THE DEVELOPMENT OF GUIDED INQUIRY-ORIENTED BILINGUAL WORKSHEET TO REHEARSE SCIENCE CHARACTER VALUE ON FACTORS THAT AFFACTED REACTION RATE TOPIC

Risma Aditya. M. A dan Mitarlis
S-1 Pendidikan Kimia, FMIPA, Universitas Negeri Surabaya, e-mail: meeoncah@gmail.com

Abstrak

Penelitian ini bertujuan untuk mengetahui kelayakan Lembar Kerja Siswa (LKS) bilingual berorientasi inkuiri untuk melatihkan nilai karakter sains pada materi faktor-faktor yang mempengaruhi laju reaksi yang diujicobakan secara terbatas di SMA Negeri 1 Manyar. Karakter sains yang dikaji dalam pengembangan LKS ini adalah disiplin, ingin tahu, teliti, jujur dan tanggung jawab. Rancangan penelitian menggunakan rancangan Penelitian dan Pengembangan dimana pada studi pengembangan dilakukan model pengembangan Thiagarajan (model 4D) yang hanya dilakukan sampai tahap pengembangan (*development*). Rancangan LKS ditelaah oleh 3 orang dosen kimia Universitas Negeri Surabaya dan di validasi oleh 3 orang dosen kimia Universitas Negeri Surabaya dan 1 orang guru Kimia SMA Negeri 1 Manyar. Hasil penelitan menunjukkan bahwa LKS yang dikembangkan layak digunakan sebagai salah satu sumber belajar. Penilaian dosen dan guru kimia terhadap LKS sangat layak dengan presentase kriteria isi sebesar 90,63%, kesesuaian dengan model pembelajaran inkuiri sebesar 80,68%, kriteria penyajian sebesar 89,29%, kriteria kebahasaan sebesar 82,81% dan kriteria kegrafikan sebesar 86,61%. Respon siswa terhadap LKS sangat layak dengan presentase sebesar 96,67%. LKS juga dapat melatihkan nilai karakter sains kepada siswa antara lain disiplin, ingin tahu, teliti, jujur, dan tanggung jawab dengan presentase kelima karakter adalah 80%-100%.

Kata Kunci: *Pengembangan Lembar Kerja Siswa (LKS), Pembelajaran Inkuiri, Nilai Karakter Sains*

Abstract

The objective of this study was known the feasibility of bilingual worksheet with guided inquiry-oriented to rehearse science character value on topic of factors that affected on reaction rate. The bilingual worksheet has been tested to the limited group in SMA Negeri 1 Manyar. Science character in this experiment are discipline, curiosity, accurate, honest and responsibility. Design of this study used research and development design in which on development step used 4-D model by Thiagarajan. This step is only done through the development stage (*development*). This worksheet was analyzed by 3 chemistry lecturer of Surabaya State University and 1 chemistry teacher of SMA Negeri 1 Manyar. The result of this research show that bilingual worksheet which is developed is feasibility to be used as learning resource. Validation result toward Lecture toward bilingual worksheet by chemistry lecturer and teacher is very good with percentage of content criteria is 90.63%, suitability of guided inquiry learning model is 80.68%, presenting criteria is 89.29%, language criteria is 86.61%. Students responses for bilingual worksheet is very good with percentage is 96.67%. Bilingual worksheet can also rehearse science character value that are discipline, curiosity, accurate, honest and responsibility with all of science characters in this study the percentage is 80%-100%.

Keywords: *Development of worksheet, Inquiry Learning, Science Character Value*

INTRODUCTION

Character is unique values which is embedded and expressed in behavior, then this value was arranged in master design of character building (Desain Induk Pembangunan Karakter Bangsa 2010-2025) and defined as kindness value, do a good things and real in life [1].

Character education is a cultivation system of character values to students that include components: awareness, understanding, caring, and commitment to implement these values, to God, ourselves, others, the environment, society and the nation, thus becoming the perfect man according to nature [2].

Character education in schools can be done through the curriculum. Based on Manual Character Education (Pedoman Pelaksanaan Pendidikan Karakter), the principle of curriculum development of character education is not included in the subject matter, but integrated into the subject, self-development and school culture. Character values is developed in the curriculum, syllabus and Lesson Plan, which is completed as a learning material. [3]

Lesson plan implementation should be supported by the availability of instructional media, one of them is worksheet. Worksheet is a teaching material that has been packaged in such a way, so students are expected to learn the teaching materials by their self [4]. Worksheet can assist students to receive learning instruction in classroom, one of them is on chemistry learning.

Chemistry learning in school can be done in the classroom or laboratory by doing experiments. Learning model is needed to support it, is inquiry learning model. Guided inquiry-based experiments focused on the activities of students as experiment performers [5]. Students are actively involved in every step of experimentation by doing the scientific method, from designing procedures to conclude the experimental result. While the teacher or lab instructor perform as a facilitator.

Inquiry is the scientific process of active exploration by which we use critical, logical and creative thinking skill to raise and engage in question of personal interest [6]. Is a cycle of inquiry (Inquiry Cycle) [6]. One of the learning theory underlying inquiry learning is Discovery Learning theory stated by Jerome S. Burner. The concept is learning to find (Discovery Learning) students organize the learned lessons in a final form that corresponds to the level of the child's thinking progress [7].

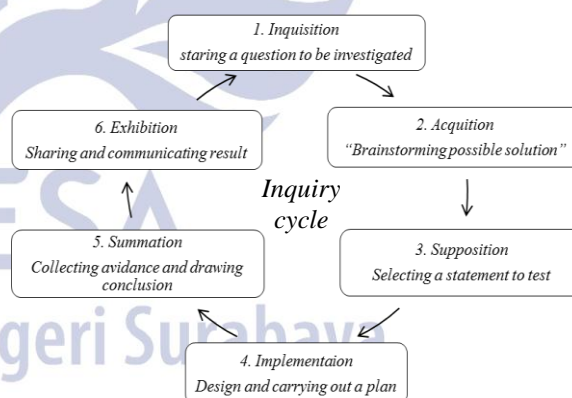According to Llewlyn there are six step on inquiry learning in the following cycle.

Figure 1. Inquiry Cycle According to Llewelyn [6]

The explanation of inquiry step will be explained on the table 1.

Table 1. Inquiry Step

Inquiry Learning Step	Activity
Inquisition - staring a question to be investigated a "what if" or " I wonder" question	Student start the inquiry activity by exploring and posing a question. Question can come from open exploration (phenomena) or direct activity undertaken by teacher
Acquition - brainstorming possible procedures	Students rely on the prior experience to argue the possible ideas and solutions to the inquiry
Supposition – identifying and "I think" or "if....then" statement to test	Students discussed the information under study to propose a prediction for solving the problem. In general, this stage includes states a hypothesis to test questions that will be examined
Implementation - and carrying out a plan	Student design a plan to test their prediction (hypothesis) and carry out the plan
Summation - collecting avidance and drawing conclusion	Student record and analyze their observation to compare the to original
Exhibition - sharing and communicating result	Student communicate their findings and new information

[6]

One of the chemistry materials that can be studied by conducting experiments in the laboratory is topic of factors that affect the reaction rate. In chemical process, there are several factors that affect the reaction rate such as, concentration, surface area, temperature, and catalyst. This topic in schools is considered difficult by students. It supported with survey that conducted to 30 XI grade students of SMAN 1 Manyar. The obtained data showed 60% of students still struggling with this material. Other data obtained are the worksheets was still in the Indonesian language. However, to meet the global competition, the usage of international language, English, have to be increased. Thus, it requirement to be developed a worksheet contain two languages (Bilingual).

Learning experiments in laboratory is one which includes three domains at once, cognitive, affective and psychomotor [8]. Affective can be reflected with a positive attitude or character of students. The good character consists of processes that include, knowing the good, desiring the good, and doing the good. Good character must be supported by the habit of mind, habits of heart, and habits of action [1]. Characters in the reality psychological context and also the socio-cultural categorized into: spiritual and emotional development, intellectual development, physical and activity development, and affective and creativity development [1]. Even though in fact the implementation of student character value in learning process has not been filled maximally on chemical subject. There are some characters, especially science character value such as discipline, curiosity, honest, accurate and responsibility that required to be rehearsed.

Based on the description above, it is required to be developed bilingual worksheet to rehearse the science character value, especially in factors that affect reaction rate topic. The developed worksheet was tested limitedly to know the feasibility of worksheet with contain criteria, suitability with inquiry learning,

presentation criteria, language criteria and graphic criteria. Besides that, the limited test was be done to know the students responses and rehearse science character value.

METHOD

Design of this study used research and development. Development of bilingual worksheets with guided inquiry-oriented used Research and Development design. For the development study phase use 4-D instructional models (define, design, develop, and disseminate) by Thiagarajan [9] . In this study is limited to the develop stage only.

The target of this study was an inquiry -oriented bilingual worksheets to rehearse science character value. While source of the data was obtained 3 chemistry lecturers, chemistry teacher and 12 XII grade students at SMAN 1 Manyar. In this case, it was conducted on students that using bilingual teaching and they have got the topic of factors that affect reaction rate.

The research instrument used were reviewer sheet, feasibility sheet, student response questionnaire and character behavior observation sheet. Reviewer sheet was given to chemistry lectures of three Surabaya State University. Feasibility sheet was given to chemistry lectures of three Surabaya State University and a chemistry teacher at SMA Negeri 1 Manyar. Student response questionnaire was given to 12 students of SMA Negeri 1 Manyar . While the character behavior observation sheet is given to the observer.

Data analysis techniques used were qualitative and quantitative. Qualitative descriptive was used to analyze the results of instructional media reviewer, while quantitative descriptive was used to analyze the results of feasibility, student's

responses and character behavior observations.

The results of feasibility that have been conducted by chemistry lecturer and teacher is presented in Likert scale shown in Table 2.

Table 2. Scale of Likert Score

Assessment	Score
Very good	4
Good	3
Medium	2
Bad	1
Very Bad	0

The formula used in feasibility result calculation to obtain the percentage is:

$$P(\%) = \frac{sum\ of\ colected\ data\ score}{Criteria\ Score} \times 100\%$$

$$Criteria\ Scor = highest\ score \times \sum aspect\ in\ criteria \times \sum validator$$

The result of feasibility sheet analysis was used to know the feasibility of developed bilingual worksheet by using score interpretation at table 2.

Table 3. Score Interpretation

Percentage	Category
0% - 20%	Very Bad
21%-40%	Bad
41%-65%	Medium
65%-80%	Good
81%-100%	Very good

[10]

Based on criteria, the worksheet was stated feasible if the percentage $\geq 61\%$.

Student response questionnaire was made in multiple choice "Yes" and "No". The obtained result will be calculated based on Guttman scale on table 4.

Table 4. Scale of Guttman Score

Answer	Score
Yes (Y)	1
No (T)	0

[10]

The obtained data can be calculated its percentage by using formula:

$$P(\%) = \frac{sum\ of\ collected\ score}{criteria\ score} \times 100\%$$

$$Criteria\ Score = highest\ score \times \sum aspect \times \sum responden$$

The obtained percentage is interpreted on the table 3. Based on criteria, the worksheet was stated feasible if the percentage $\geq 61\%$.

Obtained data of character behavior assessment was analyzed with this criteria

Table 5. Character Behavior Assessment Criteria

Score	Descrription
3	Cultivate
2	Began to Develop
1	Began to Seen
0	Not Seen Yet

[3]

Obtained data was calculated in percentage form by using formula:

$$P(\%) = \frac{sum\ of\ all\ students\ assessment}{Criteria\ Score} \times 100\%$$

$$Criteria\ Score = highest\ score \times \sum aspect \times \sum responden$$

Obtained percentage was interpreted into criteria at table 3. The result is stated good if the percentage $\geq 61\%$.

RESULT AND ANALYSIS

Feasibility of developed worksheet was obtained from feasibility result that conducted by three chemistry lecturer and chemistry teacher based on established criteria. The criteria are contain criteria, suitability with inquiry learning model, presentation criteria, language criteria and graphic criteria. Feasibility result is giving in table 6.

Table 6. Validation Result of Bilingual Worksheet

No	Feasibility Criteria	Percentage (%)	Category
1.	content	90.63	Very Good
2.	Suitability with inquiry learning	80.68	Very Good
3.	Presentation	89.29	Very Good

Continued table 6

No	Feasibility Criteria	Percentage (%)	Category
4.	Language	85.16	Very Good
5.	Graphic	87.05	Very Good

Based on feasibility result in table 6, the explanation are:

1. Content Criteria

   The obtained percentage for contain criteria was 90.63% which was it $\geq 61\%$. Developed worksheet contain was suitable with basic competency that refer to KTSP curriculum. Indicators in the worksheet is written operationally. Besides that, the worksheet question was easy to understand and accordance with the indicators to be achieved.

2. Suitability with Inquiry Learning

   Based on validation result in table 6, the percentage of this criteria was 80.68% which was it $\geq 61\%$. It shows that developed worksheet is suitable with inquiry learning with its step Inquisition, Acquisition, Supposition, Implementation, summation, and Exhibition.

3. Presentation Criteria

   The obtained percentage was 89.29%, which was it $\geq 61\%$. It shows that developed worksheet has good presentation and can be stated feasible.

4. Language Criteria

   Based on validation result at table 6, the obtained percentage was 85.16% which was it $\geq 61\%$. It shows that language used was suitable with student growth level. Developed worksheet was also use good language and easy to understand.

5. Graphic Criteria

   The obtained percentage is 87.05%, which was it $\geq 61\%$. It shows

that developed worksheet have attractive appearance and can be stated feasible.

Besides validation result, the other data was obtained was student's responses toward developed worksheet. This was conducted to 12 XII grade students of SMA Negeri 1 Manyar that have been got topic of factors that affect reaction rate. Students was divided in three groups with four students each. Groups were separate randomly by teacher so these represent all XII grade students. The limited test was ndone in two times which 1x45 minutes each meeting. During test students instructed to do worksheet accordance its step. These steps are *Inqusition* by reading the phenomna, *Acquisition* by giving response to the phenomena and proposing problem formula, *Supposition* by making a prediction (hypothesis), *Implementation* by conducting an experiment to solve the problem and determine the variables, *Summation* by doing analysis and give a conclusion, and *Exhibition* by presenting the experimental result.

After did their work, students asked to fill student's response questioner sheet. Here is the result of student's responses toward the development worksheet.

Table 7. Result of Student's Responses toward Developed Worksheet

No	Assessment Aspect	Percentage (%)
1.	The language used in the worksheet is easy to understand	100
2.	The figure in the worksheet support or make clear the mater	100
3.	The provided time is sufficient to finish the worksheet	91.67

Continued table 7

No	Assessment Aspect	Percentage (%)
4.	The appropriateness of task in the worksheet with phenomena and answering ability	100
5.	Motivation incurred from exiting task	100
6.	Worksheet presentation is easy to understand	83.33
7.	The font used can be read	100
8.	Worksheet presentation motivated you to actively in learning process	100
9.	Worksheet presentation is attractive and entertaining	91.67%
10.	Worksheet cover support the mater	100%
	Total Percentage	**96,67**

Based on students responses, the obtained percentage was 96.67% which was $\geq 61\%$. It shows that this category get positive response from students.

Rehearse of science character value in this study was observed during the test. The science character value that rehearsed were discipline, curiosity, accurate, honest, and responsibility.

Based on experiment result in this development worksheet, the obtained percentage of all of science characters rehearsed was 80%-100%. It shows that science character value of student was very good.

Conclusion

Based on data analysis result, thus can be concluded that developed worksheet is feasible to be used as

instructional media, because it have been filled feasible requirement:

1. Criteria of content feasibility has been fulfilled gained percentage is 90,63%.
2. Suitability with guided inquiry learning feasibility has been fulfilled with obtained percentage is 80.68%.
3. Criteria of presentation feasibility has been fulfilled with gained percentage is 89.29%.
4. Criteria of language feasibility has been fulfilled with obtained percentage is 85.16%.
5. Criteria of graphic feasibility has been fulfilled with gained percentage is 87.05%.
6. Students response is positive with percentage is 96.67%.
7. Rehearse science character value that are discipline, curiosity, accurate, honest and responsibility with all of science character percentage is 80%-100%.

Suggestion

From analysis result, researcher can give these following suggestion:

1. It was needed to be done until disseminate stage because this study only done in development stage.
2. The observer to limited test should be given more explanation to avoid an error in observations.
3. It was needed to be held to know the impact of bilingual worksheet with guided inquiry-oriented toward students achievement because researcher only studying of worksheet feasibility.

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