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## Cognitive Learning Outcomes of Gas Kinetic Theory Based on Inquiry Approach

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**Abstract:** The purpose of this study is to find the result of student's cognitive through the implementation of gas kinetic learning media based on the inquiry approach of XI MIA 3 SMAN 4 Pekanbaru. This research form is pre-experimental with one shot case study method. The data of this study is student's cognitive score by the post-test. The analysis conducted on the student's cognitive learning outcomes in the form of study absorption, learning effectivity and the percentage of student's pass of each tested indicator. The result obtained from this study are, from 36 students, 3 students have a very good study absorption, 23 have a good study absorption, 8 have a good study absorption, 1 has a less good study absorption and 1 fail. The learning effectivity is in a good category with a percentage of 69,4%. The conclusion is physics learning with inquiry approach goes well.

**Keywords:** Inquiry approach, cognitive study result

### 1. Introduction

Education is divided into three domains, cognitive (knowledge), affective (ethics and feelings) and psychomotor (attitude). Based on Bloom-Anderson's taxonomy, the realm of cognitive learning is divided into 6 levels, remembering, understanding, implementing, analyzing, evaluating and creating (Anderson et al., 2001). In the world of education, the determination of cognitive assessment standards is considered more accurate and can be applied generally when compared with standards in other domains. The Ministry of Education and Culture of Indonesia makes the cognitive domain a reference for students graduating from elementary and secondary school. This can be seen from the determination of the National Examination standard or the value since 2015 referred to as USBN. The cognitive domain is also used as a reference for universities in the process of receiving new students. Some of the above explanation shows how the cognitive domain is the main focus in assessing the success of education (Kemendikbud, 2015).

The kinetic theory of gas material is a material that is classified as difficult to master by students. The ability of students to understand and answer questions on the material of gas kinetic theory is still relatively low (Alfiah, 2015). This is because the kinetic theory of gas is an abstract physical material (Musanni, et al., 2015). Gas kinetic theory material is material that can only be explained theoretically. The scope of the discussion of the matter is the concept of microscopic objects such as atoms and certain conditions that cannot be observed in the actual environment (Suseno, 2014). Based on the previous study in delivering abstract material, the

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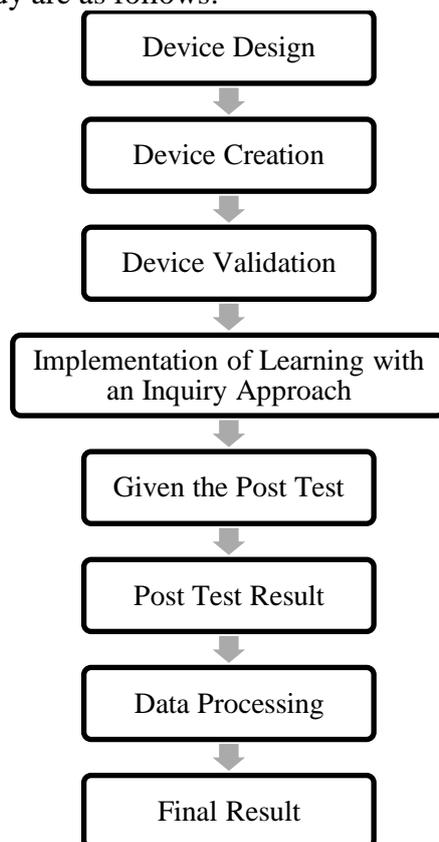
use of learning media will make the learning process take place more efficiently (Zannah, et al., 2014).

In line with the 2013 curriculum, inquiry presents student-centered learning. Inquiry makes students construct their own understanding through a series of research methods (Keselman, 2003). The inquiry approach requires students to play an active role so that the concepts obtained will be longer embedded in students (Wagijartini, 2010; Gusmida, 2017). The use of the inquiry approach is considered to be able to improve students' understanding of concepts and learning outcomes (Madesa and Anna, 2015). The inquiry approach and supporting learning media make students better understand the theory being taught (Nurhasanah, 2016). Based on previous research, students gave a positive response during the implementation of learning using the inquiry method (Madesa and Anna, 2015). This proves that inquiry learning is able to make students play an active role and not feel bored.

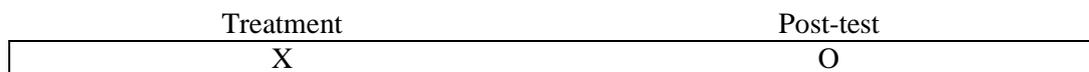
This study aims to describe students' cognitive learning outcomes on the material of gas kinetic theory through an inquiry approach. The inquiry approach is expected to improve students' cognitive learning outcomes. In addition, the results of this study are also expected to be an inspiration for teachers in carrying out classroom learning, as well as being able to improve students' understanding of the kinetic theory of gas material.

## 2. Methodology

The steps taken in this study are as follows:



The type of research used is pre-experimental with the oneshot case study method. The experimental group is given a stimulus then the dependent variable is measured, without a comparison group. This research design is described as follows:



explanation:

- X : The treatment implementation of gas kinetic theory learning media based on the inquiry approach
- O : Post-test after treatment

This research was conducted at SMAN 4 Pekanbaru. This study lasted for two months, precisely in November 2017 - January 2018. The population in this study were students of class XI MIA in SMAN 4 Pekanbaru. And the sample taken was 36 students in class XI MIA 3 at SMAN 4 Pekanbaru.

The instrument used in this study is divided into two type, learning devices, and data collection devices. Learning tools consist of syllabi, RPP, LKPD and experimental devices for kinetic gas theory. This data collection device is an essay test in the form of post-test.

Data analysis techniques in this study were carried out using descriptive analysis techniques including absorptive capacity, student learning effectiveness, and student graduation percentage in each cognitive indicator tested.

One shot case study method is used because this research is still an initial research. The experimental tool used is the result of original designs that have not been tried before. This experimental tool shows the legal concepts of Boyle, Gay Lussac, Charles and Boyle-Gay Lussac so that students can observe for themselves the changes in variables that occur.

### 3. Result and Discussion

Based on the results of descriptive analysis of students' cognitive learning outcomes data on the material of kinetic theory of gas in class XI MIA 3 of SMAN 4 Pekanbaru students absorbed were shown in Table.1.

Table.1 Student Absorption Category

Student absorption percentage (%)	Value of Student	category
80-100	3	Very good
66-79	23	Good
56-65	8	Good enough
40-55	1	Less
30-39	1	Fail
<b>Average student absorption (Effectiveness)</b>		69,4 %
<b>Effectiveness category</b>		Effective

The effectiveness of student learning refers to the absorption power achieved by students. The learning effectiveness of class XI MIA 3 students on the material of gas kinetic theory that was achieved was 69.4%. Thus, ongoing learning is categorized as effective.

The analysis of the percentage of the number of students in class XI 3 who graduated for each indicator can be presented in Table 2.

**Table 2. Percentage of the number of students who graduate for each indicator**

No	1	2	3	4	5	6	7	8	9	10	11	12	13
CL	C <sub>1</sub>	C <sub>3</sub>	C <sub>1</sub>	C <sub>3</sub>	C <sub>1</sub>	C <sub>3</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>3</sub>	C <sub>2</sub>	C <sub>4</sub>	C <sub>4</sub>	C <sub>4</sub>
VS	36	24	23	29	35	35	5	35	29	33	21	0	11
Percentage (%)	100	67	64	81	97	97	14	97	81	91	58	0	31

Explanation:

- VS : The value of students who pass each indicator
- CL : Cognitive Level

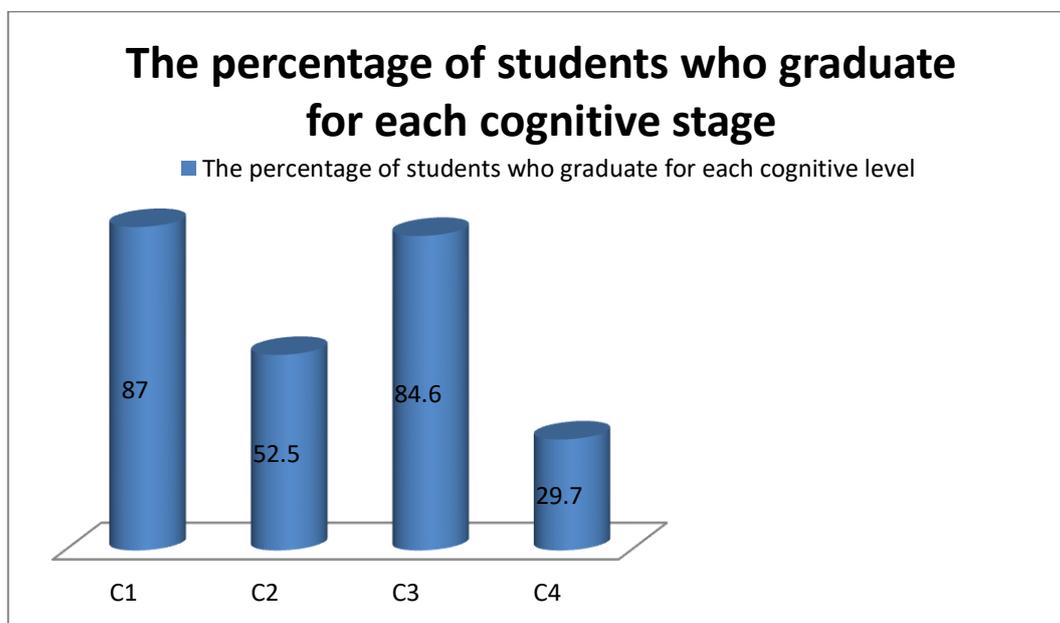


Figure 1. Percentage of the number of students who graduate for each cognitive stage

Overall, if averaged, the percentage of students who completed the post-test given in this study amounted to 63.45%. Based on the given post-test, C1 cognitive stages have the highest percentage of students. The stages that are most difficult for students to master are stage C4, which is the ability to count. This shows that, the higher the cognitive stages tested, the more thinking skills needed to do it. In addition to needing thinking skills, other skills are also needed such as calculating manipulation and observation, and critically responding to a problem.

The post-test results provided also show that more students have difficulty in working on the theoretical questions found in step C2 rather than a matter of calculation that has a C3 cognitive stage. This shows that students do not understand the concept and are only trained to do calculation problems.

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The weakness that can be observed during the learning process is that students are not used to learning using the inquiry approach. This causes a longer time for students to follow each stage of inquiry given. Lesson hours available at school are too short to be able to apply the inquiry learning process so that the learning process goes unwell.

#### 4. Conclusion

Based on the data analysis and discussion of the research that has been done on the cognitive learning outcomes of students through the implementation of the learning media of the kinetic theory of gas based on the inquiry approach in class XI MIA 3 Pekanbaru 4 SMA, it is known that students get good cognitive learning outcomes supported by the absorptive the majority are in the category of good and effective learning effectiveness. Students have been able to master most of the indicators tested. The percentage of student learning success for each indicator and every cognitive level is also quite good, although there are still some students who have not been able to reach the minimum pass limit, especially in the C4 cognitive level. Although the inquiry approach is still new to students, students can follow well and enthusiastically in carrying out learning.

#### Reference

- Alfiah, 2015, Kemampuan Siswa dalam Menyelesaikan Soal-Soal Uraian Terstruktur Pokok Bahasan Teori Kinetik Gas. EDUSAINS 3(02)
- Anderson, L.W. (Ed.), Krathwohl, D.R. (Ed.), Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., & Wittrock, M.C., 2001, A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of Educational Objectives (Complete edition). New York: Longman
- Kemendikbud, 2015, Hasil UN Tetap Jadi Pertimbangan SNMPTN, Asah Asuh Kemendikbud Edisi 2 Th VI Maret 2015. hlm. 5. <https://www.kemdikbud.go.id>
- Keselman, A. (2003). Supporting inquiry learning by promoting normative understanding of multivariable causality. *Journal of Research in Science Teaching*, 40, 898–921.
- Madesa, E., Anna P., 2015, Penerapan Pembelajaran IPA Terpadu Tipe *Threaded* dengan *Level of Inquiry* untuk Meningkatkan Keterampilan Berpikir Kritis dan Penguasaan Konsep Siswa Kelas VIII pada Tema Indera Penglihatan dan Alat Optik. EDUSAINS. 7 (2). 143-150
- Musanni, Susilawati, Hadiwijaya. A.S. 2015. "Pengembangan Bahan Ajar Fisika SMA Berbasis *Learning Cycle* (LC) 3E Pada Materi Pokok Teori Kinetik Gas Dan Termodinamika". *Jurnal Penelitian Pendidikan IPA (JPPIPA)*. Vol. 01.
- Nurhasanah. 2016. Penggunaan Tes Keterampilan Proses Sains (KPS) Siswa dengan Pembelajaran Konsep Kalor dengan Model Inkuiri Terbimbing. Repository UIN Jakarta
- Rifqa Gusmida, Nur Islami, 2017, The Development of Learning Media for the Kinetic Theory of Gases Using the ADDIE Model with Augmented Reality, *Journal of Educational Sciences* 1 (1), 1-10
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- Suseno, N., 2014, Pemetaan Analogi pada Konsep Abstrak Fisika. Jurnal Pembelajaran Fisika.
- Wagijartini. 2010. Pembelajaran Fisika Dengan Pendekatan Inkuiri Terbimbing Melalui Metode Eksperimen Dan Demonstrasi Ditinjau Dari Kemampuan Awal Dan Aktivitas Belajar Siswa. Digilib Universitas Sebelas Maret
- Zannah, P.Z., Diah M., Fathiah A., 2014. Penggunaan Media Pembelajaran Zooming Presentation untuk Meningkatkan Hasil Belajar Siswa Kelas X pada Konsep Suhu dan Kalor. EDUSAINS. 7(02). 212-216