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Practicality of student worksheet oriented to higher order thinking skills on biology subject for grade XI

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Abstract

Students must possess higher-order thinking skills (HOTS) as a demand for 21st century competence. Teachers need to prepare teaching materials that can place high-level thinking students in solving the problems they face. One of the learning tools to solve these problems is the HOTS-oriented worksheets (LKPD). This study aimed to test the practicality of HOTS-oriented worksheets in biology subjects in the even semester of class XI at SMAN 1 Barru. This type of research is Research and Development (R&D) with the ADDIE development model, which includes analysis, design, development, implementation, and evaluation. The instruments used were product implementation observation sheets and teacher and student response questionnaires. HOTS-oriented worksheets was implemented at SMA Negeri 1 Barru with research subjects, namely three biology teachers and 33 students in class XI MIPA 2. The results showed that the percentage of the practicality of HOTS-oriented worksheets through product implementation was 4.23 (practical), the teacher's response was 4.51 (practical), and student responses of 4.02 (practical). Overall, the HOTS-oriented worksheets are classified as practical. Further research is expected to train students' HOTS to meet the demands of 21st century competencies and better learning outcomes.

Abstrak

Keterampilan berpikir tingkat tinggi (HOTS) merupakan salah satu yang wajib dimiliki oleh peserta didik sebagai tuntutan kompetensi abad-21. Guru perlu menyiapkan bahan ajar yang mampu menempatkan peserta didik berpikir tingkat tinggi dalam memecahkan permasalahan yang dihadapinya. Salah satu perangkat pembelajaran untuk memecahkan permasalahan tersebut adalah Lembar Lembar Kerja Peserta Didik (LKPD) berbasis HOTS. Tujuan penelitian ini adalah menguji kepraktisan LKPD berbasis HOTS pada mata pelajaran biologi semester genap kelas XI di SMAN 1 Barru. Jenis penelitian ini adalah *Research and Development* (R&D) dengan model pengembangan ADDIE yang meliputi analisis, perancangan, pengembangan, implementasi, dan evaluasi. Instrumen yang digunakan yaitu lembar observasi keterlaksanaan produk, angket respon guru, dan angket respon peserta didik. Implementasi LKPD berbasis HOTS dilaksanakan di SMA Negeri 1 Barru dengan subjek penelitian yaitu tiga guru mata pelajaran biologi dan 33 peserta didik kelas XI MIPA 2. Hasil penelitian menunjukkan persentase kepraktisan LKPD berbasis HOTS melalui keterlaksanaan produk sebesar 4,23 (praktis), respon guru sebesar 4,51 (praktis), dan respon peserta didik sebesar 4,02 (praktis). Secara keseluruhan LKPD berbasis HOTS ini tergolong praktis. Penelitian lanjutan diharapkan untuk melatih HOTS peserta didik sehingga memenuhi tuntutan kompetensi abad 21 dan hasil belajar menjadi lebih baik.

A. Introduction

Thinking is a process of managing information mentally and cognitively. Thinking can also be defined as a symbolic representation of some item or event (Urban, 2005). Thinking skills consist of several components, namely problem solving skills, critical thinking, and creative thinking (Lim, 2011; Nugroho, 2021). One of the thinking skills that must be possessed by students as a competency requirement for the 21st century is Higher Order Thinking Skills (HOTS) (Kemendikbud, 2018; Salleh et al., 2020; Hujjatusnaini et al., 2022).

HOTS is defined as cognitive thinking skills such as analysis, evaluation and creation taught by teachers to their students (Nugroho, 2021; Gradini, 2019; Fauziah & Fitria, 2020). HOTS was part of curriculum development which is expected to be able to improve critical thinking skills student which are currently at a low level. The results of observations from 10 high school biology teachers obtained data that around 90.87% of learning was still LOTS (Low Order Thinking Skills) oriented and only about 9.13% of learning was HOTS oriented. The study results also reveal that education in Indonesia only reaches a low level thinking, namely knowledge, understanding and application, while analysis, evaluation and creativity are still very low. (Nurrachman, 2015; Saraswati & Agustika, 2020; Noprinda & Sofyan, 2019). Some of the teacher's questions are still closed and only in the C1 and C2 cognitive domains (Widodo & Pujiastuti, 2006; Anggraini et al., 2019; Ningsih et al., 2022).

Based on these demands, it is necessary for teachers to prepare teaching materials that are able to encourage students to be active in the learning process and to be able to place students to think critically in solving the problems they face. Adnan et al. (2014) asserts that knowledge is obtained from the results of internalization external reality and the reconstruction took place accurately. The learning environment plays an important role in collaborative learning through social interaction, and this process is expected to improve students' ability to analyze problems from different perspectives and produce their own solutions.

One of the teaching materials offered by researchers in solving these problems is student HOTS-oriented worksheets. This course must go through various stages so that it is declared valid for use in the learning process. A product was said to be valid after a feasibility test was carried out to determine the level of validity, practicality and effectiveness (Borg & Gall, 1983).

The results of the study revealed that the use of student HOTS-oriented worksheets was able to improve student cognitive abilities which were described by students being focused and active in problems solving and expressing their opinions on the problems they faced. (Azis et al., 2011; Karsono, 2017; Wiyasih, 2020; Pebriani et al., 2022; Purwasi & Fitriyana, 2020). Adnan et al. (2019) also state the use of constructivist-based e-books increase student learning motivation from the aspects of attention, relevance, confidence and satisfaction as perceptual factors of motivation. Some of these studies focus more on how students was able to increase learning motivation and critical thinking skills, therefore the research that will be carried out by researchers focuses on increasing student learning outcomes and students' abilities in higher order thinking which focuses on the cognitive domain, namely analyzing, evaluate and create.

Based on the results of observations made by 10 biology teachers who used student worksheets. Most of the teachers had not implemented HOTS. The data was obtained from the student worksheet analysis which shows that around 70.77% of the questions was cognitive level LOST while only about 29.23% of the questions was cognitive level HOTS with a description of about 24.62% at the cognitive level C1; 36.92% are at the cognitive level C2; 9.23% are at the cognitive level C3; 13.85% are at the cognitive level C4; 9.23% are at the cognitive level C5 and 6.15% are at the cognitive level C6. From these data it can be concluded that the demands of the 2013 curriculum have not been met where the questions in the student worksheet have not been able to reach the entire cognitive range C1 to C6. Based on this explanation, the researcher interested in conducting research on the development of teaching materials in the form of "Practicality of student worksheet oriented to higher order thinking skills on biology subject for grade 11st at SMAN 1 Barru".

B. Material and Method

The research design used in this study is the ADDIE development model, namely *Analyze*, *Design*, *Develop*, *Implement* and *Evaluate* (Hobri, 2010). The analysis phase was carried out by conducting field observations to determine the needs of teachers and students. The second stage was the design stage, at this stage it is carried out by designing the product according to what is needed.

The intended product was a student HOTS-oriented worksheets which contains material on the excretory system, respiratory system, reproductive system, immune system and coordination system. Inside this worksheet student will trained in the ability to analyze, evaluate and create through interesting questions.

The development stage aims to realize all the stages that have been carried out before and to produce a final product student HOTS-oriented worksheets. Prototype of student HOTS-oriented worksheets developed is based on the HOTS view in terms of taxonomy bloom consisting of C4 (Analysis), C5 (Evaluation) and C6 (Create). After the student worksheet was completed, the implementation phase was carried out, namely concrete steps to implement the student HOTS-oriented worksheets that was being developed, The focus of this research is related analysis Product practicality test form student worksheet oriented obtained through product implementation analysis, teacher response questionnaires and student response questionnaires. Product implementation results data student HOTS-oriented worksheets which has been developed obtained through the observation sheet. Observations were carried out by two observers during the learning process.

Data was also obtained through the provision of research instruments to three Biology teachers for class XI SMAN 1 Barru as potential users of the HOTS-oriented worksheets that had been developed and trials conducted on 33 students of class XI MIPA 2 SMAN 1 Barru. The data obtained will then be analyzed by referring to Hobri (2010) assessment (Table 1).

Table 1 Practicality level interval

Practical Intervals	Criteria
1 ≤ IO < 2	Impractical
2 ≤ IO < 3	Less practical
3 ≤ IO < 4	Quite practical
4 ≤ IO < 5	Practical
IO = 5	Very practical

Description:
IO = Total average score for all aspects

The criteria used in determining the HOTS-oriented worksheets meet the practicality criteria if the minimum practical value is " Quite practical". If the value is below these criteria, then the product needs to be revised again, especially on aspects with less value criteria. Then a trial was carried out again with the aim of fulfilling the practicality based on the implementation indicators in learning.

C. Results and Discussion

After conducting a validity test to find out whether the product being developed is declared fit for use in the learning process. So, the next step is the practicality test. Nieveen (Rachman et al., 2017) suggests that the practicality of a developed learning tool can be seen from the level of ease and assistance in it is use. The practicality of learning devices can also be seen from whether teachers can carry out learning in class properly when using these learning devices in the learning process.

Practicality in this study was determined through product implementation, teacher and student response questionnaires. The three instruments are used to find out the responses of the users of the developed learning tools regarding how suitable and easy it is to implement the learning tools. Worksheet can be said to be practical if the teacher responds well to Worksheet and students respond well to Worksheet. Response assessment the worksheet was assessed based on instruments by expert validators.

The results of the research conducted by observing the learning process and providing research instruments to three Biology teachers in class XI SMAN 1 Barru and to 33 students in class XI MIPA 2 SMAN 1 Barru are presented as follows.

1. Worksheet Implementation in The Learning

Data on the results of the implementation of HOTS-oriented worksheets products developed were obtained through observation sheets. The results of the analysis of the data obtained during the five meetings (Table 2). It can be concluded that the worksheet is practical with an average value of 4.23. This value has reached the conditions to be declared in the practical category, namely 4 ≤ IO < 5. From these results it can be seen that learning activities using HOTS-oriented worksheets was practical to use and are in accordance with the learning time for both initial activities, core activities, and closing activities. This is illustrated by the increased activity of students during the learning process. Students are braver to ask questions that are not yet understood, channel arguments, give suggestions on a problem and convey conclusions.

Table 2 Results of HOTS-oriented worksheets implementation data analysis

Aspect	Evaluation	Average	Criteria
Initial activity	The learning process begins with creating conducive conditions and implementing apperception activities	4,17	
Core activities	Students was directed to work on worksheet in groups guided by the teacher	4,25	**Praktis**
Closing activities	Students convey the conclusion of the material which is complemented by the teacher's explanation	4,27	
Average		**4,23**	

2. Implementation on Teachers

The practicality test on teachers was carried out by three Biology teachers for class XI SMAN 1 Barru. Each teacher to review and assess the contents of the HOTS-oriented worksheets that has been developed. After that each teacher filled out a teacher response questionnaire that had been prepared by the researcher as shown in Table 3.

Tabel 3 Analysis of teacher responses to the content feasibility aspects of HOTS-oriented worksheets

No	Assessment Aspect Indicator	Average
1	The assignments in the Worksheet followed the learning objectives to be achieved	5
2	The assignments contained in the Worksheet reflect the HOTS approach	4,66
3	HOTS-oriented worksheets support biology learning	4,33
4	HOTS-oriented worksheets makes it easier for students in the learning process	4,33
Average aspect percentage		**4,58**

Tabel 4 Analysis of teacher responses to the appearance aspects of HOTS-oriented worksheets

No	Assessment Aspect Indicator	Average
1	Variations in type and size of letters used in worksheet are proportional	4
2	The quality of the illustrations (pictures) presented in the worksheet is clear	4,66
3	Placement of pictures and tables as needed	4,33
4	The color composition used was not interfere with the contents of the worksheet	4,66
Average aspect percentage		**4,41**

Tabel 5 Analysis of teacher responses to the language aspect of HOTS-oriented worksheets

No	Assessment Aspect Indicator	Average
1	Presentation of Indonesian in accordance with enhanced spelling (EYD) on worksheet	4,33
2	Presentation of simple language, easy to understand and not double meaning	4,66
Average aspect percentage		**4,50**

Tabel 6 Analysis of teacher responses to the benefit aspect of HOTS-oriented worksheets

No	Assessment Aspect Indicator	Average
1	The use of HOTS-oriented worksheets can increase students biology learning activities	4,66
2	The use of HOTS-oriented worksheets can attract students attention	4,33
3	The use of HOTS-oriented worksheets can help students better understand biology learning material	4,66
Average aspect percentage		**4,55**

Tabel 7 Teacher response analysis to HOTS-oriented worksheets

No	Assessment Aspect	Average	Category
1	Content eligibility	4,58	Practical
2	Appearance	4,41	Practical
3	Language	4,50	Practical
4	Benefit	4,55	Practical
Percentage average		**4,51**	**Practical**

Based on Table 3, the average teacher response to worksheet based on the content feasibility aspect is 4.58 which is in the interval 4 ≤ IO < 5 or can be categorized as "practical". Based on Table 4, the average teacher's response to worksheet based on the display aspect is 4.41 which is in the interval 4 ≤ IO < 5 or can be categorized as "practical". Based on Table 5, the average teacher's response to worksheet based on language aspects is 4.50 which is in the interval 4 ≤ IO < 5 or can be categorized as "practical". Based on Table 6, the average teacher response to worksheet based on the benefit aspect was 4.55 which is in the interval 4 ≤ IO < 5 or can be categorized as "practical". Based on the average value of all aspects (Table 7), the teacher's response to worksheet was 4.51 or was in interval 4 ≤ IO < 5 so that it can be categorized as practical.

The teacher agrees that each of these HOTS-oriented worksheets activities has specific instructions that allow students to work independently or in groups. Teachers also agree that the developed worksheet directs students to experience cognitive conflicts that will be resolved

both individually and collaboratively, stimulate thinking skills, evaluate knowledge critically and be able to assist students in finding their own lesson concepts.

3. Implementation on Student

This HOTS-oriented worksheets was implemented in 33 students of class XI MIPA 2 at SMAN 1 Barru. Filling out the questionnaire was carried out directly in the classroom together according to the school rules that were in effect at that time. The results of student responses to worksheet based on the feasibility aspect of the content are shown in (Table 8).

Based on Table 8, the average student response to worksheet based on the content aspect is 3.70 which is in the interval 3 ≤ IO <4 or can be categorized as "less practical". Based on Table 9, the average response of students to worksheet based on the display aspect is 4.20 which is in the interval 4 ≤ IO < 5 or can be categorized as "practical". Based on Table 10, the average student response to worksheet based on language aspects is 4.03 which is in the interval 4 ≤ *IO* < 5 or can be categorized as "practical". Based on Table 11, the average student response to worksheet based on the benefits aspect is 4.16 which is in the interval 4 ≤ IO < 5 or can be categorized as "practical". Based on the average value of all aspects (Table 12), the teacher's response to worksheet was 4.02 or in the interval 4 ≤ IO < 5 so it is categorized as practical. Students agree that HOTS-oriented worksheets was fun to use in the learning process and are able to help them practice higher-order thinking skills.

Tabel 8 Student responses to the content aspects of HOTS-oriented worksheets

No	Assessment Aspects	Average
1	I like studying using HOTS-oriented worksheets	3,33
2	The HOTS-oriented worksheets provided is easy to use in learning biology	3,40
3	The HOTS-oriented worksheets increased my interest in studying biology	4,18
4	The HOTS-oriented worksheets help me understand biology material more easily	3,88
Average Percentage of Aspects		**3,70**

Tabel 9 Student responses to the appearance aspects of HOTS-oriented worksheets

No	Assessment Aspects	Average
1	The appearance of the HOTS-oriented worksheets attracted my attention to study it	3,97
2	The use of type and size of letters makes it easier for me to read the contents of the worksheet	4,40
3	The appearance of each worksheet page has a color composition that caught my attention	4,30
4	The quality of the illustrations (pictures and videos) presented in the worksheet is clear	4,12
Average Percentage of Aspects		**4,20**

Tabel 10 Student responses to the language aspects of HOTS-oriented worksheets

No	Assessment Aspects	Average
1	Presentation of Indonesian in accordance with enhanced spelling (EYD) on HOTS-oriented worksheets	3,94
2	Presentation of simple language, easy to understand and not double meaning	4,12
Average Percentage of Aspects		**4,03**

Tabel 11 Student responses to the benefits aspect of HOTS-oriented worksheets

No	Assessment Aspects	Average
1	HOTS-oriented worksheets give me meaningful learning experiences	3,85
2	HOTS-oriented worksheets practice my higher order thinking skills	4,40
3	HOTS-oriented worksheets makes it easier for me to understand biology material	4,24
Average Percentage of Aspects		**4,16**

Tabel 12 The results of the analysis of student responses to HOTS-oriented worksheets

No	Assessment Aspect Indicator	Average	Category
1	Content Eligibility	3,70	Less Practical
2	Appearance	4,20	Practical
3	Language	4,03	Practical
4	Benefit	4,16	Practical
Percentage average		**4,02**	**Practical**

Based on the product implementation criteria, the results of the teacher and student response questionnaires, the HOTS-oriented worksheets is practical. The practical HOTS-oriented worksheets can be used in learning, but still needs further testing to find out its effectiveness. The results of this study also show that students' HOTS can be trained or developed through creative efforts in compiling learning tools, in this case in the form of worksheets. Rochmad (2012); Sartyka et al. (2021); Aufa et al. (2021) argues that a learning device is said to be practical if practitioners or experts state that the learning device developed can be applied in the field. Nieveen (1999) suggests that the practicality of a developed learning tool can be seen from the level of ease and assistance in its use, Nababan & Tanjung (2022) addition that especially by student. In addition, Revita (2019) state the practicality of learning devices can also be seen from whether the teacher can carry out learning in class properly when using these learning devices.

D. Conclusion

Based on the results of the implementation HOTS-oriented worksheets product analysis, teacher responses and student responses, it can be concluded that the worksheet developed was classified as a practical category for use in biology learning, especially material for class XI SMA/MA even semester. This is reviewed from three aspects, namely: 1) the average product implementation analysis was 4.23 (practical category), 2) the average teacher response questionnaire to worksheet was 4.51 (practical), 3) the average student response questionnaire to worksheet was 4.02 (practical). So it can be concluded that the HOTS-oriented worksheets was classified as practical. The results of the development of this worksheet will then be applied in the learning process to train students' high-level thinking skills and are expected to be able to improve student learning outcomes in accordance with the demands of 21st century competencies that are integrated in the 2013 curriculum.

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