

DEVELOPMENT OF BILINGUAL WORKSHEET BY USING MIND MAPPING LEARNING STRATEGY FOR ATOMIC STRUCTURE

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Abstrak

Telah dilakukan penelitian pengembangan Lembar Kerja Siswa (LKS) bilingual dengan strategi belajar Mind Mapping. Tujuan penelitian ini adalah untuk mengetahui kelayakan LKS yang dikembangkan ditinjau dari kriteria materi, kebahasaan, penyajian dan pemenuhan terhadap komponen mind mapping. Selain itu juga untuk mengetahui respon dan hasil belajar siswa pada uji coba terbatas terhadap media pembelajaran berupa Lembar Kerja Siswa (LKS) bilingual dengan Strategi Belajar Mind Mapping pada materi struktur atom. Metode penelitian yang digunakan adalah metode Research and Development (R&D) dan pada tahap studi pengembangan digunakan model 4-D. Uji coba terbatas dilakukan terhadap 15 siswa kelas X SMA Negeri 1 Manyar Gresik dengan tujuan memperoleh data berupa hasil belajar siswa dan respon siswa dengan menggunakan deskripsi kuantitatif. Hasil validasi diperoleh persentase untuk masing-masing kriteria kelayakan materi, penyajian, kebahasaan, dan komponen mind mapping berturut-turut sebesar 93,9%, 93,5%, 88,89%, dan 100%. Dari data hasil angket respon siswa diperoleh respon positif siswa dengan kategori sangat kuat berdasarkan kriteria materi sebesar 100%; kriteria penyajian sebesar 100%; kriteria kebahasaan sebesar 99,05%; dan juga kriteria komponen Mind Mapping sebesar 96,67%. Selain itu juga diperoleh data bahwa siswa mengalami peningkatan hasil belajar 100%.

Kata Kunci: LKS bilingual, mind mapping, struktur atom.

Abstract

It has been conducted the study of bilingual worksheet with *Mind Mapping* Learning Strategy on Atomic Structure matter. The aim of this study were to evaluate the feasibility of developed worksheet which was indicated by the criteria of matter, language, presentation, and fulfillment of *Mind mapping* components. In this study, student's response and student's learning achievement of the learning media using *Mind Mapping* Learning Strategy were evaluated by limited trial test. The method in this study was conducted by using Research and Development (R&D), in addition, 4-D model was applied on the step of development. Limited trial test was conducted to 15 students of 10th grade of SMA Negeri 1 Manyar Gresik in order to gather the student's response and student's learning achievement as the data by using quantitative description. The result of the validation acquired for each criteria of feasibility, presentation, language and components of *Mind Mapping* as followed 93,9%, 93,5%, 88,89%, dan 100%. Based on the student's response questionnaire, it was obtained a positive response, which was considered very good based on the criteria matter as much as 100%; feasibility criteria as much as 99,05%; and component criteria of *Mind Mapping* as much as 96,67%. Beside, this study indicated that there was an exclamation of student's learning achievement as much as 100%.

Keywords: bilingual worksheet, mind mapping, atomic structure.

INTRODUCTION

Globalization era is symbolized by the tighten competition in the technological

sector, management, and human resources. Technological mastery is a must-needed point in order to elevate the value, products variety (commodity or service),

and the quality of the products. The superior management will lead to the exaltation of effective and efficient education quality in this country. Whereas, excellent human resources will determine the viability, development, and continuous victory of global competition, supported by strong technology and management, as the characteristic of effective school. [1]

In order to compete in this globalization era, technology, management, and human resources are needful to support the implementation of education system and must be applied since earlier level of education. Performing thus educational process, curriculum is the best reflection. Curriculum demand the students to expand their self-ability. Supporting student's self-ability development, especially in material comprehension, supportive material comprehension of learning material resources from the teachers is extremely required.

Learning resource termed as every condition which establish a path to gain several information, knowledge, experience, and skills for the students during learning process. Learning resource as termed before means human (teacher), matter (guideline book), environment (classroom, laboratory, library) and learning media [2]. One of learning resources which can assist the students to deepen the given matter is a worksheet. Worksheet contains information and command/instruction must be done by students in order to carry out a learning activity by working, practicing, or applying a learning achievement to attain a goal. As one of the learning resource for students, a worksheet should be able to fulfill criteria as follow: matter, presentation, language, and illustration in

order to complete the good function of worksheet as one of learning media for the students both in the classroom and outside, and also the supplementary media for the teacher to assist the student's deepen comprehension during learning process. Almost all of the subject matter seize on the worksheet as the learning resources. Chemistry is one of the concrete examples of those subject matters.

Chemistry as one of the Mathematic and Natural Science group subject matters, has to able to explain various chemical process phenomenon which occur in the daily life. It is important to establish an understanding global concept to complete the competition and facilitation for the students, beside the student also expected to command the international language skill in order to apply English in the natural science subjects. One of the obstacles during this application is less ability of the students in English skill, particularly for the chemical terminology in English. Thereby, implementation of thus learning standard require a teacher as the learner who able to carry out English as the supportive language skill to face the competition in the global era. Moreover, a bilingual worksheet (using Bahasa Indonesia and English) is absolutely needed to support the teacher to achieve the expected learning process.

Learning process is an interactive process between the student, the teacher, and learning resources as well. During learning process, there is a feedback of study and giving study activities both by the teacher and the students. Thus, it can be called as a group of activities which bound together. Learning is an active process of the student to studying and understanding the developed concepts in the learning activity, either individually or

grouped, neither autodidact nor within guidance. Meanwhile, to learn is an active process of the teacher to assist the student, so that the student able to learn and enter upon the developed concepts which is used during learning process [3]. The teaching activity will be going on properly and in an optimal fashion when the teacher able to apply a strategy to assist the student to finished their learning assignment completely [4]. There are many learning strategies that can be applied to help the students to conceive the given matter. One of them is learning strategy use *Mind Mapping*.

Mind Mapping is a record-keeping technology which was developed in 1970 by Tony Buzan, this method was designed based on the research about how does the brain actually work? [5]. *Mind Mapping* is a learning strategy which able to facilitate the student to understand the connection between the matter. There are many benefits using the *Mind Mapping* method, for instance: flexible learning, constructing attentive study, increase understanding, and pleasurable learning [5]. *Mind Mapping* becomes one of the choices to facilitate an incisive mind because it uses imagination and association.

Mind Mapping is related with constructive learning theory and processing information theory. Processing information theory is a cognitive theory of learning, explaining the process, storage, and ability re-call of the brain [6]. The learning resources which is being studied will be caught by the five senses then enter the early processing, after processing information has completed, it will enter the short time memory and continue with repetition and coding in multiple times so that the information can be saved as long

term memory. *Mind Mapping* able to help the students to absorb the information so that it can be saved effectively as long term memory. *Mind Mapping* also has another function as learning strategy, assisting the students to discover and apply a concept by themselves, and/or their own idea. This statement related with the constructive learning theory. Constructive learning theory suggests that the students by themselves, personally, have to able to discover and transform the complex information [6].

According to the pre-study questionnaire of the X grade SMA Negeri 1 Manyar which was suggested that 67 % of the total student considered the learning methods was less interesting, especially in the Atomic Structure Subject. The worksheet which is used also does not contain mapping matter, whereas 80% of the total student expects a schematic worksheet equipped with draw, color, and line. This is the criteria of the *Mind Mapping*.

Atomic Structure Subject and Periodical Elements System matters contain the development of atomic theory, basis particle arrange the atom, the notation of atomic formation, electron configuration, and valence electron that is related to the periodical element and the characteristic of periodical element. This is theoretical subject which considerably need a learning strategy in order to facilitate the student's comprehension. So that, *Mind Mapping* is a way out learning strategy to achieve this goal, since this method able to organize the information to be kept in the long-term memory space.

Based on the Kurikulum Tingkat Satuan Pendidikan, main matter of atomic structure and periodical elements are included in the grade X first semester. The

knowledge about Periodical Elements System with the whole problems is a theoretical matter. So that, a learning strategy of atomic structure and periodical elements is completely needed to establish attractive and easy to learn learning media for the student during learning process.

Based on the statements above, it was conducted a study of development of bilingual worksheet with *Mind Mapping* Learning Strategy on Atomic Structure matter in order to evaluate the feasibility of the worksheet, indicated by the criteria of matter, language, presentation, fulfillment of *Mind mapping* components, student's response and student's learning achievement.

RESEARCH METHOD

This research is a developmental research by using Research and Development (R&D) Method. However, on the stage of development, 4-D model was applied. The subject of this research is the students of Xth grade SMA Negeri 1 Manyar Gresik.

Data were obtained by using questionnaire method, whereas the instruments of the research used are assessment sheet, validation sheet, student's response sheet, and pre- and post-test assessment sheet.

Assessment sheet filled by 4 observers consist of 3 lecturers and 1 teacher. The obtained data contains suggestion which is analyzed by using quantitative description method. Validation sheet filled by 2 lecturers and 1 teacher. The obtained data are reflected as percentage based on Likert Scale calculation. Here is the following formula:

$$P\% = \frac{\text{total score}}{\text{criteria score}} \times 100\%$$

Score criteria = Highest score x total aspect
x total reviewer

The result of the calculation will be interpreted using Score Interpretation Table as followed:

Table 1. Score Interpretation

Percentage	Categories
0% - 20 %	Very less
21 % - 40 %	Less
41 % - 60 %	Enough
61 % - 80 %	Fair
81 % - 100 %	Very good

Ridwan, 2011 [7]

According to the table above, developed worksheet could be appraised as fair if the percentage is 61 % for each of the categories.

To evaluate the student's learning result, the instrument of question sheet were used. Question sheet were given to the students to be performed individually, and then obtained data were compared with the criteria of minimum completeness grade for chemistry subject.

Student's response sheet was given to the students in order to find out the student's response of bilingual worksheet using *Mind Mapping* learning strategy. Obtained data were estimated based on Guttman Scale. The following formula which is used:

$$P(\%) = \frac{F}{N} \times 100\%$$

Where:

P = answer percentage of the participant (student)

F = "Yes" answer percentage of the participant (student)

N = Total participant (student)

Based on the questionnaire response of the developed worksheet, it can be stated

that the developed worksheet noted as fair if the percentage as much as 61%.

The assessment sheet contains questions components which will be given to the students in order to gain information about the student's learning result after finish the worksheet. The result was obtained as a score which its determination adopted from the Likert Scale. Assessment score will be calculated using this formula bellow:

$$SCORE = \frac{\text{total score}}{\text{maximum score}} \times 100$$

Student's learning results were obtained according to the calculation using the formula above. Furthermore, those learning result will be compared with the criteria of minimum completeness grade, 80.

RESULT AND DISCUSSION

The result of the study were obtained from the validation activity of chemistry worksheet by using *mind mapping* learning strategy conducted by chemistry lecturers and teacher, also the limited trial step used to determine the student of Xth grade SMA Negeri 1 Manyar response.

This research adopted R&D and 4-D design. There are 2 stages of introduction study, first to find out the problem potency and to carry out literature study to solve the problems. Furthermore, developing study was conducted by creating worksheet and review of the worksheet. The result of review of the worksheet were used as the standard to overcome the evaluation. The evaluations, as followed before, for instance: re-assemble the cover, and the maintenance of grammatical structure neither in sentences nor words. After review, the next step is validation and limited trial test to the developed

worksheet to determine the estimation of the worksheet.

Worksheet Validation

Validation is conducted in order to reveal the feasibility of bilingual worksheet by using *Mind Mapping* learning strategy. According to BSNP (2006), bilingual worksheet by using developed *Mind Mapping* learning strategy own content validation if the developed worksheet have the appropriates of the matter, presentation, language, and illustration [8]. These similarities show if the validation result that gain the percentage of 61% in agreement with Likert Scale modification.

Based on the assessment conducted by the expert matter, it is indicated that the developed worksheet able to fulfill the criteria of matter according to BSNP (2006), using KTSP curriculum which is relevan with the learning result indicator, it contains propriety contents (fact, law, concept, principle) and agree with science structure [8]. Average percentage which is obtained from the result is as much as 93,9%, so that this worksheet have fulfilled the feasibility criteria which is noted as very good, according to the table interpretation score between 81% - 100%. Systematic arrangement of the matter capable to help the students to gain the informations from the worksheet. Nur [6] suggested that the learning resources which is being studied will be caught by the five senses then enter the early processing, after processing information has completed, it will enter the short time memory and continue with repetition and coding in multiple times so that the information can be saved as long term memory.

Developed worksheet able to stated to fulfill the criteria of presentation if it appropriate with BSNP (2006) among of them are: logical and systematical presentation, bring motivation to the student, encourage the student to be more active in the learning process, pay attention to student's heterogeneity, also bring an attractive and interesting impression [8]. The average percentage obtained from the validation as much as 93,56%, so that this worksheet fulfilled the very good criteria according to the table interpretation score between 81% - 100%.

The fulfillment of language criteria in this Chemistry Worksheet has been suitable with the criteria according to the BSNP (2006), which is using the proper and correct language, using appropriate language for its ages, and the terminology also easy to understand [8]. The average percentage obtained from the language assessment 88,89%, so that this worksheet fulfilled the very good criteria according to the table interpretation score between 81% - 100%. Attractive and convenient presentation can be seen by the color presentation and picture illustration from the worksheet in order to stimulate student's thought deepness and invest the conceptual matter specifically. Windura [9] suggested that one of the *Mind Mapping* superiority is it's attractive process, not tiresome, since it uses right brain element for example picture, color, and dimension. De Porter dan Hernacki [5] also mention that one of the benefit using *mind mapping* is a please learning because it stimulate the unlimited student's creativity and imagination. Applying color, picture, code, symbol or dimension during learning process able to assist the students commit to memory of the matter in the worksheet. Beside,

according to Buzan [10], one step to create *mind mapping* is by using the color, because it will make the *Mind Mapping* more alive, more energetic to the brain, more creative and fun.

Several aspects assessed in the *Mind Mapping* assessment including the location of the main idea, various color, various pictures, code, symbol or dimension, branches that were chosen (the branches is getting slighter sheering off the center picture), and using keywords [10]. Based on the assessment, conducted by the experts on developed worksheet using *Mind Mapping* learning strategy, it was indicated that this worksheet has already fulfilled a very good category with the percentage as much as 100%.

Limited Trial Test

In this step was obtained 2 data, student's response and student's learning result.

1. Student's response

According to the result of the questionnaire filled by the students, and after the limited trial test for the developed bilingual worksheet, there are several aspects which are stated to determine the student's response, for instance: of the matter, presentation, language, and illustration and the assessment of *Mind Mapping*. Based on the student's response result of the developed bilingual worksheet using *Mind Mapping* Learning Strategy it is showed that the entire aspects obtained total percentage of "yes" answer as much as 97,9% which exceed 61% and was categorized as very good. This indicates that the bilingual worksheet using *Mind Mapping* Learning Strategy has earned positive response from the students.

This positive response also reflected from the student's comments about the developed bilingual worksheet using *Mind Mapping* Learning Strategy. In fine, in a general way the student put their comments as this worksheet is attractive, interesting, and really helpful in order to understand the concepts, furthermore the students also put a note that this bilingual worksheet using *Mind Mapping* Learning Strategy able to increase their motivation to study chemistry.

2. Student Learning Result

Student's learning result is an assessed grade, obtain from the test result conducted by the teacher directly after learning process. Student's learning result on the Atomic Structure matter after being tested by using bilingual worksheet with *Mind Mapping* learning strategy is in average of 81.

Beside, based on the student's learning result it was revealed that the entire student was obtained an exclamation of learning result after given by developed worksheet. Based on the post-test result, the student gain an exclamation as much as 100%. Nevertheless, there are four students gain under minimum standard for some chemistry subjects in senior high school.

Assessment also conducted to the student's *Mind Mapping*. This result performed in a given grade to appreciate student's creative work which is *mind mapping*. The assessment of student's *Mind Mapping* result was observed according to *Mind Mapping* assessment sheet.

CLOSING

Conclusion

Based on the data analysis of development of bilingual worksheet by using *Mind Mapping* Learning Strategy on

Atomic structure matter, it can be concluded that:

1. Developed worksheet is feasible with the validity content of the worksheet, shown by the obtained percentage of criteria of matter as much as 93,9% and categorized as very good; the presentation criteria obtained percentage of 93,5% and categorized as very good; the the language criteria obtained percentage of 88,89% categorized as very good.
2. The developed worksheet fulfill the criteria of *Mind Mapping* component, this criteria obtained percentage of 100%, indicating very good category.
3. The developed worksheet has got positive response from the student and achieved very-good category based on the criteria of matter as much as 100%; the presentation criteria as much as 100%; the language criteria as much as 99,05%; and also the assessment of the *Mind Mapping* criteria obtained the percentage of 96,67%.
4. The developed worksheet able to assist the students to increase students' learning achievement as much as 100% .

Suggestion

In order to achieve the complete research, it is highly recommended to organize further research up to the disseminate level. In addition, the implementation of this worksheet also required to maximize the student's learning process and to detect the activity level of the students. Sample pictures of *Mind Mapping* on the worksheet should be given once at the first so that the students capable to create creative picture by themselves.

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