The Analysis of Questions Quality at Higher Order Thinking Skill (HOTS) in Chemistry Subjects (Hydrocarbon, Petroleum, and Thermochemistry) of Class XI at SMA Negeri 5 Yogyakarta

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ABSTRACT

This study aims to analyze the quality items of the Higher Order Thinking Skill (HOTS) in chemistry subjects (Hydrocarbons, Petroleum, and Thermochemistry) in the odd semester of class XI of SMA Negeri 5 Yogyakarta. The research method uses development model, an R&D (research and development) to produce products, and test the effectiveness of the product. The subject of class XI MIPA students in 2021/2022 amounted to 93 students. The Analysis using the Anates program of 4.0.9 to test the quality items, reliability, difficulty level, discriminatory power, and effectiveness of distractors. The results show that 1) the questions reliability is 0.890 (Reliable), 2) the distinguishing power of the quality items in the good category is 25 questions (83.3%), while the remaining 5 questions (16.7%) are in the bad category, 3) the level of difficulty in the range of 13.98 - 80.65, it means that 28 questions have a good level of difficulty, 4) there are 27 significant questions correlation, 5) the quality of the distractors is good, because the answer options are not too far from the answer key. Based on the overall item-based analysis aspect, it was concluded that 25 question items (83.3%) of Higher Order Thinking Skill (HOTS) in chemistry subjects had good quality, and the remaining 5 question (16.7%) were not used. Suggestions for teachers and question makers need to select and equalize the level of difficulty of the questions to be tested.

Keywords: Question Items, HOTS, Hydrocarbons, Petroleum, Thermochemistry, Anates 4.0.9

1. INTRODUCTION

Chemistry is learning that emphasizes on development cognitive, affective and psychomotor aspect. Participant educate must trained to be able think critical so that have ability think level higher (*Higher Order Thinking Skills*). Learning process could said good and growing need conducted evaluation. Evaluation is arrangement from every systematic process that is held for knowing understanding student participants (Purwanto, 2014).

The test questions used for evaluate how much big absorption material that has been delivered in the learning process (Anita, Tyowati , & Zuldafrial , 2018). For knowing how much far the potential developed by participants educate so required evaluation (Br Purba, Susanti , & Rosna, 2017). The chemistry question items for evaluation test consider a number of criteria , that is suitability with Basic Competencies (KD) and Competency Achievement Indicators (GPA), effectiveness use and equity level difficulty, understanding and mastery, and confusion Theory in accordance curriculum.

The chemistry question item quality based *Higher Order Thinking Skill* (HOTS) covers ability analyze, evaluate and creating. The HOTS Question is an instrument for measure thinking ability level height, that is ability think not just remember (*recall*), states back (*restore*), or refer without to do processing (*recite*). HOTS activities help student look for knowledge in reasoning inductive and deductive for identify and explore fact existing ones (Sharifah, 2019).

Based on condition above, need conducted research to analyze quality of question item *Higher Order Thinking Skill* (HOTS) chemistry subject materials (hydrocarbons, petroleum, and thermochemicals) odd semester class XI SMA Negeri 5 Yogyakarta .

2. METHODS

The research carried out is a development model with type of research *research and development* (R&D) what was done at SMAN 5 Yogyakarta odd semester Year 2021/2022 with subject student class XI MIPA totaled 93 students. Data collection techniques are test with *google forms.* The test in the form of question choice double totaling 30 question items, with 5 alternatives answers (A, B, C, D, and E). The Analysis conducted with Excel and *Anates* software *Version 4.0.9* test validity item questions, reliability test, effectiveness deceiver, the distinguishing power, and difficulty level.

3. RESULTS AND DISCUSSION

Reliability Test
A test show level high reliability when tested in different period time however give result that consistent. The analysis of question items results with ANATES 4.0.9, it is known that the alpha value is 0.890 > 0.80, meaning that the item analysis has a high level of reliability.

Distinguishing Power
Calculation Distinguishing power is activity measure understanding participant educate in complete question based on the criteria already enforced (Arifin, 2014). Results Distinguishing power for good category reach 25 items (83.3 %), meaning index power different with highest conversion, make question item test have good distinguishing power for maintained on future test, while the rest is 5 grains (16.7 %) bad distinguishing power.

Level of Difficulty
The good question Item test when test item have difficulty level in the interval 0.16 - 0.85, meaning question item no too difficult and not too easy. The Results obtained 1 item (3.3 %) with question items category is very simple, there 7 items (23.3 %) with easy category, there are 20 items (66.8 %) with medium category, 1 item (3.3 %) with the question levels difficult category, and 1 item (3.3 %) belong very difficult. There are 28 question items the easy, medium and difficult categories.

Item Score Correlation
Correlation measured with significant or whether or not something question item test with consider Among r_{table} (0.205) and r_{count} on each item matter. The correlation determination is used something constant general if $r_{count} > r_{table}$ so question item significant and vice versa . The majority of question items in the very significant category were 15 items (50.0%), there were 12 items (40.0%) in the significant category, and the remaining 3 items (10.0%) were in the insignificant category.

Distracting Quality
Distractor quality of choice answer as answer choice distractor. The distractor functioning if selected at least 5% of the total participant test. Results effectiveness distractor on the question item it's good, because of the answer option not very far from key answers and student participants abilities high in assessing option answer or choice answer .

Results of the Recapitulation of Questions HOTS
The results of the recapitulation of *Anates analysis 4.0.9* in terms of assessment of discriminatory power, level of difficulty, correlation, distractor quality and conclusions.

Table 1. Recapitulation Results

No	Discriminatory Power (%)	Description	difficulty	Information	Correlation	Sign. Correlation	Conclusion
1	40.00	Good	54.84	Moderate	0.303	Significant *	Be Used
2	64.00	Good	73.12	Easy	0.628	Very Significant	Be Used
3	64.00	Good	75.27	Easy	0.611	Very Significant	Be Used
4	80.00	Good	76.34	Easy	0.808	Very Significant	Be Used
5	92.00	Good	68.82	Moderate	0.795	Very Significant	Be Used
6	64.00	Good	77.42	Easy	0.656	Very Significant	Be Used
7	72.00	Good	76.34	Easy	0.679	Very Significant	Be Used
8	28.00	Bad	70.97	Very Easy	0.284	Significant *	Not be used
9	44.00	Good	54.84	Moderate	0.375	Significant	Be Used
10	20.00	Bad	64.52	Moderate	0.227	Significant *	Not be used
11	-16.00	Bad	46.24	Moderate	0.013	-	Not be used
12	64.00	Good	63.44	Moderate	0.540	Very Significant	Be Used
13	36.00	Good	47.31	Moderate	0.273	Significant *	Be Used
14	44.00	Good	36.56	Moderate	0.289	Significant *	Be Used
15	64.00	Good	69.89	Moderate	0.563	Very Significant	Be Used
16	20.00	Bad	44.09	Moderate	0.233	-	Not be used
17	68.00	Good	64.52	Moderate	0.568	Very Significant	Be Used
18	64.00	Good	56.99	Moderate	0.565	Very Significant	Be Used
19	64.00	Good	51.61	Moderate	0.446	Significant	Be Used
20	8.00	Bad	13.98	Very difficult	0.070	-	Not be used
21	48.00	Good	47.31	Moderate	0.362	Significant	Be Used
22	36.00	Good	40.86	Moderate	0.264	Significant *	Be Used
23	44.00	Good	44.09	Moderate	0.396	Significant	Be Used
24	76.00	Good	60.22	Moderate	0.581	Very Significant	Be Used
25	76.00	Good	68.82	Moderate	0.621	Very Significant	Be Used
26	52.00	Good	27.96	It's hard	0.368	Significant	Be Used
27	36.00	Good	49.46	Moderate	0.277	Significant *	Be Used
28	60.00	Good	80.65	Easy	0.667	Very	Be Used

No	Discriminatory Power (%)	Description	difficulty	Information	Correlation	Sign. Correlation	Conclusion
29	48.00	Good	55.91	Moderate	0.457	Significant Very Significant	Be Used
30	80.00	Good	75.27	Easy	0.678	Very Significant	Be Used

The results of this study are in line with previous results conducted by Djemari Mardapi, et al (2014). Test results show that all 44 items and instruments PhysTHOTS proven fit with PCM, reliability of 0.95, index item difficulty from -0.86 to 1.06 means all items in category good. Shin'an Musfiqi and Jailani (2014) with results show the resulting teaching materials are valid, practical, and effective reviewed from orientation teaching materials for characters and HOTS. The Effectiveness teaching materials shown through questionnaire character and HOTS tests .

Agus Budiman (2014) with the result that instrument HOTS assessment in the form of question HOTS test consisting of of 24 double choice question items and 19 question items of description from material aspect, construction, and language declared valid and worthy used. Desi Lestari Ningsih, Rini Rita T Marpaung and Berti Yolida (2018). Results show that almost all (92.5%) UN questions are of the HOTS type. Ani Syahida and Dedi Irwandi (2015), with the majority of results UN Chemistry questions in 2011/2012 (92.5%) and 2012/2013 (85%) showing the Skills of low levels students thinking.

4. CONCLUSION

Conclusion of This research shows the quality of question item *Higher Order Thinking Skill* (HOTS) of chemistry subject on the material (Hydrocarbons, Petroleum, And Thermochemicals) in odd semester of class XI SMA Negeri 5 Yogyakarta. The Quality results of question item HOTS with the quality of the questions can be used on the test there will be 25 questions (83.3 %), as many as 5 questions (16.7 %) for category no can be used or thrown away. All aspects analysis Higher Order Thinking Skill (HOTS) of chemistry subject have questions item quality is good. Advice for teachers and question makers need to do selection and equalization level of difficulty the question want tested.

ACKNOWLEDGMENT

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Anates Results Attachment 4.0.9

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RECAPITULATION ANALYSIS POINTS
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Average = 17.38
Standard Deviation= 6.31
CorrelationXY= 0.80
Test Reliability= 0.89
Item Question = 30
Number of Subjects= 93
File name: D:\ANATES\SOAL HOTS.ANA

 Btr Baru  Btr Asli  D.Pembeda(%)  T. Kesukaran  Korelasi  Sign. Korelasi
     1         1        40,00      Sedang         0,303     - Signifikan*
     2         2        64,00      Mudah          0,628     Sangat Signifikan
     3         3        64,00      Mudah          0,611     Sangat Signifikan
     4         4        80,00      Mudah          0,808     Sangat Signifikan
     5         5        92,00      Sedang         0,795     Sangat Signifikan
     6         6        64,00      Mudah          0,656     Sangat Signifikan
     7         7        72,00      Mudah          0,679     Sangat Signifikan
     8         8        28,00      Sangat Mudah   0,284     - Signifikan*
     9         9        44,00      Sedang         0,375     Signifikan
    10        10        20,00      Sedang         0,227     - Signifikan*
    11        11       -16,00      Sedang         0,013     -
    12        12        64,00      Sedang         0,540     Sangat Signifikan
    13        13        36,00      Sedang         0,273     - Signifikan*
    14        14        44,00      Sedang         0,289     - Signifikan*
    15        15        64,00      Sedang         0,563     Sangat Signifikan
    16        16        20,00      Sedang         0,233     - Signifikan*
    17        17        68,00      Sedang         0,568     Sangat Signifikan
    18        18        64,00      Sedang         0,565     Sangat Signifikan
    19        19        64,00      Sedang         0,446     Signifikan
    20        20         8,00      Sangat Sukar   0,070     -
    21        21        48,00      Sedang         0,362     Signifikan
    22        22        36,00      Sedang         0,264     - Signifikan*
    23        23        44,00      Sedang         0,396     Signifikan
    24        24        76,00      Sedang         0,581     Sangat Signifikan
    25        25        76,00      Sedang         0,621     Sangat Signifikan
    26        26        52,00      Sukar          0,368     Signifikan
    27        27        36,00      Sedang         0,277     - Signifikan*
    28        28        60,00      Mudah          0,667     Sangat Signifikan
    29        29        48,00      Sedang         0,457     Sangat Signifikan
    30        30        80,00      Mudah          0,678     Sangat Signifikan
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Basic Competency Appendix

No	Basic Competence	Indicator Achievement Competence
1	3. 1.Analyze structure and properties compound hydrocarbon based on characteristics of carbon atoms and groups the compound	3.1.3 Distinguish primary, secondary, tertiary, and quaternary carbon atoms. 3.1.5 Write general formulas for alkanes, alkenes and alkynes based on analysis of structural formulas and molecular formulas 3.1.7 Explain nature physics on alkanes, alkenes, and alkynes 3.1.8 Determining isomers compound hydrocarbon 3.1.10 Differentiate the types of reactions of alkanes, alkenes

No	Basic Competence	Indicator Achievement Competence
		and alkynes.
2	3.2 Describe the formation process faction petroleums, separation technique as well as use	3.2.4 Explain the main components that make up petroleum
3	3.3 Identify reaction burning perfect hydrocarbons and not perfect as well as nature substance results combustion (CO_2, CO, particulates carbon)	3.3.1 Writing reaction burning hydrocarbon 3.3.3 Analyzing impact burning ingredient burn to environment 3.3.4 Analyzing utility compound hydrocarbon
4.	3.4 Explain draft change enthalpy reaction to pressure permanent in equality thermochemistry	3.4.3 Distinguish between reactions that release heat (exothermic) and those that receive heat (endothermic) through an experiment
5.	3.5 Explain type enthalpy reaction , Hess's law and concepts energy bond	3.5.2 Describing understanding and concept from types reaction it and its implementation in determination change enthalpy
6.	3.5 Explain type enthalpy reaction , Hess's law and concepts energy bond	3.5.3 Explaining Miscellaneous change enthalpy 3.5.4 Counting price H reaction _ through experiment / calorimeter 3.5.5 Calculating the value of *H* reaction based on Hess's Law 3.5.6 Counting price H reaction _ based on change data enthalpy formation standard 3.5.7 Counting price H reaction _ based on price change enthalpy based on binding energy data