

# The Effect of Chemiclife Media on Chemical Bond Material Based on Completeness and Student Learning Outcomes

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## ABSTRACT

The aim of the research is to obtain the validity of Chemic-life media on chemical bond material. This research use 4D model (Define, Design, Develop and Disseminate) modified by Ibrahim, for this research the stages of dissemination have not been carried out. Chemic-life Media was tested on 12 students of XI MIA 2 class of Senior High School 1 Geger, Madiun. The instrument used in this research was students learning outcomes test sheet in the form of pretest and posttest sheet. The effectivity of the media in terms of completeness student learning outcomes all student declared complete with posttest value  $\geq 75$ , while in terms of increasing in learning outcomes 75% of students are on criteria and 15% are on medium criteria.

**Keywords:** Chemic-life media, chemical bond material, effectivity

## 1. INTRODUCTION

The teacher main task is to condition the environment in order to support the occurrence of behavioral changes and the formation of student competencies. For this purpose, it is necessary to condition a conducive environment and challenge the student's curiosity, so that the learning process will take place effectively. The indicator of learning success is marked by the students understanding in the learning process so that teachers are required to be able to create a pleasant learning climate that can lead students understanding maximally [1]. One way that can be done to be able to create a pleasant and active learning atmosphere in the learning process, is by using teaching materials that can attract student's attention.

One of the teaching materials that can attract student's attention is the use of learning media. The learning media has a role as an information carrier technology that can be utilized for the learning process. Through the learning process, teaching materials will be delivered to students more effectively [2].

The use of media is important because in learning process the obscurity of the material presented can be helped by using media as an intermediary. Learning media can represent what the teacher is less able to explain through certain words. Learning media are defined as media that carry information aimed instructional or contain teaching intentions [3].

Based on pre-research result data, 79.4% of students were interested in using comics as learning media. The definition of comics is a form of stories with funny series of images.

Comic books provide simple criteria, easily captured and understood [4]. The comic media in the teaching and learning process fosters the student's interest, the teaching and learning process becomes effective, increase interest in learning and generate interest in appreciation. Research also shows that comics help engage and form students' attitudes in a positive way.

Comics provide a pedagogical tool that can attract students into certain issues, motivate them to find relevant information, help to remember the content of the material and make science learning more interesting. So that comics can increase students learning motivation [5]. Comics can convey messages more easily understood. This is because comics combine the power of illustrations and texts that are arranged in illustrated storylines. Text making comics easier to understand, while illustrated lines make the message convey easier to remember [6].

The role of comics in education more considered because it has ability to tell, convey messages and increase the students' activity and creativity [7]. One of the chemistry materials is chemical bonds concept which according to the revised 13 syllabus and curriculum is the chemistry subject matter of senior high school X class. Students must understand chemical bonds concept so that it can make students to understand chemical structure concept easily. Because chemical bond is one of the fundamental in the structure learning which is key in chemistry. Chemical bonds explain the relationship between atoms to becomes molecules, ions, crystals and other stable species, but in fact

there are still many students have difficulty to understand the material.

Based on the pre-research results conducted in XI MIA 2 grade of Senior High School 1 Geger Madiun, as many as 61.8% of students stated that they were still having difficulties with chemical bonding material. Chemical bonding material was conveyed with the help of book and power points, but as many as 55.9% of students revealed that the books used not yet able to make it easier to understand chemical material. Based on the pre-research results, as many as 52.6% of students stated that the chemical book was dominated text and chemical formulas so that it was difficult to understand, as many as 31.6% of students stated that chemical book was less interesting or boring and others students argue that chemical book was too monotonous with difficult language and not accompanied by illustrations.

Comics that researchers will develop when compared to comics that are already on the market differences in sub material, concepts and story lines. From the explanation above, the researcher took the research to develop comic media as a learning media for chemical bonding material entitled "The Development of Chemiclife Media in the Chemical Bond Material".

## 2. METHOD

Chemiclife media development has been carried out according to the stages of 4D research method. The research stage of 4D are: Define, Design, Develop and Disseminate but in making Chemiclife media will only carried out until develop stage [8]. These stages are described as follows:

### 2.1 Define Stage

The development of 4D begins with design stage, at this stage the researcher can find out the student's problems and get the data through interview with teacher and give a pre-research questionnaire to students.

### 2.2 Design Stage

The second stage is designing Chemic-life media through the following steps: making material summaries, making comic story boards, describing characters in comics, making comic sketches, adding pictures or appropriate illustrations, coloring, adding comic complementary component, designing comic cover and printing Chemic-life media.

### 2.3 Develop Stage

Chemic-life media development stage begins through the guidance process to the lecturer then the result of the guidance and suggestion from the lecturer were used as revised material to produce draft media I. Draft I that has been obtained then through review stage by chemistry lecturer. After reviewing Chemic-life media it will obtain criticism and suggestions, then it will be used as reference for further improvements to obtain the comic draft II. The next stage is Chemic-life media validation in terms of content validity and construct validity.

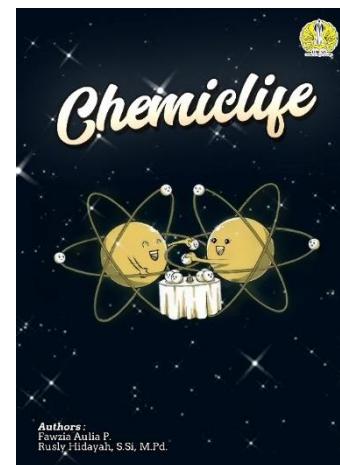
The next stage is doing limited trial test stage when the media declared valid reviewed from content and construct validity. At this stage get the practicability and effectiveness

data of media that developed. The practicability of media reviewed from the result of 12 students' responses as trial subject and also supported by the observation of students' activity during the limited trial process.

The effectiveness of Chemic-life media is determined based on the completeness of student learning outcomes in terms of students' posttest result and improvement of student learning outcomes.

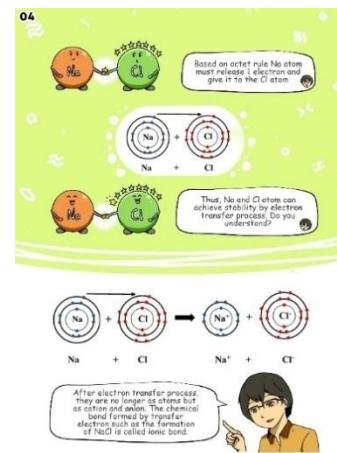
## 3. RESULTS AND DISCUSSION

The results of 4D research method is developing a Chemiclife media which can be presented as in Fig. 1 and Fig. 2.



**Figure 1** The Front Cover

In Fig. 1, the front cover contains: (1) the name of the media; (2) the symbol of Unesa; (3) an illustration depicting the contents of the media, namely chemical bonds; and (4) the author of Chemic-life.



**Figure 2** The Content of Media

In Fig. 2, it is the content of media. Like comics in general, the story content in Chemiclife contains narration, dialogue between characters, characters, supporting illustrations that are depicted so that it becomes a coherent story. Chemiclife media contains 36 pages.

The effectiveness of Chemiclife media is determined based on completeness and improvement of student learning

outcomes. The completeness students learning outcomes in terms of students' posttest results. The completeness students learning outcomes have been reached if the value obtained  $\geq 75$  [9].

The student learning outcomes improvement can be calculated from the pretest and posttest scores, the pretest and posttest questions are given to 12 students when the limited trial test is conducted as in Fig. 3.



**Figure 3** Limited Trial Test

The contents of the pretest and posttest questions are in accordance with Basic Competencies and indicators of chemical bonding material. The student learning outcomes improvement can be measured by calculating the n-gain value. Learning outcomes are stated to be increased if the n-gain value  $\geq 0.7$  in the high category or  $0.7 > g \geq 0.3$  with enough category.

Before the pretest and posttest results data are calculated using the n-gain formula, the students' value data is tested for normality to know that the data that has been obtained has a normal distribution. The normality of student value data is tested using SPSS with the Kolmogorov-Smirnov test, a data can be said to be normal if the Asymp value.  $Sig > \alpha = 0.05$ . The results of the normality test data of the pretest and posttest results are presented in Table 1.

**Table 1.** Normality Test Results using the One-Sample Kolmogorov-Smirnov Test

	PRETEST	POSTTEST
TOTAL STUDENTS (N)	12	12
Nominal Parameters <sup>a,b</sup>	Mean	49.5833
	Std. Deviation	11.57158
Most Extreme Differences	Absolute	.179
	Positive	.154
	Negative	-.179
Test Statistic	.179	.193
Asymp. Sig. (2-tailed)	.200 <sup>c,d</sup>	.200 <sup>c,d</sup>

- a. Test distribution is Normal.
- b. Calculated from data.
- c. Lilliefors Significance Correction.
- d. This is a lower bound of the true significance.

Based on Table I above through the 1-Sample K-S test it can be seen that the students' pretest and posttest results are normally distributed data because of the Asymp value.  $Sig > \text{value } \alpha = 0.05$ . Based on the test data above, the Asymp value.  $Sig$  of pretest and posttest data was 0.2. Furthermore, after knowing the data has normal distribution, the results of the pretest and posttest values are calculated using the n-gain formula. Table 2 presents the calculation of the results of the pretest and posttest using the n-gain formula and completeness according to Minimal Completeness Criteria (MCC).

**Table 2.** Calculation Results using the n-gain and completeness formula according to Minimal Completeness Criteria (MCC)

Name	Pretest Score	MCC Criteria	Posttest Score	MCC Criteria	n-gain	Category
WAA	45	Not complete	90	Complete	0,818	High
VYP	40	Not complete	75	Complete	0,583	Enough
RIDP	60	Not complete	80	Complete	0,5	Enough
WCA	55	Not complete	75	Complete	0,444	Enough
FIR	55	Not complete	90	Complete	0,778	High
AYA	70	Not complete	95	Complete	0,833	High
ACF	25	Not complete	90	Complete	0,867	High
RAS	45	Not complete	95	Complete	0,909	High
GAB	45	Not complete	85	Complete	0,727	High
NS	45	Not complete	85	Complete	0,727	High
MK	60	Not complete	95	Complete	0,875	High
NCN	50	Not complete	80	Complete	0,6	Enough

Based on data from Table II above, 8 students get n-gain values with high category while 4 other students are in the enough category. There are 4 students who are in the enough category because when collecting data, the selection of students is carried out in accordance with the criteria of 3 low-ability students, medium-ability students and 3 high-ability students. So, students do the pretests and posttest question in accordance with their abilities, resulting in the value obtained varies. Comics in science education besides from being able to attract students' interests are also effective in conveying science knowledge to students with different abilities [10].

In addition, from the recapitulation of the number of correct answers about students' posttest question, there are several questions on certain indicators getting fewer number of correct answers compared to other questions. The recapitulation of the number of student's correct answer is presented in Table III for ionic bonds, Table IV for covalent bonds and Table V for metal bonds below.

**Table 3.** The Recapitulation of Correct Answers Ionic Bonds

Indicator	Number of Question							
	1	2	3	4	5	6	7	8
3.5.1	12	12	-	-	-	-	-	-
3.5.2	-	-	11	10	10	11	12	12

**Table 4.** The Recapitulation of Correct Answers Covalent Bonds

Indicator	Number of Question									
	1	2	3	4	5	6	7	8	9	10
3.5.3	10	10	7	-	-	11	9	9	12	11
3.5.4	-	-	-	10	11	-	-	-	-	-

**Table 5.** The Recapitulation of Correct Answers Metal Bonds

Indicator	Number of Question	
	1	2
3.5.5	8	9

Based on Table IV it can be seen, covalent bond question number 3 for indicator 3.5.3 students are able to explain the process of forming covalent bonds, the number of correct answers from students is only 7, it means 5 students gave incorrect answer. Still on the same covalent bonds question and indicator, for question number 7 and 8 get 9 correct answer.

Furthermore, in Table V, the metal bonds question number 1 and 2 with the indicator 3.5.5 students are able to explain the process of forming metal bonds, for number 1 get 8 correct answer and number 2 get 9 correct answer. From the results obtained, the process of forming covalent and metals bond material that exist in the Chemiclife media is not complete enough so that the question number with indicators 3.5.3 and 3.5.5 didn't get satisfactory results because there are still many students who answer incorrectly, other than if it is associated with the expert assessment for the content validity has not gotten satisfactory results so that it can be said the material content from Chemiclife media is not yet complete enough.

The effectiveness of the media is also determined by the completeness of the students' posttest results. Based on Table 2 the pretest and posttest scores of students when viewed from the Minimal Completeness Criteria (MCC) score, for the pretest score all students in the incomplete category but for the posttest score, 2 students get the same score as MCC score and 10 other students above MCC score or can be said all students are in complete category.

After knowing the individual completeness, it can also be known classical completeness. If  $\geq 85\%$  of students in the class achieve individual completeness, then the class achieves classical completeness [11]. Reviewed from the completeness and improvement of student learning outcomes, the Chemiclife media is said to be effective as a learning media.

#### 4. CONCLUSION

Chemiclife media is declared effective in terms of completeness and improvement of student learning outcomes. Reviewed from the completeness of student learning outcomes, all students declared complete with a posttest value  $\geq 75$ , while in terms of increase in learning outcomes 75% of students are on high criteria and 15% others are on medium criteria.

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