

The Development of Chemtoon (Chemistry Cartoon) Comic as Chemistry Learning Media on Acid Base Matter for XI grade of Senior High School

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Abstract— This study was intended to determine the feasibility of Chemtoon comic that was developed as a chemistry learning media on acid-base matter. It was conducted at SMAN 1 Wringinanom on 15 students in XI IPA 2 with heterogeneous abilities. The comic designed according to the criteria for learning media. The Method using research and development until the limited trial test. The results will ultimately be analyzed using the feasibility rule of Nieven, from aspects of validity, practicality, and effectiveness. The validity was obtained from two media expert lecturers and matter experts. The result was showed validity 82,5% of content criteria, 80% of language criteria and 87,5% of presentation criteria. Practicality is obtained from the response questionnaire given to students and supported by observation sheets of student activities. The result was showed practicality 95,2% of students respond positively to the comic. While the effectiveness obtained from the results of the pretest and posttest during the limited trial test. The result of effectiveness was showed as much as 80% of students who were succesfully achieved minimum completeness criteria that apply in school.

Keywords—*Chemistry, Learning Media, comic, acid base matter*

I. INTRODUCTION

2013 Curriculum is a curriculum that applies in Indonesia at the elementary school level to the high school level. The aim of the 2013 curriculum is to prepare Indonesian people to have the ability to live as personal and citizens who are faithful, productive, creative, innovative, and affective and able to contribute to the life of the world, nation, state and world civilization. So to achieve this one can be realized through a learning program. Therefore, almost all nations try to improve the quality of their education, including Indonesia [1].

Chemistry was subjects that judged as a difficult one by students. Included in acid-base matter. It was matter that introduces many abstract concepts that were considered difficult by students [2]. Another factor that causing these difficulties was because students were not actively involved in the learning process. Other words learning learning activity was mostly teacher center [3]. The knowledge was not obtained passively by someone, but through some action. Learning through active participation with concepts and principles was highly

recommended for gaining experience, and conducting experiments that allow them to discover the concepts themselves [4].

Based on distributing questionnaire that was did in September-October, 2018. Obtained a result which told that 44% student considered the chemistry had too many abstract term and concepts, it can not understand easily. 33% student considered chemistry contained many of memorization material. 23% students mentioned chemistry learning is too monotonous. Meanwhile 100% students wanted these chemistry lesson became enjoyable. Therefore, emphasis on mastery of concepts in learning chemistry that becomes very important.

High school chemistry syllabus states that in the learning process was needed certainly learning media to make it easier for achieved the competence. But in the school there was very little used of learning media. Through the results of questionnaires, the media used are 13% student worksheet, 32% lesson books, 28% powerpoint, 14% using projectors, 11% video, and 2% tutoring. So, the most frequently used of media was used lesson book. But 54% of students feel that their books are not interesting. 40% said that their books had too many formulas and texts that were difficult to understand. 60% of students stated their books were too monotonous.

The age of children and teenager were preferred to read comics than to read subject books [5]. One of the learning media that rarely develop in science learning was comics. It was book that contained of illustrated stories. The pictures and contained interesting stories were made it more liked. The advantages of comics were: a) The main role of comic books in guiding interesting reading interest in students, b) Comics add the vocabulary of the reader's words, c) Ease students to catch concepts or formulas that abstract, d) The entire comic storyline leads to one thing, namely goodness [6]. Through questionnaires obtained 80% of students think that comics are fun if used as learning media. 82% of students agreed if the development of comics was held as a chemical learning media for acid-base material. The similar study was conducted of some researcher. One of it was did in Turkey. The research stated that comics have been used as a pedagogical tool to motivate

students to read, help them remember the content, and make the whole learning process fun [7]. The other study was state that did a work shop for teacher the main results praise comics' playful character and their potential to stimulate creativity in students, as well as indicate the relevance of educational material authorship in the pedagogical practices of professors in training [8]. Those benefit could be underestimate for developing comic in learning of chemistry.

Based on literature studies and field surveys that had been conducted, a fun learning comic was needed. So that it can attracted students to learn acid-base material. Because so far there had never been a similar research on the development of comics. So, a research proposal was proposed with the title "Development of Chemtoon (Chemistry cartoon) Comic as a Chemistry Learning Media in Acid-Base Materials XI Grade of Senior High School".

Based on these problems, the development of this comic is focused on (1) describing the validity of Chemtoon (Chemistry cartoon) comics as chemical learning media in terms of content criteria, language criteria and presentation criteria (2) Describing the practicality of Chemtoon (Chemistry cartoon) as a chemical learning media in terms of the activities and responses of students. (3) Describe the effectiveness of Chemtoon (Chemistry cartoon) comics as a chemical learning media that is viewed from the completeness of student learning outcomes.

II. METHOD

The design of this study used a modified Research and Development (R&D) design by Sukmadinata which has three stages consisting of preliminary studies, development, and testing. The procedure can be seen in Figure 1.

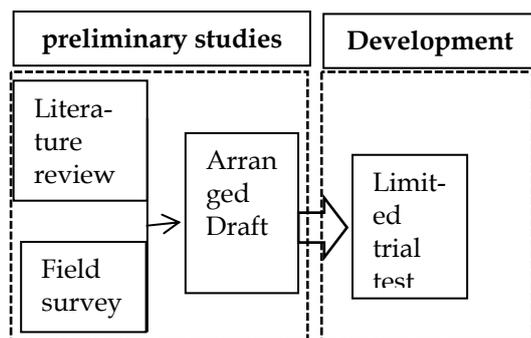


Fig 1. Research and Development (R&D) Procedure

The steps that was did, according the picture above include:

This preliminary study phase consists of three steps, they were literature study, field survey, and Arranged draft. This literature study was carried out by collecting information through libraries and existing research development books. In addition, this literature study also carried out several activities such as reviewing the curriculum to determine the learning objectives to be achieved, reviewing the criteria for comic learning media, selecting comic-making techniques, seeking supportive learning theories, and reviewing acid-base material for Chemtoon comic development.

The field survey was conducted by looking for supporting data that strengthened the development of this research. The survey was conducted by giving questionnaires to high school students. This questionnaire was obtained from three different schools, they were SMAN 1 Sidoarjo, SMAN 1 Wringinanom Gresik, and SMAN 1 Kedamean Gresik. By conducting questionnaires, one school was chosen to conduct a limited trial test.

The drafting of the product is done by making comic designs in the form of storyboards. Storyboard displays features and descriptions of comics that will have been created. Furthermore, the preparation of the instrument was carried out by considering the aspects that have been studied. Consists of review sheets and validation sheets addressed to media expert lecturers and material expert lecturers. The response questionnaire sheet is addressed to students. Activity observation sheets are addressed to observers who helped during the learning process. While the pretest and posttest sheets are used to determine the effectivity of comics to achieved mastery learning. Each instrument will support the feasibility of comics in terms of validity, practicality and effectiveness [7].

After the drafting the comic product was submitted to the reviewer. In this steps carried out by media expert lecturers or material expert lecturers. The purpose of the review process was to get comments or suggestions for the sake of supporting the perfection of comics. After being repaired and approved, it will have been continued to the validation process.

Limited trial test will be done after validation processed. Limited trial test conductes in 15 sstudents of XI grade, senior high school. The object chosen by heterogeneity ability. The test had hold to test the comic's capability as learning media.

Analyzing the result of this experiment, used feasiblty of Nieven by aspect of validity, practicality, and effectiveness [9]. The validity of Chemtoon media was seen based on the criteria of content, language, and presentation. The effectiveness of Chemtoon media was seen based on the completeness of student learning outcomes, as well as the practicality seen based on student response questionnaires.

The results of the validity of each criterion are calculated by the formula:

$$P\% = \frac{\sum \text{score obtained}}{\text{maksimum score} \times \sum \text{validator}} \times 100\%$$

Chemtoon's media will be in the valid category and very valid if every aspect assessed shows mean value of $\geq 61\%$.

Practical aspects are obtained from the questionnaire responses of students and the activities of students. The scale used in determining the practicality of using the Guttman scale was illustrated in table 1.

TABLE 1. GUTTMAN SCALE

Scale	Score
Yes	1
No	0

[10]

Calculating practical aspects using the questionnaire response sheet and activity observation sheet. The results of each component on the response questionnaire sheet and activity observation sheet are calculated using the formula:

$$P\% = \frac{\sum \text{score obtained}}{\text{maksimum score} \times \sum \text{respondent}} \times 100\%$$

Chemtoon's media will be in a very practical category if every aspect assessed shows an average value of $\geq 61\%$.

Effectiveness aspects obtained by analyzing the learning outcomes of students. Learning outcomes were measured using pretest and posttest. It was stated that it will be completed if the learning results shown have reached the school KKM, which is 70. Then the classical completeness calculation will be carried out using the formula:

$$\%P = \frac{\sum \text{student achieved learning outcomes}}{\sum \text{student}} \times 100\%$$

Chemtoon comics will fulfill the effectiveness aspects if the classical completeness obtained is $\geq 75\%$.

III. RESULT AND DISCUSSION

A. The Result of Review Process

The design of the Chemtoon comic was made using a hybrid technique. This technique combined traditional processed by drawing sketches manually, and digital techniques by editing images through Photoshop software. The making of chemtoon can be seen in figure 2.

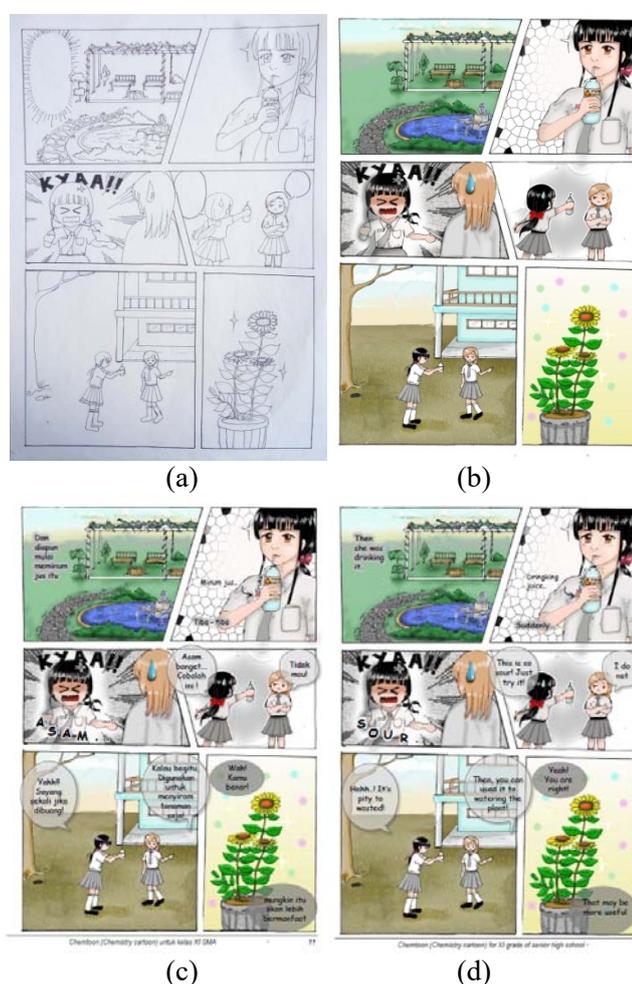


Fig 2. Making of Chemtoon comic, (a) sketching, (b) coloring stage, (c) giving dialogue, (d) translating dialogue

Figure 2 above showed the process of making comics. Figure (a) was the stage of making sketches that were done manually using traditional techniques. Used a pencil sketch drawn on A5 paper. Then, repeated the line using a pen. To tidy up the lines, the pencil marks were removed cleanly. Figure (b) showed the image editing results. After scanning the image, enter the Photoshop application to do the coloring. The selected color comes from the photoshop directory so that there was color consistency. Picture (c) was one example of the results of giving balloon conversations using Microsoft

Powerpoint. The used of this software was deliberately chosen because of its ease of access and because it was easily available. Figure (d) was the process of translating dialogue. Finally Chemtoon was printed in an A5 sized book (14.8cm x 2cm) taking into account the practicality of shape and size.

After draft in form of comic completely, then it submitted to the media expert lecturers for review. This is intended to get supportive suggestions. The results of this comic review,

got an improvement. Improvements can be seen in figure 3, figure 4, figure 5, and figure 6.



Fig 3. Improving the color and text blend to make it clearer.

According to Arsyad that color is used as a guiding tool and draw attention to important information and to provide each component. So from that as a guide, color should not be more prominent than the information conveyed [11].

No	Rumus kimia	Nama senyawa	No	Rumus senyawa	Nama senyawa
1	HCOOH	Asam format	21	H ₂ PO ₃	Asam fosfit
2	CH ₃ COOH	Asam asetat	22	H ₂ PO ₄	Asam fosfat
3	HF	Asam fluorida	23	H ₂ AsO ₂	Asam arsenit
4	H ₂ CO ₃	Asam karbonat	24	H ₂ AsO ₄	Asam arsenat
5	C ₆ H ₄ O ₂	Asam sitrat	25	H ₂ CN	Asam flosianat
6	HCN	Asam sianida	26	C ₆ H ₅ OH	Asam fenol
7	HNO ₂	Asam nitrat	27	C ₆ H ₅ O ₂	Asam salisilat
8	H ₂ Be ₂	Asam boreat	28	C ₂ H ₃ O ₂	Asam laktat
9	H ₂ SiO ₂	Asam silikat			
10	H ₂ SbO ₂	Asam antimarat			
11	H ₂ SbO ₄	Asam antimonat			
12	H ₂ SeO ₂	Asam stanat			
13	H ₂ SeO ₃	Asam stantit			
14	H ₂ PbO ₂	Asam plumbat			
15	H ₂ PbO ₄	Asam plumbit			
16	H ₂ C ₂ O ₄	Asam oksalat			
17	C ₆ H ₄ COOH	Asam benzoat			

Fig 4. Repairement of concepts.

Comics as learning media, according to Nengsi must present data in an interesting and reliable manner. Therefore, some lists of acidic bases that are wrong are immediately corrected correctly [12].

No	Indikator	Tyapik pH	Perubahan warna
1	Kristal violet	0,0-1,0	Kuning-biru
2	Tinjal biru	1,2-2,8	Merah-kuning
3	2,4-dinitrofenol	2,0-4,0	Tak berwarna-kuning
4	Brom timol biru	3,0-4,6	Kuning-biru
5	Brom kresol hijau	3,8-5,4	Kuning-biru
6	Metil merah	4,4-6,2	Merah-kuning
7	Alizarin	5,6-7,2	Kuning-merah
8	Brom timol biru	6,0-7,6	Kuning-biru
9	Fenolftalein	8,0-10,0	Tak berwarna-merah muda
10	Fenolftalein	8,0-10,0	Tak berwarna-merah muda
11	Alizarin kuning	10,1-12,0	Kuning-merah

Fig 5. Translating picture of acid base indicator in formed of table.

Whereas according to Nengsi the role of learning media in addition to generating students' interest and motivation, learning media can also play a role to improve understanding, facilitate interpretation of data and compact information [12]. Therefore, the previous dual acid base indicator image was drawn into a table so that the information presented became more dense.

Tujuan pembelajaran

Melalui komik ini diharapkan capaian belajar yang dapat dicapai diantaranya:

- ❖ Peserta didik mampu mendeskripsikan teori asam basa menurut Arrhenius melalui cerita dan dialog yang disajikan
- ❖ Peserta didik mampu mendeskripsikan teori asam basa menurut Bronsted-Lowry melalui cerita dan dialog yang disajikan
- ❖ Peserta didik mampu mendeskripsikan teori asam basa menurut Lewis melalui cerita dan dialog yang disajikan
- ❖ Peserta didik mampu menganalisis pH larutan melalui perhitungan
- ❖ Peserta didik mampu menganalisis konstanta asam/ basa melalui data yang disajikan dalam cerita
- ❖ Peserta didik mampu merancang prosedur percobaan pembuatan indikator dari bahan alam

Fig 6. Inclusion of learning objectives

After had been improved, comics then submitted to the validator to got an assessment. The validator consists of media expert lecturers and expert lecturers. This activity was carried out to fulfill the validity aspect. The Result Of Validity Comics can be used as teaching material [13]. So, the process of validation must fulfil the 3 criteria of teaching materials, they were the criteria of content, language, and presentation [14]. Through this comic validation step, aspects of validity will be obtained which are reviewed from the content criteria, language criteria, and presentation criteria that results illustrated in figure 6.

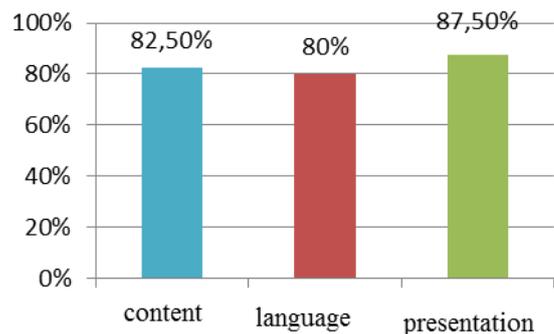


Fig 7. Validity graphic

From the results shown through the picture above, it was mentioned that the content criteria get an assessment 82.50% with a very valid category. The language criteria get an 80% with a valid category. While the presentation criteria get an evaluation of 87.5% with a very valid category. In other words, the Chemtoon media that wad made in accordance with the special characteristics of comics and has been assessed with many valid and very valid predicate. It caused by comics stories have an advantages to emphasize motion and actions that are displayed through images and made in a special way with a mixture of words [15]. The Chemtoon comic contains acid base material that have been assessed valid, also consedired as valid media to lead a independently learning process based on questionnaire of presentation aspect. Development of knowledge independently will have more potential to be remembered longer [16]. The other benefit of comic was the feature that mixed animation and words which collaborated to deliver an information communicatively. It also called as easy on the eye and easy on the brain [17].

B. The Limited Trial Test Result

At this stage of the limited trial test conducted at SMAN 1 Wringinanom in Gresik. The subjects used were 12 students XI IPA 2 with heterogeneous abilities. Activities had been carried out during May 13-15 2019. Pretest sheets were given at the beginning to measure the students' initial abilities. Then Chemtoon comics were given to be applied as learning media. The activities of learning comic were divided into 4 steps. The first step was called pre-mission which aims to train students' ability to find and formulate problems. Step 2 was called mission 1 with the aim of learning to described Arrhenius's acid base theory. Step 2 was called mission 2 with the learning objectives to be achieved were described the Bronsted-Lowry's acid base theory, determining acid base constants, determining pH, and using acid-base indicators, also designing procedures for making natural indicators. Step 4 was called mission 3 with the aim of learning achieved was to described the Lewis acid base theory. During ongoing learning observed by observers by filling in the activity observation sheet. The end of the test was given posttest to find out student learning outcomes and student response questionnaire sheets. The analysis of the limited trial results can be described below:

I. Results of the Response Questionnaire Sheet and Activity Observation Sheet

Both of these instruments support the practical aspects of Chemtoon comics. In the response questionnaire, there are several questions consisting of:

- a. Using Chemtoon comics you are more motivated to learn acid-base? Points get 100% positive repons in the practical category. Some advantages of comics is its ability to attract students' reading interest through creative images or displays. so that with the interest of students can motivate them to learn [6].
- b. were you more interested in learning with comics than text in books without pictures? This point got 100% positive answers in a very practical category. This point is intended to compare the lesson books used by students with Chemtoon comics. This was found when pre-research was conducted with a questionnaire. As many as 54% of students stated that their books were not interesting. Therefore, this point

was proposed to students to find out how much this comic can be a solution in improving the shortcomings of the previous ones. the dynamic style and presentation with infused visual storytelling in comics was making these medium much more interesting than textbooks, using comic also help to encourage the undeveloped and special needs students to get into reading and promote literacies [18].

- c. Did the expression and dialogue between characters in the comic help you feel comfortable or familiar with the story line that is presented? This point got 86.6% positive answers with a very practical category.
- d. After reading the pre-mission section, do you feel challenged to find a solution to the problem that occurred? This point got 66.6% positive answers with practical categories.
- e. Did the illustrations presented in the comics (Arrhenius, Bronsted-Lowry, and Lewis's section on acid-base theory definitions) help you imagine abstract concepts? This point got 100% positive answers in a very practical category. This point is given based on pre-research, it was found that the cause of the difficulty of acid-base material is due to the abstractness of the concept conveyed. This abstract was difficult to student as learning a new or unknown things. Comic could help to promote the learning of foreign language [19]. Comic was one of best tools to promote a new thing. Therefore, this point is very important to ask with the aim of helping to clarify the abstract acid-base concept.
- f. Did the pH calculation procedure and the acid base constants help you to understand the long formula? This point got 80% positive answers with practical categories.
- g. Using the Chemtoon comic made the chemistry learning media more varied in school? This point got 100% positive answers in a very practical category..

Through the observation sheet the activities of learning activities with comics are illustrated through table 2.

TABLE II. RESULTS OF ACTIVITY OBSERVATION SHEET

Activites	% carried out	Estimation (minutes)	Mostly showed expression	Categories
Meeting 1	100%	(60 minutes)	Reading seriously	Very practical
Meeting 2	100%	(90 minutes)	Smile, disscussion actively	Very practical
Meeting 3	100%	(45 minutes)	Smile	Very practical

From the observation sheet above it was known that the estimated time needed to study this Chemtoon comic is 225 minutes or equivalent to 5 hours of study divided into 3 meetings. According to interview with Suhari, the chemistry teacher at SMAN 1 Wringinanom explained that usually chemical materials were delivered for at least 4 meetings including evaluations. With Chemtoon learning chemistry especially of acid-base matter can be completed 3 times, so learning requires more effective time. Proveen from the observation sheet, the assessment shows 100% with a very practical category.

Through the expressions given by students, at the beginning of learning students read seriously. This could indicated the process of thinking of students. There were some students who read comics with a smile. This expression was obtained in the activities of reading missions 2, and 3. This indicates that in these activities students felt comfortable and happy. Smiles can reflect some happy, funny, and could be a shield when covering up some other emotions [19]. The happy emotions also could be clearly seen through a smile [20]. It was proven that in the execution of tasks as well as compilation of summaries, good results were obtained without any sign of intimidation.

The activities of students who injected occurred in the experimental activities. Experiments were carried out in groups. This activity creates an active learning condition was characterized by activities of discussion and interaction between friends.

From the observation sheet if described in the form of a statement, it will support the fulfillment of the following criteria:

- a) Availability of time used in learning
- b) Encourage active learning

The data displayed in the table illustrated each of the results obtained for each meeting. The results of the activity observation sheet and the subsequent response sheet were added and then calculated the average score. Obtained the final value of 95.2% with a very practical category.

2. Student's Learning Outcomes

After applying the pretest and posttest, the comparison of the values that obtained was illustrated in Figure 7 and Figure 8. The red color showing uncomplete learning outcomes and blue showing completed learning outcomes.

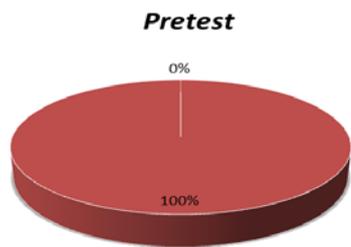


Fig 8. Classical completeness of pretest

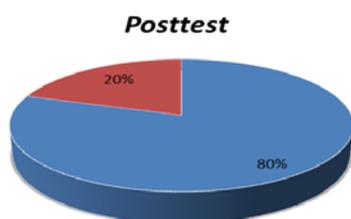


Fig 9. Classical completeness of posttest

With the existence of the Chemtoon comic as a learning media, it could convey messages or information for teaching [21]. The way for serving material in comics was also intended, so that students will be able to understand the concept easily and not get bored quickly [22]. The acid-base was contained abstract matter. Using a comic can be an alternative medium to combines text and images in creative content, helping visualize abstract concepts [23]. To understanding complex information, students whose limited ability to read, they will easier to understand the contents through reading comic than a book containing dozens of paragraphs, because words and images are needed in explain long material which can not be done in ordinary textbooks [24]. Therefore the development of this comic was effective as a learning media for acid-base material. So, after being given comics student's experienced a high increase in learning outcomes. Thus, Chemtoon comic had been fulfilled the effectiveness aspects by achieving classical completeness by 80% with effective predicates.

IV. CONCLUSION

Based on the research on the development of Chemtoon comics as a chemical learning media in acid-base material for class XI SMA, it was feasible in terms of validity, practicality and effectiveness. This can be seen with the following results:

1. Chemtoon's comic has been validated by two, material expert lecturer and media experts lecturer. The results showed that the average percentage of criteria for content was 82.5%, language criteria 80%, and presentation criteria 87.5%. From these results, Chemtoon comics had fulfilled all criteria with very valid categories.
2. Chemtoon comics have been given a questionnaire to determine the response of students. This questionnaire was to know aspects of practicality. Supported by activity observation sheets provided by observers. Through the response questionnaire a percentage of 86.6% showed that this comic was in a very practical category.
3. Chemtoon's comics have been limited to testing. Learning outcomes in limited trials are seen from classical completeness after being given posttest. The results shown reached 80% or 12 out of 15 students were completed. therefore, chemtoon comics have met the effectiveness criteria with effective predicates.

REFERENCES

- [1] Cirgas, Yudistira, Rusmini. 2016. "Pengembangan Lembar Kerja Siswa Praktikum Kimia Berorientasi Pada *Scientific Approach* Pada Materi Reaksi Reduksi Dan Oksidasi Kelas X SMA". *Unesa Journal of Chemical Education*. 5(3): 679-683
- [2] Chang, R. 2013. *Kimia Dasar: Konsep-konsep Inti jilid 2* (3 ed., Vol. 2). (A. S. S., Penerj.) Jakarta: Erlangga.
- [3] Ashadi. 2009. *Kesulitan Belajar Kimia Bagi Siswa Sekolah Menengah*. Accessed on Oktober 22th, 2017. accessed from UNS Library: <https://library.uns.ac.id/kesulitan-belajar-kimia-bagi-siswa-sekolah-menengah>
- [4] Kurniawan, edi., Rusmini. 2017. "Pengembangan Lembar Kerja Siswa (Lks) Berorientasi Guided Inquiry Untuk Melatihkan Keterampilan Proses Sains Pada Materi Asam-Basa". *UNESA Journal of Chemical Education*. 6(3): 427- 434,
- [5] Pramana, T. C. 2011. Pengembangan Media Komik Sebagai Bahan Ajar IPA Materi Hubungan Sumber Daya Alam Dengan Lingkungan Pada Siswa Kelas IV SD Negeri Pendowoharjo Sleman. *PGSD FKIP Universitas PGRI Yogyakarta*.
- [6] Novianti, R. D., & Syaichudin. 2010. Pengembangan Media Komik Pembelajaran Matematika untuk Meningkatkan Pemahaman Bentuk Soal Cerita Bab Pecahan pada Siswa Kelas V SDN Ngembung. *Jurnal Mahasiswa Teknologi Pendidikan Universitas Negeri Surabaya*.
- [7] Muzumdar, Jaganath. 2016. An Overview of Comic Books as an Educational Tool and Implications for Pharmacy. *Journal Innovations of Pharmacy*. 7(4):1-10
- [8] Weber, K. C., Saldanha, T. C., Silva, K. K., Santos, P. M., Souza, D. D., & Arroio, A. 2013. Introducing Comic As An Alternative Scientific Narrative In Chemistry Teaching. *Batu Anadolu Eğitim Bilimleri Dergisi*, 4(8): 1-14
- [9] Akker, J. V. D., Bannan, B., Kelly, A. E., Nieveen, N., & Plomp, T. 2010. An Introduction to Educational Design Research. *educational design research*. Netherlands: SLO.
- [10] Riduwan. 2015. Skala Pengukuran Variabel-variabel Penelitian. (J. Husdarta, A. Rusyana, & Enas, Editor.) Bandung: Alfabeta
- [11] Arsyad, A. 2014. *Media Pembelajaran*. Jakarta: Rajawali pers.
- [12] Nengsi, Sri. 2017. "Pengembangan Media Pembelajaran Bentuk Komik Pada Materi Fotosintesis Untuk SMP Kelas VIII". *Journal IPTEKS Terapan*. 11(1): 99-108.
- [13] Sudjana, N. 2011. *Penilaian Hasil Proses Belajar Mengajar*. Bandung: Remaja Rosdakarya.

- [14] Afrahmiryanto, & Ariani. 2017. Analisis Validitas Buku Ajar Untuk Sistem Perkuliahan E-Learning Pada Mata Kuliah Kimia Dasar di FKIP UMMY Solok. *Jurnal Ekstra Pendidikan (JEP)*. 1(2): 104-111
- [15] Zalmansyah, Achril. 2013. Meningkatkan Perbendaharaan Kata (*Vocabulary*) Siswa dengan Menggunakan Komik Strip Sebagai Media Pembelajaran Bahasa Inggris. *Journal of Kandai*. 9(2): 262-275.
- [16] Dahar, R.W. 1996. *Teori-teori Belajar*. Erlangga:Jakarta
- [17] Kose, esra ozay. 2013. Effects of Cartoons on Students' Achievement and Attitudes in Biology Teaching (Endocrine System). *Kastamonu Education Journal*. 21(03): 931-944
- [18] Muniran, Faezal., Yusof, M.R.M. 2008. Using Comics and Graphic Novels in School and Libraries to Promote Literacies. *Journal ICOLIS*. 01(01).123-127
- [19] Hasanat, Nida Ul. 1997. "Anda Sedang Bersedih? Cobalah Tersenyum Atau Tertawa". *Buletin Psikologi*. 5(2): 26-31
- [20] Prawitasari, J.E. 1995. "Mengenal Emosi Melalui Komunikasi Nonverbal". *Buletin Psikologi*, 2(1); 26-43
- [21] Karap, Zsuzsanna. 2017. The possible benefits of using comic books in foreign language education: A classroom study. *Training and Practice Journal*. 15(1): 243-260
- [22] Sunyono, Suyadi, dan Suyanto. 2009. Identifikasi Masalah Kesulitan dalam Pembelajaran Kimia SMA Kelas X di Propinsi Lampung. *Jurnal Pendidikan MIPA- FKIP Universitas Lampung*. 1(1):1-12.
- [23] Pratiwi, D.K.P., Sudibyo. "Keefektifan Penggunaan Media Pembelajaran Komik Pada Materi Gerak Untuk Meningkatkan Minat Baca Siswa SMP Kelas VIII". *ejournal-pensa Unesa*. 6 (2): 290-295
- [24] Fawaidah, H., Sukarmin. 2016. " Pengembangan Media Chemic (Chemistry Comic) Sebagai Media Pembelajaran Pada Materi Ikatan Kimia untuk Siswa Kelas X SMA" . *Unesa Journal of Chemical Education*. 5(3): 621-628
- [25] Wahab, Abdul., Wasis., Syifa, I., 2016. Pengembangan Bahan Ajar Komik Pada Materi Sistem Transportasi Makhluk Hidup Untuk Menumbuhkan Minat Baca Dan Meningkatkan Hasil Belajar. *Jurnal Pendidikan Sains Pascasarjana Universitas Negeri Surabaya* 6(1): 1090-1099