

CHAPTER III RESEARCH METHODOLOGY

3.1 Research Method

This research uses a pre-experimental method, using a one-group pre-test-post-test design. The choice of method using one group pre-test and post-test was carried out because the class that was the respondent in this study was a class that had an average score. -medium average compared to other classes, so that it can represent classes that have high and low average scores. The use of pre-test and post-test was carried out in order to be able to measure the learning process before and after treatment (the use of comics in studying the human respiratory system). This method makes it possible to know the results of treatment more accurately because it can be compared with the conditions before and after treatment. This research design was used because it was considered appropriate for this research, namely to see the effectiveness of comics in learning and see the increase in students' grades before and after learning using comics.

3.2 Research design

This research uses a one-group pre-test and post-test design. This is because all students participated in this research, students received the same test in the form of critical thinking research instruments twice, first when students were learning about the respiratory system using media, and second when students were after carrying out the learning process using media. Then the results of the pre-test and post-test will be compared and seen whether there is an increase in student scores or not. This research serves to see the differences in the increase in critical thinking by using comics as a learning media for the human respiratory system. This design is shown in the table 3.1 below:

Table 3.1 Design Experiment

O ₁	X	O ₂
Pre-test	Treatment (Reading comic as a learning media)	Post-test

O₁: Pre-test of student's critical thinking

X: Students reading comics as a learning media

O₂: Post-test student critical thinking in learning the human respiratory system

3.3 Sample and Population

The participants in this research were 8th-grade junior high school students consisting of 39 students who had not yet studied material on the human respiratory system. This school is located in Bogor where the school uses the Merdeka curriculum to implement student learning. Details of respondents will be displayed in the table 3.2 below.

Table 3.2 Data of The Respondents

Population	Gender	Sample	Percentage (%)	Total (%)
8th-grade students	Female	20	51	100
	Male	19	49	

Table 3.2 above is the result of data analysis of students who participated in this research and then for sampling techniques using convenience techniques. This is because students are willing to participate in this research. According to Sugiono (2019) it is a process of selecting respondents based on their willingness to fill out a questionnaire. Respondents in this case were chosen based on chance, being in the right place, at the right time, and their readiness to fill out the questionnaire, making it easier to carry out this research.

3.4 Assumption

- 1) The use of comics in studying the human respiratory system can be an interesting media, this is because there are interesting visuals in comics
- 2) Comics can make abstract concepts and explanations that are difficult to understand easier for students to understand
- 3) All components of comics such as pictures, illustrations, and storylines can stimulate students' critical thinking
- 4) Students can analyze information, argue, and make conclusions after reading comics
- 5) The storyline in comics is adapted to students' daily lives so that it is easier for students to understand and visualize how it would happen in their own lives.

- 6) Apart from improving students' critical thinking, learning using the discussion method can improve students' understanding of the material, writing skills, analytical skills, ability to work in teams.

3.5 Hypothesis

Temporary estimates obtained based on problems and research that have been carried out previously can be concluded that comics are able to improve student's critical thinking in learning the human respiratory system. The hypothesis in this research is temporary so it must be tested first using scientific method steps. The hypotheses used in this research include:

H 0: There is no significant difference in the use of comics as media on learning the human respiratory system to improve students' critical thinking

H 1: There is a significant difference in the use of comics as media on learning human respiratory system to improve students' critical thinking

3.6 Research Instrument

This research uses three instruments, each of which has its function. The research instrument used in this research will be explained in Table 3.3 below.

Table 3.3 Instrument

Type of Data	Instrument
Student critical thinking	Objective test
Student responds	Questionnaire
Implementation of Comics as a learning media	questionnaire

The table above explains all the instruments used in this research, a more detailed explanation of each will be given in the next section

3.6.1 Student Critical Thinking Instrument

In this research, we discuss and examine students' critical thinking before and after using comics. To measure this, objective tests are needed. The objective test in this research uses critical thinking aspects, but only two aspects are used, namely basic clarification and inference. This is because basic clarification is the basis for students in analyzing the information they obtain so if the basics are good, it means students already have a foundation for critical thinking, namely analyzing

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information, the use of inference in this research functions as a benchmark. for an understanding of making logical conclusions based on facts. Consists of 20 questions, of which 10 questions are for basic clarification and the other 10 questions are for inference. This instrument has been validated by experts and is used twice, namely before learning takes place (pre-test) which functions to see students' critical thinking before using comics, and after learning (post-test) the results of the post test will be used. considered. The difference in pre-test and post-test scores shows an increase or decrease in students' critical thinking levels. Details of the questions on this objective test will be presented in the blueprint table 3.4 below.

Table 3.4 Blue Print Instrument

Critical Thinking Aspect	Indicator	Number of question	Total
Basic clarification	Question "why"	1, 2, 3, 4	10
	Argument Identify and handle irrelevance	5, 6, 7, 8, 9, 10	
Inference	Induction generalization	11, 12, 13, 14, 15	10
	Seeking other possible explanations	16, 17, 18, 19, 20	

Table 3.4 above explains the instruments used in the pre-test and post-test in this research. To test whether this instrument was feasible, a series of tests were carried out which are explained in the next section.

1. Instrument Development

Making the instrument consists of several stages starting with making the instrument, then going through two expert judgments to find out whether this critical thinking instrument is feasible or not, then suggestions from expert judgment become considerations for making a better critical thinking instrument,

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after revising the next instrument, the instrument tested directly on students through the validation test, reliability, difficulty, and discrimination index stages. More detailed results and analysis are discussed in the next section.

a) Validity test

Before testing other data, the first step that must be taken is to ensure whether the questions for the pre-test and post-test can measure students' critical thinking abilities, to ensure this, test the validity of the questions. An instrument is said to be valid if the questionnaire can reveal something that the questionnaire will measure. This validity test uses Pearson Product Moment, namely by calculating the correlation between the values obtained from the statements. A statement is said to be valid if the significance level is below 0.05 Ghazali (2016).

b) Reliability test

The reliability test is used to see the consistency of student answers from respondents. Answers will be said to be reliable if the respondent's answers are consistent or stable (Ghazali., 2009). In SPSS software, reliability testing can be done by looking at the Cronbach Alpha value, where the questionnaire is said to be reliable if the Cronbach Alpha value is greater than 0.60. For decision making, it can be determined by category values, this research uses category values based on (Kaplan & Saccuzzo, 2017). The category table for reliability scores is presented in Table 3.5 below.

Table 3.5 Category of Reliability

Correlation coefficient	Reliability criteria
0,80 - 1,00	Very High
0,60 - 0,80	High
0,40 - 0,60	Enough
0,20 - 0,40	Low
0,00 - 0,20	Very Low

Table 3.5 above shows the differences in values and category levels used in the reliability test. The results of the testing instruments used in the pre-test and post-test will be presented in Table 3.6 below.

Table 3.6 Result of Validity and Reliability

Item Number	Validity sig. (2-tailed)	Reliability Cronbach's alpha	Int	Notes	New Item number
1	.000	0.931 High Category	VALID	USED	1
2	.000		VALID	USED	2
3	.000		VALID	USED	3
4	.000		VALID	USED	4
5	.000		VALID	USED	5
6	.000		VALID	USED	6
7	.000		VALID	USED	7
8	.000		VALID	USED	8
9	.000		VALID	USED	9
10	.000		VALID	USED	10
11	.000		VALID	USED	11
12	.000		VALID	USED	12
13	.000		VALID	USED	13
14	.000		VALID	USED	14
15	.000		VALID	USED	15
16	.000		VALID	USED	16
17	.000		VALID	USED	17
18	.000		VALID	USED	18
19	.000		VALID	USED	19
20	.000		VALID	USED	20

Table 3.6 above presents the results of the validity value of each question consisting of 20 questions in the table. It also shows a reliability value of 0.931, which means that the reliability value is in the high category.

c) Difficulty Index

According to Saiful Azwar (2006), the level of difficulty of each question is measured as a ratio between the number of test takers who answered the question correctly compared to the number of test takers as a whole. In other words, easier

questions are marked by the number of test takers answering the question correctly, while more difficult questions are marked by fewer test takers answering correctly. The following table 3.7 shows the basis for decision-making.

Table 3.7 Criteria of Difficulty Index

Value	Difficulty Criteria
0,00 – 0,30	Difficult
0,30 – 0,70	Medium
0,70 – 1,00	Easy

Table 3.7 above shows four categories based on the values obtained from the difficulty index, then the results of the difficulty index analysis for each question are presented in Table 3.8 below.

Table 3.8 Result of Difficulty Index

Item number	Mean	Notes
1	0,60	Medium
2	0,52	Medium
3	0,81	Easy
4	0,76	Easy
5	0,52	Medium
6	0,52	Medium
7	0,58	Medium
8	0,62	Medium
9	0,62	Medium
10	0,82	Easy
11	0,78	Easy
12	0,48	Medium
13	0,54	Medium
14	0,66	Medium
15	0,70	Medium
16	0,44	Medium
17	0,50	Medium

18	0,62	Medium
19	0,86	Easy
20	0,60	Medium

After each question was explained, it was found that the majority of the questions used in this study were 15 media questions, but the other five questions were included in the easy category.

d) Discrimination index

The discriminating power of a question is the ability of a question to distinguish between clever students and students who are less clever. (Martondang., 2009). Discrimination index is a method used to evaluate how well an item or question can differentiate between highly intelligent students and less intelligent students on an exam or test. Based on the value obtained from the discrimination index results, it can be divided into several categories, the explanation for each category is shown in table 3.9 below.

Table 3.9 Discrimination Criteria

Value	Discrimination Criteria
0,00 – 0,19	Not Good
0,20 – 0,39	Enough
0,40 – 0,69	Good
0,70 – 1,00	Very Good

Based on table 3.9 above, the values from the discrimination index analysis results can be grouped into four criteria, then the discrimination index analysis for each question is shown in table 3.10 below.

Table 3.10 Result of Discrimination Index

Item Number	Person	Notes
1	0,78	Good
2	0,74	Good
3	0,51	Good
4	0,55	Good
5	0,75	Good
6	0,72	Good

7	0,68	Good
8	0,69	Good
9	0,65	Good
10	0,49	Good
11	0,47	Good
12	0,84	Good
13	0,47	Good
14	0,67	Good
15	0,46	Good
16	0,78	Good
17	0,75	Good
18	0,58	Good
19	0,42	Good
20	0,57	Good

3.6.2 Instrument of Student Respond

To strengthen the pre-test and post-test findings, students were given a questionnaire, in which there were nine statements, each of which three statements had different indicators. More detailed information regarding this student response instrument will be presented in Table 3.11 below.

Table 3.11 Instrument Student Respond

Indicator	Statement
Learning	Comics make learning the respiratory system more interesting
Experience	Comics make me enjoy learning about the respiratory system
	Comics make me more confident when discussing and expressing opinions
Comic as a Learning Media	Comics help me explain the concept of the respiratory system better
	I am more enthusiastic about learning when using comics
	Comics make discussions of the respiratory system more interesting
	Comics can improve my critical thinking

Student Critical thinking	Comics helped me to question information on the respiratory system
	Comics helped me identify the relationship between the concept of the respiratory system and everyday life

3.6.3 Instrument of Student Peer Assessment (Observation)

Apart from the instrument regarding student responses to comics, this research also uses a questionnaire containing the results of observations between students in which detailed questions from all statements will be presented in Table 3.12 below.

Table 3.12 Result of Student Peer Assessment (Observation)

Number of test Item	Indicator	Statement
1	Basic	Your friend analyzes the information in the comic
3	Clarification	Your friends can provide arguments when discussing with group friends or with other groups
2	Inference	Your friends can relate the information learned to everyday life
4		Your friend can summarize the results he learned today

Table 3.12 above explains the contents of the observation instrument between fellow students in the use of comics, in which there is a Likert scale to make data collection easier, which consists of "strongly agree" which is worth five, "agree" is worth four, "neutral" is worth three, "disagree" has a value of two and finally "strongly disagree" has a value of one, for making decisions from this data. In this research, the Likert scale was used based on (Joshi et al., 2015) where each criterion will have its own score from one to five, for more complete criteria table 3.13 (Joshi., 2015) is shown below.

Table 3.13 Student questionnaire responses and observation

Criteria	Score
Strongly disagree	1
Disagree	2

Neutral	3
Agree	4
Strongly agree	5

(Joshi et al., 2015)

After each student's opinion is calculated based on the criteria in the table above, then the average value obtained will be looked at and determined what the level of student agreement is based on (Spanich., 2021) which is explained in table 3.13 below.

Table 3.14 Likert Scale

Mean Score	The level of agreement
0.00 – 1.50	Very low
1.51 – 2.50	Low
2.51 – 3.50	Moderate
3.51 – 4.50	High
4.51 – 5.00	Very high

The table above explains the criteria for the mean obtained by the questionnaire which uses a Likert scale to collect data. There are five criteria seen in the table above, namely very low, for the mean obtained from 0.00 to 1.50, low for the mean 1.51 to 2.50 up to the highest average value. namely 4.51 to 5 which means student agreement is very high.

3.7 Research Procedures

Research is structured systematically based on learning stages. There are three main stages consisting of the process: preparation, implementation, and completion. The third stage is explained as follows:

- 1) Preparation stage
 - a. Identifying the research problem
 - b. Formulating research objective
 - c. Conducting a literature review on the comic as a media for learning, student critical thinking, and the human respiratory system
 - d. Make a research instrument
 - e. Validating research instrument by expert judgement

f. Revising research instrument

2) Implementation stage

Implementing comics to improve students' critical thinking requires good learning strategies and methods, as well as the role of teachers in using media, how to integrate media into learning, and explanations of strategies and methods. In this research, teacher explanations are used which function as a basis for the information obtained by students, with the information received by students. Apart from that, the teacher's function in the classroom is to provide space for students to express themselves and also as a guide for students to more easily obtain information (Moustafa et al., 2013) based on the teacher's function is to stimulate students to think critically and ask questions from the information. Next, students are asked to read comics which aim to add to the information explained by the teacher previously. The stories in comics are made in such a way that they relate to life. students in the surrounding environment. Apart from the storyline, there are pictures of characters, pictures of the respiratory system, and information such as information from journals. After students read stories in comics and see pictures related to everyday life, students can ask lots of questions. Apart from that, the main function of comics in research is to make comic media capable of improving students' critical thinking. Likewise, research conducted by (Setiyani, 2019) found that the use of comics in learning was able to increase students' knowledge.

Before students learn to use comics, students are given a pre-test, then the teacher explains material about the respiratory system as a basis because the participants have not studied the material, during the learning process students tend to pay attention to the teacher's explanation, no one interrupts to ask about learning, even though the teacher provides opportunity for students to ask questions, then students are asked to read comics related to the respiratory system. The use of comics in learning should be done through print media, this is because obstacles were found during the learning process such as some students not bringing cellphones, apart from that there was also a lack of several learning support media such as the absence of posters, mannequins and even a focus on clarifying the information provided. Then students do group assignments where students have to

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make questions based on the information they get from the teacher's explanation or from comics they have read previously.

One class consists of five groups, each group consisting of 6 to 7 students. Next, after all, the groups have asked questions, each group throws questions to the next group, group one throws questions to group two, group two throws questions to group three, and so on, the group given the questions will be given a time duration of two minutes for each question. Apart from that, within two minutes the group is asked to discuss to get answers. If the target group is unable to answer the question, the question will be thrown to another group.

During the process of answering questions, the entire group can look for answers in notebooks, comics, and also on the internet so they will get a lot of new information, not only from the teacher's explanation but from various sources. A picture of the learning process using comics will be shown in Figure 3.1 below



Figure 3.1 Learning Using Comic

Figure 4.1 above shows that when students are discussing the questions and answers, it can be seen that the students are paying attention to reading the comic, then when the question and answer session starts between groups, all students participate actively in learning, starting from looking for answers to groups that get questions and other groups that don't get questions. this makes them more prepared and already have answers when the target group cannot answer, not just a process of looking for answers when the target group is unable to answer, many students raise their hands to fight over the questions asked. Images of active students in class will be shown in Figure 3.2 below.



Figure 3.2 Active Students

Figure 4.2 above shows when students want to answer questions, based on this picture students are more active than before when studying using comics, then all students pay attention to other students who ask questions, and some students record the questions they ask, this is because students who ask questions can only repeat three times. Pictures of students asking questions will be shown in Figure 4.3 below.



Figure 3.3 Student Asking Questions

Figure 4.3 above is when students ask questions and other students listen to the questions carefully. Can be seen that some students immediately look for answers, some students record questions and some students listen. This session discusses the questions and answers that students made previously, the results of which are presented in table 3.15 below

Table 3.15 Question and Answer by Students

Group	Real Questions	English Version
1	a) Dalam satu batang rokok yang cio gunakan ada 0,6 mg. lalu pada satu malam cio menghabiskan 7	a) 4,2 mg kandungan nikotin yang masuk ke dalam tubuh cio b) Karbon monoxide

	<p>batang rokok, berapa mg kandungan nikotin yang masuk ke dalam tubuh cio dalam semalam?</p> <p>b) Dalam cerita za tapa yang membuat oksigen dalam darah berkurang?</p> <p>c) Bagaimana proses berkurangnya oksigen dalam darah?</p> <p>d) Apa nama sebutan bahan bangunan dan bahan pembuat aspal yang terkandung dalam rokok?</p> <p>e) Ketika anda berhenti merokok butuh berapa tahun untuk bisa normal kembali?</p>	<p>c) Hemoglobin dalam darah yang seharusnya mengikat oksigen malah membawa karbon monoksida yang dihasilkan rokok jadi, oksigen dalam darah berkurang</p> <p>d) Tar dan toluene</p> <p>e) 2 tahun setelah berhenti untuk menurun ke tingkat normal</p>
2	<p>a) Apakah kecanduan rokok dapat diatasi?</p> <p>b) Apakah kecanduan gas CO₂ yang terkandung dalam tubuh?</p> <p>c) Selain kanker paru-paru kanker apalagi yang sering menyerang perokok?</p> <p>d) Apa yang dimaksud dengan thorax?</p> <p>e) Apa kandungan zat dalam rokok yang</p>	<p>a) Berhenti merokok saat itu juga</p> <p>b) Fungsi otot dan jantung akan menurun</p> <p>c) Kanker serviks</p> <p>d) Thorax adalah bagian tubuh yang terusun dari tulang dada, ruas tulang belakang dan tulang rusuk</p> <p>e) Karbon monoksida</p>

	mengakibatkan gangguan pada system respirasi?	
3	<p>a) Mengapa rokok bisa menyebabkan sesak napas dan batuk?</p> <p>b) Apa yang terjadi dengan lendir jika kita merokok?</p> <p>c) Bagaimana cara kerja rokok masuk ke dalam tubuh?</p> <p>d) Apa gangguan Kesehatan yang mempengaruhi fungsi trakea</p> <p>e) Apa penyebab kadar hemoglobin tidak normal</p>	<p>a) Karena membuat paru-paru mengeluarkan senyawa tertentu yang membatasi jumlah udara yang masuk ke paru</p> <p>b) Merokok meningkat kan jumlah lender di saluran udara dan membuatnya lebih kental</p> <p>c) Ketika kita membakar rokok lebih dari 7000 bahan kimia akan tercipta. Rokok ini menghasilkan 1-2 mg nikotin, nikotin ini akan memberikan kesenangan sementara bagi tubuh. Saat alveolus bekerja menukarkan oksigen dan karbon dioksida, rokok akan meninggalkan ribuan bahan kimia berbahaya yang akan membuat produksi mucus berlebih sehingga menyebabkan sesak napas. Jadi oksigen dalam darah berkurang dan malah membawa karbon monoksida yang dihasilkan rokok, lalu hal tersebut membuat sesak napas dan pingsan dan akan menimbulkan penyakit paru-paru bahkan kanker.</p>

		<p>d) Trakomalasia, stenosis trakea, trakeitis, fistula trakea esofagus, kanker trakea</p> <p>e) Kadar hemoglobin tinggi dan kadar hemoglobin rendah</p>
4	<p>a) Ketika kita membakar rokok berapa banyak bahan kimia yang terbakar?</p> <p>b) Berapa banyak nikotin yang ada dalam satu batang rokok, jika kamu merokok 3 kali sehari?</p> <p>c) Jika saat bernapas menghirup oksigen mengapa saat menghembuskan nafas mengeluarkan karbon dioksida</p> <p>d) Apa manfaat nikotin bagi tubuh</p> <p>e) Apa itu stimulan</p>	<p>a) Lebih dari 7000 bahan kimia yang akan tercipta 69 diantaranya menyebabkan kanker dan banyak yang beracun</p> <p>b) Jika kamu merokok 3 kali sehari maka 1,8 mg nikotin masuk ke tubuh kamu</p> <p>c) Karena ada tempat pertukaran sel karbon dioksida dan karbon dioksida yang disebut alveolus</p> <p>d) Adanya rileks pada tubuh karena nikotin menjelma sebagai stimulant</p> <p>e) Obat-obatan yang menaikkan Tingkat kewaspadaan di dalam rentang waktu singkat</p>
5	<p>a) Nucleus akumbens adalah?</p> <p>b) Mengapa perokok berdampak mempunyai kanker paru</p>	<p>a) Struktur otak subkortikal yang terletak di dalam stiatum</p> <p>b) Rokok mengandung bahan karsiogenik</p> <p>c) Karena supply dan demand, selama masih ada orang yang</p>

	<p>c) Kenapa rokok masih dijual</p> <p>d) Apa yang terjadi dalam kasus merokok di kalangan remaja</p> <p>e) Berapa lama waktu untuk menghilangkan nikotin dalam tubuh</p>	<p>merokok maka rokok tetap diproduksi</p> <p>d) Penurunan penyembuhan luka, gangguan pernapasan, seperti asma, pneumonia dan bronchitis</p> <p>e) Waktu paruh nikotin adalah 2 jam</p>
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The use of comics in this research started with giving a pre-test to all students. Next, the teacher provides an explanation related to the topics in the comic, namely the respiratory system, organs, and especially how cigarettes affect the body. Explanation of material about the respiratory system is carried out as a basis for student knowledge. During learning, students tend to be quiet and only listen to the explanations given by the teacher. Several opportunities to ask questions are given to students through question sessions both while the teacher is explaining and at the end of the lesson, but students are still silent. The learning process should be carried out in two directions between students and teachers actively. According to (Arwidiyarti et al., 2022) appropriate learning methods do not focus only on the teacher, but students also participate in learning students can express their thoughts and opinions and they are free to ask questions without being afraid of objections or being afraid to argue. The lack of student activity in class causes learning to only take place in one direction, where there is a lack of teacher interaction with students such as discussions in class. This is because students feel embarrassed to ask questions, the willingness to discuss is still small, and students have an individualistic character, (Pratiwi & Samsuri, 2019) in contrast to research results (Hariyadi, 2014) stating that the reason students do not ask questions during learning is that they are afraid of being considered stupid, because they lazy, worried that the questions they ask will offend someone, it is difficult to explain the

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question or find it difficult to find the right choice of words to ask, there is no opportunity for them to ask questions, they have no ideas, and they assume that they already understand the material that has been explained by the teacher

Students are given information in the form of material explained by the teacher, which will make their curiosity arise, this is similar to research conducted by (Hariyadi, 2014) where the results of his research show that the teacher's job is not only to help students increase productivity, but teachers must also be able to increase students' creativity and skills in solving problems, this is obtained from the activities that teachers carry out in class such as being a facilitator for students, organizing, guiding and also motivating students to be enthusiastic about learning. Learning and teaching activities by teachers are carried out after students have finished filling in their pre-test, then not only providing material, students are given other activities such as discussions between friends, making students become motivated to argue, this makes the learning process carried out by students more meaningful. (Silverio 2019) The result of meaningful learning increases the potential of students (Doron et al., 2023). At the end of the lesson, students were asked to conclude the lesson that had been explained by the teacher previously, and several students began to convey what they had summarized from the teacher's explanation. The conclusions that students made were aimed at improving student critical thinking, namely making conclusions.

Next, after the students are given an explanation of the material about the human respiratory system, the teacher divides the students into several groups, where the students are asked to discuss questions and answers. Apart from that, the benefit of discussion in this research is that students can exchange views with their group friends, with this it is hoped that students will get new information, namely in the form of views from their friends, and discussions. students from each group did this after they read the comic which then produced five questions for each group, they were asked to make questions and answers based on the information they had previously obtained provided by the teacher, and from the comic they read.

In the discussion, each student is actively involved in creating questions and answers. According to (Ennis, 2011) asking questions is one of the important

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aspects of critical thinking. There are several types of challenge questions, including questions that start with why?, questions that ask for the main point, and examples, and questions that ask for facts. Judging from the previous learning step, when the teacher explained material about the respiratory system, no students had previously asked questions, therefore students were asked to discuss to make questions during the discussion. According to (Zahranie et al., 2020) asking questions can improve students' critical thinking.

All students are active during the discussion and question and answer process between groups. This is different from when learning did not use comics, the teacher explained the lesson using the lecture method and without any media to support learning, only a whiteboard was used, this is due to the lack of supporting media for learning at school, when learning takes place students focus only on paying attention to the teacher's explanation. , they tend to be passive, but when asked questions related to the material they can answer well, some of them are even able to conclude the lesson well, based on the student's ability to conclude the results of the learning they have learned, it can be concluded that some students have able to develop critical thinking, namely inference, where inference is an aspect that looks at students' ability to make conclusions based on the information they receive.

3) Completion stage

- a. Analyze the result of the objective test
- b. Discuss and conclude data of analysis result
- c. Research report arrangement

3.8. Data Analysis

1) Normality Test

The normality test is a statistical test that is used to find out whether the data you have comes from a normally distributed population or not. The normality test in this study was carried out parametrically using Kolmogorov Smirnov and Shapiro Wilk significance values as the basis for decision-making. The Kolmogorov-Smirnov significance value is used if the respondents in the study are more than 50, but if the respondents are less than 50 then the Shapiro-Wilk

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significance value can be used as a reference. There are two options for basic decision-making, namely,

If the significance value is >0.05 , then the data is said to be normal

If the significance value is <0.05 , then the data is said to be abnormal

2) Wilcoxon Test

According to Sugiyono (2017), the Wilcoxon Signed Rank Test, also known as the Wilcoxon Match Pair test, is used to test the differences between two paired or correlated data but not normally distributed. After the normality test is complete, data with a non-normal distribution can be used to carry out statistical tests. The research results are based on probability values. The Asym sig 2-tailed probability value must be less than 0.05, and more than 0.05, so there is no difference in the averages. In this research, the Wilcoxon Signed Rank Test was used to evaluate differences in respondents' level of knowledge about student critical thinking before and after learning to use comics as a learning media. The pretest and posttest results show this difference.

3) N-Gain Score

According to Hake (1999) The N-gain test shows an increase in learning outcome scores through a comparison of pre-test and post-test scores. The N-gain formula used is

$$\text{N-Gain} = \frac{\text{Post test score} - \text{Pre test Score}}{\text{Maximum score} - \text{Pre test score}}$$

3.9 Research Flowchart

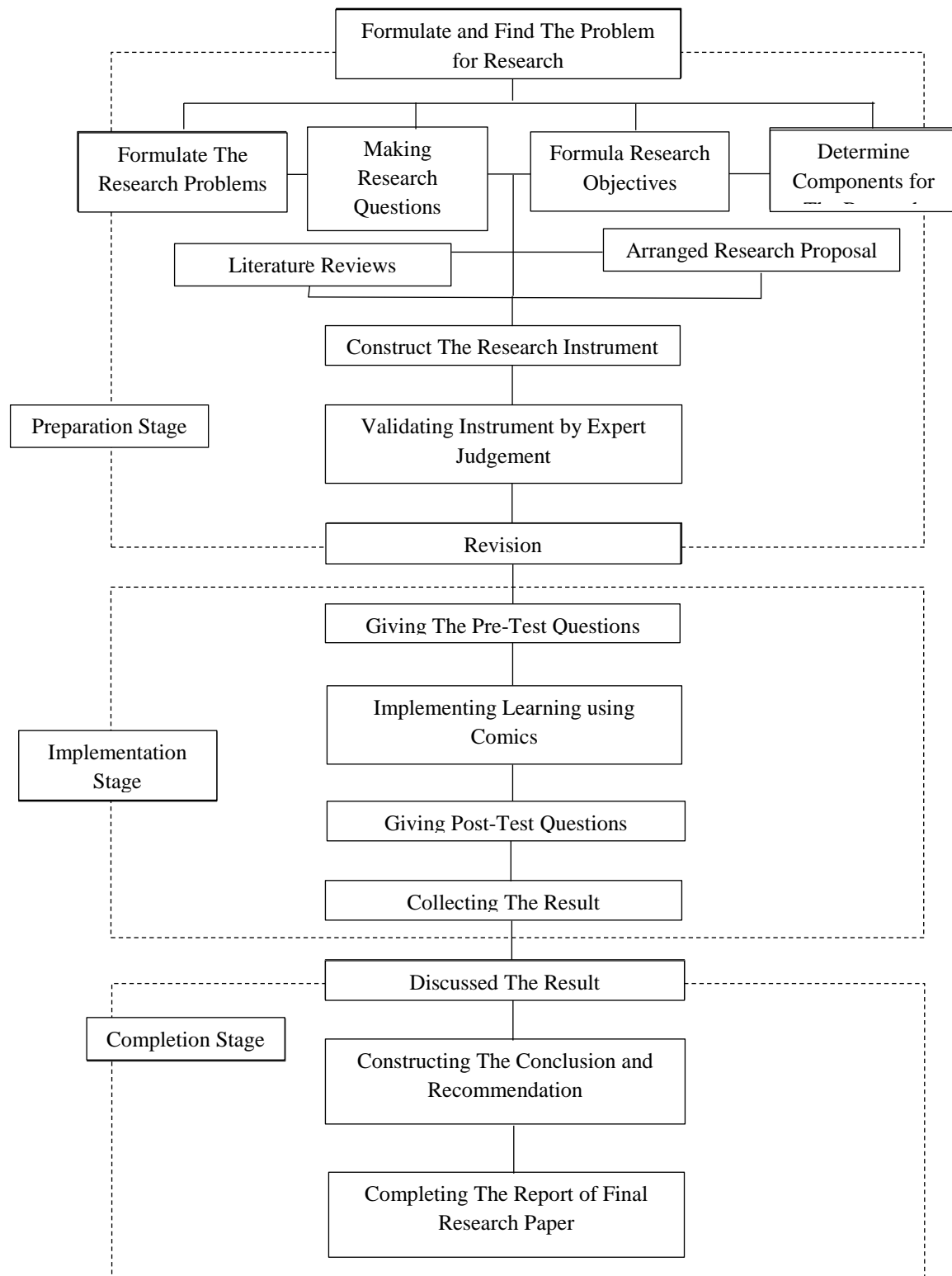


Figure 3.4 Research Flowchart