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VALIDITY OF GENETICS MATERIAL TOPIC STUDENT WORKSHEET BASED ON KNOW-WANT-LEARNED (KWL) STRATEGY TO TRAIN STUDENT METACOGNITIVE SKILLS

Nurul Ahillah

Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Surabaya
Gedung C3 Lt 2, Jalan Ketintang, Surabaya 60231, Indonesia
Email: nurulahillah@gmail.com

Endang Susantini

Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Surabaya
Gedung C3 Lt 2, Jalan Ketintang, Surabaya 60231, Indonesia
Email: endangsusantini@unesa.ac.id

Abstract

This research was aimed to produce valid student worksheet based on KWL (Know-Want-Learned) strategy for genetics material topic to train student metacognitive skills. The development was refferred to ADDIE model, consisted of Analyze, Design, Develop, Implement, and Evaluate phase. The research stage was begun by curriculum, concept, task, and student analysis then continued with design and development stage in Biology Department, Mathematics and Natural Sciences Faculty, Universitas Negeri Surabaya. The developed student worksheet was then implemented limitedly to fiften 12th grade students of SMA Negeri 1 Gresik. The observed parameters were the validity of the stundent worksheet and pretest-posttest questions. The data of worksheet and pretest-posttest questions validity obtained from the validation of an education expert, as well as the validation of a material genetics expert and a biology teacher that were analyzed based on mode. The validation result showed that the student worksheet and pretest-posttest questions were very valid with score 4 and 100%, respectively. Based on these results, it can be concluded that the student worksheet and pretest-posttest questions were very valid and worthy to be used in training student metacognitive skills.

Keyword: student worksheet, KWL, metacognitive skills, genetics material.

INTRODUCTION

Indonesia government developed Kurikulum 2013 which has metacognitive skill as one of the complex skills that must be mastered by students. With this skill, students are wished to be able to be an independent learner which understand the learning topic they learn, also the factors infuencing their understandings. Susantini (2004) stated that students were able to learn independently and develop themselves honestly with metacognitive skills by setting and achieving learning goals to improve learning outcomes.

Observation result in SMA Negeri 1 Gresik showed that students found difficulties in learning biology. It was because they felt that learning biology needed much memmorization so that students less understood in learing topic they learn. Students were not motivated in learning biology. Besides that, the teaching style of biology teacher that not involving students actively made students did not interested in the learning biology, especially for some abstract and complex topics, such as genetics material. One of the factors that influences the less motivation of the students was the learning sources used, such as students worksheet could not train student metacognitive skills.

Know-Want-Learned (KWL) is a kind of learning strategy that can explore student metacognitive skills because it can combine students' intelligence, both psychomotor and cognitive. It can improve all learning components through three main activities, namely know, want, and learned. It is designed to help students learning completely, as well as before reading, whilst reading, and after reading. The KWL strategy will facilitate students to build their prior knowladge by remembering the concepts that had been known (know), determine what concepts students want to learn (want), and identify what concepts that has been learned (learned). Moreover, other components that interact in learning success namely learning resources are very essential. One of learning resources is student worksheet.

Student worksheet is activity sheet that is usually formed in some instructions and steps to complete certain tasks according to basic competencies to achieve (Majid, 2011). The student worksheet based on KWL strategy that was developed to train students metacognitive skills in genetics material topics.

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Tok (2013) proposed that students are able to diagnose their needs when they are aware about what they are learning. Because of that, students can apply their metacognitive skill to eliminate their shortcomings as well. Accordingly, the student worksheet based on KWL strategy has some goals including help students to understand how to produce what is known, what wanted to know, then what they have learned. They can also compare the concept that they have learned and their prior knowladge.Based on the description stated above, the objective of this research was to evaluate the validity of student worksheet based on KWL strategy in genetics material topic to train student metacognitive skill.

METHOD

The developmental research reffered to ADDIE model consisted of five phases namely analyze, design, develop, implement, and evaluate. This research was carried out during Juli-Oktober 2017. The research was begun by curriculum, concept, task, and student analysis then continued with design and development stage in Biology Department, Mathematics and Natural Sciences Faculty, Universitas Negeri Surabaya. The implementation was then conducted limitedly in SMA Negeri 1 Gresik involving 15 students of XII class majoring in mathematics and natural sciences 2017/2018 academic year.

The validity of student worksheet and pretest-posttest questions based on the validation by an education expert, as well as the validation of a genetics material expert, and biology teacher. The data was collected by employing validation method. Then, it was analyzed based on mode. The components assessed are content, language, design, and KWL characteristics. Validity analysis was conducted using Likert scale as in Table 1.

Table 1. Likert Scale (adapted from Tuckman, 2012)

Scale	Category
1	Poor
2	Average
3	Good
4	Very good

The data then interpereted using interpretation of validity score criteria in Table 2.

Table 2. Interpretation of Validity Score Criteria of Student Worksheet (adapted from Ratumanan and Laurens,2011)

Validity Score	Category
1,00-1,50	Not valid
1,51-2,50	Average
2,51-3,50	Valid
3,51-4,00	Very valid

According to those criteria, the student worksheet was categorized to be wort, if the mode score of validation result was ≥ 2,51 in the category of valid or very valid.

Besides the validition of student worksheet, validation was also conducted to the pretest-posttest questions that measured using Guttman scale (score 0 if not suitable; score 1 if suitable). The valued aspects included material worthy, construction worthy, and language. The score that was obatained then interpreted using the following equation:

$$\% \, validity = \frac{\sum mode \, of \, each \, validator}{maximum \, score} \, x \, 100\%$$

The score that was obtained then interpreted using interpretation of test validity score criteria in Table 3. Based on the criteria, the pretest-posttest questions determined valid if the score had ≥ 70%.

Table 3. Interpretation of Validity Score Criteria of Pretest-Posttest Questions (adapted from Sugiyono, 2016)

Validity Score (%)	Category
30-50	Not valid
51-69	Average
70-85	Valid
86-100	Very valid

RESULTS AND DISCUSSION
Results
1. Validity of Student Worksheet

The genetics material student worksheet validation was resulted from four main valued aspect namely content, language, design, and KWL characteristics that were assessed by three validators. The result indicated that each main aspects gained a mode value of four, from scale 1-4, except in design aspect. The attainment of value mode of four in each aspect indicated that the student worksheet is well worth to be tested in biology learning based on KWL strategy. The validity value of student worksheet is given in Table 4.

Table 4. Validation Result of Student Worksheet

Valued Aspect	Mode	Category
Content	4	Very valid
Language	4	Very valid
Design	3	Valid
KWL characteristics	4	Very valid

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2. Validity of Pretest-Posttest Questions

Validation by experts and biology teacher were also conducted to pretest-posttest questions of genetics material. The valued components that were assessed were material worthy, construction worthy, and language worthy. The result of pretest-posttest question validation was given in percentage. The validity value of pretest-posttest questions is given in Table 5.

Table 5. Validation Result of Pretest-Posttest Questions

Valued Aspect	Validity Score	Category
Material worthy	100%	Very valid
Construction worthy	100%	Very valid
Language worthy	100%	Very valid

Based on the validation result of pretest-posttest questions above, the pretest-posttest questions are very valid and worth to be used to measure the learning goals achieved by students based on the indicators that will be achived in genetics material topic.

Discussion

The develpoment of student worksheet based on KWL strategy in genetics material topic and pretest-posttest questions to train student metacognitive skills got some suggestions from experts before validation to produce a valid student worksheet and pretest-posttest questions. The suggestions were related with some components in student worksheet, i.e provide the concepts one by one so that the students will be easier to write the confidence rating; give additional explanations in summary part; and give different color for each subtopic. The improvements icluded construction and content revision. This was suitable with the statement of Nieeven (1999) that the main aspects used as validity parameters were construction and content aspect.Student worksheet and pretest-posttest questions improvements were conducted to produce a worth student worksheet and pretest-posttest questions based on validity aspect.

Validation result showed that the student workheet based on KWL strategy in genetics material topic obtained mode four so that it could be stated very valid. This result indicated that the developed student worksheet had fulfilled the required steps of student worksheet development in order to produce worth and suitable student worksheet that can be used as learning resources. The developed student worksheet should be

also designed to achieve the learning goals (Depdiknas, 2004). The development of student worksheet was conducted by following systematics steps, starting from curriculum analysis, student analysis, and concept analysis. The topic that was chosen genetics material because it had abstract and complex characteritistics. So that, students were needed to be trained the metacognitive skills through KWL strategy by involving reading activity to increase their understandings about the topic and checking their prior knowladge and the final knowladge they had after learning activity. This was also beneficial to reduce missconceptions that offen occured.

The number and order of student worksheet developed was also adjusted to how many subtopics that will be learned. The number of student worksheet was three subtopics, with each topics ordered systematically, namely gene, chromosome, DNA, and RNA structure and function; DNA replication; and protein synthesis.

Analysis result of four main valued aspects in student worksheet validation including content, language, design, and KWL characteristics showed that three of four aspects obtained mode 4. The valued aspects were content, language, and KWL characteristics. This result indicated that the student worksheet developed had fullfilled those aspects worthy. While one other valued aspect namely design gained lowest mode 3. This was because some weaknesses that were included in the student worksheet, such as the cover that did not have explanation of KWL so that it could be confusing to a reader who is not familiar with the term KWL. Also, there was not relevant explanation about some pictures that can help students easier to understand the concept that they learn by learning using the developed worksheet.

Besides student worksheet, the developed pretest-posttest questions was also validated by experts and biology teacher and obtained validty score 100% with very valid category. The components that were assessed in pretest-posttest questions including concept worthy, language worthy, and construction worthy. The validation result showed that the developed pretest-posttest, which each consisted of ten questions had fulfilled the requirements of arranging a good questions. It also indicated that the questions had been suited with the indicators that will be achieved through learning activity.

The developed questions were also stated capable to train student metacognitive skill. It was because the question model adapted to three-tier model consisting of three levels, namely traditional multiple choices on the

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first level, confidence rating in the second level, and open reason in the third level. It then analyzed with the three-tier test rule of scores according to Pesman (2010).

Overall, the validation result of student worksheet and pretest-posttest questions showed that both of student worksheet and pretest-posttest questions were very valid, so that it was worth to be applied in learning processes. The developed KWL student worksheet to train metacognitive skill had been suited with some metacognitive skill indicators, including knowing the topic that students will learn, realizing their own skill through know column, arrangging the concepts that they want to know in want column, also answering the questions that had been made in learned column after reading activities. Besides that metacognitive skills indicators, there were several indicators that were indirectly trained to the students as long as they learnt using the KWL student worksheet, i.e: skill of indentifying mistake resources from the data obtained by making a discussion group to answer the questions asked as well as skill of realizing knowladge students have to do the learning tasks. It was because in the KWL worksheet students could give score independently based on their learning processes.

CLOSING
Conclusion

From the developmental research, it can be concluded that the developed KWL student worksheet in genetics material topics and pretest-posttest questions are very valid based on validation by experts and a biology teacher. Therefore, the developed KWL student worksheet and pretest-posttest questions are worthy and suitable to be implemented to train metacognitive skills through learning processes.

Suggestion

Some suggestions related to this research are as follow:
1. Similiar research needs to be conducted to apply the developed students worksheet in larger scale.
2. Teacher role is very essential in learning processes using KWL strategy in order to increase students motivation in reading activities.

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