Development of Human Skeleton Comic to Enchance Student's Motivation and Science Learning Outcomes

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Article Info

Abstract

The purpose of this study was to produce teaching material for human skeleton material in 5th grade class Elementary School Mahad Islam. The research used research and development models (R&D) with ten stages, i.e. (1) potential and problems, (2) data collection, (3) product design, (4) design validation, (5) design revisions, (6) product trials, (7) product revisions, (8) usage trials, (9) final products, (10) dissemination. Comic are declared valid by obtaining scores from media experts, namely 4.0 with good categories and obtaining scores from material experts, namely 3.91 including good categories. Comic are declared effective by obtaining a score of learning interest that is 86% including in the high category. N-Gain measurements show a result of 6.7 including medium category. Learning outcomes of students classical completeness has a percentage of 90.9% already above 80% requirement. Based on the results of the research, it can be concluded that the comic material with the material of human skeleton in science subjects is valid and effective so that it is suitable to be used as teaching material. In this study, comic teaching materials has the benefit that are creative, innovative and fun for students.

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INTRODUCTION

Text understanding is a process that has a systematic stage in order to understand the overall information from a reading source, both linguistic and extralinguistic information. (Busri, et al. 2016). Prokop (2006), who examined the relationship between 10-year-old children, knowledge of drawing on organ systems and their knowledge of 133 organs. Based on how do the children draw the organ system, it is found that children's knowledge, including the human skeleton, is the least.

Based on observations and interviews with 4th grade class teachers at Elementary School Mahad Islam, Elementary School Purwoyoso 01, Elementary School Purwoyoso 06, Islamic Elementary School Hasanuddin, Islamic elementary school Kebonharjo and Islamic Elementary School Nurul Huda, they were complained about the human skeletal material. In 4th grade, human skeleton material is difficult to teach because it is a quite complicated topics. Based on the daily value of the human skeletal topics in these schools there were about 85% of students scored still below of 70.

As a complement to the data on scores and interviews with 4th grade Islamic elementary school and elementary school teachers, it was obtained information that there were many obstacles in learning human skeletons. Teaching materials for students in each school are limited in visualization of drawing illustrations. Learning objectives will be more optimal if explanatory and interesting pictures are included in the textbook so that students are more interested in understanding the skeletons.

Based on the fact described, it is obviously important to enhanced the learning program human skeleton topics. One of the supplementary material that support the learning program was comic that contains elementary school subject matter in the form of human skeletons.

The idea was inspired by science books that are packaged in the form of comics provided by one of the famous book store in Semarang, Central Java. According to Arroio (2011), comics are learning tools for students that are easy to remember and to be learned. Therefore the teacher is encouraged to assemble a comic narrative that relates to the science subject matter. Versaci (2001) stated that providing comics in learning can train critical and analytical thinking skills of students.

Sudjana (2001) said that comics were means that have a capability in making visualization of messages or information packaged and poured into sequential images in a frame accompanied by dialogue balloons or explanatory sentences in the form of dialogues or conversation texts. Comics according to Spiegel (2013) can be used as an alternative in science learning informally, initially even as designed as entertainment.

According to Dupont (2011) many popular films adapted from a comic, including Batman Begins, the dark night, Spiderman and many more will grow students' interest in reading as expressed by Rohani (1997).

The comic engineering book can be applied in science because of its broad appearance and its earnest explanation rather than just entertainment (Sudjana & Rivai, 2010). Comics can be used by teachers to introduce technology to students (Herbest, 2010), as a powerfull tool for social criticism (Budiyanto, 2008). Children's stories should contain a message that is easily understood by students and the moral message can be integrated into the reader (Rustatiningsih, 2012).

For this reason, it is important to provide teaching materials that have comic storylines on human skeletons to attract students to read and understand the human skeletons concepts.

METHODS

The research was conducted in even semester (2) from January to February 2018, is held in class 5 Mahad Islam Elementary School in Semarang Tengah, which the author also teaches there to facilitate the research process. The study uses research and development (R & D) using ten stages Sugiyono (2015), can be seen in Figure 1.

Models with ten stages, namely potential and problems, data collection, product design, design validation, design revision, product trial, product revision, usage test, the final product, and dissemination.
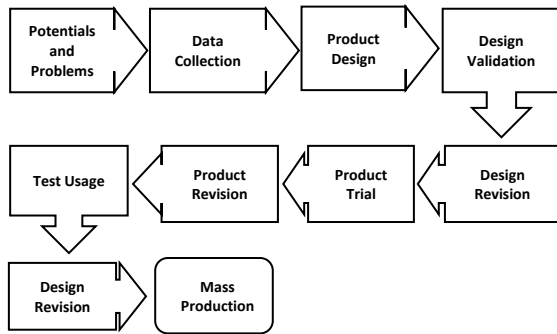

Figure 1. Steps of Research and Development Methods (R & D) (Sugiyono, 2016)

The product produced in this study is teaching material in the form of a comic material human skeleton. Small-scale tests are carried out in 6th grade, while large-scale trials were carried out in 5A class and 5B class. Test questions were conducted at the Bangunharjo Elementary School in Semarang Tengah, who are close by Elementary School Mahad Islam. Research design using One-Group Pretest-Posttest Design (Sugiyono 2015) as presented in Figure 2.
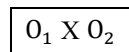
$$\boxed{O_1 \ X \ O_2}$$

Figure 2. The Research Design of One-Group Pretest-Posttest Design

Information:
X : treatment
O$_1$: the value of the pretest before being treated
O$_2$: posttest value after being treated

The instruments used are the syllabus, lesson plan, small-scale test questionnaire, interest in learning questionnaire, and learning outcomes test. The first research stages were the validation test of media experts and material experts. Small-scale in the 6th grade elementary school class with a questionnaire. Then the analysis uses a percentage method by Sugiyono (2004), i.e.

$$Percentage = \frac{\sum Answer\ "yes"}{\sum Questionnaire\ answers} \ x \ 100\%$$

The main data used to see the improvement in learning outcomes are the results of the pretest and posttest data. The data was analyzed to see the test results scores. Furthermore, the test results are calculated on average. As well as calculating the Gain Score between pretest and posttest. To calculate the Gain Score, you can use the Hake formula (Meltzer, 2002).

$$\langle N - Gain \rangle = \frac{Sf - Si}{n_{maks} - Si}$$

Criteria for obtaining a Gain Score can be seen in Table 1.

Table 1. N-Gain Score Acquisition Category

Limit	Category
g > 0.7	High
0.3 < g ≤ 0.7	Medium
g ≤ 0.3	Low

After the research data was obtained through a questionnaire then data analysis was carried out. To describe students' learning interests, the data were analyzed by the following percentage formula. (Anas Sudijono, 2011)

$$P = \frac{F}{N} \ X \ 100\%$$

Then to find out the students' interest category, it can be seen in Table 2.

Table 2. Criteria for Percentage of Student Learning Interest

Percentage of interest score	Criteria
76 – 100	High
56 – 76	Medium
0 – 56	Low

RESULTS AND DISCUSSION

The comics that had been developed contained stories of exciting adventures and material human skeletons for 5th grade elementary school. The contents of the comic consist of a comic cover that has a picture of three children who are the main role and a giant monster behind the three children. The background cover is a picture of the universe. The opening picture, character recognition of the

characters in the comic, a table of contents consisting of two chapters: the first chapter entitled hero who wants to cure spinal abnormalities, the second chapter is entitled three important parts of the human skeleton. Then enter in the first chapter which consists of the introduction of figures namely Hansa who has a bent spine abnormality (Kifosis), Toso who has an abnormality bent forward (Lordosis), and dicky has a sideways spinal disorder (Scoliosis).

They met a hermit grandfather in Lawang Sewu who promised to heal their spinal deformities by searching for a magic skeleton that now spread throughout the world. Each bone is carried by monsters, stealth, giants, and ghosts.

Hans, Toso, and Dicky were given the power by the old hermit to confront powerful enemies. Their first enemy is a bear carrying a pelvic bone. The second enemy is an octopus carrying a leg bone, the third enemy is a giant lizard carrying a hand bone. The three of them were assisted by a robot controlled by a beautiful woman named Ida.

At the end of chapter one is closed by a bonus question consisting of four questions. Then stepping on chapter two, they continue to search for magic bones and fight with pocong carrying the backbone. The fifth enemy is the eagle who carries a shoulder bone. Fifth is a kind orangutan carrying a breastbone. The sixth enemy is the shadow stealth that carries ribs. Seventh is the last search that brings them together with Nyi Roro Kidul who carries a skull.

They returned to Lawang Sewu and assembled the bones into a human skeleton. There is no reaction of occult energy that occurs when human skeletons are arranged. The three of them reexamined all bone bones starting from the skull, skeletons of motion and skeletons of the body apparently there was one missing part, the tip of the tailbone.
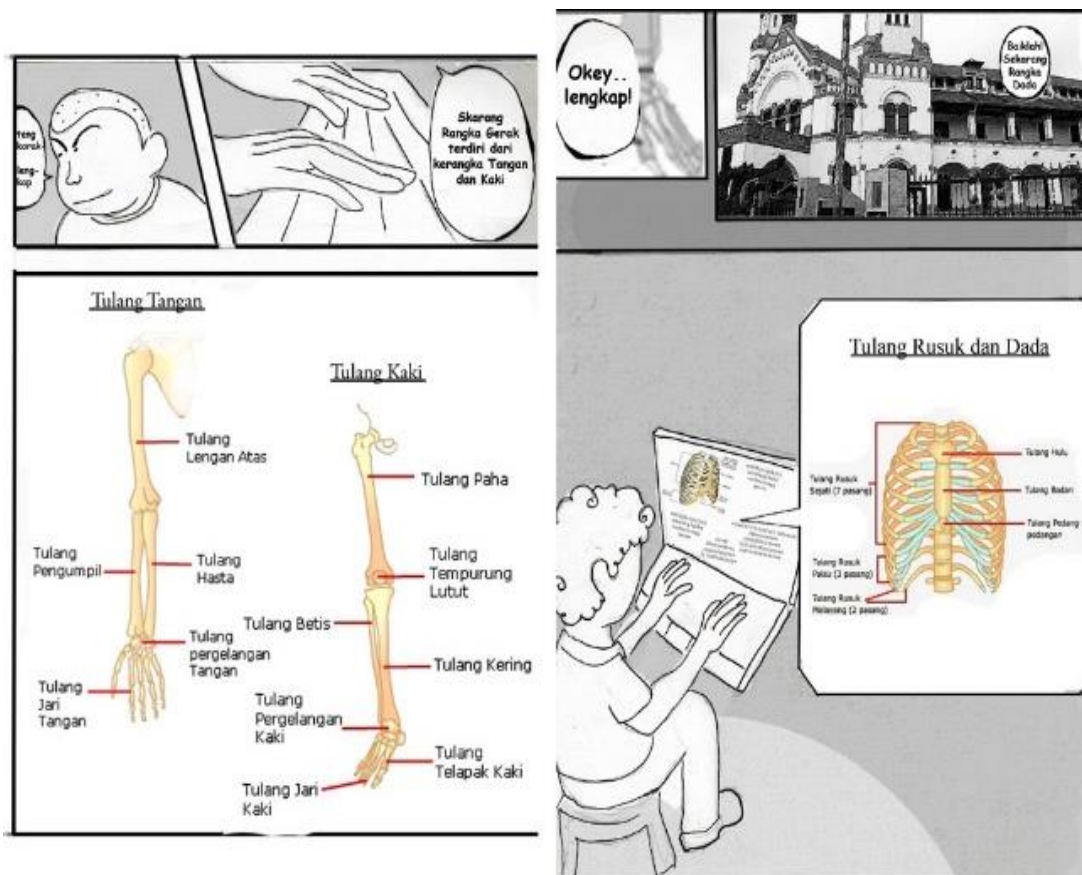

Figure 3. Motion Skeletons and Body Skeletons

The tailbone is carried by an old hermit, when the old hermit puts on a tailbone, the old hermit becomes a frightening giant monster. This giant monster destroyed part of the city of Semarang. The persistent resistance of Hans, Toso, and Dicky finally they were able to defeat the giant monster.

The design of the comic material product of human skeleton was validated by the selected media experts were lecturers of the Arts faculty. Validation is done using a questionnaire that contains various aspects of product feasibility. Validation sheets contain 17 assessment criteria using a 1-5 scale. The results of the media expert validation assessment of each criterion get a score of 4 so that the total score of 68 is an average score of 4, which means including good criteria. This means that the comic with human skeleton material is suitable for use as teaching material for students. Based on the assessment by material experts on human skeleton material. Overall the comic with the human skeleton has a score of 47 and an average of 3.92 which is included in the good and proper category to be used as teaching material.

Small-scale tests are conducted to find out students' responses regarding the human skeleton material comics. This trial uses one meeting with a sample of 10 students. Small-scale trials were conducted on February 10, 2018, at 6th grade class Elementary School Mahad Islam. The response of 6th grade students to the human skeleton material comics was obtained with a "yes" answer of 560 and a total of 572 (44 respondents x 13 questionnaire questions). Categorization of the criteria for small-scale percentage of test is 76% – 100% is a high criterion, 56% – 76% is in the medium category, 0% – 56% is in a low category. The criteria for the calculation result are as follows.

$$\text{Percentage} = \frac{\sum 560}{\sum 572} \times 100\% = 97.9\%$$

From these calculations obtained results of 97.9% included in the high criteria.

Student learning outcomes are measured using the N-gain formula to determine the effectiveness of the treatment given to 5A and 5B class. N-Gain measurement results for 5A class and 5B class have the results of pretest 67.95, while the posttest results for 5A and 5B class are 89.43, the difference between posttest and pretest is 21.47. Criteria for obtaining N-Gain scores, that is, if g > 0.7 it is included in the high category, 0.3 < g ≤ 0.7 including the medium category, g ≤ 0.3 including the low category. The calculation of the N-gain test can be seen in the calculation below.

$$\text{N-gain} = \frac{postest - pretest}{100 - pretst} = \frac{21.47}{32.45} = 0.67$$

So, the N-gain results obtained have a score of 0.67 which belongs to the medium category.

Recapitulation of learning outcomes data shows data obtained by students whose grades under KKM 80 are 4 students, while students who score above the KKM 80 have 40 students. Calculations can be seen below.

$$\frac{40}{44} \times 100\% = 90.9\%$$

So the classical completeness of 5A and 5B class students is 90.9%. The percentage of classical completeness is above the stipulation of 80%. Student response data is obtained by analyzing student response questionnaire sheets which are given at the end of the learning process. In this interest in learning, there are three categories: high category 76% – 100%, moderate 56%, and low 0% – 56 %. While the total income score was 1469 for the total of 1716. The results of the percentage of students' interest in learning were 86%. Calculations of student learning interest can be seen below.

$$P = \frac{F}{N} \times 100\%$$
$$P = \frac{1469}{1716} \times 100\%$$
$$P = 0.86 \times 100\%$$
$$P = 86\%$$

The results of filling out the questionnaire for students showed that students were interested

in the comic with the human skeleton. This is shown by students who focus on reading comics. Students also have great attention to comic learning. The teacher also cares about students having an interest in seeing students very enthusiastic when understanding the comic story and students are very enthusiastic when the teacher explains material human skeleton based on stories in comics.

Based on the students' verbal responses to the teacher, they said that they were very interested and hoped that the comic book would be sold so that students could buy it. According to the students, the story in the human skeleton, comic is very exciting. Some students also want researchers to make comic adventures with the second human skeleton series. But there are also a small number of students who are not interested in comics.

Based on the research above the results of N-Gain got a score of 0.67 which included the medium category. While the classical completeness of students gets a score of 80% of the number of students in 5A and 5B class. While the interest in learning to get a percentage of 86%, that is the high category. Although the N-gain score is in the medium category, the results of the students 'classical completeness and students' interest in learning are in the high category. Likewise, the average value of pretest was 67.95 while the posttest score of 89.43 showed the average value of the increase after being given the teaching material with the comic of human skeleton. So it can be said that the teaching material for human skeleton comics is effectively used as teaching materials for students.

Based on studies related to comics, positive results were produced, including Alimuddin research (2014) regarding the development of teaching materials containing the values of Pancasila by using comics can increase the activity and learning outcomes of students at the Elementary School 01 and 02. Comics also have a positive impact in growing students' interest in reading and instilling this values. Wahyudi's research (2014) shows the development of comic-shaped teaching materials with an Atong-based Nationalism character based on the problem of how to develop interesting instructional materials, so that they have a positive impact on activities, learning outcomes, and impose the character value of Nationalism on students. Prasetio research (2014) that comics can also foster the ability to tell students. According to Pranowo's research (2014) Counseling guidance media through comics can also increase student motivation.

CONCLUSION

The conclusions from this research, i.e. comics consisting of cover, preliminary drawings, introduction to characters in comics, table of contents consisting of 2 chapters. At the end of each chapter, there is a question that students will answer later. The human skeleton comic entitled "Magic Bone" is an interesting comic because it contains human skeleton science lesson and there are exciting adventures.

Based on the analysis in the research above shows that the average grade has increased after being treated with comic media and interest in learning of comics is high.

REFERENCES

Alimuddin, J. (2014). Pengembangan Bahan Ajar Bermuatan Nilai-Nilai Pancasila pada Pembelajaran "Tema Cita-Citaku" dengan Menggunakan Komik. *Journal of Primary Education*, 3(2). https://journal.unnes.ac.id/sju/index.php/jpe/article/view/6967

Anas, S. (2011). *Pengantar Statistik Pendidikan*. Jakarta: Raja Grafindo Persada.

Arroio, A. (2011). Comics as A Narrative in Natural Science Education. *Western Anatolia Journal of Educational Science,* 71(1), 93-98. https://www.researchgate.net/publication/326400699_comics_as_a_narrative_in_natural_science_education

Budiyanto, A., & Wicandra, O. B. (2008). Romantika Manusia Malayudi Bandar Raya (Imaji-Imaji Kehidupan Kota dalam Komik Kartun Indonesia-Malaysia). *Jurnal Desain Komunikasi Visual Nimana*, 10(1), 1-11. http://nirmana.petra.ac.id/index.php/dkv/article/viewFile/18000

Busri, H., Irawati, R. P., & Nawawi, M. (2016). Pemanfaatan Cross Cultural Understanding (Pemahaman Lintas Budaya) dalam Bahan Ajar Nusus Adabiyyah (Analisis Teks Sastra). *Journal Penelitian Pendidikan*, 33(1), 45-51. https://journal.unnes.ac.id/nju/index.php/JPP/article/view/7663

Dupont, N. (2011). Holywood Adaptations of Comic Book in A Post-9/11 Context: The Economic and Culutral Factors. *Transatlancia*, 7(2). https://journals.openedition.org/transatlantica/5419

Herbest, P., Daniel, C., Chia-Ling, C., & Michael, W. (2010). Using Comics-Based Representations of Teaching, and Technology, to Bring Practice to Teachers Educations Courses. *ZDM: The International Journal on Mathematics Education*, 43(1), 91-103. https://www.researchgate.net/publication/225444665_Using_comics-based_representations_of_teaching_and_technology_to_bring_practice_to_teacher_education_courses

Martin, E. P. (2012). Pengembangan Bahan Ajar Science Entrepreneurship Berbasis Hasil Penelitian untuk Mendukung Program Kreativitas Mahasiswa. *Journal Penelitian Pendidikan*, 29(2), 15-20. https://media.neliti.com/media/publications/126014-ID-pengembangan-bahan-ajar-science-entrepre.pdf

Meltzer, D. E. (2002). The Relationship between Mathematics Preparation and Conceptual Learning Gains in Physics: A Possible "Hidden Variable" in Diagnostic Pretest Scores. *American Journal of Physics*, 70(12), 1259-1268. https://asu.pure.elsevier.com/en/publications/the-relationship-between-mathematics-preparation-and-conceptual-l

Pranowo, T. A., Sugiharto, D. Y. P., & Sutoyo, A. (2014). Pengembangan Media Bimbingan dan Konseling melalui Komik Edukasi untuk Meningkatkan Motivasi Belajar Siswa Sekolah Dasar. *Journal of Primary Education*, 3(1). https://journal.unnes.ac.id/sju/index.php/jubk/article/view/3623

Rohani, A. (1997). *Media Instruksional Edukatif.* Jakarta: Rineka Cipta.

Rustatiningsih, Supriyanto, T., & Rusilowati, A. (2012). Pengembangan Materi Ajar Membaca Cerita Anak Bermuatan Nilai-nilai Karakter, *Journal of Primary Education*, 1(1). https://journal.unnes.ac.id/sju/index.php/jpe/article/view/792

Spiegel, N. A., McQuillan, J., Halpin, P., Matuk, C., & Diamon, J. (2013). *Engaging Teenegers with Science Trough Comics. Res Scie Duc,* 43(2), 16-32. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3859376

Sudjana, N., & Rivai, A. (2010). *Media Pengajaran* (*Penggunaan dan Pembuatannya*). Bandung: Sinar Baru Algensindo Offset

Sudjana, N., & Rivai, A. (2001). *Media Pengajaran*. Bandung: Sinar baru Algensindo.

Sugiyono. (2004). *Metode Penelitian*. Bandung: Alfabeta.

Sugiyono. (2015). *Metode Penelitian Pendidikan*. Bandung: Alfabeta.

Versaci, R. (2001). How Comic Books Can Change the Way Our Students See Literature: One Teacher's Perspective. *English Journal*, 91(2), 61-67. https://eric.ed.gov/?id=EJ634623

Wahyudi, G. (2014). Pengembangan Bahan Ajar IPS Berbentuk Komik dengan Karakter Nasionalisme Berbasis Atong pada Kelas V SD. *Journal of Primary Education*, 3(2). https://journal.unnes.ac.id/sju/index.php/jpe/article/view/6970