BioEdu
Berkala Ilmiah Pendidikan Biologi
Vol. 10 No. 2 Tahun 2021 Hal: 335-342
https://ejournal.unesa.ac.id/index.php/bioedu

THE IMPLEMENTATION OF E-LKPD USING KNOW-WANT-LEARNED (KWL) STRATEGY ON GENETIC MATERIAL TOPIC TO TRAIN METACOGNITIVE SKILLS

Penerapan E-LKPD Berorientasi Strategi Metakognitif *Know-Want-Learned* (KWL) Materi Substansi Genetika untuk Melatihkan Keterampilan Metakognitif

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Abstract

The high school curriculum encourages students to have metacognitive skills. Genetics is one of the materials in biology that train metacognitive skills. Since the outbreak of Covid-19, the learning system has changed into online learning that causing new problems, such as teaching materials unable to facilitate students to train metacognitive skills. Teaching materials in the form of electronic student worksheet (E-LKPD) by using Know-Want-Learned (KWL) strategy assisted by the application of Ms. Office Word can be used to facilitate online learning. This research was aimed to describe the effect of implementing E-LKPD by using Know-Want-Learned (KWL) strategy on learning outcomes and student's metacognitive skills. This study was conducted online using One Group Pre-test Post-test Design which was carried out at SMA Negeri 3 Tuban on 30 students on XII MIPA 1. The results showed that the implementation of learning obtained an average of 100% in the very practical category. The student's responses obtained an average of 96.7% in the very practical category. Learning outcomes based on the pre-test and post-test score obtained the N-Gain Score's average of 0.6%. The completeness of the item indicators with sensitivity score of ≥ 0.30. Score of metacognitive skills was increased from poor category to the very good category. Thus it can be concluded that E-LKPD by using KWL strategy can be a solution for the lack of material in the outbreak of Covid-19 practical and effective to be applied in online learning to train metacognitive skills.

Keywords: E-LKPD, metacognitive KWL, online learning.

Abstrak

Kurikulum SMA/MA menganjurkan peserta didik memiliki keterampilan metakognitif. Substansi genetika merupakan salah satu materi pada pelajaran biologi yang dapat melatihkan keterampilan metakognitif. Sejak pandemi Covid-19, sistem pembelajaran berubah menjadi pembelajaran daring sehingga menimbulkan persoalan baru, salah satunya bahan ajar yang kurang memfasilitasi peserta didik untuk melatih keterampilan metakognitif. Bahan ajar berupa E-LKPD berorientasi strategi metakognitif *Know-Want-Learned* (KWL) berbantu aplikasi Ms. Office Word dapat digunakan untuk menunjang pembelajaran daring. Penelitian ini bertujuan untuk mendeskripsikan pengaruh penerapan E-LKPD berorientasi strategi metakognitif KWL terhadap hasil belajar dan keterampilan metakognitif peserta didik. Penelitian ini dilakukan secara daring dengan menggunakan *One Group Pretest-Posttest Design* yang dilaksanakan di SMA Negeri 3 Tuban pada 30 peserta didik kelas XII MIPA 1. Hasil penelitian menunjukkan keterlaksanaan pembelajaran memperoleh rata-rata sebesar 100% dengan kategori sangat praktis. Respon peserta didik memperoleh rata-rata sebesar 96,7% dengan kategori sangat praktis. Hasil belajar ditinjau dari rata-rata N-*Gain Score* pada nilai *pretest* dan *posttest* sebesar 0,6%. Ketuntasan indikator butir soal dengan kepekaan soal baik memperoleh nilai sensitivitas ≥ 0,30. Keterampilan metakognitif ditinjau dari peningkatan rata-rata skor metakognitif dari kategori kurang baik menjadi kategori sangat baik. Dengan demikian dapat disimpulkan bahwa E-LKPD berorientasi strategi metakognitif KWL dapat menjadi solusi kurangnya ketersediaan bahan ajar berbasis elektronik di masa pandemi Covid-19 yang terbukti praktis dan efektif diterapkan dalam pembelajaran daring untuk melatihkan keterampilan metakognitif.

Kata Kunci: E-LKPD, metakognitif KWL, pembelajaran daring

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INTRODUCTION

The outbreak of Covid-19 has affected all aspects in life, including education. Several policies have been implemented to break the Covid-19 spreading, one is learning from home as stated in the Ministry of Education and Culture Letter number 4 of 2020 concerning the implementation of educational policies in the emergency period of the Covid-19 outbreak (Siahaan, 2020). The learning process that was initially carried out 100% face to face, turned into online learning. Even though the learning process is carried out online, the aims of Curriculum 2013 that require students to have metacognitive skills must achieved (Aydin, 2016).

In fact, the implementation of Curriculum 2013 still faces many obstacles. Based on research by Vasmin, *et al.* (2020), difficulties in learning process found due to internal factors was 54.04%, while external factors was 57.90%. The situation requires teachers to prepare appropriate learning strategies and learning materials, especially for learning activities from home (Kurniasari *et al*., 2020).

Interview result with Biology teacher in grade XII at SMA Negeri 3 Tuban stated that students used student worksheet in learning process but it was not able to facilitate student to train high order thinking skills, one of which is metacognitive skills. Another problem that exists due to the outbreak of Covid-19 is the learning process became less optimal because the learning materials were still printed out as student worksheet and no electronic-based LKPD was available. Students tended to receive material from teacher which causes learning process to be teacher-centered so students were unable to train metacognitive skills.

Metacognitive abilities are able to grow and develop along age, as in the Theory of Mind (ToM) (Sunanto & Aisyah, 2018). Metacognitive is an activity of "thinking about thinking" or thinking about the way of thinking itself in which cognitive processes are consciously regulated (Iskandar, 2014). Metacognitive skills can be taught in biology using metacognitive strategies. Know-Want-Learned is a learning strategy that able to train metacognitive skills through remembering the initial concept (Know), determining the concept wanted to learn (Want), and identifying the concept that has been learned (Learned) (Kusniyah, 2019). Metacognitive activities include planning, monitoring, and reflexing (Livington in Iskandar, 2014). Metacognitive strategies can be applied to encourage students to become independent learner and as an effort to acquire meaningful learning (Susantini *et al*., 2018).

Genetics is one of the materials in biology that able to train metacognitive skills. The basic competencies students must achieved in KD 3.3 are analysing the relationship between structure and function of genes, DNA, and chromosomes in the application of the principle of inheritance in living things, and in KD 4.3 are formulating the sequence of protein synthesis processes in relation of sending genetic codes (Kemendikbud, 2016). One of the teaching materials that can be used in learning process is student worksheet. The use of student worksheet by using KWL strategy makes student more active because it can connect the old concepts (from the Know column) with the new concepts (from the Learned column) (Susantini, 2016; Auliya, 2018). Student worksheet by using KWL strategy on genetic material that has been created by Ahillah (2018) was proven to be able to train metacognitive skills. The worksheet created was categorizes as very valid with a validity score of 4, very practical with a learning implementation score ≥ 70%, and effective with an averages of N-Gain score on the high category.

The type of student worksheet that suitable for online learning is digital student worksheet. Student worksheet in electronic form (E-LKPD) is able to facilitate students to learn independently and give a chance for communication between teacher and students. Based on the description, the researcher intended to apply the student worksheet by using KWL strategy that created by Ahillah (2018) which modified into electronic form (E-LKPD) assisted by Ms. Office Word software. E-LKPD was designed in colour and had a systematic Know-Want-Learned phases. One of the advantages of the E-LKPD KWL implemented was the ease of access so that students could immediately type the answers of the questions provided.

Accordingly, implementation research was carried out to describe the praticality and effectiveness of the E-LKPD by using Know-Want-Learned (KWL) strategy of genetic material to train metacognitive skills on learning implementation, completeness of indicators, and increase learning outcomes and student metacognitive skills.

METHOD

This research was an implementation research with pre-existing product, namely E-LKPD by using KWL

strategy on genetic material topic. The E-LKPD implemented was a modified result of the student worksheet created by Ahillah (2018). This research was design as one group pre-test post-test design. Pre-test was carried out before students being given treatment, while post-test carried out after students were given treatment using E-LKPD KWL in learning process.

This research was performed from 16th to 26th November, 2020 in SMA Negeri 3 Tuban on 30 students from grade XII MIPA 1. All research activities were carried out online using the Google Classroom platform. Data collected including the learning process, student responses, completeness of indicators, and student learning outcomes such as the result of pre-test and post-test also students' metacognitive skills.

The data of learning activities process using E-LKPD KWL were obtained from the results of observations done by three observers using the learning activities observation sheet instrument. Observers gave a checklist in the "Yes" or "No" column according to the observed student activities. The observation result was then analysed using Guttman scale category as in Table 1.

Table 1. Guttman scale category (Sugiyono, 2013)

Category	Score
Yes	1
No	0

Data collected was then analyzed of percentage of E-LKPD KWL practicality, which was calculated using the following formula:

$$\%\text{Practicality} = \frac{Sum\ of\ activities\ carried\ out}{Sum\ of\ the\ activities}\ x\ 100\%$$

Then, the percentage of E-LKPD KWL practicality was interpreted into five categories (%) based on the Likert scale as in Table 2.

Table 2. Implementation score based on the Likert scale (Ratumanan & Laurens, 2011)

Average Score (%)	Category
0 – 48	Impractical
49 – 60	Less Practical
61 – 74	Fair Practical
75 – 87	Practical
88 – 100	Very Practical

Student responses were obtained using response questionnaires that were filled in by students after learning was complete. Students gave a check in the "Yes" or "No" column according to the assessed category. Then, the results of the questionnaire analysed using the Guttman scale category as in Table 3.

Table 3. Guttman scale category (Sugiyono, 2013)

Student Response	Score
Yes	1
No	0

Then, the percentage of student responses was calculated using the following formulas:

$$\%\text{Student response} = \frac{\sum Answer\ for\ "Yes"}{\sum Maximum\ score} x100\%$$

Percentage of student responses was converted into the student response conversion scale as in Table 4.

Table 4. Student response conversion scale (adapted from Sugiyono, 2016)

Average Score (%)	Category
30 – 50	Impractical
51 – 69	Fair Practical
70 – 85	Practical
86 – 100	Very Practical

According to the category in Table 4, E-LKPD KWL could only be stated practical only if average score of the student response ≥ 70%.

Student learning outcomes were measured by comparing the scores obtained at the pre-test and post-test with the minimum completeness category (KKM) in biology is 70%. Completeness of indicators at pre-test and post-test was calculated using the following formula:

$$\%\text{Completeness of indicator} = \frac{\sum Students\ who\ passed}{\sum All\ students}\ x\ 100\%$$

Then, the percentage of completeness each indicator was interpreted into indicator completeness interpretation category as in Table 5.

Table 5. Indicator completeness interpretation category (adapted from Ahillah, 2018)

Completeness of Indicators (%)	Category
0 – 25	Poor
26 – 50	Average
51 – 75	Good
76 – 100	Very Good

To find out the sensitivity of each item in learning process, it was calculated using sensitivity score of each item with the following formula:

$$\text{Sensitivity} = \frac{\sum Students\ answered\ correctly\ on\ (postest-pretest)}{\sum All\ students}$$

Item with good sensitivity in learning process have sensitivity score ≥ 0.30. The greater of sensitivity' score of an item, the more sensitive its item in learning process (Brown, 2017).

Learning outcomes were calculated using the N-Gain Score method from the pre-test and post-test results which obtained after calculating the percentage. The N-Gain Score was calculated using the following formula:

$$\text{N-Gain Score} = \frac{\%score\ posttest - \%score\ pretest}{100 - \%score\ pretest}$$

Then, the N-Gain Score will be interpreted into N-Gain Score category as in Table 6.

Table 6. N-Gain Score category (Hake, 1999)

N-*Gain Score*	Category
0.70≤ N-*Gain* < 1.00	High
0.30≤ N-*Gain* < 0.70	Fair
0.00 < N-*Gain* < 0.30	Poor

Metacognitive skills were measured according to four phases, such as: 1) determining the initial and the final concept with the category for score 1 if suitable with the criteria and score 0 if otherwise; 2) determining the score for the own answer with category for score 1 if the difference score between teacher and students ≤ 7 and score 0 if otherwise; 3) comparing the initial and the final concept with category for score 1 if suitable with the criteria and score 0 if otherwise; and 4) write down the level of confidence according to the answer with category for score 1 if the level of confidence ≥ 65% of the total questions and score 0 if otherwise

The average score of metacognitive was calculated according to the score of four components of metacognitive skills, afterwards interpreted into the classification of score range of metacognitive skills as in Table 7.

Table 7. Score range of metacognitive skills (adapted from Ahillah, 2018)

Score Range	Category
3.25 < X ≤ 4	Very Good
2.5 < X ≤ 3.25	Good
1.75 < X ≤ 2.5	Average
1 ≤ X ≤ 1.75	Poor

RESULT AND DISCUSSION

Implementation of E-LKPD by using KWL strategy in learning process was divided into three meetings which each meeting discussed one sub-material as follows: 1) the first meeting used E-LKPD 1 for the structure and function of chromosomes, genes, DNA, and RNA; 2) the second meeting used E-LKPD 2 for DNA replication; and 3) the third meeting used E-LKPD 3 for protein synthesis. Practicality of E-LKPD KWL in the learning process was seen through the results of observation of its implementation in learning activities and student response questionnaires. The percentage of the implementation E-LKPD KWL in learning that was observed by observers in three meetings was 100% (Figure 1). Through the phases Know, Want, and Learned students can complete the activities and learning steps which contained in the E-LKPD KWL so that the results of learning activities expressed very practical.

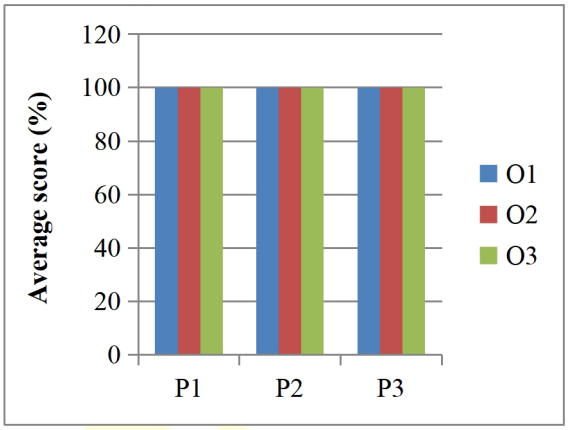

Figure 1. Recapitulation of Implementation Learning Activities by Using E-LKPD Know-Want-Learned (KWL).

Note:
O1 = 1st Observer P1 = 1st Meeting
O2 = 2nd Observer P2 = 2nd Meeting
O3 = 3th Observer P3 = 3th Meeting

Student responses toward the use of E-LKPD KWL in learning process obtained a very practical category with an average positive response of 96.7% and a negative response of 3.3%. There were four criteria assessed in the response questionnaire, such as appearance, readability, material, and characteristics of the E-LKPD KWL as in Table 8.

Table 8. Student responses toward the use of E-LKPD KWL in learning process

No.	Assessed Criteria	Average of Student Responses (%)		Category
		Positive	Negative	
1	Appearance	100	0	Very practical
2	Readability	95	5	Very practical
3	Material	96.6	3.3	Very practical
4	Characteristics of E-LKPD KWL	98.9	1.6	Very practical
	Average (%)	96.7	3.3	Very practical

Appearance criteria of the E-LKPD KWL obtained an average positive response of 100% which indicated that the E-LKPD KWL had an attractive appearance and the instructions given both written and oral were clear. Readability criterion obtained an average positive response of 95% because several students were constrained by the time allocation. Several students complained about the time given was insufficient to

complete all questions in the E-LKPD KWL because they were constrained by incompatible device and the internet network suddenly disappeared. Furthermore, the material criteria obtained an average positive response of 96.6% because several students felt not motivated to take part in learning activities. The last criteria was characteristic of E-LKPD KWL obtained an average positive response of 98.9% because several students were not accustomed to follow the Know-Want-Learned phases. KWL strategy is still unfamiliar for several students. The highlighted characteristics of E-LKPD KWL including the student's ability to measure their own understanding, determine what they want to learn in the Want column, and distinguish between the initial concept (Know) and the final concept (Learned). This is in accordance with the research conducted by Nuraini (2019) that finding the concept itself will lead to satisfaction so that student's interest will increase. Overall, the implementation of the E-LKPD KWL obtained a very high positive response from students so that it was very practical to be applied in genetic material.

Data of the effectiveness of E-LKPD KWL obtained from the completeness of the indicators, the N-Gain Score, and the students' metacognitive skills. The completeness of ten indicators showed from the percentage of the pre-test score where the ten indicators were incomplete to the post-test score where the ten indicators were complete.

Table 9. Completeness of indicators and item sensitivity for pre-test and post-test

No.	Item Indicators	%Completeness *Pre-test*	%Completeness *Post-test*	Sensitivity
1.	Analyzing the comparison of the meaning of chromosome and gene exactly	46.7	80	0.3
2.	Analyzing the function of chromosome structure	33.3	73.3	0.4
3.	Analyzing the chromosome structure for a specific function	33.3	86.7	0.5
4.	Comparing structure of DNA and RNA	43.3	80	0.3
5.	Comparing function of DNA and RNA	23.3	73.3	0.5
6.	Determining the systematic DNA replication process	43.3	83.3	0.4
7.	Determining the enzymes involved in DNA replication	20	83.3	0.6
8.	Determining the systematic protein synthesis process	20	83.3	0.6
9.	Determining the process of protein synthesis in prokaryotic and eukaryotic organisms.	20	83.3	0.6
10.	Implementing the structural and functional relationship of gene, chromosome, and DNA in principle of inheritance	36.7	73.3	0.3

According to the data on the completeness of the item indicators, ten item indicators showed to be complete and had good sensitivity. An item has good sensitivity if the sensitivity score of the item indicator ≥0.30 proven by the increase in the percentage of pre-test and post-test score for ten indicators as in Table 9. As Brown (2017) revealed the greater sensitivity' score of an item, the more sensitive an item in learning

The increase of student learning outcomes was calculated using the N-Gain Score method based on the pre-test and post-test score data as in Table 10.

Table 10. Recapitulation of increasing learning outcomes using the N-Gain Score

Students	Pre-test Score	Post-test Score	N-*Gain Score*	Category
1	40	70	0.5	Fair
2	50	80	0.6	Fair
3	40	73.3	0.5	Fair
4	43.3	80	0.6	Fair
5	16.7	70	0.6	Fair
6	10	70	0.6	Fair
7	43.3	70	0.4	Fair
8	30	73.3	0.6	Fair
9	40	80	0.6	Fair
10	30	93.3	0.9	High
11	16.7	80	0.7	High
12	46.7	90	0.8	High
13	36.7	90	0.8	High
14	40	90	0.8	High
15	30	73.3	0.6	Fair
16	20	76.7	0.7	High
17	10	70	0.6	Fair
18	16.7	70	0.6	Fair
19	20	73.3	0.6	Fair
20	23.3	73.3	0.6	Fair
21	20	73.3	0.6	Fair
22	30	76.7	0.6	Fair
23	23.3	86.7	0.8	High
24	30	70	0.5	Fair
25	50	90	0.8	High
26	20	76.7	0.7	High
27	26.7	70	0.5	Fair
28	60	96.7	0.9	High
29	30	80	0.7	High

Students	Pre-test Score	Post-test Score	N-*Gain Score*	Category
30	13.3	76.7	0.7	High
Average (%)	**30.2**	**78.1**	**0.6**	**Fair**

According to the recapitulation data of student learning outcomes, it was obtained an average pre-test score of 30.2% before students received treatment and an average post-test score of 78.1% after students received treatment of E-LKPD KWL in the learning process. Then, the data from pre-test and post-test score obtained was analyzed for average N-Gain Score from total of 30 students, at 0.6 in the fair category. It showed that there was an increase in learning outcomes and the E-LKPD KWL used in learning has an affected to student learning outcomes. This was in accordance with the research conducted by Kusniyah (2019) that the use of KWL metacognitive strategy help students to understand the lesson more. Increased learning outcomes were achieved because students were more able to manage their own understanding through planning, monitoring, and reflexing activities (Livington in Iskandar, 2014). The phases in Know-Want-Learned were able to train metacognitive skills through remembering the initial concept (Know), determining the concept you want to learn (Want), and identifying the concept that has been learned (Learned) (Kusniyah, 2019).

Implementation of E-LKPD KWL was also aimed to train student metacognitive skills. Metacognitive skills trained include the skill of determine the initial and final concept, determine the score, compare the initial and final concept, and write down the confidence level. The results of student metacognitive skills are showed in Table 11.

Table 11. Recapitulation of student metacognitive skills after the use of E-LKPD KWL in the learning process

No.	Metacognitive Skills	Average of Metacognitive Score		
		E1	E2	E3
1.	Determining initial and final concept	0.9	1	1
2.	Determining score	0.2	0.9	1
3.	Comparing initial and final concept	0.2	1	1
4.	Writing down the confidence level	1	1	1
Total of Metacognitive Score		2.3	3.9	4
Category		Poor	Very Good	Very Good

Note:
E1 : E-LKPD 1
E2 : E-LKPD 2
E3 : E-LKPD 3

The data in Table 11 showed that there was an increase in student metacognitive skills from the use of E-LKPD 1 until E-LKPD 3 during the learning process. The total of metacognitive score at E-LKPD 1 was 2.3 with a poor category because this was the first time students received learning using KWL metacognitive strategy. At the first meeting, students were less active during the discussion and lacked confidence to ask questions so that there were many mistakes when following the Know-Want-Learned phases. Then at E-LKPD 2 obtained a total of metacognitive score of 3.9 with a very good category which indicates a significant increase from the previous meeting. Students were able to adapt to the use of E-LKPD KWL during the learning process. During the learning process, students become more active and often ask questions if they encounter difficulties. The total of metacognitive score for E-LKPD 3 was 4 with a very good category, which indicates that students were familiar with the KWL metacognitive strategy so that they experienced an increase in metacognitive skills. The use of E-LKPD by using KWL strategy made students more active because it could connect old concept (from the Know column) with new acquired concepts (from the Learned column) (Susantini, 2016; Auliya, 2018).

Teaching materials such as E-LKPD by using Know-Want-Learned (KWL) strategy to train metacognitive skills as solution to the problem of the lack of electronic-based teaching materials during the outbreak of Covid-19 have proven to be practical and effective for use in the learning process.

CONCLUSION

Based on the research result on the implementation of genetic material E-LKPD by using KWL strategy to train metacognitive skills, it can be concluded as follows. The implementation of E-LKPD KWL was practical to be applied in learning according to the average score of implementation learning activities of 100% and the average of student responses of 96.7% with a very practical category. The implementation of E-LKPD KWL was effective to improve student learning outcomes as indicated by an average N-Gain Score of 0.6%, as well as completeness of the item indicators with a sensitivity score ≥ 0.30. The implementation of E-LKPD KWL also effective to train

metacognitive skills in terms of the increase in the average metacognitive score from the 1st meeting to the 3rd meeting from poor category become very good category. Thus the E-LKPD KWL as a solution for the lack of material in the outbreak of Covid-19 is practical and effective in learning to train metacognitive skills

Suggestion

Further research for the implementation of E-LKPD by using KWL strategy on a larger scale is necessary. In further research, the researcher should look for supporting application that more compatible so that E-LKPD can be accessed via device and Personal Computer (PC) without reducing any components.

ACKNOWLEDGEMENT

The researchers would like to thank to Mrs. Lisa Lisdiana, Ph.D. and Mr. Guntur Trimulyono, S.Si., M.Sc. as reviewers. The researchers also would like to thank to Dra. Nur Wahyu Tri. S. as biology teacher at class XII SMA Negeri 3 Tuban, also all students of XII MIPA 1 SMA Negeri 3 Tuban who have been willing to be respondents in this research.

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