The effect of STAD learning model and science comics on cognitive students achievement

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Abstract. This research aimed to determine the effect of STAD learning model and science comics on cognitive students achievement. The type of research was quasi-experimental. The research design used nonequivalent control group design which was consisted of two experimental groups and one control group. The sample in this research included 84 grade VIII students taken from Junior High School in Manokwari. The Technique of collected data used achievement test. The result of data analysis used Kruskal-Wallis Test showed that there was a mean difference of cognitive students achievement (P = 0.000 < 0.05), where the mean of cognitive students achievement taught used STAD learning model and science comics higher than cognitive students achievement of students taught used STAD learning model and conventional learning model. The 1st experimental group gain score was 0.59, the 2nd experimental group was 0.40, and the control group was 0.37. It can be concluded that there is an effect of STAD learning model and science comics on cognitive students achievement.

1. Introduction

Learning is a process of interaction that occurs in both directions between teachers and students. The learning process will be better if the students become active and teachers act as facilitators, motivators, and mentors. To create active and innovative learning, teachers should be able to develop learning activities that attract students to learn through the use of learning models and learning media as a tool for information delivery. STAD learning model is one of the simplest and easiest types of cooperative learning models to implement for beginner teachers in a learning process in the classroom. The cooperative learning model is a more effective learning model compared to conventional learning model [1]. STAD learning model affects students achievement. Cooperative learning including STAD has a positive effect on students achievement [2]. The STAD learning model is a more effective learning model than the conventional learning model in teaching [3]. STAD learning model affects improving student learning outcomes [4]. In the lecture for teacher candidates in the third year using STAD learning model during the 12 weeks of learning, it is showing that STAD learning model encourages students to behave positively, achievement better, and students become motivated to learn compared to using direct instruction [5].
Based on the research that has been conducted by some researchers shows that STAD learning model has an effect on students' achievement and make students more motivated to learn compared with direct instruction or conventional learning model that is often using by teachers to teach the concept of material to students. Learning is become effective because using the right of the learning model.

STAD learning model is an effective learning model compared to conventional learning model and direct instruction. However, the use of the TAI learning model significantly gave a better effect than the STAD learning model, and the STAD learning model was better than the conventional learning model [6]. There is no significant difference between students' achievement taught using STAD learning models and conventional learning models [7]. The use of STAD learning model in 61 students in Malaysia during one semester showing that there was no difference in the scores of students' achievement between students taught using STAD learning model and conventional learning model [8].

Learning using STAD learning model is more effective than conventional learning model, but in other research, the use of STAD learning model is not different from conventional learning model to improve students' achievement. To overcome it, it takes a learning tool to deliver messages or material concepts to students. One of the tools to deliver messages or scientific information in teaching is learning media. The use of educational media appropriately and varied can overcome the passive attitude of students in the learning process. Learning is a system in which there are interconnected components. Components of learning objectives, learning materials, learning media, learning strategies and evaluation of interrelated learning. Learning media has a stake in helping teachers to pass on scientific information. One of the learning media that can help teachers in conveying the concept of learning materials to students is a comic learning media. Comic learning media can serve as an independent learning media because students can find their concepts with and or without the help of teachers and effectively improve students' achievement [9]. Comics are favorite art medium specially made for children and is a medium that has possible education and communication of scientific information [10].

Comics and local culture of Jember integrated into science learning very useful assist in improving affective skills, psychomotor skills and cognitive ability, students become motivated to learn, because comic learning media is an interactive media that can be applied to real-life situation and experience for learners and in teaching [11]. Comics influence students reading ability, where the reading ability of students taught to use comics is better than the reading ability of students taught without the use of comics [12]. Has a positive influence on reading literacy and reading motivation [13]. One characteristic of the comic is to influence learners or readers to understand a history of an event that they did not observe directly [14]. Through the comics, scientists can develop a bond of sympathy [15]. Images in biological comics such as cholesterol uptake improve memory in long-term memory of students [16].

One crucial feature characteristic of today's young generation is that they are no longer closely connected to conventional text-based communications, they are more visually involved with multimedia communications [17]. Students or other readers may reject the science textbook, but feel more comfortable with the material presented in comic form. [18]. Comic learning media presents interesting things for science communication that have not been widely exploited [19]. The combination of STAD's learning model and learning media will be an innovative in improving cognitive students achievement.

2. Method
The type of research was quasi-experimental. The research design used nonequivalent control group design which was consisted of two experimental groups and one control group. The sample in this research included 84 grade VIII students taken from Junior High School in Manokwari. Sampling on this research was purposive sampling technique. The first experimental group (students taught used
STAD learning model and science comics) was 29 students, the second experimental group (students taught used STAD learning model) was 29 students and control group (students taught used conventional learning model) was 26 students.

**Table 1.** Nonequivalent control group design with two experimental group

| Group                | Pre-test | Treatment | Post-test |
|----------------------|----------|-----------|-----------|
| 1st experimental group | O₁       | X₁        | O₂        |
| 2nd experimental group | O₃       | X₂        | O₄        |
| Control group        | O₅       |           | O₆        |

Instruments used in the research was a lesson plan, student worksheet, science comics, and achievement test. The validity of comic learning media by a material expert was 98% get a very valid category, and media learning expert was 96% get a very valid category. The validity of the achievement test was 100% get a very valid category. Analyze data used Kruskal-Wallis Test with significant level 0.05. The following formula calculated students response to learning used comic media:

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\text{Percentage of students response} = \frac{\text{Number score obtained}}{\text{Maximum score}} \times 100\% \quad (1)
\]

**Table 2.** Student response criteria

| Percentage | Criteria   |
|------------|------------|
| 85 - 100   | Excellent  |
| 70 – 84    | Good       |
| 55 – 69    | Enough     |
| 40 – 54    | Less       |
| < 40       | Very Less  |

3. Result and Discussion

The science comics using in this research focus on the material of the human digestive system. The cover and content designs of science comics are shown in Figures 1 and 2:

**Figure 1.** Front cover of science comic

**Figure 2.** Science content of the science comic
Figure 1 shows the front cover design of science comics, where the concept in science comics is a human digestive system. Characters that appear in science comics is the character of Papua children who have a friendship relationship that is Maher, Fika, and Simon, where the main character is Simon has a smart robot named RBI. RBI can explain the concept of matter that is not understood by Maher and Fika. The humor and simple displays make students interested to read comics. Figure 2 shows that the material displayed in comic content is a matter of the human digestive system. Explanation of the concept of the science of human digestive system described by Simon and assisted by his robot RBI. The materials in science comics help students understand the material presented by the teacher.

Table 3. Data of pre-test, post-test and gain score

| Group          | Mean  | Gain  |
|----------------|-------|-------|
|                | Pre-test | Post-test |       |
| 1st Experimental | 22.52     | 68.35     | 0.59  |
| 2nd Experimental | 26.76     | 55.83     | 0.40  |
| Control        | 26.42     | 54.00     | 0.37  |

Table 3 shows that when of pre-test the cognitive students’ achievement score of the 1st experimental group was lower than others. Mean score of post-test 1st experimental group is higher than 2nd experimental and control group. These results indicate that cognitive students’ achievement taught using STAD learning model and science comics are higher than students taught using STAD learning model without comic and conventional learning model. The students’ memory score taught by learning using comics is higher than that of students taught without the use of comics [20]. Increased cognitive students’ achievement is indicating the gain score, where the gain score is in the medium category, but 1st experimental group shows higher cognitive students achievement with the gain score is 0.59.

Table 4. Data result of Kruskal-Wallis Test

| Data       | Chi-Square | df | Asymp.Sig | α   | Decision                        |
|------------|------------|----|-----------|-----|---------------------------------|
| Pre-test   | 2.607      | 2  | 0.272     | 0.05| There is no an effect           |
| Post-test  | 27.641     | 2  | 0.000     | 0.05| There is an effect              |
| Gain       | 28.942     | 2  | 0.000     | 0.05| There is an effect              |

Table 4 shows that there is no significant difference between the mean pre-test of the experimental class and the control class. These data indicate that students’ initial abilities are the same. After the learning was conducted, there is a significant effect of STAD and science comics learning model on cognitive students’ achievement (P = 0.000 < 0.05). In addition, there is also a significant effect on the improvement of cognitive students’ achievement (P = 0.000 < 0.05). The result of the research shows that STAD learning model and science comics are a combination of learning model and innovative learning media to using in teaching and learning process in the classroom, and as a solution in improving cognitive students’ achievement. We found out that the low cognitive students’ achievement taught using STAD learning model and conventional learning can be improved by adding science comics learning media. Students taught using comic learning media higher students achievement than students taught without using comics [21].

Most students believe that comics can help them to learn the concept of science easily and make their learning outcomes and retention better [22]. In this research, we found that before being taught using STAD learning model and science comics learning models, cognitive students ‘achievement was lower than that of cognitive students’ achievement taught using STAD and conventional learning models. After being treated using STAD learning model and science comic, cognitive students’ achievement is higher than that of cognitive students’ achievement taught using STAD and conventional learning models. The results showed that the effectiveness of the learning that is
implementing by teachers depends on creativity and innovation in a learning process. Rigorous science learning with principles and theories can be made fun by using science comics to convey scientific information. Comics is quite effective in communicating scientific information [23]. Students response to learning using comic are shown in Table 5:

**Table 5. Students response**

| No | Question                                                                 | Response (%) |
|----|---------------------------------------------------------------------------|--------------|
| 1  | Does the illustration of the image present help you in understanding the material? | 100          |
| 2  | Does the storyline help you understand the material?                       | 89.29        |
| 3  | Do you find it easier to learn materials using comic learning media?        | 100          |
| 4  | Does the display of comic learning media be good?                          | 100          |
| 5  | Are the picture and illustrations displayed on comic learning media interesting? | 100          |
| 6  | Does the language used in comics easy to understand?                       | 100          |
| 7  | Are the display and typeface used in comic learning media legible and easy to understand? | 100          |
| 8  | Does color selection on comic learning media already support comic display? | 100          |
| 9  | Does comic learning media interest you in learning science?                | 100          |
| 10 | Will you interesting in other science materials are taught using comic learning media? | 96.43        |
|    | Average                                                                  | 98.57        |

Table 5 shows that students responses to learning using science comics learning media are excellent. This data proves that students are interested in learning science using science comics learning media. Science comic has the potential to develop one's pleasure in learning science by reading comics [24]. Science comics are an important role in attracting and make students attitudes positively [25]. Science comics learning media make students more easily understand the concept of science, interesting in learning science and forming the positive attitude of students.

4. Conclusion

Based on the result of the research, it can be conclusion that there is an effect of STAD learning model and science comics on cognitive students’ achievement. Students who are learning using STAD learning model and science comics have higher cognitive students achievement than students taught with STAD learning model without comics and conventional learning model. Students response to learning using comics learning media is excellent.

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