

Development of Teaching and Learning Tool Kit for Science Subject in Secondary School

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Abstract: Science plays a significant role in equipping students with valuable skills such as problem-solving, critical thinking, self-reliance, and creativity. Despite this, there still exists a challenge in terms of lack of percentage of students who are interested in learning and pursuing their studies in science. Hence, this study was conducted to develop and test the efficiency of educational kit upon understanding science subject in selected secondary school in rural area (SMK Alauddin Riayat Shah 1 Pagoh, Johor, Malaysia) by using Analysis, Design, Development, Implementation, and Evaluation (ADDIE) Instructional Design Model. A total of 73 students from form 3, 4 and 5 students were participated in this study. The result shows almost 97 percent of the respondents understand the explanation delivered by the aids of educational kit and feel happy and enjoy learning using the educational kit. Therefore, this study encourages and suggest more interactive teaching and learning tool kit should be developed using ADDIE method to help students to enhance understanding and interest in science subject.

Keywords: Secondary School, Science Subject, Educational Kit, ADDIE Instructional Design

1. Introduction

Educational kit is crucial and important for teachers and students during teaching and learning process [1]. A teaching and learning tool kit has help so many students in understanding the complex subject easier and effectively during the learning process [2]. The usage of the teaching and learning tools kit makes easier for students to share information gathered to others about the topic that they have learn. This is because during learning process in classroom, the educational tools kit makes the learning environment more fun. Development of educational kit does not only help student but also to assist teachers in shortening the period of learning process compared to the old method where teachers teach, and students listen with no fun learning activities for them. The successful of educational kit tools in helping teachers and students are due to the variety of methods and technique to attract the student's attention [3].

The main objectives of developing the food web prototype tools kit are so that the learning and teaching tools kit manage to be used as facility in every rural area of secondary school in Malaysia. Other than that, to increase students understanding and learning of Food Web topic in science subjects clearly and easily with the aids of educational kit developed. Next is to help increase students' interest and motivate them in learning science related subjects. With the aids of teaching and learning tools kit developed, it will trigger the sensory of the students to know, dig, ask and curious while learning science subject which helps them to increase their interest and attention towards learning the subjects of in school. The teaching and learning tools kit does also gives many benefits that makes the whole learning and teaching process easier for teachers and students which results in success of understanding the subject matter easier, successful and effectively [4].

2. Materials and Methods

2.1 Study Area

SMK Alauddin Riayat Shah 1 is a secondary school located in Kampung Paya Redan, Pagoh exactly in the coordinate 2.10911, 102.80656. SMK Alauddin Riayat Shah 1 consist about a total of 1362 students. SMK Alauddin Riayat Shah 1 is located about 7.5 km from UTHM Pagoh. This took around 12 minutes from UTHM Pagoh to the school. Survey is performed within one of the halls inside the secondary school. Figure 1 below shows the location of the study conducted.



Figure 1: Location and approximation area of SMK Alauddin Riayat Shah 1

2.2 Sampling Methods

In this study, the method to gather the data was by distribute the questionnaires by face-to-face survey to the respondent to answer before and after the explanation with the aids of educational kit. This method is used because operating a survey or interview method are more practical and effective especially involving a big [5]. A total of 73 participants, consisting of form 3, form 4 and form 5 completed the survey. The questionnaire developed consist of 3 sections: a) demographics; b) Knowledge on Food Web; and c) Opinion and Point of View. In this survey, the respondents were asked to pick and choose on the answer provided on every questions. The first section focused on the respondent's demographic data. This section consists of four questions on gender, age and stream. The second section focused on the respondent's knowledge on Food Web. The section consists of 7

questions overall to test the respondent's knowledge before and after the explanation using the teaching and learning tool kit. The third section focused on the respondent's opinion and point of view on the success of the teaching and learning tool kit.

2.3 Analyse, Design, Development, Implementation and Evaluation (ADDIE) Methods for Developing Teaching and Learning Tools Kit

The process of developing this educational tool kit were used by the ADDIE Instructional Design method. The method consists of 5 steps which is Analyse, Design, Development, Implementation and Evaluation. ADDIE model is an approach of instructional design system that has been used widely in all over the world [6]. The ADDIE Instructional Model was developed by Florida State University in 1975 for the U.S Army a repeatable and standard set of tasks to create training [7].

3. Results and Discussion

The total number of 73 respondents involved in this study. The number of 22 respondents from age 15 years old, 50 respondents from age 16 years old and 1 respondent from age 17 years old which all of them are from different kind of stream backgrounds. Different gender, age and stream does affect the respondent reaction to the question and the choice of answer picked due to their knowledge and experience [8].

3.1 Demographic Questions

According to the Figure 2, there were 39 (53.4%) male respondents and 34 (46.6%) female respondents participated in this survey. The pie chart shows that most of the respondents are male compared to females. Next, there were 50 (68.5%) of the respondents are from 16 years old. Meanwhile, 22 (30.1%) respondents are from the age of 15 years old and 1 (1.4%) from the group of age 17 years old. On the stream section, most of the respondents are from Literature stream which are 20 (27.4%), followed by Business stream with 18 (24.7%) respondents. The number of respondents from no stream are 17 (23.3%). The number of respondents in Science and Account stream are 8 (11.0%) and 6 (8.2%) respectively. The least number of respondents is from Arts and Music stream which are 2 (2.7%) equally.

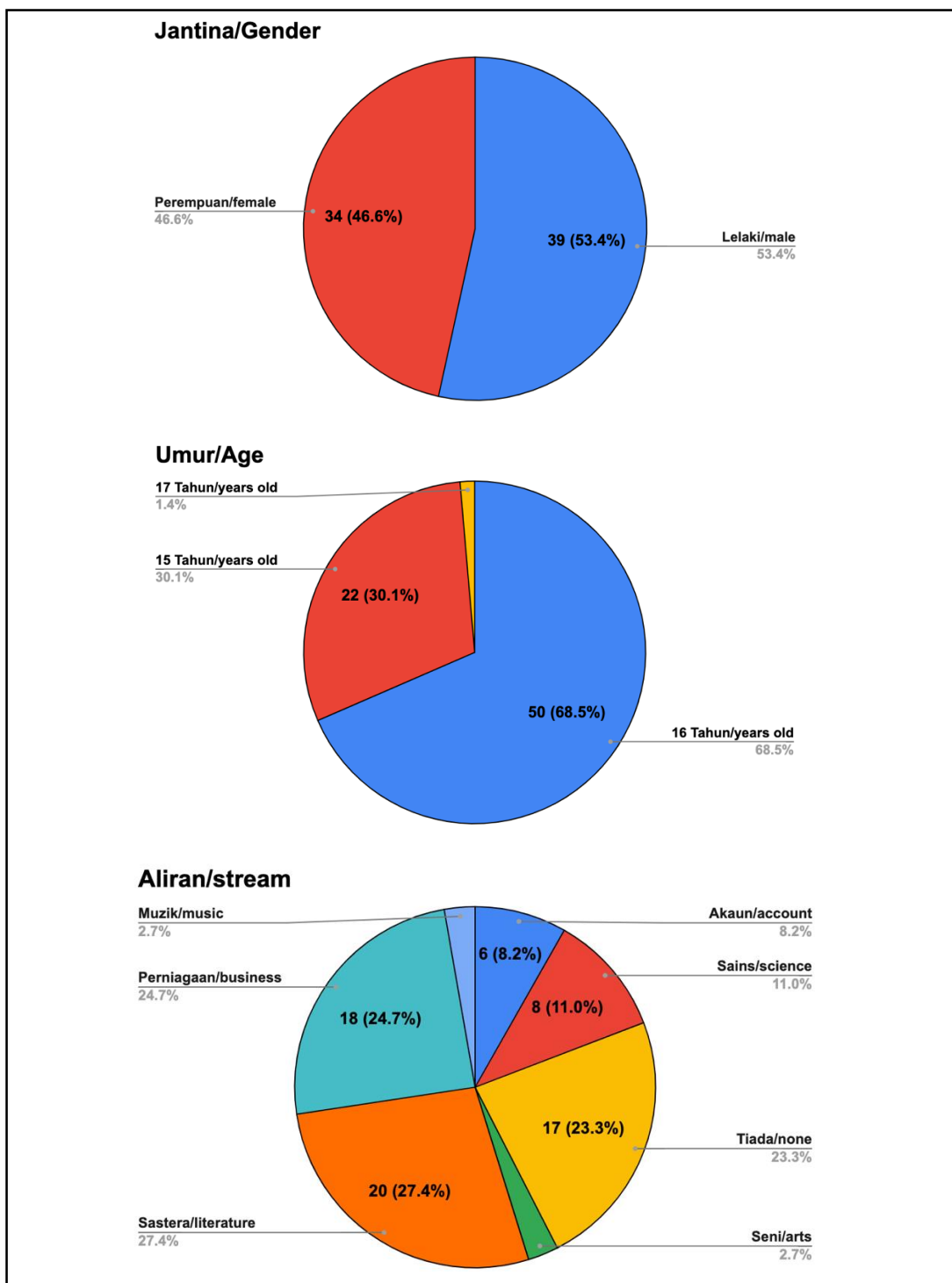


Figure 2: Respondents data of gender, age and stream

3.2 Knowledge about Food Web

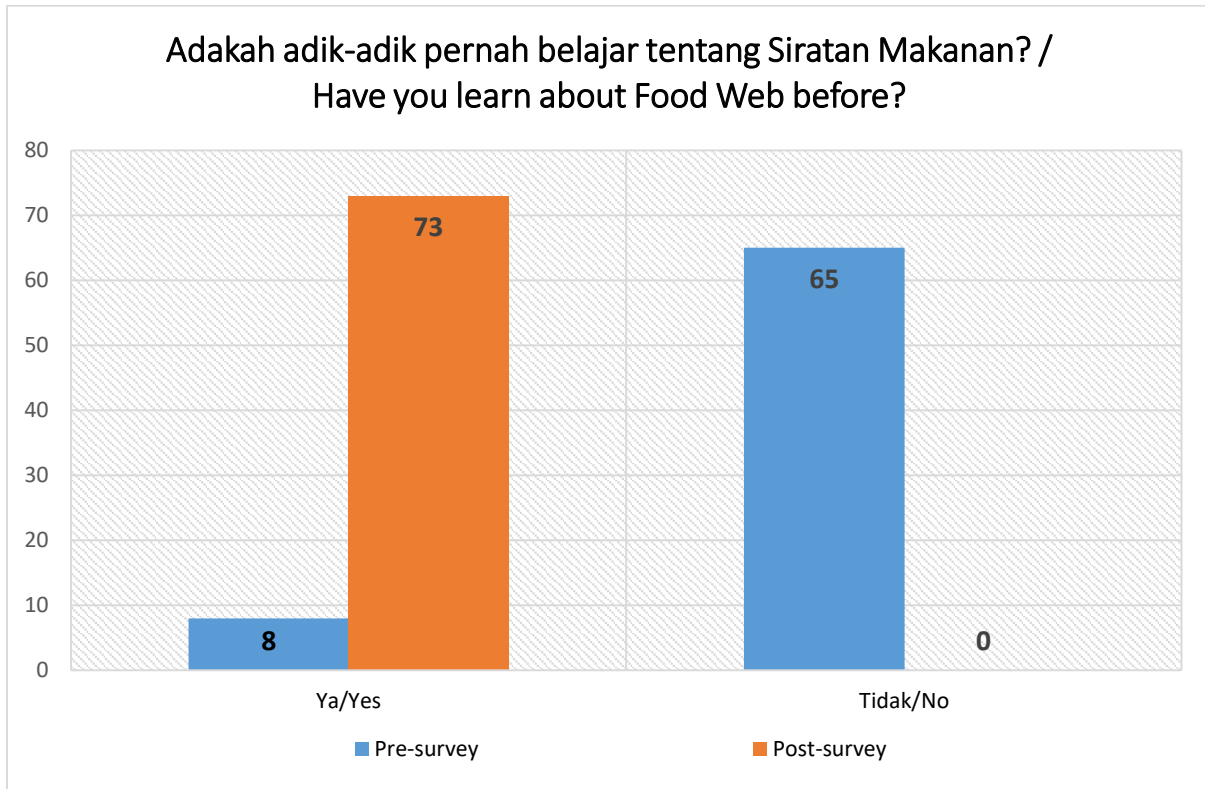


Figure 3: Question 1 pre and post survey of respondent data

Figure 3 indicates the first question asked during the pre-survey and post-survey to the respondents. The number of respondents answered yes to the question was 65 (89.0%) while the remaining 8 (11.0%) respondent answered no to the question asked. However, after the explanation session with the aids of the Food Web prototype, based on figure above, all the respondent agreed by answering yes to the questions that they have learnt about the Food Web topic before. Thus, these can be concluded that all the respondents had learn the Food Web topic before.

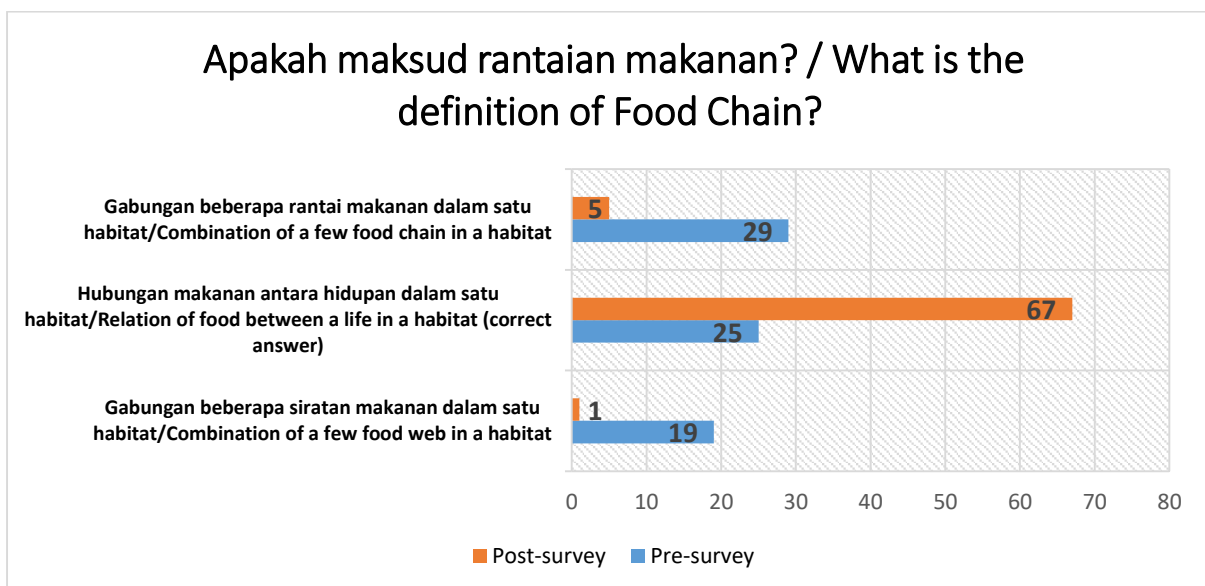


Figure 4: Question 2 pre and post survey of respondent data

Figure 4 illustrates the second question asked during the pre-survey and post-survey to the respondent. The number of respondents answered “Combination of a few food chain in a habitat” as their answer was 29 (39.7%) and 5 (6.8%) respectively. Next, the number of respondents picked the answer “Relation of food between a life in a habitat” was 25 (34.2%) and 67 (91.8%) respectively which is the correct answer for the second question. Finally, for the answer “Combination of a few food web in a habitat”, 19 (26.0%) respondents answered in the pre-survey and 1 (1.4%) respondent answered in the post-survey. Based on the observation of the pre and post survey for second question, the educational kit does help students in understanding science effectively and successfully [9]

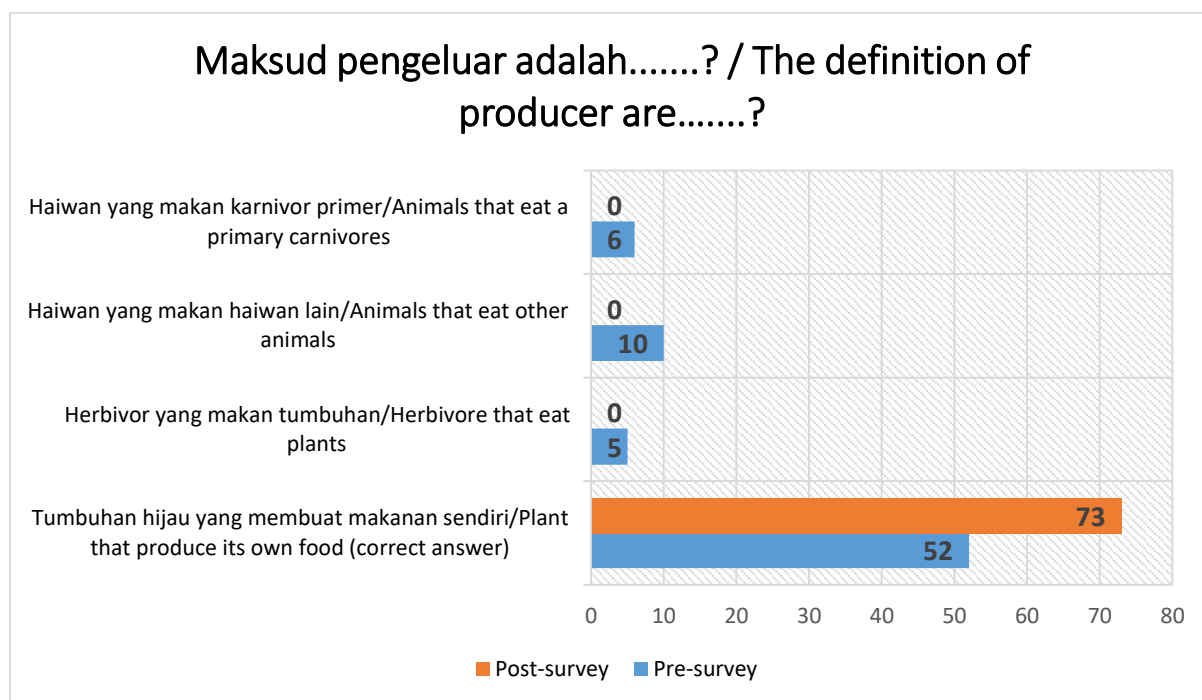


Figure 5: Question 3 pre and post survey of respondent data

Figures 5 display the third question of the pre and post survey questionnaire. Based on the pre-survey the highest score answered by respondents were 52 (71.2%) which is “Plants that produce its own food” which the correct answer for the third question. The second highest answered by respondents was 10 (13.7%) which is “Animals that eat other animals”. Next, the third highest answered pick by respondents was 6 (8.2%) which the question is “Animals that eat a primary carnivore”. The least answered by respondents was 5 (6.8%) which the question is “Herbivore that eat plants”. Meanwhile in post-survey, all the respondents answered “Plants that produce its own food” after the explanation session with the aid of Food Web prototype. Thus, it can be concluded that process of learning especially science with the aids of educational kit increase students’ performance and understanding [10]

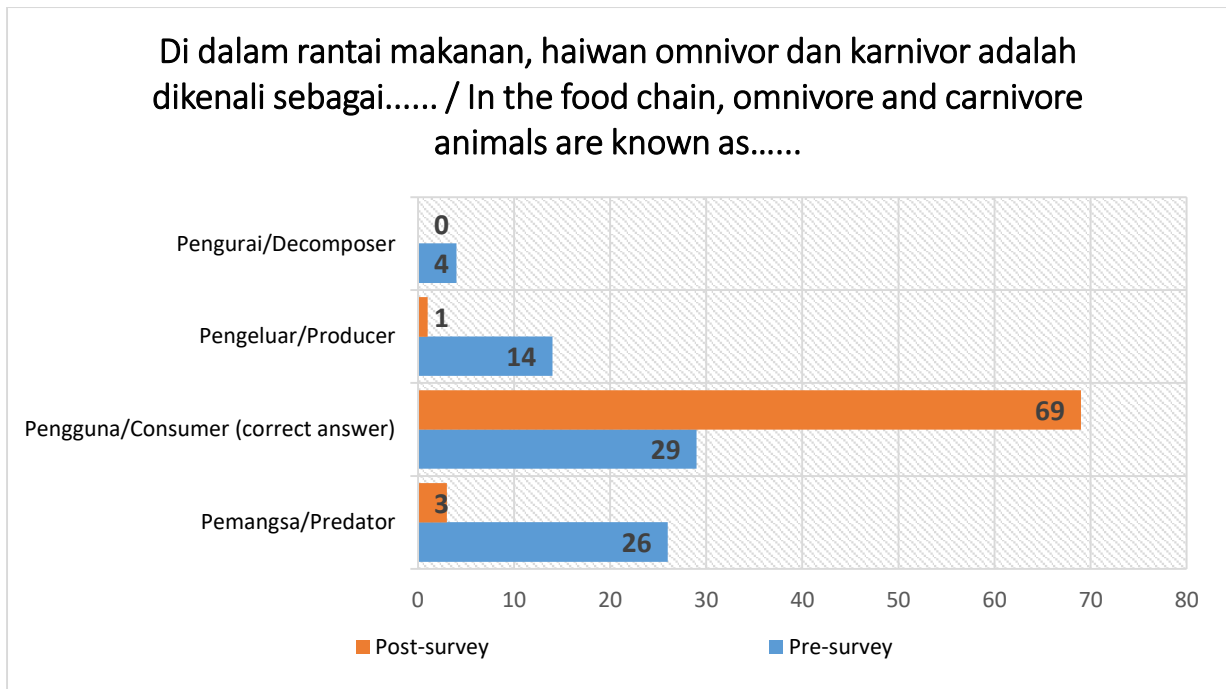


Figure 6: Question 4 pre and post survey of respondent data

Figure 6 represents the data of the pre and post survey of the fourth question. Based on comparison of pre and post survey, respondent answered “Consumer” as their answer was 29 (39.7%) and 69 (94.5%) respectively. Next, the number of respondents choose “Predator” as their answer was 26 (35.6%) and 3 (4.1%) respectively. The number of respondents answered “Producer” as their answer was 14 (19.2%) and 1 (1.4%) respectively. Lastly, the number of respondents answered “Decomposer” was 4 (5.5%) and 0 respectively. The right answer for this question is “Consumer”. This shows the number of respondents answered the correct answer rose after the explanation session with the education kit. This shows that the education kit does effectively helps the students to understand science better [11]

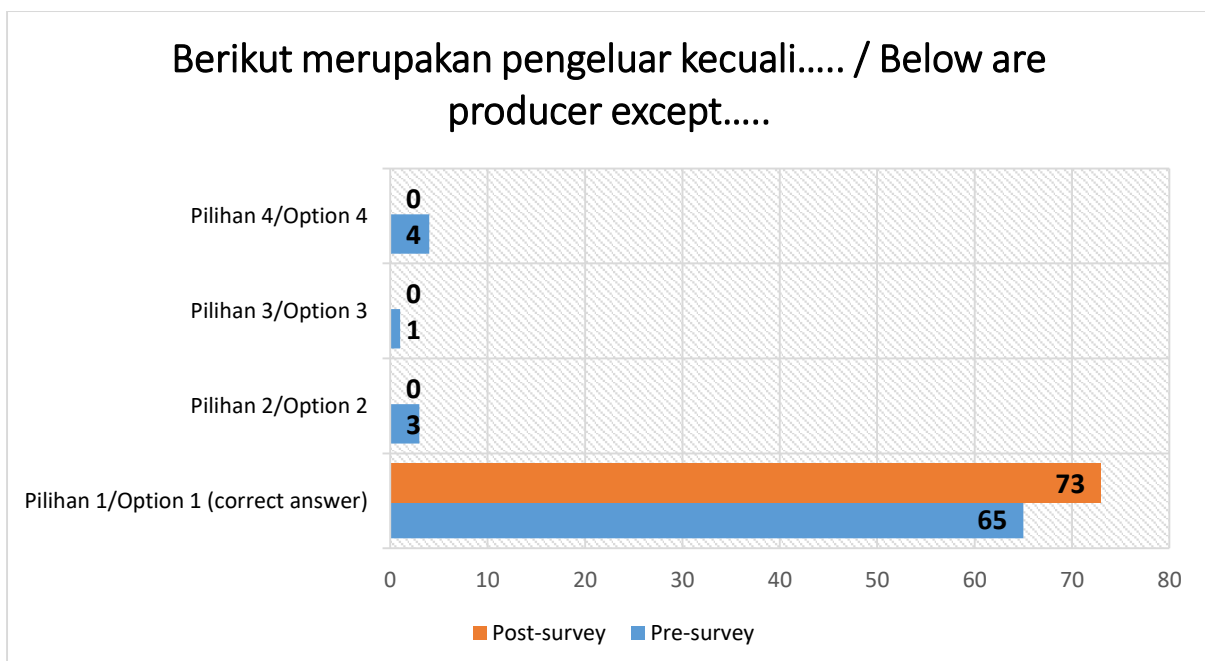


Figure 7: Question 5 pre and post survey of respondent data

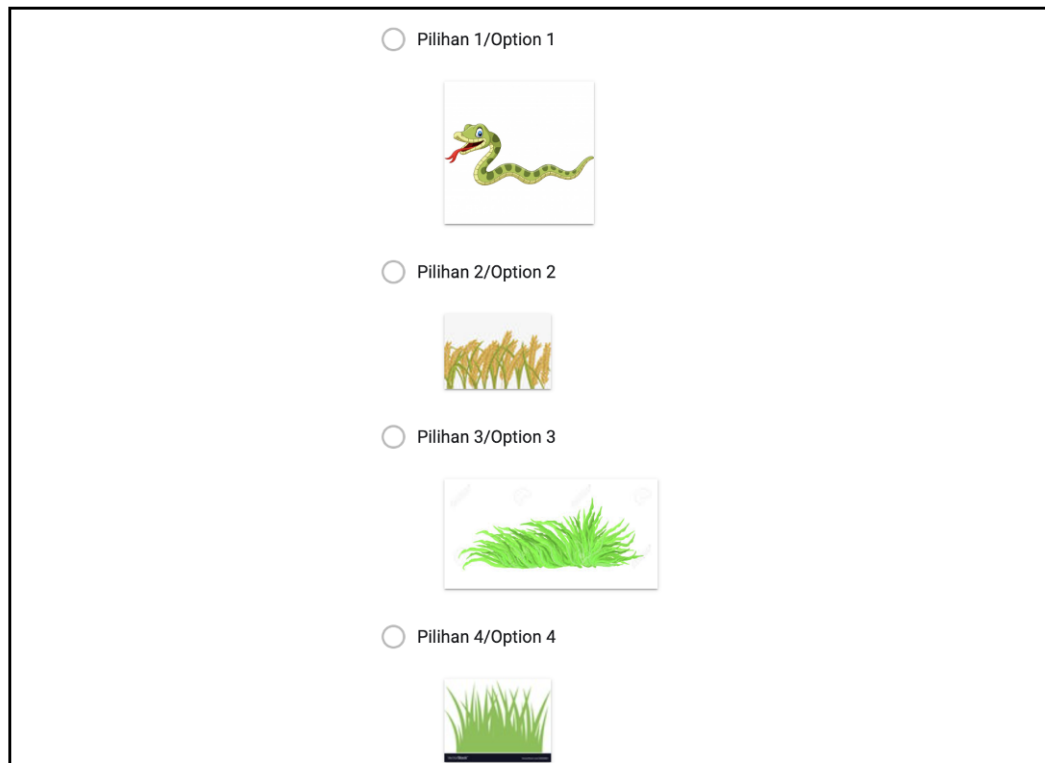


Figure 8: Answer option 1 to 4 for fifth question

Figure 7 shows the fifth question for the pre and post survey. Based on the pre-survey, the highest answered by respondents was the “Option 1” answer with 65 (89.0%). Next the second highest answered by respondents was “Option 4” with 4 (5.5%). The number of respondents answered “Option 2” was 3 (4.1%) which the third highest. Lastly, the least answered by respondents was “Option 3” with 1 (1.4%). Meanwhile based on post-survey, all the respondent answered the correct answer which is “Option 1”. With the data showed in Figure 8, this clearly shows that the students understand the Food Web topic with the aid of the prototype build.

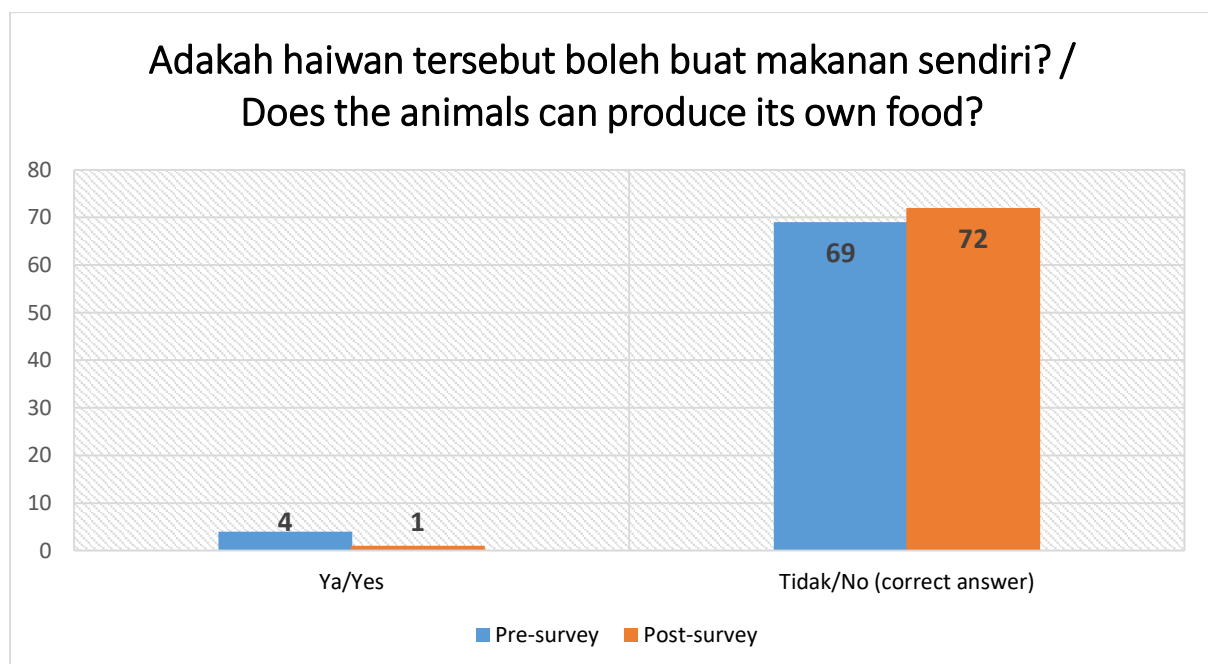


Figure 9: Question 6 pre and post survey of respondent data



Figure 10: Question for number six

Figure 9 illustrates the pre-survey and post-survey for question number six. According to Figure 9, the highest answered by respondent is “No” by 69 (94.5%) while the lowest answered by respondent is “Yes” with 4 (5.5%).

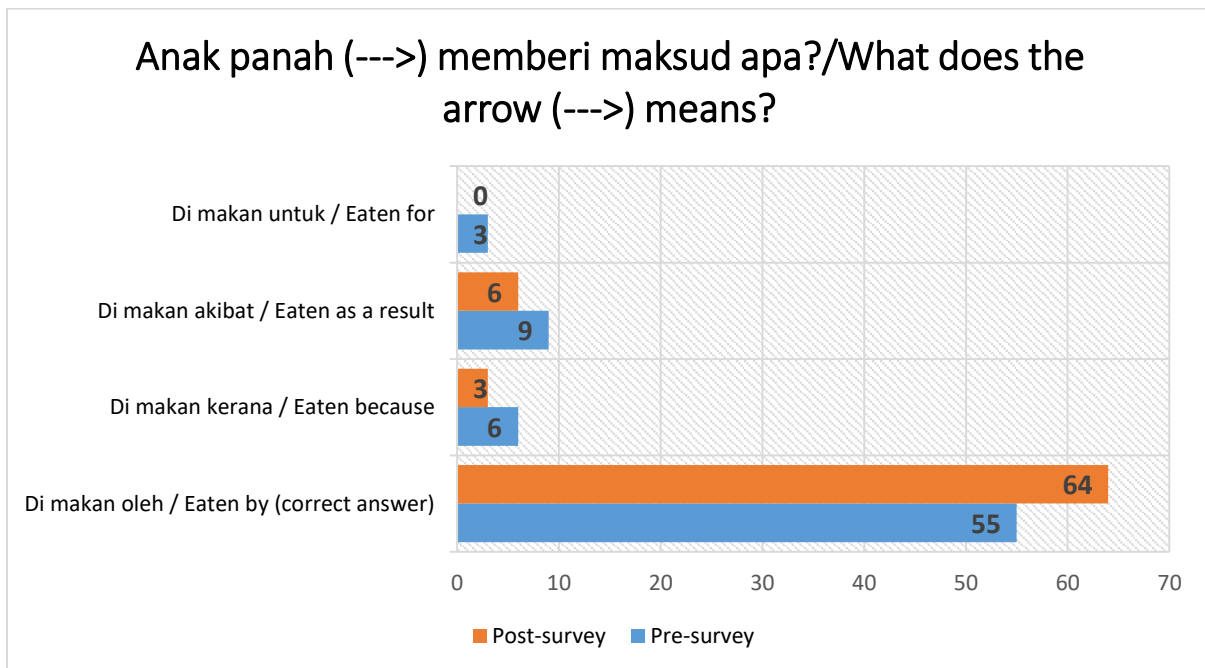


Figure 11: Question 7 pre and post survey of respondent data

Figure 11 displays the respondents pre and post answer. According to pre and post survey comparison, respondent answered “Eaten by” with 55 (75.3%) and 64 (87.7%) respectively. Next, respondent answered “Eaten as a result” with (12.3%) and 6 (8.2%) respectively. The number of respondents answered “Eaten because” as their answer was 6 (8.2%) and 3 (4.1%) respectively. Lastly, the number of respondents answered “Eaten for” was 3 (4.1%) and 0 (0%). The correct answer for this question is “Eaten by”. Based on the comparison of both pre-survey and post-survey, the percent rose 9 (12.4%).

This shows that the level of understanding of the students does increase after explaining to them with the aids of the educational kit developed.

3.3 Opinion and Point of View

Question 1	Option of answer	Pre-survey	Post-survey
Is it easy for you to understand what is learned by using the teaching aids provided?	Yes	50 (68.5%)	68 (93.2%)
	No	23 (31.5%)	5 (6.8%)
Question 2	Option of answer	Pre-survey	Post-survey
Do you enjoy learning science with the help of the teaching tools provided?	Yes	57 (78.1%)	71 (97.3%)
	No	16 (21.9%)	2 (2.7%)

Table 1: Respondents feedback on the educational kit

Table 1 illustrates the respondent's ease of understanding the explanation of the topic with the aid of an educational kit developed for educational purpose and the respondent likeliness of the Food Web prototype developed. Based on the table 1, the number of respondents answered "Yes" increase from 50 (68.5%) to 68 (93.2%). Meanwhile respondents that answered "No" decrease from 23 (31.5%) to 5 (6.8%). These evaluate that the respondents do understand the topic clearly with the educational kit developed helps during learning process. Next, according to table 1, the number of respondents answered "Yes" rose from 57 (78.1%) to 71 (97.3%). Meanwhile the number of respondents answered "No" decrease from 16 (21.9%) to 2 (2.7%). Thus, it can be concluded that with the aids of educational kits used during learning process, students have fun while learning and this eventually increase their understanding and performance in learning and mastering that chapter.

As a result, the educational tools kit developed manage to help secondary schools to understand science subject especially the food web topic easily and effectively as based on the comparison of the pre and post survey from the respondents. Not only for science students but also for other stream students. This shows that the educational tools kit developed success to increase secondary students' interest and motivation in learning science subject and also make them easier to learn and understand with the aids of educational kit during learning process of science subject.

4. Conclusion

At the end of this research study, due to the development of teaching and learning kit tools, secondary school students get to learn, understand, and recall the complex topic easily and smoothly as the educational kit helps them to not only memorize and understand the theory but to imagine and do practical with the educational kit provided. This not only help the students to understand and learn better, but also increase their interest to further study in STEM courses in the future. Other than that, by the help of educational kit, students' skills and ability get to be sharpen like critical thinking. This is in line with the second and third objectives. Hence, more research and study need to be done in developing even more STEM educational kit as it is crucial to help students understand the subject easily, effectively and successfully.

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