



Development of Student Worksheets Based on Comics to Improve Students' Motivation and Learning Outcomes on Material Vibration, Waves, and Sound

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DOI: [10.29303/jppipa.v6i2.424](https://doi.org/10.29303/jppipa.v6i2.424)

Article Info

Received : April 10th, 2020

Revised : May 29th, 2020

Accepted: June 8th, 2020

Abstract: This research develops a comic-based student worksheet to learn about feasibility, learning outcomes, and motivation of the student worksheet. The research was carried out using research and development (R&D) methods with the ADDIE development model. The implementation of this comic-based Student Worksheet uses a pretest-posttest control group design. The population in this study were students of class VIII at MTsN 3 Banda Aceh. The samples in this study were 57 students in the class of Abu Bakar Ash Siddiq and Zaid bin Thabit who were selected by purposive sampling. Data collection using validation tests, written tests, and questionnaires. The results of the feasibility test showed that the Developed Student Worksheet was included in the feasible category with an average score of assessments by experts and natural science teachers of 91.25% and 99.03%. Analysis of learning outcomes data using the t-test, obtained $t_{count} > t_{table}$ ($4.42 > 2.01$) shows that there are differences in the value of student learning outcomes between the experimental and control classes where the value of the experimental class is higher than the control class. Results of analysis Motivation of students $t_{count} > t_{table}$ ($15,53 > 2,01$) also shows the use of comic-based worksheets can increase students' learning motivation so that it can be concluded that the use of comic-based worksheets is feasible, it can improve student learning outcomes and motivation.

Keywords: Comic-based student worksheet, Motivation, and Learning Outcomes.

Citation: Khaira, N., Yusrizal, Gani, A., Syukri, M., Elisa & Evendi (2020). Development of student worksheets based on comics to improve students' motivation and learning outcomes on material vibration, waves, and sound. *Jurnal Penelitian Pendidikan IPA (JPPIPA)*. 6(2), 143-151. Doi: <https://doi.org/10.29303/jppipa.v6i2.424>

Introduction

Natural science has complex and dynamic traits that are not easily defined or mastered (Glaze, 2018). This learning requires teachers who have sufficient understanding to provide overall knowledge

(Pantiwati et al., 2017). The teacher must implement a variety of strategies, using innovative methods and techniques to make learning more meaningful. Teachers must also use scientific language in a way that is comfortable conveying concepts, as well as motivating students to want to explore information

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independently (Rohandi, 2017; Oyelekan et al., 2017; Aydin & Aytengin, 2018). Science lessons require students to find their own learning resources, either by reading, experimenting, or observing what is happening around them so that it makes it easier for students to learn (Sudjito et al., 2018). The irony is that the current science learning outcomes are generally still low, it can be seen in the MTsN national exam results for the past few years, from the 2015/2016 academic year to 2018/2019 with successive percentages of 56.27; 52.18; 47,00 45,00 and 47.77% (Puspendik, 2017; 2018; 2019). Furthermore, based on the national exam scores for the 2018/2019 school year, electric and magnetic wave material is one of the natural science materials in MTsN 3, which has an average national exam score with a percentage of 19.57% (Puspendik, 2019).

Related to instructional media, schools expect more creativity and struggle from the teacher to prepare the required materials themselves (Suluh & Ate, 2019). Natural science teaching materials that are not enough to facilitate students to explore information in the learning process (Sari et al., 2019). Learning so far in MTsN 3 uses textbooks issued by the Ministry of Education and culture. This is supported by the results of observations that have been made showing that so far, the teacher and students only use science textbooks, which mostly contain writings so as to make students less interested. According to Lubis (2018), teaching materials centered on textbooks make students feel bored in learning. This factor causes students not interested in reading. Textbooks that are used by students are only borrowing rights when science subjects take place because they will be used for the next class. Even though adequate learning resources are one of the tools that every school must-have. The results of interviews with MTsN 3 Banda Aceh teachers also found that teachers and students rarely used other teaching materials such as the use of student worksheets. Student worksheets that have been used only to contain questions, thus making students less interested in learning science material, especially on vibration, wave, and sound material. Sorapure (2018) revealed that unlike images, text cannot be understood at a glance, it takes time and attention to read and understand. Moreover, this material contains calculations, where students must be able to understand the concepts and calculations at the same time (Retnawati et al., 2018). This affects the motivation and learning outcomes obtained by students. Based on observations made, it is known that student learning outcomes on this material are still low. This can be seen from the data of the average value of daily tests that is on a score of 46.45. This value is categorized as low compared to the value of the minimum completeness criteria of students, which is a score of 70. This

indicates that student learning outcomes in the material vibration, waves, and sounds are not yet complete. In accordance with the opinion of Pradilasari et al., (2019) which states that learning outcomes can be said to be complete if they meet the minimum completeness criteria set by each school.

The solution that can be strived to improve students' motivation and learning outcomes is to develop a teaching material. Teaching material is a source of learning in addition to the teacher who plays an important role in helping the learning process to achieve core competencies and Basic Competencies (Ramdoniati et al., 2018). The learning process will be more meaningful if students truly understand the teaching material provided by the teacher, although it is simple, rather than being given in full they only know the beginning (Sukasni & Efendy, 2017). Learning is a process of behavior change that is expressed in the form of mastery, use, concerning attitudes, values, knowledge, and basic skills found in various fields of study (Arozaq et al., 2017). Designing learning material is selecting and connecting knowledge, facts, imagination, and assumptions to formulate desired results according to objectives, the sequence of activities required, behavior that is useful in problem-solving (Turi et al., 2017). The development of teaching materials is needed to achieve the expected learning goals (Asnaini et al., 2016). One very effective teaching material that can be developed is comic-based student worksheets. Student worksheets in the form of sheets containing assignments according to related material to be worked on by students independently. Apertha et al. (2018) suggested that student worksheets are learning resources developed by teachers as facilitators with the aim of facilitating the learning process. Integrating comics into student worksheets can build students' motivation to read. Rusdi et al. (2017) state that reading is one of the factors influencing students to obtain and understand information from reading material and be able to evaluate the content of reading based on students' knowledge experience (Rengur, 2018; Nazurty et al. 2019). One way to trigger students to read is by having interesting pictures like those in comics. This is believed to make it easier for students to understand the material that has an impact on learning outcomes. Agreeing with Kilanowski (2019) comics containing pictures can make it easier for students to understand the material that will increase motivation and learning outcomes. Affeldt et al. (2018) added that the application of cartoons and comics in science education can increase students' understanding of scientific phenomena. In addition, Suparmi (2018) revealed that learning by applying comic media is able to create a more efficient teaching and learning process, and can reduce students' boredom. Some research on

the development of comic-based worksheets has been carried out positively influencing learning such as research conducted by Utomo (2018) using comic-based worksheets that can increase student literacy. Another study conducted by Nasriyati et al. (2017) Comic-based student worksheets can increase student motivation in junior high school learning. Another study conducted by Lusiana et al. (2017) developing comic-based student worksheets proved to be effectively characterized by students feeling happy, understanding, understanding, and interested in the comic-based thematic worksheets that had been developed.

Based on the explanation above, research has been conducted on one of the teaching materials in the form of comic-based worksheets for students to increase motivation and learning outcomes in science learning material vibration, waves, and sounds, so as to increase student learning motivation so that their understanding of the material increases and obtain good learning outcomes

Method

Research and development methods have been carried out. The development research model uses the ADDIE model, namely analysis, design, development, implementation, and evaluation. The development that has been carried out is developing comic-based student worksheets on vibration, wave, and sound material. The research design used was a pretest-posttest control group. The research site was conducted at MTsN 3 Banda Aceh. As for the population in this study were all students of class VIII at MTsN 3 Banda Aceh in the academic year 2019/2020.

Students numbered 168 people from 6 classes in class VIII MTsN 3 Banda Aceh. Sampling uses a purposive sampling technique based on the characteristics of the same value of natural science. Furthermore, to determine the control and experimental classes, the results obtained from the sample VIII class Abu Bakar Ash Shiddiq as the experimental class and VIII Zaid Bin Thabit as the control class. This study uses test questions and motivation questionnaire instruments. The test sheet instrument contains vibration, wave, and sound material, which is a comic-based student worksheet instrument. Motivational questionnaire related to the use of comic-based student worksheets in the learning process. The multiple-choice test questions contain 15 questions with 4 multiple choices a, b, c, and d. The motivation questionnaire using the ARCS model with four assessment indicators including attention, interest, confidence, and satisfaction containing 36 statements consisting of negative and positive statements.

Result and Discussion

Development of Comic-Based Student Worksheets

Comic-based student worksheets integrate comics into worksheets that must be done by students. Development This comic-based student worksheet uses the ADDIE model with stages of analysis, design, development, implementation, and evaluation.

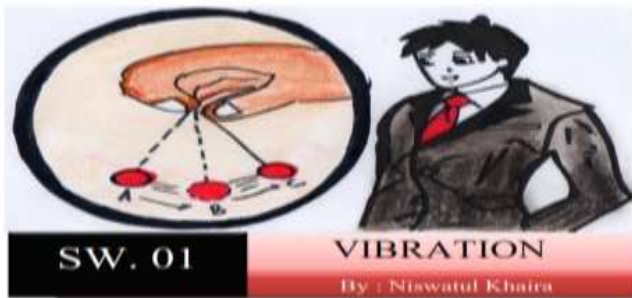
1. Analysis

The first stage of the results of observations and interviews that have been carried out is the needs analysis. Students need teaching materials that have a short description and are interesting to read. Teaching material containing wave and sound material must be able to be owned by students so that students have time to read the material, follow the basic competencies and core competencies so that learning objectives are stated in the learning program plan. The solution to these problems is the development of comic-based student worksheets to increase students' motivation and learning outcomes. One of the reasons why comics are integrated into students' worksheets is because comics are popular with students and their language is easily understood. According to Untari & Saputra (2016) to understand the contents of the readings of students must concentrate so that the vocabulary that is read can be understood its contents. Another matter stated by Nasriyati et al. (2017) Student worksheets is one of the teaching materials used by teachers in the teaching and learning process to increase student motivation. Fun in reading can be grown by using comic books.

2. Design

Comic-based student worksheets contain instructions, and steps for activities students must do. The story in the comic is of Islamic value according to the place of research, namely MTsN 3 Banda Aceh. This comic illustrates a group of students who carry out daily activities related to the concept of wave and sound vibrations. Comic illustrations are told lightly and also add a little humor to inspire students to read. The main character in the comic is kak Ari who will associate and explain concepts related to activities carried out by children. The background of the story is adjusted to the material. Vibration, wave, and sound have 5 sub discussions, namely 1) vibration, 2) wave, 3) sound, 4) hearing mechanism in animals and humans, and 5) application of wave and sound vibration in technology. Storyboarding is done on HVS A4 paper, which starts with making panels, initial sketches. According to Hariadi (2018) when starting drawings in comics use a pencil to minimize mistakes when

drawing. Create a draft in the form of a frame box, page layout, then start drawing characters in it. The finished drawing is thickened with a drawing pen, then colored using crayons, at the corners of the image thick with watercolor. The scanned image is then added to a word bubble (conversation) or narration description box using Microsoft Word. As for the drawings of some parts of the student worksheet design, comic-based vibration material for more details are presented in Figure 1



NAME GROUP: _____

NUMBER OF GROUP MEMBERS: _____

1. _____

2. _____

3. _____

4. _____

a

Basic competencies
 3.11 Analyzing the concepts of vibration, waves and sound, in everyday life including the human hearing system and the sonar system in animals.

Indicators of Competence Achievement
 4.11.1 Conduct experiments to measure the period and frequency of swing pendulum vibrations.

Learning objectives
 Through this SW students are expected to be able to understand the notion of vibration, investigate pendulum vibration events and calculate frequency of vibration swing

INSTRUCTIONS FOR USE SW COMIC-BASED

1. Before using this comic-based SW, fill in the biodata completely and sit down with a predetermined group.
2. Carefully read the instructions and steps before carrying out the activity.
3. Read grade VIII junior high school science books and other books that are relevant to the vibration material to strengthen your concepts and understanding.
4. Discuss each issue in the comic-based SW with the group yourselves.
5. Answer the questions in this comic-based SW correctly.
6. Ask the supervisor if there are things that are unclear.
7. When you have finished the discussion and filled in all the questions in this comic-based SW, please represent the group to present the results of the discussion in front of the class.

b



c

Let's do it!

The tools and materials needed

1 pendulum
 1 stativo, 1 stopwatch,
 2 nylon ropes with a length of 15 cm and 30 cm

Next, tie the pendulum to the stativo so that it hangs

Full the pendulum by giving a small deviation (10°), then release it. After the pendulum moves one vibration, turn on the stopwatch!

Don't forget to note the time needed for the pendulum to move back and forth with the amount of vibration and length of the rope as listed in table 1.1! complete the table!

Table 1.1 Observation results of pendulum vibrations

Long Ropes (l)	Amount Vibration (n)	Time Ceteran (t)	Time for once vibrate (T)	amount Vibration In 1 second (f)
15	5			
	10			
	15			
	20			
20	5			
	10			
	15			
	20			

d

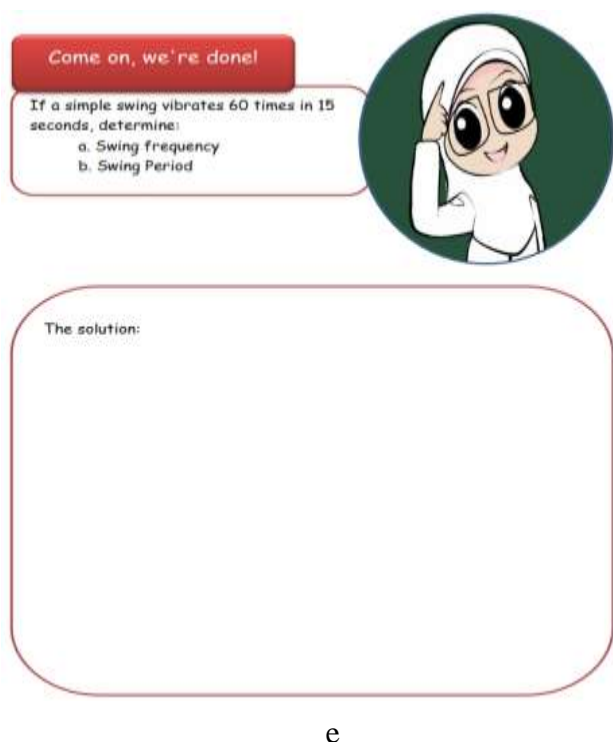


Figure 1. Description of Comic-based worksheet design for students; (a) cover, (b) core competencies, basic competencies, learning objectives and information on student worksheet instructions, (c) material (d) Experiment instructions, (e) Questions.

3. Development

The development phase begins with the validation process. The assessment of the feasibility of student worksheets includes several aspects of format, content, scenarios, language, comic-based participant worksheet display. The first stage is expert judgment and revisions are carried out according to expert advice. The results of the assessment by experts can be seen in Table 1.

Table 1. Results of the assessment of student worksheets

No	Rated aspect	Student worksheet assessment%	Criteria
1	Comic-based worksheet format for students	90.28	Very valid
2	Fill in the comic-based worksheets for students	88.89	Very valid
3	Comic-based student worksheet scenarios	91.67	Very valid
4	Language worksheet based on comic students	93.75	Very valid
5	Comic-based student worksheet display	91.67	Very valid
Average		91.25	Very valid

Based on Table 1, it is found that the average value of the assessment of comic-based worksheets of

students which is 91.25% shows that the worksheets of these students fall into the very valid category. Furthermore, in the second stage, after being validated by experts and revised, the second stage of validation was carried out by three science teachers, and the teacher's assessment of the student worksheets is presented in Table 2.

Table 2. Results of the assessment of students' worksheets by the science teacher

No	Rated aspect	Student worksheet assessment%	Criteria
1	Comic-based worksheet format for students	97.22	Very valid
2	Fill in the comic-based worksheets for students	100.00	Very valid
3	Comic-based student worksheet scenarios	100.00	Very valid
4	Language worksheet based on comic students	97.92	Very valid
5	Comic-based student worksheet display	100.00	Very valid
Average		99.03	Very valid

Based on Table 2 it is found that the average value of the assessment of comic-based worksheets of students that is 99.03% shows that the worksheets of these students fall into the very valid category. The results of revision I and revision II obtained a percentage of 91.25 and 99.03 with very valid categories so that the comic-based student worksheets could already be used both by the teacher and by the students. Comic-based student worksheets before they are implemented are first tested in small groups of 10 people.

4. Implementation

At the stage of applying comic-based worksheets for students who have passed the validation process. The implementation was carried out using two classes where one class used a worksheet based on comics and another class used a regular worksheet of students. Each worksheet has a different experiment adapted to the vibration, wave, and sound sub material in accordance with the statement of Hartina et al., (2020) that learning science will be better if it is supported by experimental activities. The implementation process before learning begins students are given a pretest to determine the level of initial ability and motivation questionnaire to measure students' motivation. Then the learning process using worksheets until then at the end of the learning process given a posttest to determine the level of student ability to increase or not.

A questionnaire is given to see whether the worksheet based on comics can increase students' motivation.

5. Evaluation

The evaluation phase is called the final stage. The evaluation aims to find out the improvement in the quality of the learning process of students (Yusrizal, 2016). At this stage, an evaluation is carried out in the

form of evaluating the learning outcomes of students in the control and experimental classes and knowing the motivation and learning outcomes of students towards the implementation of comic-based student worksheets.

Students' Motivation towards Comic-Based participant Worksheets

Table 3. Results of Analysis of Students' Motivation Data Before Using the Student Worksheets

Class	Statement	Motivation Assessment for Each Indicator (%)				Average	Criteria
		Attention	Relevance	Confidence	Satisfaction		
Experiment	Positif	74.40	74.46	73.91	76.09	74.71	Good
	Negatif	57.07	50.54	46.38	54.35	52.08	Quit Good
Control	Positif	75.96	77.08	76.68	78.30	77.01	Good
	Negatif	53.61	47.12	42.95	54.81	49.62	Quit Good

Table 3 shows the percentage of results of the analysis of the initial motivation levels of the two classes being the same. Positive statements of experiment and control class with an average of 74.71% and 77.01% in the good category, and for positive statements 52.08% and 49.02% in the quite good

category in both. While the percentage of analysis results after using the worksheets of students is different. The results of data analysis of students' motivation after learning with regular and comic-based worksheets can be seen in Table 4.

Table 4. Results of analysis of student motivation data after using the student worksheets

Class	Statement	Motivation Assessment for Each Indicator (%)				Average	Criteria
		Attention	Relevance	Confidence	Satisfaction		
Experiment	Positif	89.86	88.22	84.24	87.89	87.55	Very good
	Negatif	83.70	87.50	83.33	91.30	86.46	Very good
Control	Positif	82.48	82.37	81.25	83.10	82.30	Very good
	Negatif	64.18	57.21	52.88	60.58	58.71	Quite Good

Based on Table 4. the percentage of scores after the use of student worksheets, it can be concluded that the students' learning motivation in the experimental class after the use of comic-based worksheets is very good. In general, there is an increase in student motivation before and after learning. Furthermore, to find out the increase in learning motivation, the hypothesis is tested using the t-test. The results of the analysis of learning motivation obtained t_{count} of 15.53 while the table with a level of confidence of 0.05, degrees of freedom $57-2 = 55$ is 2.01. This shows that $t_{count} > t_{table}$ so that the hypothesis that reads the use of comic-based student worksheets can increase student motivation to be "accepted". This happens because comic-based student worksheets can make students motivated to learn. Based on observations show that students are very enthusiastic about conducting discussions and actively ask the teacher if there are those who do not understand.

Comics are teaching materials to motivate students. Through comics as a medium, the teacher can motivate students to learn in ways that are more fun and interesting (Zahra, 2016). The main advantage of comics, namely the story is formed in a picture, so

students easily understand the contents of the story in the comic including learning material contained in it (Maghfirah & Herowati, 2017). According to Nasriyati et al. (2017), comic-based worksheets can meet four indicators of learner learning motivation, 1) attention, learning to use comic-based worksheets attracts more attention of students to read and understand the material available in the worksheets of students, matters this is influenced by the appearance of interesting comics. 2) relevance, students are able to connect the material learned with the experiences they have experienced in everyday life. 3) self-confidence, students have positive evaluations about themselves, so they tend to display good achievements continuously. 4) the satisfaction of students who are taught using comic-based worksheets that have been developed more easily in completing the tasks contained in the worksheet of students well so that students feel satisfied.

Student learning outcomes

Student learning outcomes material vibration and sound waves that have been implemented for

assessment are the pretest, posttest and N-gain values. The learning outcomes obtained from each class can be seen in Figure 2.

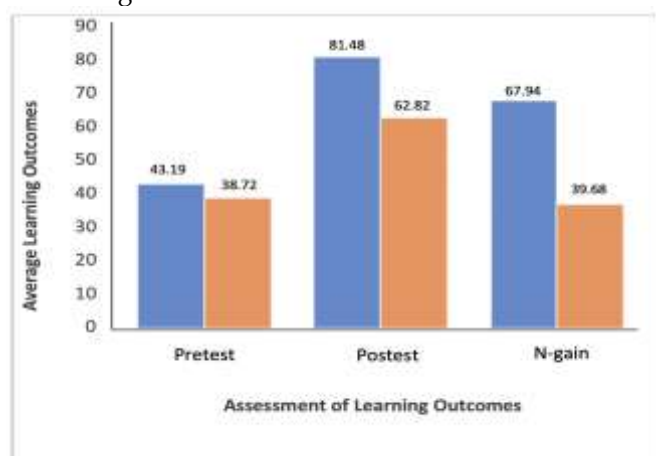


Figure 2. Average scores of pretest, posttest and N-gain MTsN 3 in Banda Aceh

Figure 2 shows that the average initial ability of students regarding learning material between the experimental class (blue) and the control class (orange) has almost the same range of values. However, the

value of the posttest of the two classes namely the experimental and control classes experienced a significant increase. The experimental class shows a better value increase compared to the control class. Criteria for learning outcomes through the calculation of the N-gain values of the two classes show different categories. The experimental class has a greater N-gain value of 67.94 compared to the control class with an N-gain value of 39.68 but equally moderate. Based on the results obtained, data analysis was conducted to test the hypothesis of this study of learning that has been carried out using comic-based student worksheets that have been developed and compared with regular student worksheets. Data analysis using statistical tests using SPSS software version 20. A normality test was conducted to determine whether the data obtained after the study was carried out normally or not. The data includes a pretest, posttest, and N-gain experimental and control classes using the Kolmogorov-Smirnov test with a level of 0.05, while homogeneity uses a Levene test with a significance level of 0.05. The results of normality and homogeneity test with the N-gain values of the experimental and control classes are:

Table 5. Tests the normality, homogeneity, and hypotheses of learning outcomes

Class	N-gain Value	Normality	Homogeneity	t-test		Meaning
				t _{count}	t _{table}	
Experiment	67.94	0.892	0.168	4,43	2,01	There were differences
Control	39.68	0.653				

Table 5 shows that the normality test of student learning outcomes with N-gain values of the experimental class and the control class are 55.88 and 37.61. Homogeneity of the learning outcomes of the experimental class and control class students is 0.65. The scores obtained from the two tests at each school are sig. > 0.05, so it can be concluded that both data are normally distributed and homogeneous. After testing the normality and homogeneity for the N-gain values of the two classes, with the results obtained normal and homogeneous then the next hypothesis test is performed to find out whether the N-gain values of the two classes are different or not. Testing this hypothesis is done through statistical tests using SPSS 20. The results obtained from Table 5 show that t_{count} ≥ t_{table} shows that between the experimental and control classes there is a significant difference which means that after learning activities carried out in the experimental class and control the level of student learning outcomes has a difference. The difference can be seen from the value of N-gain, which is the experimental class higher than the control class. This proves that the use of comic-based student worksheets has a good influence so that students' learning

outcomes can increase. The same thing was stated in the research of Putri et al. (2013) the application of comic students 'worksheets to science learning outcomes has a good effect as evidenced by the higher scores in the experimental class explaining that the application of comic students' worksheets can be applied to improve student learning outcomes.

The steps of working on the student worksheets provide an opportunity to increase students' knowledge and skills (Ramdani et al., 2019). The addition of comics in student worksheets will make it easier for students to understand the message conveyed because each explanation given is based on the situation that students have experienced in everyday life. According to research Susanti et al., (2016) student worksheets accompanied by comics on learning in junior high schools are included in the category quite effectively to be applied. Maghfirah & Herowati (2017) revealed that colored pictures also attract students' attention to read so that science material that is packaged in comic forms makes students gain two benefits at once, namely educational benefits and entertaining benefits.

Conclusion

Based on the formulation of the problem and the results of the research that has been done it can be concluded that the feasibility of comic-based student worksheets based on expert validation obtained a very valid category. There was an increase in students' motivation after using the comic-based student worksheets at MTsN. There was a significant difference between the improvement of experimental class learning outcomes with the control class after using comic-based student worksheets.

References

- Affeldt, F., Meinhart, D., & Eilks, I. (2018). The use of comics in experimental instructions in a non-formal chemistry learning context. *International Journal of Education in Mathematics, Science and Technology*, 6(1), 93-104. <https://doi.org/10.18404/ijemst.380620>
- Apertha, F. K. P., Zulkardi, & Yusup, M. (2018). Pengembangan LKPD berbasis open-ended problem pada materi segiempat kelas VII. *Jurnal Pendidikan Matematika*. 12(2):47-62.
- Arozaq, M., Aman, & Sunarhadi, M. A. (2016). Implementation of reading guide strategy in global climate change material for enhancement of student learning outcome. *International Journal of Active Learning*, 2(2), 82-89. <https://doi.org/10.15294/ijal.v2i2.10803>
- Asnaini, Adlim, & Mahidin. (2016). Pengembangan LKPD berbasis pendekatan *scientific* untuk meningkatkan hasil belajar dan aktivitas peserta didik pada materi larutan penyangga. *Jurnal Pendidikan Sains Indonesia*, 04(02):191-201.
- Ayudin, A., & Aytikin, C. (2018). Teaching materials development and meeting the needs of the subject: a sample application. *International Education Studies*, 11(8), 27. <https://doi.org/10.5539/ies.v11n8p27>
- Glaze, A. L. (2018). Teaching and learning science in the 21st century: Challenging critical assumptions in post-secondary science. *Education Sciences*, 8(1), 1-8. <https://doi.org/10.3390/educsci8010012>
- Hariadi, C. (2018). *Cara Asik Menggambar Komik*. Sidoarjo: Media Cerdas.
- Hartina, L., Rosidin, U., & Suyatna, A. (2019). Pengaruh penerapan instrumen performance assessment pada pembelajaran ipa berbasis laboratorium real terhadap hasil belajar siswa. *Jurnal Penelitian Pendidikan IPA*, 6(1), 25. <https://doi.org/10.29303/jppipa.v6i1.299> <https://doi.org/10.17509/mimbar-sd.v3i1.2354>
- Kilanowski, J.F. (2020). Agricultural safety comic book for latinx migrant families: development and evaluation. *Journal of Pediatric Health Care*. <https://doi.org/10.1016/j.pedhc.2019.11.003>
- Lubis, A.M. (2018). The development of teaching comics to improve interest in reading civic education in min ramba padang, south tapanuli regency, Indonesia. *Budapest International Research and Critics Institute (BIRCI-Journal) : Humanities and Social Sciences*, 1(3), 71-83. <https://doi.org/10.33258/birci.v1i3.31>
- Lusiana, Z., Wahyuni, S., & Putra, P.D.A. (2017). Pengembangan LKS tematik berbasis komik pada mata pelajaran IPA di SMP. *Jurnal Pembelajaran Fisika*, 6(3): 232-239.
- Maghfirah, F., & Herowati, H. (2018). Pengembangan media komik strip sains "pemanasan Global" untuk meningkatkan motivasi membaca siswa kelas VII SMPN 2 Sumenep. *LENSA (Lentera Sains): Jurnal Pendidikan IPA*, 7(2):76-84. <https://doi.org/10.24929/lensa.v7i2.24>
- Nasriyati, C., Safrida., & Hasanuddin. (2017). Pengaruh pengembangan LKPD berbasis komik terhadap motivasi belajar pada materi struktur dan fungsi organ tumbuhan di SMP Negeri 1 Montasik Aceh Besar. *Seminar Nasional II USM*, 1:186-192.
- Nazurty, Rustam, Priyanto, Nurullaningsih, Pratiwi, A., Sarmandan, Habibi, A., & Mukminin, A. (2019). Learning strategies in reading: The case of Indonesian language education student teachers. *Universal Journal of Educational Research*, 7(11), 2536-2543. <https://doi.org/10.13189/ujer.2019.071133>
- Oyelekan, O.S., Emoyoke, F., & Adekunle, O.S. (2017). Science teachers' utilization of innovative strategies for teaching senior school science in Ilorin, Nigeria. *Malaysian Online Journal of Educational Sciences*, 5(2), 49-65.
- Pantiwati, Y., Wahyuni, S., & Permana, F.H. (2017). Instructional model of natural science in junior high schools, batu-malang. *Journal of Education and Practice*, 8(8), 117-123. Retrieved from <http://ezproxy.lib.uconn.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1139066&site=ehost-live>.
- Pradilasari, L., Gani, A., & Khaldun, I. (2019). Pengembangan media pembelajaran berbasis audio visual pada materi koloid untuk meningkatkan motivasi dan hasil belajar siswa SMA. *Jurnal Pendidikan Sains Indonesia*, 7(1), 9-15. <https://doi.org/10.24815/jpsi.v7i1.13293>
- Puspendik. (2019). *Laporan Hasil Ujian Nasional Tahun Pelajaran 2018-2019*. Jakarta: Balitbang, Kemendikbud
- Puspendik. (2018). *Laporan Hasil Ujian Nasional Tahun*

- Pelajaran 2017-2018. Jakarta: Balitbang, Kemendikbud
- Puspindik. (2017). *Laporan Hasil Ujian Nasional Tahun Pelajaran 2016-2017*. Jakarta: Balitbang, Kemendikbud
- Putri, A. M., Fauzi, A., & Murtiani. (2013). Pengaruh LKS bertampilan komik terhadap hasil belajar IPA Fisika siswa dalam pembelajaran *problem based instruction* materi gelombang, bunyi, dan optika dikelas VIII SMPN 3 Bukit Tinggi. *Pillar of Physics Education*, 2: 137-144.
- Ramdani, A., Jufri, A.W., Gunawan, G., Hadisaputra, S., & Zulkifli, L. (2019). Pengembangan Alat Evaluasi Pembelajaran IPA Yang Mendukung Keterampilan Abad 21. *Jurnal Penelitian Pendidikan IPA*, 5(1):98-108. <https://doi.org/10.29303/jppipa.v5i1.221>
- Ramdoniati, N., Muntari, M., & Hadisaputra, S. (2018). Pengembangan Bahan Ajar Kimia Berbasis Problem Based Learning Untuk Meningkatkan Keterampilan Metakognisi. *Jurnal Penelitian Pendidikan IPA*, 5(1), 28-33. <https://doi.org/10.29303/jppipa.v5i1.148>
- Rengur, Z.A., & Sugirin. (2019). *The Effectiveness Of Using Comic Strips To Increase Students' Reading Comprehension For The Eighth Grade Of SMPN 1 Pundong*. 330(Iceri2018), 239-243. <https://doi.org/10.2991/icsosce-icsmc-18.2019.24>
- Retnawati, H., Arlinwibowo, J., Wulandari, N.F., & Pradani, R.G., (2018) Teachers' difficulties and strategies in physics teaching and learning that applying mathematics, *Journal of Baltic Science Education*, 17, (1): 120-135.
- Rohandi, R. (2017). Teaching and Learning Science: Students' Perspective. *International Journal of Indonesian Education and Teaching*, (October), 16-31. <https://doi.org/10.24071/ijiet.2017.010103>
- Rusdi, A., Sipahutar, H., & Syarifuddin. (2017). Hubungan kemampuan membaca dan sikap terhadap sains dengan literasi sains pada siswa kelas XI IPA MAN. *Prosiding Seminar Nasional III Biologi dan Pembelajarannya*, 314-325.
- Sari, B. S. K., Jufri, A. W., & Santoso, D. (2019). Pengembangan Bahan Ajar IPA Berbasis Inkuiri Terbimbing untuk Meningkatkan Literasi Sains. *Jurnal Penelitian Pendidikan IPA*, 5(2), 219-227. <https://doi.org/10.29303/jppipa.v5i2.279>
- Sorapure, M. (2019). Text, Image, Data, Interaction: Understanding Information Visualization. *Computers and Composition*, 54:1-16
- Sudjito, D.N., Keliat, N.R., & Hastuti, S.P. (2018). Integrated science learning using scientific approach in junior high schools in semarang regency. *Indonesian Journal of Science and Education*. 2(1): 69-74.
- Sukasni, A., & Efendy, H. (2017). The Problematic of Education System in Indonesia and Reform Agenda. *International Journal of Education*, 9(3), 183. <https://doi.org/10.5296/ije.v9i3.11705>
- Suluh, M., & Ate, D. (2019). Efektifitas Pelaksanaan Kurikulum 2013 ditinjau dari Kesiapan Sekolah dan Pengaruhnya terhadap Perkembangan Sekolah. *Jurnal Penelitian Pendidikan IPA*, 5(2), 248-254. <https://doi.org/10.29303/jppipa.v5i2.280>
- Suparmi. (2018). Penggunaan media komik pembelajaran IPA di Sekolah. *Journal of Natural Science and Integration*, 1(1):62-68
- Susanti, K.D., Subiki, & Yushardi. (2016). Pengembangan lembar kerja siswa (LKS) disertai komik fisika pada pembelajaran pokok bahasan tekanan di SMP. *Jurnal Pembelajaran Fisika*, 5(3):197-204.
- Turi, L.O., Ahiri, J., Dunifa, L., & Ardiansyah, L. M. (2017). Identifying the problems of Indonesian primary school teachers in developing learning devices. *International Journal of Education, Learning, and Development*, 5(8): 55-64.
- Untari, M. F.A., & Saputra, A.A. (2016). Keefektifan media komik terhadap kemampuan membaca pemahaman pada siswa Kelas IV SD. *Mimbar Sekolah Dasar*, 3(1):29-39.
- Utomo, E.P. (2018). Pengembangan LKPD berbasis komik untuk meningkatkan literasi ekonomi peserta didik. *Jurnal Penelitian Pendidikan*, 35(1):1-10.
- Yusrizal. (2016). Analysis of difficulty level of physics national examination's questions. *Jurnal Pendidikan IPA Indonesia*, 5(1), 140-149. <https://doi.org/10.15294/jpii.v5i1.5803>
- Zahra, R.F., (2016). The effect of english comics on the students' vocabulary achievement at second year students of SMP Negeri 10 Kendari. *Journal of Teaching of English*, 1(2):1-11.