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The effect of guided inquiri based chemistry teaching module on students independent learning attitude: An experimental study on the characteristics of colligative solution teaching material

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Abstract

The purpose of this study was to work out the effect of the employment of chemistry learning modules based of colligative nature of the answer to boost of scholars independent learning attitudes. Population of this study was senior high school School PSKD 7 Depok by purposive sampling tecnique which was class XII with thirty students. Design of this study is one group pre non tes post non test group experiment. Data collection tecniques with questionnaries of 20 statement items and likert scale option. In processing data used the SPSS programs. The results of t paired test concluded that value of t count is bigger than the worth of t Table (-18.83> -23.80). Furthermore, it's also known that the importance value or post-nontest probability value (p-value) of 0,000 is smaller than 0.05 (0.000<0.05). It means there is effect of the use of chemistry learning modules based of colligative nature of the solution to improve of students independent learning attitudes. Based on the gain test to increase of students independent learning attitudes is in the high category, namely 0.82. Thus Guided Inquiri Based Chemistry Teaching Module are needed in learning nature of colligative solution.

Keywords: Module; guided inquiri; learning

1. Introduction

The quality of graduates may be a benchmark for achieving national education goals. In Law Number 20 of 2003 concerning the National Education System, Article 3, the aim of national education is to develop the potential of scholars to become faithful and fearful people of Supreme Being, noble, healthy, knowledgeable,

capable, creative, independent and become democratic and responsible citizens, to appreciate the goals of education, facilities and infrastructure are needed in education. The conditions and learning climate and therefore the different quality of resources in each institution must be a benchmark for the supply of educational facilities and infrastructure (Silaban, 2017).

According Suryosubroto (2002), Judging from the training process, existing education facilities and infrastructure are direct and indirect. one in every of the academic facilities and infrastructure that functions directly is teaching materials. Teaching materials are one a part of research which will be used for various things that contain learning messages, which are used for learning purposes. Educators are facilitators of instructional materials must adjust the sort of teaching materials to the requirements of scholars (Mulyasa, 2003). Teachers as educators among secondary schools must use teaching materials designed and developed in accordance with morality to boost the standard of education. According the opinion of Pannen & Sadjati (2005), preparation of teaching materials is meted out in3 ways, namely writing yourself, repackaging information or text and structuring information. One example of teaching materials which will be prepared by the teacher is that the learning module. Winkel (2009), defines the training module because the smallest unit of teaching and learning program, which is studied by students themselves individually or taught by students to themselves (self-instructional). Several learning models, self-instructional, independent, independent, adaptive, user friendly and consistent (Anwar, 2010).

The character of the training module must be adapted to varied models in order that the module fits the requirements of scholars Munthe et al (2019), chemistry may be a branch of scientific discipline that studies the structure of matter, the properties of matter, changes in pertain other matter, and therefore the energy that accompanies material changes. Colligative Nature of Solution in concert of the chemicals at school XII natural Sciences becomes a chemical that's associated with way of life. Purba (2017) revealed that the training objectives are students to find out to use independent learning for PSKD 7 high school students guided inkuri-based learning modules, especially students independent learning about the subject of the character of colligative solutions. One approach to inquiry is guided incentives.

The average inquiry skills and critical thinking scores of the experimental group were higher than the control group, and the significance score from using the t-test was (0.00) <0.05, which means there were differences in inquiry skills. Furthermore, sharpening skills and critical thinking scores after treatment were higher than in the control group. This concludes that learning science using inquiry-based modules with authentic assessment is effective for developing students' critical inquiry and thinking skills (Hairida, 2016). Research by Damarsas (2013) with the title "Application of the E-Module Assisted Inquiry Method", shows that the application of the chemical e-module assisted inquiry method influences student learning outcomes on

the solubility and solubility of the subject product, which is marked by a correlation coefficient (rb) of 0, 46 with the influence of 21, 61%.

Research conducted by Perangin-Angin et al. (2019), Practicum Videos and Electronic Modules affect students 'process skills with a gain value of 85%, which shows a high interpretation of improving students' process skills. Similar to the results of research Harefa and Purba (2019), the results of student responses show e-module based about simple practices is right for them to be used as a source of learning chemistry practice with an average score of 3.79 (scale 4). Sujiono and Widyatmoko (2014) on motion material using modules, positive results were obtained from students through the provision of questionnaires on large-scale trials where the average percentage of scores obtained was 88.96%, which indicates that the modules developed can improve critical thinking learning students. In addition, the research entitled Development of Student Worksheets Colligative Properties of Electrolyte-Based Science Process Skills" by Tampubolon et al. (2016) can be concluded that the teacher's response to aspects of content, construction, readability and attractiveness of the category is very high. The results of interviews with researchers on a chemistry teacher at PSKD 7 High School stated that chemistry learning had never used a learning module developed by the teacher based on needs analysis. From the description above, the researcher wanted to find out the improvement of students' independent learning attitudes through the use of material learning modules of the colligative nature of guided inquiry based solutions in Depok PSKD 7 High School.

2. Methods

The study was conducted in May-June 2018, at Depok PSKD 7 High School. This study applies a quasi experiment method, in this study used a sample of research which was selected purposively as many as 30 students. The sample was given a preliminary test, then given learning by using the material learning method of the colligative nature of the solution based on the guided inquiry approach. After the implementation of the learning, the two samples were given the final test and the feasibility questionnaire used. The research design used refers to Sugiyono (2008), namely: One group Pre-test and post-non-control control Design. The research design as shown in Table 1.

Table 1
Design of Research

Treatment group	T1	X	T2

Information: T1: Pre Non-test giving; T2: Post Non-test giving; X: Learning by using colligative material learning modules based on guided inquiry approach

To measure students' independent learning attitudes, a questionnaire was used as a data collection instrument based on a Likert scale. Questionnaire instruments

were arranged as many as 40 points with four choices, namely strongly agree (ST), agree (S), disagree (TS) and strongly disagree (STS). Here grating each indicator of Independent learning attitude that is used as an instrument in this study Table 2. Data sources, data obtained, data collection techniques, research instruments as part of data collection techniques. The data collection techniques are arranged in Table 3.

Table 2
Independent learning attitude questionnaire

Independent Learning Attitude Indicators	Questionnaire Item Number
Able to make decisions in dealing with existing problems	5, 8, 13, 19, 23, 24
There is a strong desire to learn	1, 2, 18, 20, 22, 28
Responsible for the things done	4, 7, 11, 14, 27, 30
Able to assess and improve themselves	6, 12, 17, 26, 25, 29
Confident in carrying out tasks	3, 9, 10, 16, 15, 21

Table 3
Data collection technique

Data Source	Data Obtained	Collection Tehniques	Instrument
Student	Students' independent learning attitude	Pre-nontes Post-nontes	Attitude

Referring to the questionnaire instrument, researchers conducted observations in the sample class by carrying notes of 30 observation sheets arranged, which were adjusted to the points in the students' independent learning attitude questionnaire. In this scientific attitude instrument, to conduct an instrument analysis, the researcher only conducts the validation test of the content to the expert. In this study the validity used is content validity and construct validity. The following is a brief description of data collection techniques carried out in the study. After obtaining research data, data analysis is carried out to test the hypothesis that has been proposed. Hypothesis testing is a paired sample t-test using SPSS 24. According to Arikunto (2006), to find out how much an increase in students' independent learning attitudes, a gain test was conducted.

Assessment of observations of learning activities carried out on students and researchers during the learning process takes place by looking at the checklist affixed by the observer. The results of the observations were obtained to complement the findings obtained by the researchers during the study. The research was carried out in three stages, namely: (1) the stage of research preparation; (2) the stage of conducting research; (3) the final stage. Broadly speaking, the activities carried out are as Fig 1. The data analysis of this study was carried out by testing the increase in students 'independent learning attitudes using the gain test to find out the percentage of students' self-learning increase. The representation of the gain test results is presented in Table 4.

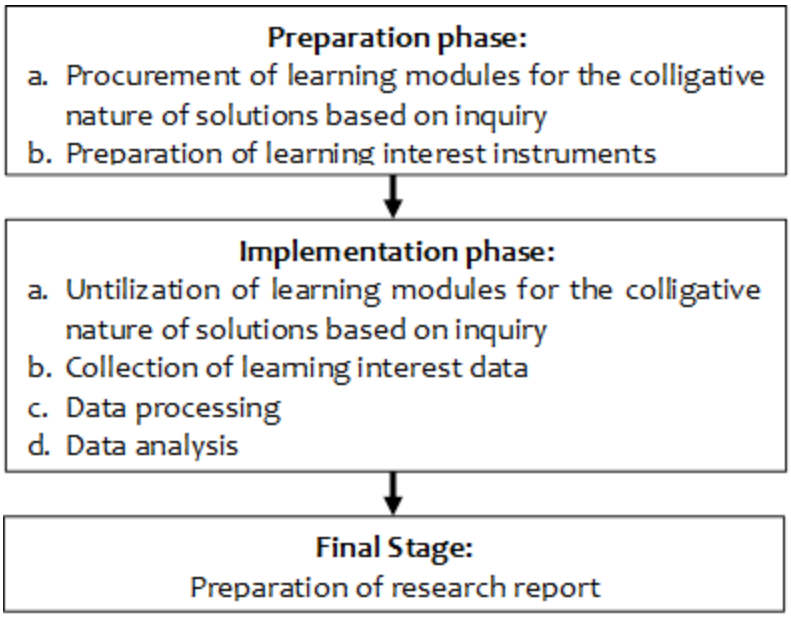

Fig 1. Research Procedure

Table 4
Gain Test Interpretation

Percentage (%)	Category
80-100	Very Good
66-79	Good
56-65	Enough
40-55	Less
0-39	Very Less

3. Results and Discussion

Validation of student self-learning attitude questionnaire instrument used in this study is construct validation. The instrument validator is an expert validator, namely Dr. Sumiyati, M.Pd. Based on the results of the validation, 30 items of statements in the questionnaire were declared to be valid as a whole with several notes to improve the word selection. After the revision was carried out, the questionnaire instrument was declared feasible to be used at the time of pre-trial and post-training to collect data on students' independent learning attitudes.

The pre-test given to students in the form of 30 statements with criteria strongly agree (ST), agree (S), disagree (TS) and strongly disagree (STS). The pre-test given to students as a sample aims to determine students' independent learning attitudes before being given a colligative nature-based guided learning (treat) module. Post-

test given to students to determine students' independent learning attitudes after being given treatment. Pretest and posttest data were analyzed using SPSS 24 described in the Table 5.

Table 5
Descriptive Statistic

Description	*Pre-nontest*	*Post-nontest*
N	30	30
Mean	57.53	84.310
Std. Deviation	5.96	5.94
Variance	37.399	74.740
Range	19.17	33.67
Minimum	45.83	58.83
Maximum	65.00	92.50
Sum	2017	3067

Based on the data in Table 5, with a standard deviation of 5.96 in the pre-test, the average value is 57.53. While in the post non test the standard deviation is 5.94, the average value is 84.31. Based on the data above, it is clear that the difference in the class value of the pre-test with the post-test. The frequency of each indicator of students' independent learning attitudes is presented in Table 6.

Based on the presentation of the data above, it can be concluded that students' independent learning attitudes increase. Of the five indicators of students' independent learning attitudes that experienced the highest increase were indicators of a strong desire to learn with a total score of pre-test 405 and post-test 631 with a total score of 720. When converted into grades, the pre-test score was 56.25 and the post-nontest value is 87.64.

Scores that have been converted into values are paired until the t-test to test the hypotheses that have been formulated. The following (Table 7) are the results of hypothesis testing obtained using the SPSS 24 application.

Table 7
Paired Samples Statistics

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	df	sig
				Lower	Upper			
Pre Non-test Post Non-test	-26.78	7.98	1.46	-29.76	-23.80	-18.38	29	0.00

Paired sample t-test test results in Table 7 above show that the value of N = 30 and the mean post-nontest is 84.31 with a standard deviation of 1.08. It is known that

the value of t count post-nontest is -18.83 while the t Table with df 29 at the 5% level is -23.80. The value of t count is greater than the value of t Table (-18.83> -23.80). Furthermore, it is also known that the significance value or post-nontest probability value (p-value) of 0,000 is smaller than 0.05 (0.000 <0.05). Therefore, it can be concluded that Ha was accepted. In other words, there is an increase in independent learning attitudes in Class XII at senior high school through the use of material chemistry learning modules in the nature of colligative, guided inquiry-based solutions (Manalu et al. 2016; Saragih et al. 2017; Nasution et al. 2018; Nuraini et al. 2019).

To review the magnitude of the effect, it is necessary to do another test, namely the gain test. The results of the gain test in this study are divided into two parts. The first part is the overall gain test and the second part is the gain test for each indicator on the questionnaire which consists of five indicators. The results of the overall gain test can be seen in Table 8.

Table 8
Gain Test

Average Score		Gain	Percentage
Pre-nontest	*Post-nontest*		
57.53	85.19	0.65	65%

Based on Table 8 above, it is known that the pre-nontest average score is 57.53 while the post-nontest average score is 85.19. If the average score is operated according to the gain formula then the result is 0.65. Therefore, it can be concluded that there is an increase in interest in student chemistry learning by 65%. When linked to the gain index, the gain value is included in the medium category.

More detailed results about increasing students 'independent learning attitudes are obtained by conducting a gain test on each indicator of students' independent learning attitudes. The gain test results for each Indicator are presented in the Table 9.

Table 9
Test the Gain of each Indicator

Indicator	Average of Pre Non Test	Average of Post Non Test	N-Gain	Percentage
Able to make decisions in dealing with existing problems	64.44	85.59	0.5859	58.59%
There is a strong desire to learn	56.94	86.25	0.6806	68.06%
Responsible for the things done	56.11	84.72	0.6519	65.19%
Able to assess and improve themselves	54.03	85.56	0.6858	68.58%
Confident in carrying out tasks	56.94	85.56	0.6645	66.45%

Based on Table 9 above it is known that the gain value for the indicator is able to assess and improve itself has the highest increase, which is 68.58%. A higher increase in this indicator is due to a significant difference between the pre-test and post-non-test scores. While the gain test for indicators capable of making decisions in overcoming existing problems experienced the lowest increase, namely 58.59%. This is because the pre-test score on this indicator is already high, so that a different increase of 10% of indicators is able to assess and improve themselves.

Table 6
Frequency of Students' Independent Learning Attitudes

Indicator	Number	Pre-nontest				Post-nontest			
		1	2	3	4	1	2	3	4
Able to make decisions in dealing with existing problems	5	5	16	8	1	0	0	19	11
	8	4	16	10	0	0	1	18	11
	13	2	9	19	0	0	1	12	17
	19	3	13	14	0	0	0	16	14
	23	3	15	12	0	0	0	20	10
	24	6	16	7	1	0	1	15	14
Sum		23	85	70	2	0	3	100	77
Score		23	170	210	8	0	6	300	308
Total Score		411				614			
Grade (maximum score =720)		**57.08**				**85.28**			
There is a strong desire to learn	1	2	17	10	1	0	0	16	14
	2	5	13	11	1	0	0	21	9
	18	5	15	10	0	0	0	15	15
	20	4	18	8	0	0	1	16	13
	22	3	16	10	1	0	0	10	20
	28	3	15	12	0	0	0	9	21
Sum		22	94	61	0	0	1	87	92
Score		22	188	183	12	0	2	261	368
Total Score		405				631			
Grade (maximum score =720)		**56.25**				**87.64**			
Responsible for the things done	4	3	16	9	2	0	2	13	15
	7	3	14	12	1	0	1	19	10
	11	4	16	8	2	0	1	17	12
	14	3	17	10	0	0	0	14	16
	27	6	14	9	1	0	1	19	10
	30	4	19	7	0	0	0	18	12
Sum		23	96	55	6	0	5	100	75
Score		23	192	165	24	0	10	300	300
Total Score		404				610			

Grade (maximum score =720)		**56.11**				**84.72**			
Able to assess and improve themselves	6	4	16	10	0	0	0	21	9
	12	4	14	12	0	0	1	16	13
	17	5	15	9	1	0	0	17	13
	25	5	16	8	1	0	2	14	14
	26	4	12	14	0	0	1	15	14
	29	3	15	12	0	0	1	11	18
Sum		25	88	65	2	0	5	94	81
Score		25	176	195	8	0	10	282	324
Total Score		404				616			
Grade (maximum score =720)		**56.11**				**85.56**			
Confident in carrying out tasks	3	5	16	9	0	0	0	15	15
	9	5	13	12	0	0	2	20	8
	10	3	11	16	0	0	0	14	16
	15	5	11	13	1	0	1	18	11
	16	4	16	10	0	0	1	12	17
	21	4	16	9	1	0	0	15	15
Sum		26	83	69	2	0	4	94	82
Score		26	166	207	8	0	8	282	328
Total Score		407				618			
Grade (maximum score =720)		**56.53**				**85.83**			

4. Conclusion

Based on the results of this study, it can be concluded that the use of material chemistry learning modules in the colligative nature of guided inquiry-based solutions can improve the independent learning attitude of Class XII students of PSKD 7 Depok high school. Increasing the attitude of self-learning in Class XII students of Depok PSKD 7 middle school students from the results of a gain test of 65%. Based on such description, the researcher suggested that teachers utilize the material chemistry learning module of the colligative nature of guided inquiry-based solutions by focusing on observing each activity carried out by students to determine students' independent learning attitudes.

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