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RESEARCH ARTICLE

THE EFFECTIVENESS OF IMPLEMENTATION MODULE BASED ON THE IMAGE PROCESS (D-GP) ON CHEMISTRY IN HIGH SCHOOL STUDENT

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Abstract

Chemistry is a branch of natural sciences education. Chemistry has different characteristics from other scientific studies. Some of these characteristics include the concept that is abstract, simple, tiered, structured and is a science capable of describing facts in everyday life. The problem that occurs in chemistry learning at this time is the unavailability of teaching materials that can increase learning motivation and able to relate material to problems in everyday life so that student learning outcomes are not satisfactory. One solution to this learning problem is the use of textbook teaching materials with process images (D-GP) that are valid, practical and effective. This type of research is R and D research and its research design refers to the 4D (Thiagarajan) development model with the stages of defining, designing, developing, and disseminating. The results of this study indicate that there is a correlation between textbooks and process drawings (D-GP) on student motivation and learning outcomes. The data obtained before using the dictation with process images (D-GP) student learning motivation was 28.7% and after using the colligative nature of the solution (D-GP) it became 29.5%. Student learning outcomes also increased to 76% with very high score criteria. The results of these studies prove that there is a correlation between the use of textbooks and process images on student motivation and learning outcomes.

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Introduction:-

Process images are images composed of processes and stages, where these processes and stages change the phenomena that occur (Sutarto et al, 2018). Process images will greatly help students in analyzing a phenomenon in understanding the concept without presenting the actual event. Sutarto & Indrawati argue that a process image is a series of difference images in describing a complete stage.

Chemistry is a branch of science. Chemistry has a different effect from other scientific studies. The definitions of chemistry include: (1) most of the concepts are abstract, simple, tiered, and structured; (2) is the science of solving problems and describing facts and events (Mentari, 2014). They are less able to relate chemical concepts in solving problems related to everyday life (contextual). Based on the education expert's statement, it is increasingly clear that

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chemistry lessons are a difficult subject for students who are in a state when learning them. This difficulty can be seen from the motivation and learning outcomes of students that are not in accordance with the targets taken.

Learning resources are one aspect that supports students' understanding of chemical abstraction. Selection of appropriate learning resources in accordance with the material with the teaching objectives to be achieved in learning, and providing facilities that allow students to learn optimally. Learning resources have several requirements so that their usefulness is right on target, namely availability that can be reached by learners and can help student to learn well. Good teaching materials must be able to motivate learners by utilizing interesting things such as picture, illustrations, examples of questions (cases), have sufficient material to support problem solving activities. In additions, textbooks are useful for developing insights into the learning process being undertaken, providing guides for the learning material being studied and operational steps to explore more thoroughly the standard material thoroughly.

Based on interviews with 35 students, 2 peers in high school in Jember East Java Indonesia needed innovations in the chemistry learning process so that they could describe chemical abstractness into a more real and meaningful learning. These innovations can be in the form of strategies, methods, models, techniques and teaching materials. If students are able to fully understand chemistry, there will be an increase in the quality of human resources.

One of the teaching materials that can be packaged densely is dictates. Dictate is a simple teaching material, designed to optimize the communication of educators and students in understanding chemical concepts in the teaching and learning process. Optimization of this communication makes it easier for students to learn. Dictates are presented with interesting and meaningful innovations so that students are able to describe abstract things to be real (Sutarto, et al: 2018).

Dictates can optimize the involvement of students actively and foster positive characters in the form of characters who have high learning motivation. A quality dictate is able to provide a strategic role in the achievement of national education and is able to foster a character of curiosity and critical thinking in accordance with the objectives of character education and become an initial character to build motivation and increase student learning outcomes. According to Nieveen in Gravemeijer (2013) states that good teaching materials (dictates) are certainly valid for students who are learning, easy to use for learning, and of course effective for learning.

The level of difficulty most often experienced by students is describing abstract concepts or material that has stages of an event process that are difficult to describe by imagination alone, such as describing the occurrence of chemical reactions, atomic theories, the occurrence of activation energy, the processes that occur in voltaic cells. and electrolysis, processes on the colligative properties of solutions and others. If this is expressed using a process image, it is possible to help students understand it. According to Sutarto, et al. (2018) states that a Process Image (GP) is a series of objects (objects, events, or phenomena that are real or abstract, which can be seen or can only be imagined) in which the images in the series are between one image and another. for others, there is always a relative difference in terms (state, position, form, and combination) which as a whole describes a coherent stage and a complete unity. The dictates that will be developed are the colligative properties of the solution with process images (D-GP).

Facts in the field show that the chemical printed teaching materials used by students are still focused on reviewing the material and solving problems only. There are still many chemistry textbooks that provide descriptive material reviews and a few pictures so that it does not provide space for students to learn with high motivation. The abstract characteristics of chemistry have not been able to concretize understanding by students so that students still have difficulty describing the events in the expected chemical concepts.

Dick, Carey, and Carey (2009: 230) add that instructional material contains the content either written, mediated, or facilitated by an instructor that a student as use to achieve the objective also includes information that the learners will use to guide the progress. Based on the words of Dick, Carey, and Carey, it can be explained that the teaching materials contain content that students need to learn, either in print or facilitated by the teacher to achieve certain goals. Teaching materials have prerequisites before being used by the general public. These prerequisites are valid, practical and effective. One type of teaching material that supports chemistry learning is dictates.

According to Rochmad (2012) argues that a development result (product) is said to be valid if the product is based on adequate theory (content validity) and all components of learning products are consistently related (construct validity). Validity is a measure that shows the validity of a product. The results of the validity test show that in general it can be said that the teaching materials are valid for use.

According to (Sukardi, 2011), these components include ease of use, efficiency of learning time, and benefits of teaching materials. There are two practicalities used, namely the practicality test according to the education staff and the practicality test according to the students. The practicality test of teaching staff is used to determine the opinions and assessments of educators on the implementation and ease of use of the teaching materials. The practicality test of students used a questionnaire that was arranged according to the components that had been determined according to the use of teaching materials then the results of the questionnaire were analyzed.

Meanwhile, according to Popham (2003) effectiveness is a learning process that should be viewed from the relationship of certain educators who teach certain groups of students in certain situations in order to achieve certain learning objectives. According to Rochmad (2012), the most important aspect of effectiveness is knowing the level or degree of product application. Effectiveness can be measured by the learning outcomes of students in the form of a pretest and posttest.

In this research, a printed teaching material will be developed in the form of a process image-based chemical dictates (D-GP). Dictates have several definitions, namely according to Maria Cholifah (2010), dictates are learning materials that are arranged based on a curriculum and syllabus which consists of chapters and contains detailed explanations, references used, has a certain standard number of pages and is usually prepared or developed as a book. Meanwhile, according to Totok Djuroto in Aguswuryanto (2010), dictates are textbooks that belong to a group of scientific essays, only they are arranged not based on research results but subject matter or subjects from a science. So based on some of the above definitions, it can be concluded that dictates are one of the types of teaching materials prepared by educators based on a curriculum and syllabus which consists of detailed explanation material, a collection of questions and references that aim to help students understand and master competencies. learning.

Research Method:-

This research is a research and development. According to Sugiyono (2019) the research and development method or R & D (Research and Development) is a method used to produce products and test the validity, practicality and effectiveness of the product.

The method used in this study is educational research and development, namely development research in the field of education. In this study, one type of printed learning media was developed in the form of a textbook with a process image (D-GP) of the colligative nature of the solution for high school students.

Research Result:-

The initial stage carried out in this study was conducting interviews with 20 chemistry educators in Jember district, as many as 75% stated that teachers in the chemistry learning process had not provided facilities to understand the concept of learning. While the interviews of 35 students found that students had never or were not used to learning concepts / materials using process images. This causes their curiosity to grow

Table 1:- The results of the recapitulation of the validation of the colligative properties of the solution with Process Pictures (D-GP)

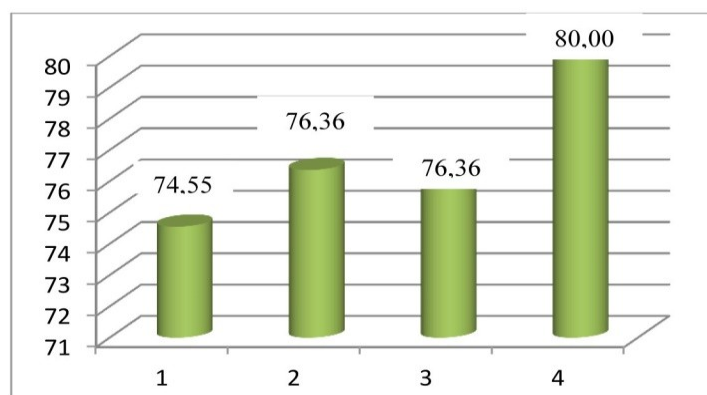
No	Aspects of the Assessment	Score				Mean Interval	Criteria
		Validator 1	Validator 2	Validator 3	Validator 4		
A.	content eligibility	3,5	3.71	3,86	3,85	4,97	very valid
B.	graphic feasibility	3,5	3.88	3.6	4	3.74	valid
C.	language eligibility	3,3	3,92	3,75	4	4.74	very valid
D.	serving feasibility	3,6	3,2	4	4	3,7	valid
	RERATA	3,475	3.678	3,802	3,96	4,29	very valid

The preliminary stage (field observation) is used as an analysis in the preparation of Drat 1 (chemical dictates based on process images). Then the results of the practitioners' validation became a guideline in drafting II (chemical dictates based on process drawings). The next stage is conducting trial 1 on 10 students. Trial I (draft II) aims to determine legibility and check whether the colligative nature of the solution with a process image (D-GP) can be read, worked on, and completed according to the provided planning and time allocation, as well as to find out weaknesses / shortcomings. The first trial was also carried out to obtain suggestions / input from students. Suggestions or input from students were collected through student response questionnaires and interviews. Table 2 Results of the student response questionnaire recapitulation in trial I

Response Criteria	Drop in Vapor Pressure (ΔP)	Boiling Point Increase (ΔT_b)	Freezing Point Drop (ΔT_f)	Osmosis Pressure (π)
Very Good	1	1	1	1
Good	3	5	3	3
Preety Good	6	4	6	6
Not Good	-	-	-	-
Not Good	-	-	-	-

The revised results from the first trial were taken into consideration for drafting III. Draft III was prepared to analyze the practicality and effectiveness of process image-based chemical dictates. Practicality is the practice of implementing D-GP in the field. Meanwhile, the effectiveness analysis can be measured by the results of the pretest posttest.

The following image is a diagram of the implementation with D-GP



- 1 = drop in vapor pressure
 2 = boiling point increase
 3 = freezing point drop
 4 = osmotic pressure

Improved understanding of concepts based on pretest and posttest scores, as well as analysis through normalized gain (normalized gain). N-gain is used to analyze the assessment before and after learning (diadaptasi dari Hake, 2002).

$$(g) = \frac{\text{gain aktual}}{\text{gain maksimal}} = \frac{\text{Skor posttest} - \text{skor pretest}}{\text{skor maksimal} - \text{skor pretest}}$$

Table 3:- Criteria for Scoring the Effectiveness of Chemical Dictates with Process Images (D-GP) with N-gain Achievement Level Criteria.

No	Interval Rerata N-gain	Kriteria
1	$0,70 < (g) \leq 1,00$	Tinggi
2	$0,30 < (g) \leq 0,70$	Sedang
3	$0,00 < (g) \leq 0,30$	Rendah

The results of the test for understanding the concept of the colligative nature of the solution are one of the determinants of the dictates with pictures of effective processes in learning. The effective colligative properties of the solution with a process image (D-GP) are known based on the increased understanding of the concept of the colligative properties of the solution as measured by the pretest value, and analyzed through normalized gain. The N-gain index with the criteria "medium" to "high" and classical learning completeness are indicators of effectiveness. Classical mastery of learning is achieved when 85% of students meet the predetermined minimum completeness value minimum completeness criteria. The results of the pretest and posttest in the second trial can be seen in Table 3, while the mean pretest and posttest values are in Figure 4.7. Based on the results of the pretest and posttest, it was found that the N-gain value was 0.76 which was in the medium criteria. The results of the pretest and posttest in the second trial can be seen in Table 3, while the mean pretest and posttest values are in Figure 3. Based on the results of the pretest and posttest, the N-gain value is 0.76 which is in the "medium" criteria.

Table 3:- Recapitulation of Pretest and Posttest Values in Trial II.

No	Uraian	Pretest	Posttest
1.	Average	16,45	80,22
2.	The highest score	30,00	100,00
3.	Lowest value	5,00	50,00
4.	The number of student with a value $\geq$ KKM	0	30
5.	Number of student with a value $<$ KKM	35	5
6.	Classical completeness	0	85,71

Based on table 3, there was an increase in students' conceptual understanding after learning using the colligative nature of the solution with a process image (D-GP). The increase in the mean value of the pretest-posttest was 38.29 with an N-gain of 0.58 in the "medium" category, indicating that the colligative nature of the solution with the process image (D-GP) that has been developed is effective for use in learning in senior high school. This is reinforced by classical completeness analysis which reaches a rate of 85.29%. The results of this study indicate that the colligative nature of the solution with a process image (D-GP) that has been developed can facilitate learner-centered learning (SCL) according to the philosophy of constructivism and supports the findings of Hickey, et al. (2001).

Conclusions:-

The conclusion based on the results of research, data processing analysis, and research discussion, is that the process image-based dictates are suitable for use in the learning process based on validation, practicality and effectiveness of a teaching product. In addition, the use of process image-based Diklat is also able to increase motivation and learning outcomes of students. Suggestions for further development research on the use of the colligative properties textbook solution with process images (D-GP) in other schools with a larger number of subjects and a longer time, so that it will have implications for different results from the findings of this study.

References:-

1. Aguswuryanto, 2010, <http://aguswuryanto.wordpress.com/2010/09/02/handout/> (diakses pada tanggal 12 januari 2017)
2. Cholifah, M. 2010, http://maria_cholifah.blogspot.com/pengertian-handoutmodul-buku-dan.html (Diakses 27 05 13)
3. Dick, W., Carey, L., dan Carey, J.O. (2009). *The Systematic Design of Instruction*. New Jersey: Pearson.
4. Hake, R.R. 2002. Relationship of Individual Student Normalized Learning Gains in Mechanics with Gender, High-School Physics, and Pretest Score on Mathematics Spatial Visualization. Submitted to the Physics Education Research Conference; Boise, Idaho; August 2002.
5. Indrawati. 2005. *Direct Learning Model*. Tiered Education and Training textbook. Bandung: Ministry of National Education, Directorate General of Primary and Secondary Education
6. Nieveen, N. 1999. *Prototyping to Reach Product Quality*. Dalam Jan van den Akker, Robert Maribe Branch, Kent Gustafson, Nienke Nieveen, Tjeerd Plomp (Eds). Design Approaches and Tool in Education and Training (hlm.125-135)
7. Popham, W. James. 2003. *Systematic Teaching Techniques (Translation)*. Jakarta: Rineka cipta

8. Rochmad. 2012. *Learning Device Development Model Design*. *Jurnal Kreano*. 3 (1): 59-72
9. Sugiyono. 2019. *Quantitative Research Methods, Qualitative and R & D*. Bandung: *Alfabeta*
10. Sukardi. 2011. *Competency Education Research Methodology and Practice*. Jakarta: PT Bumi Aksara.
11. Sutarto. 2003. *"Study of the Implementation of Science Education Policies for Senior High School Physics in Indonesia"*. Disertasi. Jakarta: Universitas Pendidikan Indonesia.