

Validity of Students Work Sheet Problem Based Learning Equipped With Crossword Puzzles on Ecosystem and Environmental Changes for Senior High School

Lidya Trinanda¹, Lufri², Zulyusri³, Ramadhan Sumarmin⁴

¹ Student of Biology Education Program Study PPS FMIPA Universitas Negeri Padang

² Lecturer of Biology Education Program Study PPS FMIPA Universitas Negeri Padang

³ Lecturer of Biology Education Program Study PPS FMIPA Universitas Negeri Padang

⁴ Lecturer of Biology Education Program Study PPS FMIPA Universitas Negeri Padang



Abstract –Schools provide opportunities for teachers to develop student worksheet in accordance with the mandate of the 2013 curriculum. based on the analysis, schools are still using student worksheet circulating in the market, and student worksheet developed by teachers only on certain materials only. In addition, on ecosystem materials and environmental changes it is known that the competence of learners is still under kkm. To address this problem then developed student worksheet based PBL equipped with crossword puzzles. Crossword puzzles are added to student worksheet so that learners can refine the concept of the material that has been learned and increase the motivation of learners in learning.

This development research uses a Plomp model consisting of 3 stages, i.e. 1) initial investigation stage, 2) development or prototype development stage, and 3) assessment. At the initial investigative stage, observations and interviews are conducted to determine problems in learning. At the development stage or prototype development is done on the development of student worksheet, after that done by experts. Student Worksheet practice data is collected by filling in a questionnaire of practicality by teachers and students. While the effectiveness data is derived from the competence of student learning outcomes.

The results showed that student worksheet based on PBL equipped crossword puzzles obtained very valid category with value 86,25%. The category of practicality with teacher response is very practical with a score of 86% and the practicality of the practical response of learners is very practical with a value of 85%. Based on the cognitive competence of learners divided into experimental class and control with the achievement of the final test is 83.7: 73.2. Both data are stated to be normal distribution, homogeneous and it is stated that the hypothesis is accepted. Student worksheet based on PBL equipped with crossword puzzles has also been effective in terms of affective competence and highly effective on psychomotor competence. Based on these results, it can be concluded that student worksheet based PBL equipped crossword puzzles on ecosystem materials and environmental changes for class X SMA N 5 Bukittinggi can be declared valid, practical and effective.

Keywords – Student Worksheet, Problem Based Learning, Crossword Puzzles.

I. INTRODUCTION

Curriculum 2013 mandates the essence of scientific approach to learning that aims to steer students to develop the ability to think naturally. Based Permendikbud No. 54 of 2013, the 2013 curriculum encourages learning models that support three scientific approach is a model *Problem Based Learning* (PBL), *Project Based Learning* (PPA), and *Learning Invention /Discovery Learning*.

Based on interviews with teachers' researchers' biology class X SMA N 5 Bukittinggi at the date of 26 November 2016 found that the school has implemented the curriculum in 2013 since the first semester of the school year 2016/2017 only class X only. However, the application has not been implemented optimally, it is seen as a learning process in the observation of researchers at the date of 26 November 2016 that at the time given the job on Activity Sheet Students not seen the process of referring to the scientific approach even

some learners still copy answers your friends and also just a few learners who are actively involved in learning.

The results of the interview also revealed that the curriculum changes affect *especially* the teaching materials used in schools. SBC replaced textbooks used textbooks to mold the curriculum of 2013. In addition, teachers also use student worksheet at each meeting. in this student worksheet directing school and provide an opportunity for teachers to create or design a separate activity sheet which directs the students into scientific approach so that objectives biology curriculum in 2013 on learning achieved.

Teachers student worksheet made aware that there are some disadvantages such as, student worksheet made only contain task sheets just do not have steps or instructions to learn. Additionally, student worksheet made by teachers not showing or leads learners to real problems or in other words has yet to lead students in activities *to observe, ask, and gather information, associates* (process information) and *communicating* in accordance with the concept of a scientific approach that is listed in the curriculum of 2013.

One of the biological material taught in class X is the 2nd half of ecosystems and environmental changes. Based on observations that have been made at the date of December 3, 2016 at SMAN 5 Bukittinggi known that the material ecosystems and environmental change learners' cognitive competence is below minimum completeness criteria (KKM). KKM given for materials ecosystems and environmental changes is 75. It can be seen in Table 1.

Table 1. The average value UH Topic Ecosystem and Environmental Change in the academic year 2015/2016 in SMAN 5 Bukittinggi

Class	Average Value
X ₁	66
X ₂	73
X ₃	78
X ₄	68
X ₅	70
X ₆	65
X ₇	64
X ₈	60
X ₉	75
X ₁₀	62

According to the biology teacher Muharni S.Pd low competence of learners in materials ecosystems and

environmental changes caused by learners considers this material is easy because it can be seen directly in everyday life so it does not need to learn. Whereas in the matter a lot of material and concepts that should not be ignored, so that learners more incomplete if faced with the problem more critical. This perception led to a way of critical thinking of students is less than optimal and less active learners in the learning activities. Therefore, strategies are needed so that learners are able to solve the problem by changing the mindset becomes active, critical, logical and scientific attitude in learning biology.

Biological material alteration of ecosystems and the environment is closely related to real life so that this matter can be raised from the problems that can be studied. One concept of scientific approach as mandated curriculum 2013 was based learning problem or *Problem Based Learning* (PBL). Model PBL can be used on materials ecosystems and environmental changes because it is a learning model that gave rise to problems in early learning so that students are required to further develop the skills of critical thinking in solving problems effectively and the expected implementation of the model PBL can overcome the difficulties learners in solving problems associated with the content that can then be used by students when faced with real problems in society. Application of student worksheet based PBL is expected to be able to direct learners to work on the problems based on real or contextual issues that are found in everyday life, especially in the matter of ecosystems and environmental changes. Problems that appear intended to build their own knowledge, learners have to think, gather facts and references that support and develop a deeper understanding of the given problem, so that students are able to understand the material through the knowledge that they find themselves.

Besides the advantages of PBL models, the shortcomings of this model are learners seek or mengkontruksikan own knowledge that some learners are often wrong concept. Therefore, it is necessary for students to be able to understand a concept by the end of learning. In addition, a questionnaire based interview guides to six learners at the date of March 11, 2017 at SMAN 5 Bukittinggi that learners have difficulty in memorizing the terms of the concept of matter, and scientific names.

Thus, one strategy to remember or understand the concept is by using crossword puzzles.

Based on the problems that have been described, it has made the development of student worksheet based PBL

equipped with crossword puzzles on ecosystems and environmental change material grade X SMAN 5 Bukittinggi.

II. REVIEW OF LITERATURE

2.1. Student Worksheet

Student worksheet/LKS according Trianto (2007:73) is a guide for students who are used to conduct an inquiry or problem-solving. In the learning process, LKS used as a medium for students to explore the material being studied. LKS is a learning resource that can be developed by the teacher.

According to the Ministry of Education (2008:16), "LKS are sheets contain tasks that must be done by learners. An activity sheet is usually a manual or the steps to complete a task ". LKS is sheets that contain tasks that must be done by learners. Worksheet learners are usually in the form of instructions, the steps to complete the task of.

2.2. Learning Model Of Problem Based Learning (PBL)

PBL model or a problem-based learning instructional model designed to solve the problems presented. According Arends (2008: 41), PBL is an instructional model that serves a variety of problematic situations authentic and meaningful to the students, which can serve as a springboard for investigation and inquiry. PBL helps students to develop critical thinking skills and problem solving skills.

Warsono and Hariyanto (2012: 150) states that the syntax of PBL are as follows.

a. Orientation of students to the problems,

Teacher explains the purpose of learning outlining the need for logistics (materials and equipment) required for solving the problem, motivate learners to engage in problem-solving activities that have been learners with the teachers, as well as handpicked by learners.

b. Defining the problem and organize students to learn.

Teacher's help learners define and organize the tasks learners in learning to solve an issue, determine the theme, schedules, tasks, and others.

c. Forge independent investigation and investigation group

Teachers motivate learners to make a hypothesis, collect information, and relevant to the task of solving the problem,

conducting experiments to obtain information and problem solving.

d. Develop and present the work

Teacher helps learners in planning and preparing the work of various tasks with friends in the group and others, and then learners present the work as evidence of problem solving.

e. Reflection and ratings

Teacher guide learners to reflect understand the strengths and weaknesses of their report, noting in memory of grains or important concepts related to troubleshooting, analyze and assess the processes and outcomes of the investigation of the problem. Furthermore, teachers prepare for further investigation related to the results of problem solving.

2.3. Student Worksheet Equipped Crossword Puzzles

Crosswords is a game language where words are arranged and adapted to any questions or definitions are delivered, then matched by the amount set his boxes, and each box is filled one letter. The words are arranged horizontally or vertically, so that there are letters that are part of another word (Davis, 2009: 2).

Crossword puzzles is a medium that is fun because it can create learning becomes active and fun, which can involve all learners to think when learning takes place with crosswords so that students become more enthusiastic in participating in lessons and learners can easily find and understand each concept in each material being taught. This is in line with research conducted by the Saran (2015: 457) that the activities of the crossword puzzle is a fun experience for the students and they enjoy interactive learning through recreation. Crosswords indispensable as a break from the monotonous lectures, making learning more fun and engaging than traditional teaching techniques.

2.4. Validation

Student worksheet as valid, if valid criteria in terms of content and construct. To determine the level of content and construct validity were developed to do both theoretically and construction content validity can be assessed through an assessment by the validator to assess the suitability of each item instrument with which he measured the concept, while empirically done by trial student worksheet developed. This is in accordance with the opinion of Ministry of Education (2008: 40) states that the components of the evaluation or assessment of the media that have made covers feasibility of the content, language, presentation, and desain of graffiti.

III. METHODOLOGY

This study is a design (*design research*). Products developed using the model Plomp. The model was developed by Tjeerd Plomp.

3.1. Development of a prototype 1

Prototype I begins with the design incorporating student worksheet based PBL equipped crossword puzzles based on the results obtained in earlier investigations (*preliminary research*). Design student worksheet presented in accordance with PBL syntax and compiled based on four aspects namely, aspects of the presentation, content, language and desain of graffiti. In this first prototype pengembangan discussed how and what techniques are used in designing the student worksheet based -PBL equipped crossword puzzles.

Student worksheet designed after completion method formative evaluation done of its own evaluation using the checklist. Evaluation itself is done to check for design errors that exist in student worksheet.

3.2. Prototype Development II

In this stage, expert review to see student worksheet validity of aspects of the presentation, content, desain of graffiti, and language. at this stage using student worksheet validation sheet. Revision prototype II is based on assessment and suggestions given by the expert or experts. Quality criteria to be obtained at this stage are the relevance and consistency as expected. Expert teachers / experts who validate the products developed.

Feedback from the validator is used to revise student worksheet developed. Validation is said to be complete when the validator expressed student worksheet is valid and ready to be tested.

IV. RESULT AND DISCUSSION

4.1. Result

Result obtained in stages of *the preliminary the research phase* (the initial investigation phase) used as guidance in developing the student worksheet based -PBL equipped crossword puzzles. The results of development activities undertaken at this stage are as follows.

4.1.1. Prototype 1

Prototype development 1 starting from the design and manufacture of products based PBL equipped crossword puzzles student worksheet accordance with step PBL models.

Characteristics student worksheet compiled based on several aspects such as the following.

a. content aspect

Student worksheet based -PBL include crossword puzzles is tailored to KI and KD are predetermined in the content standards. The components student worksheet made reference to the component of worksheet expressed by permendiknas year 2008 consists of the title, the instructions to learn or use student worksheet, competency to be achieved, and supporting information, worksheets of students, evaluation and assessment sheets.

b. Desain of graffiti aspects

Student worksheet based -PBL include crossword puzzles created using *Microsoft word 2007* text and colors on student worksheet questionnaire presented in accordance with the needs of learners. Crossword puzzles made using program *Eclips* crossword.

c. Aspects of Presentation

In the aspect of the presentation made by PBL learning steps the syntax is to orient on issues, organizing learning activities, guided and independent investigation group, develop and present work, the analysis and evaluation of problem-solving process.

d. Aspects of Language

Student worksheet developed using the correct language rules in accordance with Enhanced Spelling (EYD). Selection of the sentence in learning activities using communicative language, simple, unambiguous and in accordance with the level of understanding of learners with a clear sentence structure, making it easier for learners to use and understand student worksheet based pbl equipped with crossword puzzles.

After the design of the four aspects of evaluation itself is then carried out self-evaluation focused on the aspects of completeness student worksheet based -PBL equipped crossword puzzles. The results of self-evaluation found some improvement in terms of both writing and error sentence patterns.

4.1.2. Prototype 2

In the prototype development phase II of the project is done which is to see the validity of student worksheet based PBL equipped crossword puzzles based on the assessment of experts / specialists (*expert*) that includes four aspects: presentation, construct, language and desain of graffiti.

Assessment carried out by Indonesian experts, media experts learning and teaching materials experts.

Student worksheet based –PBL validation results equipped crossword puzzles developed can be seen in Table 2.

Table 2. Results of the test of validity student worksheet based -PBL equipped crossword puzzles based on the assessment of experts / specialists

No .	Components Assessment	Validity Value	Criteria
1.	Content Aspect	88.5%	Highly Valid
2.	Aspect Language	81.25%	Very Valid
3.	Aspects of Presentation	84%	Very Valid
4.	Aspect Desain of graffiti	86.25%	Very Valid
Total		340%	Very Valid
stocking of average		85%	

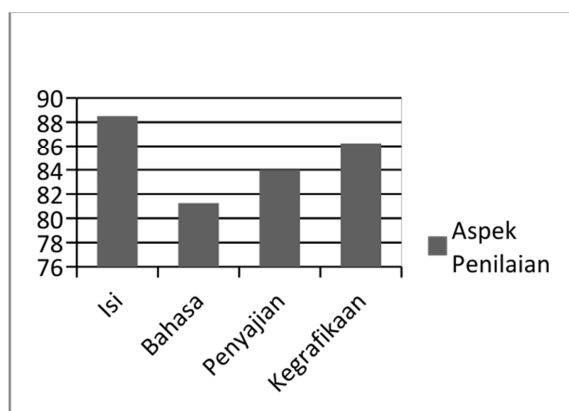


Figure 1. Aspek Penilaian

Based on Table 2 above, it is known that the validity of student worksheet based PBL equipped crossword puzzles is 85 which are very valid.

4.2. Discussion

The data analysis of the validity of the assessment sheet student worksheet based PBL equipped crossword puzzles comes from the aspects of content, language, presentation and desain of graffiti of student worksheet developed.

Student worksheet of the content aspect is expressed very valid by the validator. This indicates that student worksheet developed have been able to serve as a guide in learning activities and it can be said that the validity of student worksheet accountable because it has been rated by an expert. Validity in the aspect of the content provided by the validator caused student worksheet designed in accordance with the components of completeness student worksheet systematic, such as identity student worksheet, instructions for use student worksheet clear, the truth of the concept is right, the depth of material suitable for learners from high school and presented material support in the works can accelerate the evaluation and understanding of the learners. Besides the material adapted to ki and kd on the curriculum in 2013 and presents a clear learning objectives. Additionally, student worksheet has the model and its own uniqueness that is equipped with crossword puzzles. The addition of crossword puzzles on student worksheet has its own purpose as a test item that is presented in the form of crossword puzzles so that the material that has been learned can be remembered easily because it is presented in the form of a game. it is also supported by Davis (2009: 5) in which the strategy of using a crossword puzzle more effectively used in learning, because it has several advantages such as to accommodate various learning styles of students, reduce boredom in the classroom and motivating the unique and challenging for learners so that the material learned to be more memorable.

The validity of the contents student worksheet designed to facilitate learners to understand and remember the material concept and can increase the activity of students in learning. According arikunto (2009: 58) a scale or measuring instruments can be said to have high validity if the instrument is able to run a measuring function, or provide results in accordance with the purpose of measuring the measurements to be made. While tests have low validity will produce data that is not relevant to the purpose of measurement. Thus, the accuracy of the validity of a measuring instrument depends on proper he pleases.

Judging from the aspects of language, which is equipped student worksheet pbl-based crossword puzzles, is otherwise very valid by the validator. The validation results showed that language student worksheet already contains language that is easily understood by learners both in the delivery of information and instructions to be taken by learners. at the presentation aspect student worksheet rated very valid, because it is presented and developed according to the syntax of PBL.

Validity further assessed from the aspect desain of graffiti. Viewed from the aspect student worksheet desain of graffiti otherwise categorized as very valid and the highest level of validity among other aspects. The value is valid given validator is based on several indicators.

First, declare that student worksheet already attractive design. Student worksheet developed designed as attractive as possible using *Microsoft Word 2007*. It has a layout and orderly layout

Secondly, the clarity of writing, where *the font* used more than one type, the sizes *font* is clear and readable. The reason the use of some types of letters are due by student worksheet needs analysis questionnaire filled out by 6 learners. In addition, to increase the attractiveness and avoid boredom learners while reading.

Third, the suitability of the presentation of pictures or display pictures that help students understanding of the material. This is evidenced by the pictures on student worksheet can be seen clearly; quote results include the source image and caption in accordance with a given image. It aims to facilitate learners in understanding the displayed image so that the displayed image can clarify the concept of material that must be understood by the learner. Along with the statement by Prastowo (2012: 124) says that the presentation of the drawings is needed to support and clarify the content of the material, as well as clarifies the description can also add to the appeal and reduce the sense of boredom learners to learn. In addition Prastowo (2012: 99) also revealed that the image is able to provide motivation, meaning images can be used to motivate students to learn and keep learning. The same thing also expressed Hosnan (2014: 121) that the requirements in choosing the media is durable, shape and color attract the attention of students, it fits into the teaching and learning space.

Keempat, additional crossword puzzles at the end of the activity. Usually boredom learners in completing the questions on the activity sheet will provide challenges for learners complete the crossword. In addition as a means of playing and entertaining, crossword puzzles also aims to emphasize the concept of understanding learners after learning. According silvani (2017: 96), with the crossword puzzles to make learning more fun. Methods permainan form of activity filling the boxes empty and interconnected, it causes suasana in learning to be fun, so that students do not feel compelled to learn. Moreover, it also can increase the activity of learners.

The fourth aspect of validation votes student worksheet based PBL equipped crossword puzzles that has been described is a unified whole and support each other to perfection student worksheet equipped pbl-based crossword puzzles developed. Based on the analysis of the validity of the values obtained an average of 85% with a very valid category. According sugiyono (2012: 173) a measuring instrument is said to be valid if it can be used to measure what is supposed to be measured. the same thing also expressed by arikunto (2009: 58) when a data produced from a valid product, it can be said products developed already provides an overview of the development objectives are properly and according to the reality or the real state. rate very valid about student worksheet based PBL equipped crossword puzzles developed include this signifies that student worksheet has to be used as teaching materials for learning.

V. CONCLUSION

Based on the results of research and pilot-based LKPD pilot with TTS for high school students of Class X Semester even has been obtained conclusion that LKPD based PBL equipped TTS for learners have validity with category very valid.

REFERENCES

- [1] Arikunto, S. 2009. *Dasar-dasar Evaluasi Pendidikan* . Jakarta: Bumi Aksara.
- [2] Arends, R.I. 2008. *Learning to teach : Belajar untuk mengajar*. Yogyakarta: Pustaka Pelajar.
- [3] Davis, TM. 2011. Reveewing for exams: do crossword puzzle help in the success of student learning?. *The Journal Of Effective Teaching* 9(2):4-10.
- [4] Depdiknas. 2008a. *Panduan Pengembangan Bahan Ajar*. Jakarta: Dirjen PMPTK.
- [5] Depdiknas. 2008b. *Panduan Pengembangan Bahan Ajar*. Jakarta: Dirjen PMPTK.
- [6] Hosnan. 2014. *Pendekatan Saintifik dan Kontekstual dalam Pembelajaran Abad 21*. Bogor: Ghalia.
- [7] Permendikbud no.54 tahun 2013 *Tentang Standar Kelulusan Pendidikan Dasar dan Menengah*.
- [8] Prastowo, A. 2012. *Panduan Kreatif Membuat Bahan Ajar Inovatif*. Jogjakarta : Diva Press.
- [9] Saran, R dan Kumar S. 2015. Use of crossword puzzle as a teaching aid to facilitate active learning in dental materials *Indian Jurnal Of Applied Reasearch*. Volume : 5 April 2015

- [10] Sugiyono. 2012. Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, dan R&D). Bandung: Alfabeta.
- [11] Trianto. 2007. Model-Model Pembelajaran Inovatif Berorientasi Konstruktivistik. Jakarta: Prestasi Pustaka.
- [12] Warsono dan Harianto. 2012. Pembelajaran Aktif Teori dan Assasment. Bandung: Remaja Rosda Karya.

AUTHOR' BIOGRAPHY



Lidya Trinanda, born in Bukittinggi, April 16, 1990 Completed an undergraduate education program at a padang state university in 2013, then continued his master degree program in 2015 at the same university..