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Teachers' and Students' Perceptions of Learning Atomic Structure Material Using Online Systems

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Abstract: Teacher and Student Perceptions of Learning Atomic Structure Using Online Systems. This study aims to describe the perceptions of teachers and students towards learning the atomic structure material using an online system. The design of this study used descriptive qualitative research. The method used is a survey method. The subjects of this study consisted of 36 students of class X IPA 3 and 1 chemistry teacher. The results showed that the perceptions of teachers and students towards learning the atomic structure material, aspects of education management tend to be positive, online learning makes students more independent, students are more confident to discuss through online learning and online learning is more efficient because it can be carried out anytime and anywhere. In the aspect of human resources, it tends to be positive, online learning is able to make students and teachers develop skills and knowledge about information and communication technology (ICT) and be able to use various learning applications such as PCs and gadgets. While on the infrastructure aspect, teachers respond positively and students tend to be negative, this is because students still have problems with unstable internet access so that it can hamper the process of online learning activities.
Keywords :Atomic structure, online learning, perception, chemistry lesson

Abstrak: Persepsi Guru dan Siswa Terhadap Pembelajaran Materi Struktur Atom Menggunakan Sistem Daring. *Penelitian ini bertujuan untuk mendeskripsikan persepsi guru dan siswa terhadap pembelajaran materi struktur atom menggunakan sistem daring. Desain penelitian ini menggunakan penelitian deskriptif kualitatif. Metode yang digunakan adalah metode survei. Subjek penelitian ini terdiri dari siswa kelas X IPA 3 sebanyak 36 siswa dan 1 guru kimia. Hasil penelitian menunjukkan bahwa persepsi guru dan siswa terhadap pembelajaran materi struktur atom, aspek manajemen pendidikan cenderung positif, pembelajaran daring membuat siswa menjadi lebih mandiri, siswa lebih percaya diri untuk berdiskusi melalui pembelajaran daring dan pembelajaran daring lebih efisien karena dapat dilaksanakan kapanpun dan di manapun. Pada aspek sumber daya manusia cenderung positif, pembelajaran daring mampu membuat siswa dan guru mengembangkan keterampilan dan pengetahuan tentang teknologi informasi dan komunikasi (TIK) dan mampu menggunakan berbagai aplikasi pembelajaran seperti PC maupun gadget. Sedangkan pada aspek infrastruktur guru merespon positif dan siswa cenderung negatif, hal tersebut dikarenakan siswa masih memiliki masalah akses internet yang tidak stabil sehingga dapat menghambat proses kegiatan pembelajaran daring. Kesimpulan dari hasil yang diperoleh menyatakan bahwa mayoritas persepsi guru dan siswa terhadap pembelajaran materi strutur atom mengunakan sistem daring adalah positif.*

***Kata kunci** : struktur atom, daring, persepsi, pembelajaran kimia*

▪ INTRODUCTION

The quality of education is currently a challenge as a result of the Covid-19 outbreak. Covid-19 is an infectious disease that has the potential to cause a public health emergency. Covid-19 is a global pandemic whose spread is very worrying. As a result, the government has to work together to suppress the spread of Covid-19 by issuing a policy so that all citizens of the community to practice social distancing or maintain a distance (Secretariat of the Republic of Indonesia, 2020).

The policy letter that has been issued causes all activities
People who previously carried out activities outside the home must now be temporarily suspended and required to carry out activities at their respective homes. This fact has finally forced a number of schools in Indonesia and even abroad to temporarily suspend the teaching and learning process (KBM) with a face-to-face system in the classroom and conduct online learning. This is to prevent the transmission of the Covid-19 virus to students and teachers.

One of the impacts of social distancing also occurs in the learning system in schools. Based on Circular Letter Number 4 of 2020 concerning the Implementation of Education Policies in the emergency period of the spread of the virus, the Minister of Education and Culture urges all educational institutions not to carry out the teaching and learning process directly or face to face, but must be carried out indirectly or remotely (SE Mendikbud No. 4, 2020). The circular letter that has been stipulated makes all educational institutions replace temporary learning methods with online or online systems.

Online learning is learning that is done online, using learning applications and social networks. Online learning is learning that is done without face to face, but through an available platform. All forms of learning materials are distributed online, communication is also done online. This online learning system is assisted by several applications, such as Google Classroom, Google Meet, Edmodo and Zoom Meeting (Ivanova et al, 2020).

Based on observations made at SMA Negeri 1 Tumijajar, most online learning is carried out through the Google Classroom application. The school has implemented online learning since the beginning of the implementation of the policy to conduct online learning at home. In chemistry subjects that have been studied through the online system at SMA Negeri 1 Tumijajar, namely the atomic structure material in KD 3.2 class X odd semester. Concepts in the atomic structure of matter are generally complex and abstract. Abstract concepts tend to have the potential to cause learning difficulties and understanding the wrong concepts in students.

The atomic structure is a difficult concept, because it contains abstract concepts that are difficult for most students to understand. Several research results show that most students still have difficulty in learning the concept of atomic structure. The results of interviews on observation activities with 7 students from 36 students of class X IPA 3 which were conducted on December 10, 2020, they had difficulty in classifying various types of atoms because according to them all atoms were almost the same. In addition, they also stated that they had difficulty in understanding how to project the position of electrons in an atom, they said that abstract matter such as the atomic structure of matter was difficult to observe directly because the atomic size was very micro.

There is a study that is in line with this study which states that the level of difficulty of students in understanding atomic structure is 52.07% (medium). The factors that cause their learning difficulties are the lack of understanding of the concept of chemistry, the lack of variety of practice questions, the lack of interaction between students, teachers in

learning and the lack of learning media and the abundance of teaching materials (Rica and Suyanta, 2013).

The importance of knowing the perceptions of students and teachers in online learning is to find out more about what students and teachers experience, such as the advantages and obstacles experienced during this online learning method, especially in learning chemistry with atomic structure material. After knowing what obstacles or problems have been experienced by students and teachers, then they can find out the right solution to overcome these problems. Perceptions are measured using a questionnaire that has 3 indicators, namely, aspects of education management, aspects of human resources and aspects of infrastructure (Permana and Daryati, 2013).

To find out how the perceptions of teachers and students regarding online learning on atomic structure material, it is necessary to conduct a study entitled "Teachers and Students' Perceptions of Learning Atomic Structure Materials Using Online Systems"

▪ METHOD

This research design uses descriptive qualitative. This descriptive study aims to measure teacher and student perceptions of atomic structure learning using an online system by describing the results of distributing qualitative questionnaires for teacher and student perceptions. Data from the results of distributing questionnaires/questionnaires in this research are in the form of calculated numbers which are processed through classification, summation, finding the average, then obtaining a percentage that is adjusted to the indicators that have been set.

The method used is survey research. Because the school is carrying out online learning, online research is carried out through a questionnaire questionnaire by making statements in Google Forms that are sent to teachers and students via the web. The population in this study were all students and teachers at SMA Negeri 1 Tumijajar.

Subjects or respondents in this study were all students of class X IPA 3 who had studied the atomic structure material as many as 36 students and 1 teacher of class X chemistry. using the online system.

In general, there are three stages in this research, namely the preparation stage, the implementation stage and the final stage. The three stages can be described as follows: (1) Preparation stage, namely (a) Generating ideas or ideas about research conducted by conducting a preliminary study. Literature review and research journals on assessment on a national and international scale. From the results of the study, an idea was obtained about the preparation of a structured questionnaire. (b) Compiling questionnaire indicators according to the problems in this study, namely about perceptions of online learning in atomic structure material. (c) Then make a questionnaire that will be given to students and teachers. The questionnaire given is in the form of a closed questionnaire using the Guttman scale which is then presented via Google Form. (d) The questionnaire that has been prepared is then carried out with a content validation step by expert lecturers to see whether the statements compiled in a questionnaire are valid and feasible to be tested or not. (e) After being validated by expert lecturers, the questionnaire questionnaire is revised according to the input and suggestions given by expert lecturers, then the revised results are ready to be distributed to students and teachers. Repair of the questionnaire includes improving the suitability of indicators with perception statements, writing that is not correct, statements that are not guiding or other things that need to be improved. The questionnaire was revised according to the input and suggestions given by

expert lecturers, then the revised results were ready to be distributed to students and teachers. Repair of the questionnaire includes improving the suitability of indicators with perception statements, writing that is not correct, statements that are not guiding or other things that need to be improved. The questionnaire was revised according to the input and suggestions given by expert lecturers, then the revised results were ready to be distributed to students and teachers. Repair of the questionnaire includes improving the suitability of indicators with perception statements, writing that is not correct, statements that are not guiding or other things that need to be improved.

In (2) the implementation stage, namely (a) Conducting socialization to teachers and students regarding the procedure for filling out the questionnaire packaged in the Google Form. (b) After the socialization was carried out, a questionnaire was distributed regarding the perceptions of teachers and students in learning chemistry using an online system. Fill in the questionnaire 1 time for 1 teacher and 36 students online via Google Form. (c) Conduct online interviews with respondents about learning chemistry with an online system. Then (3) the final stage, namely (a) At this stage, data collection in the form of the perceptions of teachers and students is carried out on the Google Form page. (b) The data obtained is then processed and analyzed using the summation formula and the calculation of the average score of each indicator that has been answered by students and teachers expressed in percent.

The data was collected by downloading the answers to the teacher and student perception questionnaires that had been filled out through the Google Form page, data collection was in the form of the results of questionnaires and interviews.

In this study, the data obtained were in the form of content validation results by expert lecturers. The following are things that were done in analyzing the data that had been collected. (1) Questionnaires that have been validated by expert lecturers and have been given to students are further classified, it aims to group answers based on the aspects asked in the questionnaire questionnaire. (2) To analyze the data collected from the student and teacher perception questionnaires, qualitative and quantitative analysis will be used. (3) Questionnaire data obtained from interviews with teachers will be analyzed in the form of paragraphs of a sentence to get an idea of the perceptions of teachers and students towards learning the atomic structure material using an online system. (4) Analysis of quantitative data by calculating the frequency of answers in percentages, it aims to determine the percentage of answers chosen by students and teachers in each question item. (5) The answers to the questionnaire responses of students and teachers using the Guttman scale questionnaire used consist of two categories made in the form of multiple choice or checklist form (√) as follows:

Table 1. Guttman Scale Rating Categories

No.	Score	Information
1.	Score 1	Yes
2.	Score 0	Not

(Sugiyono, 2016)

The following is the formula used to calculate the percentage of respondents' answers to each item:

$$\%\text{J in} = \frac{\Sigma \text{Ji}}{\text{N}} \; x \; 100\%$$

Information :
%J in = percentage perception of each item
Ji = total score for each selected criterion (yes or no)
N = The number of ideal scores (Sudjana, 2005)

The level of student perception in this study refers to the measurement standards, namely: the perceptions of students and teachers get a negative response if the average percentage of the total item component positive statements is 40% and a positive response if the average percentage of the total item component positive statements is > 40 % (Maulana and Hamidi, 2020).

▪ RESULTS AND DISCUSSION

Based on the data that has been obtained during research at SMA Negeri 1 Tumijajar online through the Google Form page, the percentage value of the average perception of 36 students and 1 chemistry teacher regarding online learning on atomic structure material is as follows:

Table 2. Percentage of Teachers' Perception Results in Learning Atomic Structure Materials Using Online Systems.

No	Statement	Alternative Answer Options	
		YES	NO
1	**Aspects of Educational Management**		
1	I convey the learning objectives before starting the KBM process	√	
2	I always give structured assignments during online learning		√
3	I convey the concept of teaching materials with creative and innovative methods in online learning	√	
4	I provide another alternative in atomic structure practicum activities	√	
5	I find it difficult to convey the concept of atomic structure of matter		√
6	I ask students to make study groups to be more effective	√	
2	**Aspects of Human Resources**		
7	I am able to operate Personal Computer (PC) and gadgets	√	
8	I find it difficult to upload teaching materials through online learning applications		√
9	If I have difficulty, I discuss online with other chemistry teachers.	√	
10	Online learning helps me develop skills and knowledge of information and communication technology (ICT)	√	

No	Statement	Alternative Answer Options	
		YES	NO
11	I am able to use various LMS (Learning Management System) applications such as Google Classroom, Moodle, Edmodo, or Social Networks: WA Group, IG, etc. in carrying out online learning.	√	
3	**Infrastructure Aspect**		
12	I have difficulty with the internet network available for online learning activities		√
13	The school provides supporting equipment such as Personal Computer (PC)/Laptop & LCD Projector for online learning activities	√	
14	The school provides WiFi facilities throughout the school area	√	
15	Websites used for online learning can be accessed 24 hours	√	

1. Teacher's Perception on Education Management Aspects

The aspect of education management is seen from the aspect of the substance of the material, the aspect of the display of learning communication and the aspect of learning design. In this case, researchers need to know how the performance of teachers and students in online learning. Overall, in the aspect of education management, the average percentage of positive responses is 84% and the average negative percentage is 16%, so it can be categorized as positive teacher perceptions on the aspect of education management.

2. Teacher's Perception on Human Resources (HR) Aspects

The aspect of human resources is seen from general knowledge about computers, knowledge of the internet, skills in operating, developing teaching materials and increasing effectiveness and efficiency. In this case, researchers need to know how the performance of teachers and students in online learning. Overall in the aspect of human resources, the average percentage of 100% positive responses can be categorized, so that the teacher's perception of the aspect of human resources can be categorized as positive.

3. Perceptions of Students and Teachers on Infrastructure Aspects

The infrastructure aspect can be seen from the availability of personal computers (PC), computer network components, classification of computer network servers, multimedia equipment and access schedules. Overall, in the infrastructure aspect, an average percentage of 100% positive responses can be obtained, so it can be categorized as positive teacher perceptions on the infrastructure aspect.

Table 3. Percentage of Students' Perception Results in Learning Atomic Structure Materials Using Online Systems

No	Statement	`Alternative Answer Choice	
		YES	NO
1	**Aspects of Educational Management**		
1	In general, I am happy and satisfied with the online learning method	28.6%	71.4%
2	I am happy with the chemistry subject matter on the atomic structure material in online learning	65.7%	34.3%
3	This online learning deserves appreciation and attention among students	74.3%	25.7%
4	I find it difficult to understand atomic structure material through online learning	80%	20%
5	I am happy with the online grading system for chemistry subjects	68.6%	31.4%
6	Online learning directs students to be able to study independently	88.6%	11.4%
7	Studying from home is better than studying at school	14.3%	85.7%
8	I am more courageous and confident through online learning	57.1%	42.9%
9	Online learning can be done anytime and anywhere, not limited by space and time	82.9%	17.1%
10	Students feel disturbed by the online learning of other activities	48.6%	51.4%
11	Students can manage time and activities well and usefully	85.7%	14.3%
12	I am willing to submit any assignments through online learning before the assignment submission date	94.3%	5.7%
13	I actively participate in online learning discussions	88.6%	11.4%
14	I conduct peer assessments during online learning activities	77.1%	82.9%
15	I interact more often with friends and teachers in online learning than in face-to-face learning	17.1%	82.9%
16	The teacher checks the attendance of online learning	100%	0
17	The teacher gives assignments during learning	100%	0
2	**Aspects of Human Resources**		
18	I am able to find various sources of information about learning materials through the internet to support online learning activities	100%	0
19	Online learning makes feedback responses between peers and teachers take a relatively long time.	73.5%	26.5%
20	Online learning helps me develop skills and knowledge of information and communication technology (ICT)	94.3%	5.7%
21	My skills in applying technology, information and communication really support online learning	88.6%	11.4%

No	Statement	`Alternative Answer Choice	
		YES	NO
22	I am able to use various LMS (Learning Management System) applications such as Google Classroom, Moodle, Edmodo, or Social Networks: WA Group, IG, etc. in carrying out online learning.	100%	0
23	I am able to use various applications on the computer to complete tasks	51.4%	48.6%
3	**Infrastructure Aspect**		
24	The school provides supporting equipment such as Personal Computer (PC)/Laptop & LCD Projector for online learning activities	48.6%	51.4%
25	Preparation of technology and information infrastructure for online/online learning costs a lot	73.5%	26.5%
26	I have internet access problem for my online learning class	68.6%	31.4%
27	The school provides WiFi facilities throughout the school area	44.3%	55.7%
28	Websites used for online learning can be accessed 24 hours	76.5%	23.5%

1. Student Perception on Education Management Aspect

The aspect of education management is seen from the aspect of the substance of the material, the aspect of the display of learning communication and the aspect of learning design. In this case, researchers need to know how students perform in online learning. Overall, in the aspect of education management, the average percentage of positive responses is 64%, and the average percentage of negative responses is 36%. So that it can be categorized as a student's perception of the aspect of education management is positive.

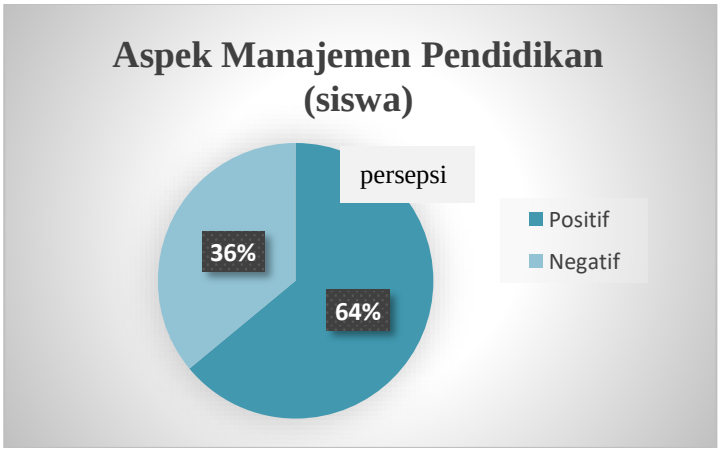

Figure 1. Diagram of the percentage of students' average perceptions on aspects of education management.

2. Student Perception on Human Resources (HR) Aspects

The aspect of human resources is seen from general knowledge about computers, knowledge of the internet, skills in operating, developing teaching materials and increasing effectiveness and efficiency. Overall, in the aspect of human resources, the average percentage of positive responses is 77%, and the average percentage of negative responses is 33%. So that it can be categorized as a student's perception on the aspect of human resources is positive

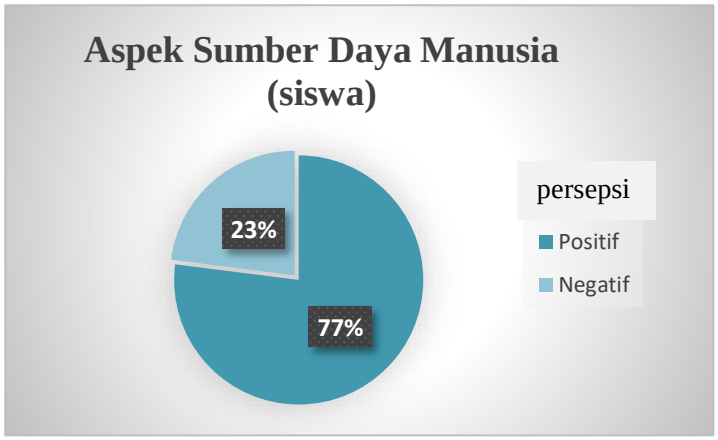

Figure 2. Diagram of the percentage of students' average perceptions on aspects of human resources.

3. Student Perception on Infrastructure Aspect

The infrastructure aspect can be seen from the availability of personal computers (PCs), computer network components, classification of computer network servers, multimedia equipment and access schedules. Overall in the aspect of education management, the average percentage of positive responses is 40%, and the average percentage of negative responses is 60%. So that it can be categorized as a student's perception of the aspect of education management is negative

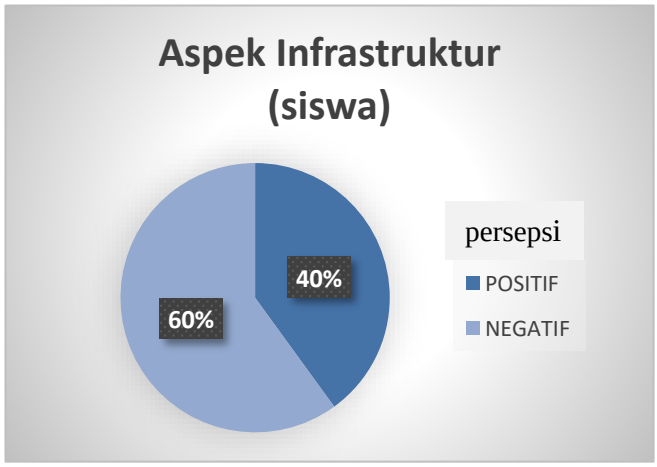

Figure 3. Diagram of the percentage of students' average perceptions of the infrastructure aspect.

Table 4. Average Results of Teacher and Student Percentage

Indicator	Average Percentage Value of Each Indicator			
	Teacher		Student	
	Positive	Negative	Positive	Negative
Aspects of Educational Management	84%	16%	64%	36%
Aspects of Human Resources	100%	0	77%	23%
Infrastructure Aspect	100%	0	40%	60%

▪ CONCLUSION

Based on data from research conducted at SMA Negeri 1 Tumijajar about how teachers and students perceive the atomic structure learning material using an online system, it can be concluded that the majority of students' and teachers' perceptions expressed a positive response. This can be seen in the aspect of education management as many as 84% of teachers responded positively and as many as 64% of students responded positively. Aspects of human resources teachers responded as much as 100% positive answers and as many as 77% of students answered positive responses. Then on the infrastructure aspect the teacher answered 100% positive responses, but students answered only 40% positive responses. Students' perceptions of infrastructure can be said to be negative. This is because students still have unstable internet access problems that hinder the online learning process.

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