Form Description

The difficulty level of the chemistry teachers' questions varied from C1 to C6 using the bloom taxonomy published in the journal [18] concerning the Application of the Revised Bloom's Taxonomy in the Development of Knowledge Domain Chemistry Problems [17]. The explanation of the difficulty level of the questions is as follows.

- C1, related to knowledge, emphasizes the process of remembering and revealing the knowledge that has been obtained.
- C2 is related to understanding, which is constructing meaning or understanding based on prior knowledge possessed, or integrating new knowledge into existing schemas in students' thinking.
- C3, related to applying, which includes the use of a procedure to solve a problem or do a task.
- C4, relates to analyzing, which describes a problem into its elements and determines how the interrelationships between these elements are.
- C5, related to evaluation (evaluate), namely making a judgment based on existing criteria and standards.
- C6, relates to creating, which is combining several elements into a unified form.
- Based on this study, it was found that questions C1 to C4 were used more often than questions C5 to C6 (Figure 5).

This is in accordance with research[18], that in the middle and low category schools, questions C1 to C4 more often used, while questions C5 to C6 were still rarely used because they were not easy to make and most students complained that the questions were difficult to do, especially in distance learning during the pandemic.

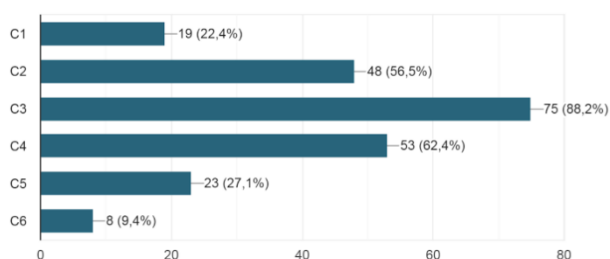


Figure 5. Question Difficulty Level

### Stages of Implementation of Cognitive Assessment

At the stage of implementing the cognitive assessment of chemistry subjects during the Covid-19 pandemic, the teacher was dominant at the end of each chapter/material with a percentage of 63.5% of respondents (Figure 6). This assessment will also continue to be carried out online.

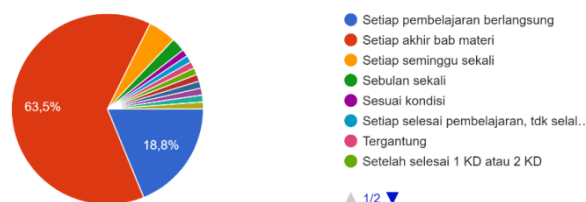


Figure 6. Assessment Frequency Form

The choice of this technique is in accordance with the research study [19] and [20] that online tests are the right assessment model to be applied during distance learning during the covid-19 pandemic. Assessments are carried out by teachers through several application platforms. Based on the word cloud (Figure 7) shows the word google form is the word with the most frequency, followed by google classroom and quizzz.



Figure 7. Word Cloud Applications Used

The reasons for using these application platforms on the basis of principles by teachers and students are in line with the research [21] and [22]. This confirms that the implementation of assessment practices is influenced by technology and the capabilities of its users. This statement is confirmed by research [23] which states that the success of online learning is influenced by technology and the quality of human resources as users. Thus, the availability of facilities and good knowledge and skills are the keys to the success of online chemistry cognitive assessments during the COVID-19 pandemic. In line with research from [24], which explains that the use of virtual laboratories in chemistry learning is very helpful, it is shown from the results of media validation from experts of 87.8% and 82.7%, which means that these two values are meaningful and feasible to use to assist teachers in learning chemistry [24].



Furthermore, teachers should try to assess students as objectively or accurately as possible when online assessments are conducted. In the results of the answers to open questionnaires regarding the methods used by teachers to check the accuracy of students' answers when conducting assessments during distance/online learning, they were analyzed using atlas.ti 9 by looking at the highest frequency of words that often appear based on the word cloud in Figure 8, it can be interpreted as following.

- Confirming direct/verbal explanation answers to test whether it is done alone or with the help of others
- Comparing activity during learning via video conference with test results
- Adapting to the answer key
- Checking the similarity/similarity of answers between students
- Giving a time limit in the test, students who understand will tend to collect answers quickly and accurately



Figure 8. Word Cloud How Teachers Review Test Accuracy

This is also in line with research studies [25] about how the teacher checks the accuracy of the answers. In this study, a study was also conducted on the level of teacher confidence in students' answers during distance learning/online assessments. Based on table 3, using a scale of 0-100, the average confidence level is 72.42. This value is included in the good category, which means that the teacher's trust in students is still high.

Table 1. Level of Confidence in Students' Answers

Level of confidence	Frequency
1-10	0
11-20	1
21-30	2
31-40	0
41-50	10
51-60	8
61-70	11

71-80	37
81-90	13
91-100	3

### Stage of Diagnosis and Follow-up of Cognitive Assessment

At this stage, the diagnosis and follow-up on the results of the cognitive assessment are carried out. As many as 81.2% of teachers have grouped students into several categories. Furthermore, remedial activities are carried out in learning activities. This remedial activity is a follow-up for students who have not completed so it is very important for teachers to know the progress of students during distance learning/ online[26].

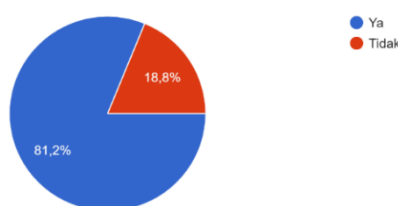


Figure 9. Follow-up Assessment

### Barriers to Cognitive Assessment

In the implementation of cognitive assessment measurements, teachers face several obstacles. In research(Sánchez, Rodríguez and Martínez, 2019), the existence of obstacles has limited participation and learning motivation of students. These obstacles in this research study are divided into four, namely (1) barriers to answer validity, (2) barriers to time constraints, (3) barriers from students, and (4) barriers to availability and use of facilities. In the research study, the obstacles to the validity of the answers were further divided into four codes based on the analysis of atlas.ti 9, namely the results were not valid/accurate, students' answers were almost the same/similar, the validity of the answers, and direct monitoring which can be seen in Figure 10 in the form of attachments to quotations.

<ul style="list-style-type: none"> <li>○ Hasil tidak shahib/akurat Created by Mobile46 on 2/24/2021 2 Quotations: 7:6 p 2 in <b>Praktik dan Hambatan Asesmen</b> Kesulitan dalam menentukan keakuratan jawaban, terutama pada asesmen kognitif. 7:8 p 2 in <b>Praktik dan Hambatan Asesmen</b> Jawaban siswa seringkali tidak sesuai yang diharapkan apalagi kondisi pandemi hampir 50% jawaban siswa hasil browsing di google atau medsos lainnya</li> </ul>	<ul style="list-style-type: none"> <li>○ Kevalidan jawaban Created by Mobile46 on 2/24/2021 1 Quotations: 7:1 p 1 in <b>Praktik dan Hambatan Asesmen</b> konfirmasi jawaban atas diri sendiri atau orang lain</li> </ul>
<ul style="list-style-type: none"> <li>○ Jawaban siswa yang hampir sama/mirip Created by Mobile46 on 2/24/2021 2 Quotations: 7:5 p 2 in <b>Praktik dan Hambatan Asesmen</b> Hasil jawaban siswa kebanyakan sama 7:7 p 2 in <b>Praktik dan Hambatan Asesmen</b> Jawaban siswa seragam.</li> </ul>	<ul style="list-style-type: none"> <li>○ Pemantauan langsung Created by Mobile46 on 2/24/2021 2 Quotations: 7:2 p 1 in <b>Praktik dan Hambatan Asesmen</b> Tidak bisa mengawasi asesmen secara langsung 7:12 p 4 in <b>Praktik dan Hambatan Asesmen</b> Kurang bisa memantau tingkat kejujuran siswa.</li> </ul>

Figure 10. Quotations Validity of Answers

Based on Figure 10, the chemistry teacher revealed that the assessment carried out was inaccurate because students did things such as looking for answers on the internet which resulted in the teacher having difficulty in determining the cognitive assessment objectively or accurately. In research[28] also stated that assessments during the covid-19 pandemic could have measurement errors. Students need the motivation to increase student interest and focus. One way to increase student learning motivation is to present interesting learning media for students [29].

The results of this study also indicate that there is a tendency for students' answers to be almost the same. In addition, regarding the validity of the results of student answers, it is also an obstacle when conducting online assessments. The tendency of students' answers to be invalid is because of the teacher during online learning. Teachers are less able to monitor assessments directly during the test so they do not know whether the answers are purely from students or the result of collaboration with other students, parents, and siblings. According to research[30] students become brave to do things that are sometimes unnatural such as cooperation during test work due to a lack of supervision from the teacher. Thus, the principles of assessment under special conditions such as valid, reliable, fair, flexible, authentic, and integrated as stipulated in the Decree of the Minister of Education and Culture of the Republic of Indonesia Number 719/P/2020 will be difficult to fulfill. As a result, many teachers feel confused about determining the next step or remedial, even though in this study 81.2% of chemistry teachers revealed remedial. However, there is a possibility that these remedial activities will also be inappropriate and will burden students even more.

- 
- Kondisi peserta didik  
Created by Mobile46 on 2/24/2021  
5 Quotations:  
7:3 p 1 in Praktik dan Hambatan Asesmen  
Gairah belajar menurun di masa covid
  - 7:4 p 1 in Praktik dan Hambatan Asesmen  
siswa kurang paham hasil asesmen menjadi kurang akurat
  - 7:9 p 3 in Praktik dan Hambatan Asesmen  
kurangnya motivasi belajar
  - 7:10 p 3 in Praktik dan Hambatan Asesmen  
Jaringan error
  - 7:11 p 4 in Praktik dan Hambatan Asesmen  
Anak2 kurang disiplin

Figure 11. Quotations of Student Barriers

In the implementation of the assessment, obstacles also came from students which included learning motivation and understanding of chemical concepts which resulted in poor assessment results (Figure

11). One of the reasons for this decrease in learning motivation is boredom during distance/online learning which has implications for the problem solving process [4]. The implementation of the assessment is also hampered by the availability and use of facilities such as not all students have smart devices and are constrained by unstable internet networks, limited quotas and lack of understanding of the use of existing technology. On the other hand, the implementation of the assessment is also limited in time, with the following excerpt from the teacher's open response.

**Respondent 65:** student readiness, the time required is relatively large

**Respondent75:** checking the results of the assessment for the form of a description takes a long time

**Respondent 76:** Timeliness of students in accessing

The obstacles that have been mentioned cause the process of delivering the material to not take place as usual, which causes a low level of understanding of students' concepts, which then leads to low learning outcomes in cognitive assessments held. The results of the assessment with the chemistry learning process itself is an inseparable part and contributes to each other. If students can understand the material taught by the teacher, the results of the assessment will be even better[31]. According to [32], research explained that improving students' cognitive abilities through problem-solving techniques is an important component of problem-solving in learning and related to thinking skills. Profil responden [32].

Although there are many obstacles in conducting cognitive assessments objectively and accurately, some of the chemistry subject teachers in this study have taken alternative steps, namely giving varied questions with a limited duration of work, selecting the appropriate assessment technique as possible, indirect assessment by looking at activeness of students during teaching and oral tests via video conferencing. These steps are in accordance with Marhaeni's suggestion(Yansa and Retnawati, 2021) who conveyed, if the implementation of online assessments still wants quality, then teachers must avoid assessment tasks that can be imitated or copied.

#### **IV. Conclusion**

Based on this research, it can be concluded that at the stage of preparation for the cognitive chemistry assessment, teachers more often use tests with the usual multiple choice question type and the descriptions that are often used are in the form of objective descriptions. The level of difficulty of the questions used varies from C1 to C6. Types of questions C1 to C4 are used more often, while questions C5 and C6 are rarely used. The majority of the assessments are carried out at the end of each completed chapter using the Google Form platform. One of the ways that teachers do in order to test

the accuracy of students' answers is by verbally confirming, comparing activity with results, checking keys and similarities between students' answers, and setting a time limit for processing. Distance learning in a time of pandemic, cause various kinds of obstacles in assessment activities, including difficulty in meeting accurate and valid aspects, the similarity of answers between students. In addition, the lack of motivation to learn and obstacles to internet access are also triggers for hampering assessment activities during the distance learning period.

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