DEVELOPMENT OF CHEMISTRY LEARNING APPLICATION CLASS XI IN SMAN 1 CIPARAY

Ganny Adisaputra[1], Kania Evita Dewi, S.Pd., M.Si[2]

[1,2]Teknik Informatika – Universitas Komputer Indonesia
Jl. Dipatiukur 112-114 Bandung
E-mail: Adisaputraganny@gmail.com[1], kania.evita.dewi@email.unikom.ac.id[2]

ABSTRACT

The teaching and learning activities at SMAN 1 Ciparay use lecture method and practice. The condition of Chemistry learning activity when the teacher deliver the material often makes the students look saturated and the students are less able to understand the material presented, then the lack of practice questions done so that the students do not understand the material and the teacher finds difficulties in giving illustration about Chemistry experiment because it only describes on board write. Based on the existing problems offered solutions to solve existing problems by building an interactive learning media of Chemistry to improve students' learning comprehension in studying chemistry subjects by providing alternative media of interactive learning, enabling students to understand the material by multiplying the exercise questions, facilitating the teacher in giving illustration about chemical experiments. The software method used to build the application is Luther Sutopo method. This application uses Computer Assisted Instruction (CAI) method. Based on the results of the questionnaire, with the application of this 80% facilitate students in understanding the materials in each chapter and based on the results of interviews with the Chemistry teacher showed that the application of this Chemical learning media can help teachers in showing the description of chemical experiments. Then looking at the comparison of mean scores tested in the control class and the experimental class showed that the application of the Chemistry learning media produced significantly better learning outcomes.

Keywords: *Learning, Chemistry, CAI, Applications.*

1. INTRODUCTION

SMA Negeri 1 Ciparay is one of the educational institutions located at Jalan Raya Pacet, Ciparay Bandung Regency. SMA Negeri 1 Ciparay was founded in 1957. The time of education taken in SMAN 1 Ciparay this is for three years, ranging from class X to class XII. Curriculum used SMA Negeri 1 Ciparay is the curriculum of 2013. Subject of Chemistry is one of the subjects taught in SMA Negeri 1 Ciparay.

Based on the interview with the chemistry teacher of class XI in SMA Negeri 1 Ciparay, Ibu Megah Fadjar, S.Pd explained that learning is done by lecture and practicum method. The material taught is still sourced from the package book as a learning tool. Learning method with lecture method is where the teacher explain the material in front of the class and the students record the material, the condition of learning activities with the lecture method often makes the students look saturated and students are less able to understand the material presented. Problem exercises only come from the teacher itself and less is done because the students are more to record the material. Then the teacher finds it difficult when giving an illustration of experiments that occur on chemistry subjects, as the delivery medium is only described and described on the board. Based on the results of questionnaires with 72 students of class XI as a measurement of chemistry lessons. Of the 72 students, 78% of students liked the chemistry lesson, then 55% felt the difficulties in understanding the material, while those who were saturated with the lecture method were 80%, then the students who did not have the 75% package book and 85% of students strongly agreed created a learning media application to assist in understanding the subjects of chemistry.

Computer Assisted Intruction (CAI) is a system for delivering learning materials designed and programmed into the system. This method displays learning using various types of media (text, picture, sound, animation), supported by multimedia facilities are expected to help chemistry subjects become more interesting, increase student interest and achievement. [1]

Judging from the problems that exist today in SMAN 1 Ciparay learning media needed to help teachers in delivering learning materials, so as to attract interest in learning and motivate students to study chemistry subjects. Therefore built an application that is expected to bridge the problem is "Development of Chemistry Learning Application Class XI in SMAN 1 Ciparay" as for the purpose of the development of instructional media applications are as follows:

1. *Improve understanding of students' learning in studying chemistry subjects by providing alternative media of interactive learning.*

2. *Facilitate students in understanding the material by multiplying the exercise questions.*
3. *Facilitate teachers in providing illustrations about chemical experiments.*

2. RESEARCH CONTENTS

2.1 *System Description*

The interactive learning application to be built is desktop client-server based and using star topology, system built using Computer Assisted Instruction (CAI) method with tutorial, drill and practice concept, and simulation. The following is a description of the architecture of the system to be built. The system will have two interfaces ie FrontEnd and BackEnd.

FrontEnd is part of the application that will be used by students for learning activities. BackEnd is part of an application made by a chemistry teacher to process student data, grades, and evaluation questions. The system description can be seen in Figure 1.

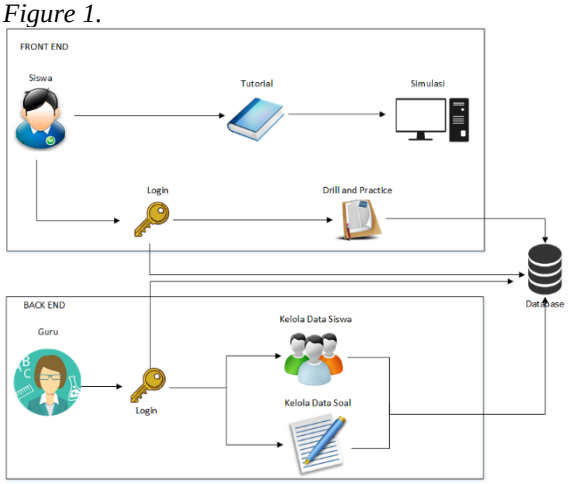


Figure 1 System description

2.2 Built Concept Description

The application of class XI chemistry learning media in SMAN 1 Ciparay is an application that can be used to help the chemistry subject teacher in delivering learning materials in class. Here is a table of conceptual descriptions of applications that will be built can be seen in table 1 below.

Table 1 Description of Application Concepts built

The Building Elements	*Description*
Title	*Development of Chemistry Learning Application Class XI in SMAN 1 Ciparay*
Users	*Student and teacher of chemistry class XI*
Material	*The material applied to the application is the material in the textbook that refers to the 2013 curriculum, presented using information visually by combining several multimedia components such as text, images, audio and simulation*
Audio	*The built-in audio app adapts to the animation on the simulation menu*
Animation	*The animation in the built app is 2D.*
Interactivity	*Interactions between users and applications can be found during simulation and evaluation.*

2.3 *Network Architecture*

Network architecture in computer lab SMAN 1 Ciparay is client-server model and use star topology (star). This architecture puts the computer located at the teacher's desk as a server with the number of 1 computer, while the student computers as clientnya amounted to 39 computers. Total number of computers in the computer laboratory SMAN 1 Ciparay amounted to 40 computers.

2.4 *Character Analysis*

In this chemical learning media application there is a main character that is a male chemist by using a lab coat. This character is used in the delivery page of the material. This animated character can be seen in the following table:

Table 2 Character Analysis

Character Analysis	
	Description of Physical Character: • Men wear lab coats • Brunette • Green shirt • Chocolate pants • Mustache • • Bring glasses, magnifying glasses, pens and rulers
	Description Character trait: The chemist has a friendly and kind character.

2.5 *Usecase Diagram*

Usecase diagram is a diagram that shows the functionality of the system, gives an idea of how something that is outside the system such as the user example, interact with the system. Usecase Diagram of interactive learning applications on chemistry subjects can be seen in Figure 2.

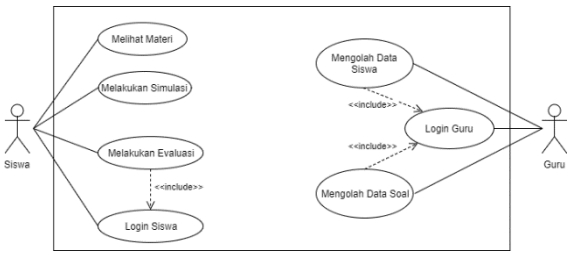


Figure* 2 *Usecase Diagram

2.6 *Entity Relationship Diagram* (ERD)

ERD model on the system to be built can be seen in the following ERD schematic drawings.

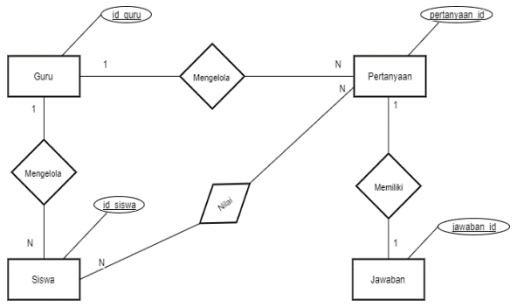


***Figure* 3 *Entity Relationship Diagram* (ERD)**

2.7 *Program Results*

The result of this program is done by showing the appearance of each program interface created. Here is an interface for students.

2.7.1 *Main Menu Interface*

Here is the main menu interface can be seen in Figure 4.



Figure* 4 *Main Menu Interface

2.7.2 *Material Menu Interface*

Here is the menu material interface can be seen in figure 5.

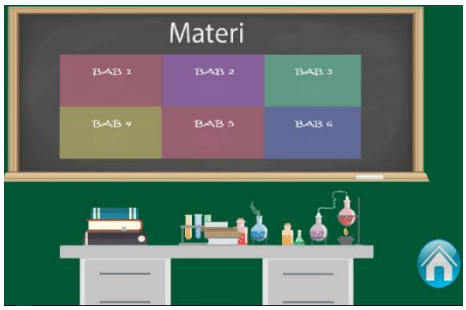


Figure* 5 *Material Menu Interface

2.7.3 *Content Fill Interface*

Here is the interface of the content of the material can be seen in Figure 6.

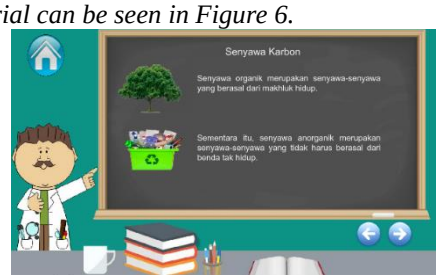


Figure* 6 *Content Fill Interface

2.7.4 *Interface Exercise*

Here is the implementation of the training interface can be seen in figure 7.

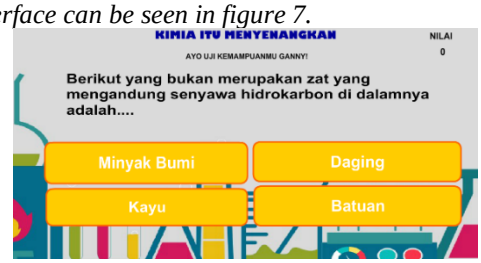


Figure 7 Interface Exercise

2.7.5 *Simulation Interface*

Here is the simulation material interface can be seen in figure 8.



Figure* 8 *Simulation Interface

2.7.6 *The student login interface*

Here is the student login interface can be seen in Figure 9.



Figure* 9 *The student login interface

2.7.7 *Interface Evaluation*

Here is the evaluation interface can be seen in Figure 10.



Figure 10 Interface Evaluation

2.8 *System Testing*

System testing is done to determine if there are errors and deficiencies in the software built, so it can be known whether the software has met the criteria in accordance with the purpose or not. The test used to test the application of learning media chemistry is done by using blackbox testing and test responses from application users in the form of interviews and questionnaires.

2.8.1 *Testing Functionality*

Testing functionality used is black box testing. Black box testing is a test performed to observe the results of execution through test data and functional check of the application. Black box testing evaluates only from outside view and functionality.

2.8.1.1 *Scenario Testing Functionality*

The functionality test scenario describes the sequence and the things tested in the tests performed on the application. The test plan is divided into 2 ie testing on the front end and testing on the back end, testing on the front end can be seen in table 3 below.

Table 3 Backend Test Scenarios

No	*Components tested*	*Testing Scenario*	*Type Testing*
1	*Login*	*Login*	*Black box*
2	*Processing student data*	*Add*	*Black box*
		Edit	
		Delete	
3	*Processing data questions*	*Add*	*Black box*
		Edit	
		Delet	

The scenario from Frontend testing can be seen in table 4.

Table 4 Frontend Testing Scenarios

No	*Components tested*	*Testing Scenario*	*Type Testing*
1	*Login*	*Verify Student Identity*	*Black box*
2	*Viewing the Material*	*Material selection*	*Black box*
3	*Conducting Simulation*	*Selection of Simulation*	*Black box*
4	*Evaluate*	*Selection of Answers*	*Black box*

2.8.1.2 *Cases and Test Results*

One example of software test cases that are based on the test scenario can be seen in table 5.

Table 5 Cases and Test Results Student Login

Cases and Test Results (Data true)			
Input Data	**Which are expected**	**Observation**	**Conclusion**
Sample Input: NIS: 161710075 Password: 1234	After entering the nis and password it will display the evaluation page	After entering the nis and password it will display the evaluation page	[√]Received [ ] Rejected
Cases and Test Results (Data wrong)			
Input Data	**Input Data**	**Input Data**	**Input Data**
Sample Input: NIS: 1617100755 Password: 1234	Failed to login and display the message	Displays error message "NIS or wrong password"	[√]Received [ ] Rejected

2.8.1.3 *Conclusion Testing Functionality*

Based on the results of tests that have been done with cases that have been tested, it can be concluded that in the application of learning media this chemistry can run well and there is no error on the existing functional process so that run in accordance with the desired.

2.8.2 *Response Tests to Application Users*

This test is the result of the observation of responses from respondents who use the application of interactive learning media chemistry from the backend side and also the frontend side. Response in the form of interviews or questionnaires that will be given to teachers of chemistry subjects and also grade XI students majoring in Science SMAN 1 Ciparay.

2.8.2.1 *Interview*

Interviews were conducted to teachers of chemistry subjects who had access rights as admins. The results of interviews with the mother Megah Fadjar P. S. Pd can be concluded that the application of learning media chemistry can help in learning activities.

2.8.2.2 *Questionnaire*

Questionnaire given to 36 students of class XI science department of SMAN 1 Ciparay. Based on the results of the calculation of each answer that has been in the value can be by using the Likert scale formula can be concluded that the purpose to improve students' understanding of learning in the subjects of chemistry provided by the teacher by providing interactive learning media, with the average student respondents more than 80% agreed so that the first goal was met. Then the purpose to facilitate students in understanding the material by multiplying the exercise questions, with the average student respondents more than 85% agree so that the second goal is met.

2.8.2.2.1 *Determine the score*

Furthermore determine the interval distance from the value. Calculation formula Class length

1. *Minimum Index Value (lowest) = number of respondents x weight of lowest answer (36 * 1 = 36)*
2. *Index Value Maximum (highest) = number of respondents x highest answer weight (36 * 5 = 180)*
3. *Distance interval = (Maximum value - Minimum Value) / 5 = (180 - 36) / 5 = 28.8 = 29*

The result of calculation of interval distance can be seen in table 6 below:

Table 6 Interval Category

Values	*Information*
152 - 180	*Strongly agree*
123 - 151	*Agree*
94 - 122	*Simply Agree*
65 - 72	*Less Agree*
36 - 64	*Disagree*

2.8.3 *Hypothesis testing*

Hypothesis Testing is a procedure performed with the purpose of deciding whether to accept or reject the hypothesis. [3]

The hypothesis used is the two-sided equality test (one-party test). In one-sided tests it is assumed that the two populations are normally distributed with mean μ_1 and μ_2 and standard deviations σ_1 and σ_2. Since in general the quantities of σ_1 and σ_2 are unknown, then here will be reviewed these things for state $\sigma_1 = \sigma_2$ or $\sigma_1 \neq \sigma_2$. [3]

Hypothesis tested:

H0: μeksperimen = μKontrol

H1: μeksperimen > μKontrol

If $\sigma_1 = \sigma_2$, then the statistic is statistic t with s^2. The applicable test criteria are: accept H_0 if $t < t_{1-\alpha}$ and reject H_0 if t has other prices. Then if $\sigma_1 \neq \sigma_2$, then the statistic is statistically t ', this test criterion is: reject hypothesis H_0. [3]

The statistical formulas are as follows:

Table 7 Statistics Formulas

Statistic	*Formulas*
T	$t = \frac{\bar{x}_1 - \bar{x}_2}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$
s^2	$s^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$
t’	$t' > \frac{w_1 t_1 + w_2 t_2}{w_1 + w_2}$

2.8.3.1 Data Normality

The data normality test has the objective to know about normal distributed research data or not. In statistical parametics normal distribution is an absolute necessity and condition that must be fulfilled. The provisions of the data normality test:

H0: the sample comes from a normally distributed population

H1: the sample comes from an abnormally distributed population

With the test criteria that if the significant value is greater than 0.01 then H0 is accepted, and if the significant value is less than 0.01 then H0 is rejected. The test of data normality is performed is kolmogorov-smirnov statistical test.

The results of the normality test data can be seen in Figure 11.

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Kelompok	Statistic	df	Sig.	Statistic	df	Sig.
Nilai	Control	.118	36	.200*	.959	36	.203
	Eksperimen	.161	36	.019	.956	36	.161

Figure 11 Data Normality Test Results

Judging from the results of normality test data, significant values obtained control class 0.200 while the significant value of 0.019 experimental class due to the significance level of both classes> 0.01 then it can be concluded that the data is normally distributed.

2.8.3.2 *Data Homogeneity*

The homogeneity test of the data is done in order to know about the variants of some of the same population or not. Furthermore, the homogeneity test data with the provisions:

H0: the sample comes from a homogeneous population

H1: the sample comes from a non-homogeneous population

With the test criteria that if the significant value is greater than 0.01 then H0 is accepted, and if the significant value is less than 0.01 then H0 is rejected. The result of homogeneity test of control class data can be seen in figure 12.

Test of Homogeneity of Variances

Posttes

Levene Statistic	df1	df2	Sig.
2.665	4	30	.052

Figure 12 Data Homogeneity Test Results

Judging from the results of homogeneity test data, significant value obtained control class 0.052 due to the significant level of control class> 0.01 then it can be concluded that the data is homogeneous.

Viewing from result of test of normality and homogeneity of data tested by application of SPSS statistic version 17 hence can be drawn conclusion that tested data stated normal and homogenous, by that mean comparison test measured by independent sample test T-test.

2.8.3.3 *Test Independent Sample T-test*

After the test data is normal and homogeneous, then the test of average comparison to the test data used Independent Sample T-test method. Hypothesis on independent test T-test conducted is:

H0: the average value of the experimental class is the same as the average of the controller class value

H1: average experiment class value is greater than the controler class average value

With the basis of decision making are:

1. *If significant (Sig.2-tailed) <0,01 then there is a significant difference between learning result in both classes or it can be concluded that H0 is accepted and H1 is rejected.*
2. *If significant (Sig.2-tailed)> 0,01 there is no significant difference between the learning result in both classes or it can be concluded that H1 is accepted and H0 is rejected.*

The results obtained from the Independent Sample T-test can be seen in Figure 13 below.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Nilai	Equal variances assumed	1.106	.297	4.609	70	.000	.26028	.05647
	Equal variances not assumed			4.609	66.217	.000	.26028	.05647

Figure 13 Independent Test Results Sample T-test

From the result of independent test of T-test data obtained significant value (Sig.2-tailed) that is equal to 0,00, because significant value (Sig.2-tailed) smaller <0.01 so it can be concluded that there is significant difference between the learning results of the control class and the experimental class.

3. CLOSING

3.1 Conclusions

Based on the results of implementation and testing that have been done, then the conclusion of the final project entitled "Development of Chemistry Learning Applications Class XI in SMAN 1 Ciparay" as follows:

1. *Application of learning media of this chemistry can help improve students understanding in learning chemistry class XI.*
2. *Application of learning media of this chemistry facilitate the student in understanding the subject matter of chemistry in each chapter.*
3. *The application of this chemistry learning media can assist teachers in showing descriptions of chemical experiments.*

3.2 *Suggestion*

In the development of class XI chemistry learning media applications in SMAN 1 Ciparay is still there are many shortcomings, therefore it needs to make some changes or additions to make this application for the better. The suggestions on the development of applications for kedepanya are as follows:

1. This app is developed by adding pictures to the evaluation question.
2. Adding animated video on the material section to make the presentation look more interesting.

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