The Development of Biology Comic Education with Compare and Contrast Learning (CaC) Method to Improve 10th Grade Students’ Literacy

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Abstract. Literacy in the biology does not only deal with reading activity but also deal with several other activities like identification, determinant, and communication of information to overcome life problems. Furthermore, in biology subject, the chapter related to virus is the one of the most difficult chapters due to the abstract cause and the complexity of the content. This research aims at producing a feasible biology comic education to increase student’s literacy in Senior high school with compare and contrast (CAC) learning method. The development of this biology comic education refers to the 4D Model. It used one-group pretest-posttest design. The comic education was applied in normal class with CAC learning method. The data of the research were collected through validation, questionnaire, and pretest-posttest instruments. The data were analyzed through descriptive quantitative statistic technique. The result of this research revealed that: (1) the biology comic education was developed in valid categorizes, (2) the literacy learning was categorized improved; and (3) the students responded positively towards the learning. These results indicated that the biology comic education which had been developed was feasible to be used to improve the students’ literacy. In addition, the biology comic education can be used as a reference or alternative learning resources in the learning in the school.

1. Introduction

Based on the results of PISA (Programme for International Student Assessment) 2012 study on literacy, Indonesia ranks in the 64th position out of 65 countries with a specific score on literacy reading of 396 or equivalent to rank 61 [1]. In response to this, the Ministry of Education and Culture Decree (Permendikkbud) Number 23 2015 about building students’ behaviors and character which requires students to read books 10-15 minutes every day before starting the lesson.

Reading is considered as the most important component in the 21st century in order to survive in the current era of globalization. The success of learners in participating in the teaching and learning activities in schools is much determined by the ability to read.

Students can read books in the classroom through a collection of class libraries with other types of books other than subject textbooks, which are categorized popular books but still within the appropriate levels and preferably for the students according to their level. Furthermore, it is mentioned also that popular
books such as domestic and foreign literature, newspapers, magazines and educational comics are some examples of books to develop student’s interest in reading. Such perception is supported by the international journal namely Journal of Science Communication [2] entitled Science comics as tools for science education and communication: a brief, exploratory study states that comics are used in promoting science literacy through education and communication.

A low reading interest causes low activity and low learning outcomes. The complexity of learning materials like the chapter of virus makes students less interested in learning and in reading textbooks including Biology textbooks. Students tend to be interested in observing picture books rather than textbooks, because they are packed with interesting attributes as well as completed with a coherent storyline and regularly which make it easy to remember. Therefore, educational comics can illustrate and explain the structure of the virus more clearly.

Hence, this study aims at fostering students’ interest in reading through reading stuffs that contain learning materials that are packed with pictures and language that are easily understood. The biology comic education would be applied in the normal class with compare and contrast (CAC) learning method.

Through this research, it is expected that such way will be used as an alternative mean for helping teachers in the learning process, especially developing educational comic learning materials on other chapters of Biology subject as well as becomes an effort to develop interest in reading (student literacy) and improving the quality of learning.

2. Theoretical framework
The image media is a medium that combines facts and ideas in a clear and powerful way through a combination of expressions of words and images; this medium consists of drawings, charts, diagrams, graphics, posters, cartoons and comics [3]. This study developed comic education to enhance students reading interest. Comics have many functions in advertising, entertainment and education. Educational comic is a comic that tells about the subject matter or matters relating to education. Comic education has two main functions as a medium of entertainment as well as a mean for conveying the purpose of education to the reader.

Interest in reading is a tendency and a high passion or a strong desire to read. Interest in reading would also determine the high quality of the learning achievement [4]. Interest is not innate, but something that can be learned and developed. It means that an interest can be developed because of certain inputs or new insights and new patterns of thinking in the form of light reading stuffs such as educational comics.

Compare and contrast (CAC) learning method would help students in doing comic education literacy in the normal class. This learning model aims at assisting students in developing critical thinking skills through image descriptions, objects, and readings as well as providing a mean for organizing new information [5]. CAC learning method consists of four main steps: 1) Reading and learning; 2) reasoning and analysis; 3) communication; and 4) reflection and connect.

3. Method
The development of this educational comic with virus material used the development learning materials of Four-D (4-D) model because the researchers think that the 4-D development model is easier to understand and apply. The 4-D device development model was developed by [6], composed of two main steps namely planning or development and implementation.

At the planning or development stage, 4D model was carried out through four stages: Define, Design, Develop, and Disseminate [7].

The defining stage (Define) is a stage to define the materials and components that exist in educational comics. Meanwhile, the Design stage aims at defining the terms of the story and the material in the comic strip. The development stage (Develop) aims at producing a revised comic based on the input of experts. The final stage is the dissemination (Disseminate) which is the use of devices that have been developed with
a wider scale [7]. After the main step of the planning or development, the next major step is the implementation. The implementation stage is the phase to implement the biology educational comics that have been developed.

Students literacy/reading interest in this study would be measured by using paper and pencil test method that used Likert scale questionnaire instruments including statements that were tailored to the indicator in order to measure students’ reading interests. The indicators to be measured in this study embraced feelings during reading, frequency, interest, and reading awareness. The statements in the questionnaire consisted of 30 questions with optional answers that would be filled by 35 students of SMAN 3 Surabaya.

The questionnaire dealing with the student literacy was filled by the students in order to know the stage of students’ reading interest in biology both before and after biology learning activities with the use of comic education and CAC learning method. In addition, this interest reading the questionnaire was also used to measure the ease of students in understanding the material contained in comic education.

The student literacy questionnaire used was closed-ended questionnaire so that students could choose an answer that matches their opinion on the option by checking (√) in the appropriate answer option (1=Disagree, 2=Less Agree, 3=Agree, and 4=Strongly Agree).

This research method used one group pretest-posttest design with formula: (O1 X O2) that gave the initial student literacy questionnaire before the learning activity progress in order to know their reading interest and their responses at the beginning of the lesson. After the 3rd meeting of the study (the last meeting), the students got questionnaires once again to know the development of students’ literacy and students’ responses about the learning activities through the use of educational comics.

The data of the student literacy was analyzed by using qualitative descriptive and entering questionnaires data in the following formula:

\[ P = \frac{\sum R}{\sum N} \times 100\% . \]

4. Analysis and Discussion

The data validation of the comic education coming from the two validators, obtained results that generally educational comic developed by researcher had valid category and very valid category with the score of 3 to 4 and reliability percentage of 86% until 100%. Based on those assessments, the comic education developed could be used with little revision.

The implementation of the research began with the collection of early data of the reading interest (preliminary research) conducted in SMAN 3 Surabaya in class X. The respondents were Class X MIA 3 which consisted of 35 students. The research was done through the student literacy questionnaire in preliminary research, the recapitulation of which resulted 24% and the student literacy questionnaire in post research, the recapitulation of which resulted 56%. The student literacy indicators used included the feeling of pleasure during reading without coercion, the frequency of reading, the interest of students to read books, and the students’ awareness of the important and purpose of reading; which were presented in the following table.

Table 1. Results of questionnaires on students’ reading interests

| No | Indicator                                      | Pre-Research (%) | Post-Research (%) |
|----|------------------------------------------------|------------------|-------------------|
| 1  | Feeling of pleasure during reading without any coercion | 15               | 38.63             |
| 2  | The frequency of reading                        | 25               | 44.25             |
| 3  | The students’ interests to read books            | 25               | 56.13             |
The awareness of the purpose of reading | 31.25 | 87.88
Average | 24.06 | 56.72

![Graph showing improvement in student literacy](image)

**Picture 1.** Improvement of the student’s literacy in pre and post research

From the graph 1, it is known that the student’s literacy on each indicator shows different results, but all the indicators showing the improvement between pre- and post-lessons using biological educational comics. The interest was not innate, but something that could be learned and developed. It meant that an interest can develop because of certain inputs or new insights and new patterns of thinking. Similar to the reading interest, it could be developed in several ways. According to [8] there are some tips to develop reading interest in students by growing motivation to be aware of the purpose of reading activity such as adding insight, being able to know the solutions to various problems, and reinforcing the knowledge of something.

The data of the students’ responses towards the educational comics developed were obtained from the data of the students’ questionnaires. All students filled the questionnaires, then the results were recapitulated. The recapitulation of the response of 35 students to the learning activities using educational comics got a strong and positive response with the percentage of response 70% to 100%. It was because the educational comics made the learning become more interesting, especially in understanding the material that was long and difficult to be understood by students.

The existence of an interesting storyline with colors in comic education that are not monotonous can attract the attention of students to learn it. According to [3], the use of appropriate colors in a learning medium can generate motivation, feelings, attention, and willingness of students in learning.

5. **Conclusion**

From the results of the development and application of biological education comics dealing with virus material at SMAN 3 Surabaya, it could be concluded that educational comics could be used to cultivate a positive attitude of the students since it improved the students' literacy or reading interests as well as it could be used as an alternative guide book for learning biology in another chapter. Some suggestions from the results of this study point out that comics can be used as one of the learning media in class, not limited to the biology course. However, it can be applied for other subjects or other learning methods to develop the aspects of the students’ reading interests, students’ activities, and students’ learning outcomes.
6. References

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