

The Using of Poster Research Result in the Science Field to Improve Students Understanding About the Heavy Metal Pollution in the Environment

(Study of the Correlation between the Degree of Acceptance of Information, Perceptual Experience, Knowledge of the Students' Understanding of Heavy Metal Contamination and Its Impact)

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Abstract: *Has done research the correlation between the level of acceptance of information, perception, knowledge of the students' understanding of heavy metal pollution through the use of media poster science research results, in Junior High School. Research conducted in junior Labschool Foundation Trustees Jakarta State University with the results as follows: 1) there is a positive correlation between the level of acceptance of heavy metal pollution information with students' understanding of heavy metal pollution on land, air and water. 2) there is a positive relationship between the perception of heavy metal pollution in darts, water and air to the students' understanding of heavy metal pollution on land, air and water 3) there is a positive relationship between knowledge of heavy metal pollution to the understanding of heavy metal pollution on land, water and air , 4) there is a positive relationship along with the level of acceptance of information, perception and knowledge of students about environmental fallow land metal pollution of water and air to the students' understanding of heavy metal pollution in the environment.*

Keywords: Poster, heavy metals, perception, understanding

1. Introduction

Understanding of the environmental conditions experienced contamination for junior high school students and is equivalent, in general still requires special attention and education among the general public. It is visible and reflected the amount of information received by the students in general through various media, experience and lack of knowledge of students in receiving information about environmental pollution by various causes. The learning process that occurs in the formal educational environment with reference to a well-planned curriculum, sometimes much less able to accommodate what information is needed by learners. This is due to many factors that make the learning process requires a lot of breakthroughs to be able to lead learners are able to have the ability and the growing perception in accordance with the demands of the times.

In the case of environmental pollution is still very minimal formal information contained in the discussion of the curriculum. While the current conditions are necessary socialization smart considering the health aspect of life is a primary requirement in determining the sustainability of the achievement of educational goals. Here are some examples of the effect of environmental pollution cases in the aspects of health / life:

In cases of heavy metal pollution Mercury (Hg) in the waters Southwestern Kyushu Minamata, Japan, cases of heavy metal pollution Cadmium (Cd) on the river Jintsu Toyama, Japan, cases of heavy metal pollution Chromium (Cr) on the island of Hokkaido Japan, cases of heavy metal pollution Cobalt (Co) in the city Ohama Nebraska and the United

States. Allegations of heavy metal pollution of the environment in Buyat Bay by PT. Newmont Minahasa Minahasa Raya, it becomes a very valuable lesson that must be recognized and to remind us how important nurturing environment. Environmental pollution is very detrimental to humans, either directly or indirectly. A statement that the activities of Industry and Technology can improve the quality of human life, this statement is true, but a negative impact if these activities cause severe pollution to the environment.

The most important thing is to maintain the quality of the environment; Humans want to acquire and improve quality of life and enjoyment of life and should be involved in efforts to overcome the impact of environmental pollution. Reduced natural carrying capacity will result in reduced quality of life, so that the natural carrying capacity must be maintained in order to remain able to provide value to human life. Industry and Technology advancement that do not pay attention to the balance of the environment can cause various effects of air pollution, water and land that has passed the quality standard threshold is a major cause of declining quality of human life.

In line with the objective of education is that it can lead to the formation of a dynamic individual behavior and be able to avoid the adverse factors in life, then in the process of education must always anticipate a lot of things that allow the distortion of the purpose of education itself. Limitations on material, time and other things, so in the learning process for students required roles other supporting components must fulfill in order to achieve optimal educational outcomes.

Studies from several studies are needed to be able to accelerate the increase in the perception of students who ultimately capable of producing human character and responsibility. Such human formation needs to consider the study of the psychological side, human beings underwent development/change in line with the factors that affect, these factors are internal factors and external factors. Both will make man has an image that is portrayed psychologically. The formation of human character that is influenced by external factors such as the presence of information that can be accepted by the individual. While internal factors will make human perception and knowledge. These factors will help shape human attitudes and behavior that is based on a prior understanding of the early stages. Associated with the human environment in which it is located, then this component will make humans can enjoy and achieve the goal of his life in meeting their needs.

The development of human thought pattern is determined by the influence of internal and external development of the individual concerned. Effect of Internal determined the level of development of psychic and physical individuals, while the external influence is the influence of the environment around the individual, in this discussion is devoted to external influences which is information heavy metal pollution in the environment, as part of which will determine the perceptions, knowledge, with a good understanding have the attitude and behavior of the individual concerned. Information heavy metal pollution in the environment is a subsystem of a communication system that is clearly outlined in several theories about communication. Information heavy metal pollution in the environment are key elements implicitly inherent in the concept of individual development planned or naturally.

Success in conveying information about heavy metal pollution in the environment is determined by the nature and quality of information received and this in turn is determined by the nature and quality of the relationship between the person when they are in touch with friends, family, and other people they know well, namely the ones that they feel safe. They need not worry how they relate to such persons. They can speak honestly and openly, and make jokes serious things.

So information heavy metal pollution in the environment at the level of the individual, the mass media, posters results of the study, the researchers have a function as a conduit of knowledge, social usefulness, avoiding the monotony of life and knowing one's position in society. In the case that such a mass media, posters science research is a source of strength, control devices, and innovation in a society that is useful as a substitute for the power of other resources. The mass media, posters results of scientific research can provide information about objects, environments and opinions learners. For learners and citizens, such information may establish, maintain or upgrade the image, so that eventually formed the impression based on the reality presented by the mass media, posters science research results. Then this impression would influence the attitudes and behavior.

State of the environment in this case is information heavy metal pollution in the environment which contains about concepts, environmental components need to be understood by individuals (students) in order to participate in order to protect and empower the environment in accordance with the state of human desire. Environmental information is an essential part of the communication contained in social life. This is caused by the presence of the man himself cannot be separated with the environment, both abiotic and biotic environment either. Reception level information of heavy metal pollution in the environment contains the concepts of environmental conditions to be able to be understood by students and the public, about the role and function of each component contained in the environment itself. The dynamic was greatly influenced by the quantity and quality of the communication system that occur in schools and communities concerned.

Perception is defined as the process of getting to know or identify something or object observed by the senses, perception comes from the word "perception" means the process which resulted in the identification of objects in the thinking of the dynamics starting from observation, as well as through the information included in the communication system that has been done by individual, for example, the perception of the line, so if a case which indicates the existence of a line, it will be examined properly when individuals can produce positive effects of an observed object. Perception is the process of giving meaning to the environment.

Perception as an active process of integration and the setting information received by the senses. Perception is also defined as the interpretation of information received by the sensory system. That is the perception of the individual obtained through the stages systematically with awareness and cognitive ability to make dynamic changes. The dynamics determined based on the individual's perception of functional factors and structural factors. Based on functional factors that determine an individual's perception can be described as follows: functional factor derived from the needs, experiences and mass and other things, including what we call personal factors.

So perception occurs spontaneously, directly and holistic. Spontaneity occurs because the will and the potential that exists always exploring (exploration) in the environment and it always involves the assessment of each object in the environment. In this case the perception of heavy metal pollution in the environment in question is the individual's perception of heavy metal pollution of the environment, especially regarding the space around it. While understanding that space, including the perception of distance is close, wide-narrow, loose-packed, uncomfortable-uncomfortable and other factors. In connection with this the necessary understanding of the indicators of personal space, privacy, territoriality, crowding and density, mental maps, as well as stress. From the above description the perception of heavy metal pollution can be explained as the product of a process of understanding and becomes meaningful when the stimulus (information) that is perceived as a knowledge memorable. So the relative nature of perception depends on personal and situational factors.

Perceptions of heavy metal pollution in the environment also have a structure as has been described in the previous section where people receive the stimulus in the form of relationships, if the relationship stimulus (stimulus) is not complete, it will be complete so obvious. Perception becomes important because it is a continuation of knowledge. Perceptions are formed through a process that is selective, because it was preceded by seeing something intact and interconnected with other things. By Sears cites two basic assumptions formation of perception, namely: (1) the process of forming an impression that is both mechanical and (2) the process was under the domination of feeling and not by the mind.

Perceptions of heavy metal pollution in the environment in question is the perception that is created is the result of a stimulus (information) on heavy metal pollution in the environment globally. Thus further the knowledge of heavy metal pollution in the environment.

Knowledge is everything that is known, henceforth known object into something meaningful for the individual concerned. Bloom incorporate domain knowledge in cognitive and has nine (9) aspect of understanding, namely; facts, rules, criteria, relationships between objects, methodology, classification, principle of generalization, theory and structure. Knowledge can be acquired through learning means that people can acquire a variety of skills, skills, and attitudes and behavior, for people learning to play an important role, particularly in furthering knowledge and culture to future generations. Another phrase describes the knowledge and culture passed down to future generations through education. Thus what is seen, heard by every member of society is not free from the influence of culture and the influence on attitudes and behavior. With the above description shows the knowledge acquired through formal or non-formal education programs. Formally the knowledge acquired through learning or the learning outcomes, by Bloom (1966), these results are part of the learning process in the cognitive, the aspect consists of (1) knowledge, (2) understanding, (3) application, (4) Analysis, (5) Synthesis, (6) Evaluation. From the description states that the cognitive aspects of the individual that learning involves not only knowledge, nor understanding, and the ability to analyze and ultimately in the life of the individual will be able to make a dynamic change.

Knowledge is the result of scientific activity (mind) that combines basic sensations. Further, he said, that knowledge is the result of a complex process where the object outside stimulate the senses that lead to changes in the internal organs. Humans seek knowledge in the hopes that earlier knowledge can be useful for him to help solve the life problems that it faces. Bloom claimed knowledge including cognitive psychology. Furthermore Bloom classifies knowledge into: (1) knowledge of the specific things that consists of knowledge of terms and knowledge of particular facts, (2) knowledge of ways and means to do anything special consists of knowledge of conventions, knowledge of trends, knowledge classifications and categories, knowledge methodology, (3) knowledge of the general and abstract, consist of knowledge abstraction and generalization principle, knowledge of the theory and structure. Another

opinion divides the area of knowledge into knowledge that is: (1) knowledge of perception is a knowledge acquired by man by way of making direct contact with nature through the means of the senses, (2) a priori knowledge is knowledge acquired by man without making contact with nature or basic knowledge without experience but is based on purely human reasoning, (3) moral knowledge is knowledge that is based on the provisions of the moral, (4) knowledge retention (memory) is a very important part in the process of reasoning, (5) knowledge of the induction is the knowledge obtained by observation, this observation with the help of statistics it can be concluded that the material scattered earlier can be understood in one sense intact. In this respect it is described that the information will increase the potential for perceptions continue increasing knowledge of heavy metal pollution in the environment and in the next step will determine the understanding that the substance of the information obtained on heavy metal pollution in the environment. Understanding Heavy metal pollution in the environment is knowledge induction that is an individual's ability to understand or comprehend well and full of observations, analysis and implementation or the ability of individuals, including the ability to grasp the meaning of the meaning of the object being studied, so as to show the contents of the subject of an information/observations known. Phase understanding of heavy metal pollution in the environment is the result of individual/student can give an explanation or give a more detailed description of the object with its own language of observation and analysis. This will increase along with the knowledge possessed by the individuals concerned.

2. Research methods

This research includes survey research, because the data obtained by measuring the things that are real and abstract notions of the survey conducted in Junior High School Labschool Pembina Foundation of State University of Jakarta. Target population throughout junior high school students and junior high school student population is affordable Labschool Jakarta. The sample is done by means of multi-stages sampling by producing as many as 250 student respondents. Selection of survey methods, adapted to the purpose of research is to know the relationship between several variables. Instruments made to measure 1) The level of acceptance of student information on heavy metal pollution in the environment. 2) The perception of students about heavy metal pollution in the environment. 3) Knowledge of students about heavy metal pollution in the environment and 4) understanding of students about heavy metal pollution in the environment.

Before use questionnaires beforehand conducted trials to determine the validity and reliability of the instrument. Further data analysis was done descriptively and differential. Descriptive analysis carried out in the form of mean, standard deviation, and frequency, whereas the inferential analysis was done by using regression and correlation analysis.

Beginning with posters against pollution and other heavy metals from the results of scientific research in the school

long before research is conducted. The survey was conducted only on a part of the population that there is or was a sample survey and sample survey is carried out only one time or one-shot method, which is directly used to determine the relationship between the variables in the study.

3. Results and Discussion

Description of the research data is intended to provide a general overview of the deployment / distribution of data in the form of symptoms of concentration and size frequency distribution. Based on the number of variables and reference to the research data, the decryption of data grouped into four groups. The first group is the description of the data on the level of acceptance of heavy metal pollution environmental information (X_1). The second group contains a description of the data on the perception of heavy metal pollution of the environment (X_2) The third group (X_3) is a data description knowledge of heavy metal pollution of the environment. The fourth group description data regarding environmental understanding of heavy metal pollution (Y). Description of this data will include the value of the average (mean), the middle value (median), the most frequent (mode) and standard deviation (standard deviation) as well as frequency distribution and histogram chart.

Data were collected from (respondent) junior high school students from grade 7 to grade 9 which is the respondents of this study were 250 students consisting of random from class 7 to class 9. Data collection receipts research instruments developed by writer/researcher in the form of guidelines written/questionnaire must be completed by the respondent. The following data decryption briefly on the results of research conducted Labschool Rawamangun First Middle School in East Jakarta.

1. The rate of receipt of information of heavy metal pollution in the environment (X_1)

Scores are expected theoretically to support the success of the study of the variables X_1 Level Admission Information pollution of environment is the range of 41 to 205 turns research results show that the range of scores for the variable rate of Acceptance of Environmental Information is between 29 Up to 136 With the average of mean of 81.34, the highest frequency (mode) of 81.18, a median of 78.83 and standard deviation of 16.85. Standard deviation obtained showed a relatively high value, it indicates there is participation varies greatly/heterogeneous.

The results indicate that as many as 91 respondents (36.4%) are at the bottom of the average score, while the number of respondents who are at average scores totaled 84 respondents (33.6%) and above the average score amounted to 75 respondents (30%) as shown in the chart below.

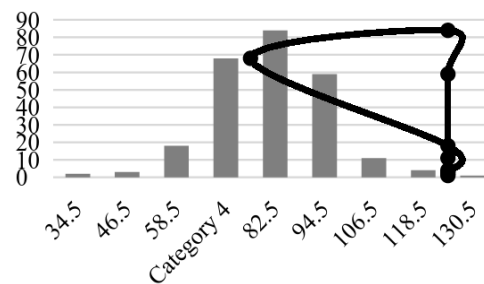


Figure 1: Histogram Score acceptance level of heavy metal pollution environmental information (X_1)

2. The perception of heavy metal pollution of the environment (X_2)

Scores are theoretically expected to support the success of the study of the variables perception of heavy metal pollution. Environment (X_2) is the range of 56 to 210 turns research results show that the range of scores for the variable perception of heavy metal pollution in the environment (X_2) is between 102 to 182 with an average price (mean) amounted to 142.28, the highest frequency (mode) amounted to 139.73, the median of 140.28, and a standard deviation of 18.56. Standard deviation obtained showed a relatively high value, it indicates there is a perception that highly variable/heterogeneous. From these results it appears that as many as 76 respondents (30.4%) are at the bottom of the average score, while the number of respondents who are in the average score amounted to 77 respondents (30.8%) and above the average score totaled 97 respondents (38.8%) based on the data listed in the table Perception of environmental heavy metal pollution (X_2), it can be graphed histogram as follows.

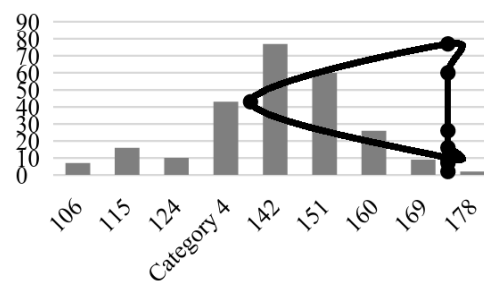


Figure 2: Histogram Scores perception of heavy metal pollution of the environment (X_2)

3. Knowledge of heavy metal pollution of the environment (X_3)

Scores are theoretically expected to support the success of research of heavy metal pollution Knowledge variable environment (X_3) is the range of 0 to 28, apparently the result of research shows that the range of scores for the variable heavy metal pollution environmental knowledge (X_3) is between 7 to 24 with a mean The average (mean) of 15.02, the highest frequency (mode) of 16.56, a median of 15.76, and a standard deviation of 10.12.

Standard deviation obtained showed a relatively high value, it indicates there is participation varies greatly/heterogeneous. From these results it appears that as many as 104 respondents (41.6%) are at the bottom of the average score, while the number of respondents who are at

average scores are 56 respondents (22.4%) and above the average score of 90 respondents (36%) based on the data listed in the table of heavy metal pollution environmental knowledge (X3), it can be graphed histogram as follows.

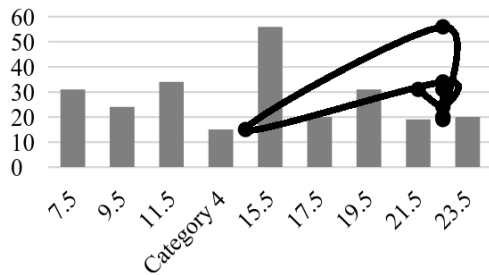


Figure 3: Histogram Score Knowledge of heavy metal pollution of the environment (X₃)

4. Understanding of environmental heavy metal pollution
 Scores are expected theoretically to support the success of the study of variable understanding of heavy metal pollution in the environment (Y) is the range of 54 to 204 turns research results show that the range of scores for the variable understanding of heavy metal pollution in the environment (Y) is between 84 to 155 with the average (mean) of 133.23, the highest frequency (mode) amounted to 120.30 at 118.01 median, and standard deviation of 246.68, standard deviation obtained showed a relatively high value, it indicates there is participation varies greatly/heterogeneous. From these results it appears that as many as 206 respondents (82.4%) are at the bottom of the average score, while the number of respondents who are at average scores totaled 27 respondents (10.8%) and above the average score totaled 17 respondents (6.8%) based on the data listed in the table. Can be graphed as follows:

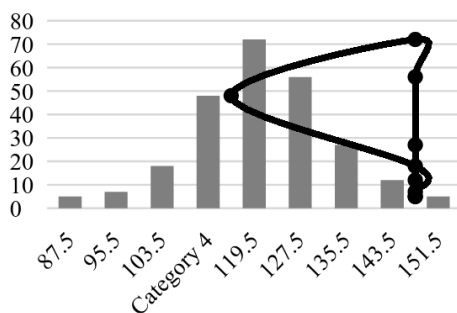


Figure 4: Histogram Score understanding of heavy metal pollution in the environment (Y)

4. Testing Requirements Analysis

To meet these conditions, it must first be tested for normality of distribution using Lilifors test, while for the homogeneity test using Bartlett test it carried out before testing the hypothesis.

1) Test Normality

Normality test error estimation is performed to determine whether the error estimated that the study did not diverge on the characteristics of the data are normally distributed. Testing was conducted on an error on the estimated

regression of Y on X_{1,2,3}, using the technical Liliefors. Testing criteria when F (z_i) - S (z_i), the largest symbolized by L₀ smaller than L_{table} the real level $\alpha = 0.05$, the estimated error of Y on X₁ normal distribution, and vice-versa.

Regression testing Y on X₁ produces L_{table} L₀ at 0.0499 while the real level $\alpha = 0.05$ value by 0.0591. Turns L_{count} < L_{table}. It can be concluded that the estimated error of Y on X₁ normal distribution. Regression testing Y on X₂ produces count L₀ price of 0,0530sedangkan L_{table} the real level $\alpha = 0.05$ value by 0.0591. Turns L_{count} < L_{table}. It can be concluded that the estimated error of Y on X₂ normal distribution. Regression testing Y on X₃ generate count L₀ price of 0.0546 while L_{table} the real level $\alpha = 0.05$ value by 0.0591. Turns L_{count} < L_{table}. It can be concluded that the estimated error of Y on X₁ normal distribution.

2) Test Homogeneity

Homogeneity test used is a test Barlett manually. In the table below presents a summary of the results of the calculation of homogeneity test using Bartlett test. The homogeneity of variance test results of the regression of Y on X₁, X₂ and Y over Y on X₃

No.	Independent variable	Dependent variabe	χ^2_{count}	χ^2_{table}	Conclusion
1.	X ₁	Y	78,63	79,10	Homogen
2.	X ₂	Y	49,29	67,50	Homogen
3.	X ₃	Y	16,28	27,60	Homogen

Homogeneity calculation results showed a pair of data each independent variable X and dependent variable Y variance homogeneous, because χ^2_{count} value is smaller than the χ^2_{table} for each degree of freedom (df) with $\alpha < 0.05$. Results from the testing requirements analysis showed that the sample of the population is taken with random data were normally distributed, and has a variance homogeneity as well as a pair of data independent variable (X) independent of one another, it has been stated that the requirements for the testing of hypotheses have been met then it could followed by the use of inferential statistics for the analysis of correlation and regression.

5. Hypothesis Testing

In this study proposed four hypotheses and the fourth hypothesis will be tested sequentially using inferential statistics as well as using correlation and regression analysis techniques. From the fourth this hypothesis will be tested by a step test as follows: (a). Search for singular and plural regression equation between variable Y with X, (b). Testing significance and linearity regression equation obtained, (c). Calculating the correlation coefficient singular and plural between X and Y and continued testing the meaningfulness, (d). Calculate the partial correlation coefficient between variable Y with each X as a control to test the meaningfulness and (e). Calculate the contribution of each variable X to Y. For each test will be described in detail as the following:

1. The relationship between the reception level information with an understanding of heavy metal pollution heavy metal pollution in the environment.

In this research, first proposed hypothesis is that there is a positive relationship between the reception level information of heavy metal pollution in the environment with an understanding of heavy metal pollution in other terms than environment can be said if the reception level information about the environment of heavy metal pollution the more it will result in an increase to the understanding of heavy metal pollution of the environment from the calculation and regression analysis of data pairs between the reception level information of heavy metal pollution in the environment (X₁) with an understanding of heavy metal pollution in the environment (Y) of the obtained regression equation like this $Y = 117.09 + 0,044X_1$, to determine whether the regression pair can be used to draw conclusions or not, the test of significance (F_{test}) and a linearity test. Analysis of variance (ANOVA), significance test and linearity can be seen in the table below.

source of variance	Dk	JK	RJK	F _{-count}	F _{-table} (0,05)
Total	250	3683515	-		
regression (a)	1	3638261	-		
regression (b/a)	1	733,76	733,76		
Residual	248	44520,24	179,41	4,10**	3,89
Tuna Cocok	48				
Error	200				

ANOVA), Significance and linearity for regression $Y = 117.09 + 0,044X_1$

Based on the test results and the significance of linearity obtained results for the regression equation $Y = 117.09 + 0,044X_1$ very significant and linear. Thus for this regression equation can be concluded that any increase in the independent variables X₁ score one unit will cause an increase of the value of the dependent variable Y amounted to 0,044 units in the same direction with a constant amount of 117.09.

The strength of the relationship between the reception level information of heavy metal pollution in the environment with an understanding of heavy metal pollution in the environment indicated by r_{y.1} correlation coefficient of 0.403. Correlation coefficient test can be seen in the table below.

Table: Correlation Coefficient Significance Tests between the level of acceptance of heavy metal pollution environmental information (X₁) with an understanding of heavy metal pollution of the environment (Y)

Degree of Freedom	Correlation Coefficient	T _{count}	t _{table}
248	0,403	8,19**	1,645

Description: **: highly significant coefficient on the real level $\alpha = 0.05$ t_{count} = 8.19 and t_{table} = 1.645

Based on the results of correlation coefficient significance test mentioned above, it can be concluded that the correlation coefficients between the reception level information of heavy metal pollution in the environment (X₁) with an understanding of heavy metal pollution in the environment (Y) is very significant with a correlation coefficient of r_{y.1} = 0.403. Of the correlation coefficient can be obtained coefficient of determination r²_{y.1} = 0.16 or 16%. It shows that 16% of the proportion of variation understanding of heavy metal pollution in the environment 1 can be explained by the level of acceptance of heavy metal pollution environmental information.

Results of calculation of partial correlation coefficients that describe the relationship X₁ with Y variable perception of heavy metal pollution of the environment (X₂) and knowledge of heavy metal pollution Environment (X₃) controlled either singly or simultaneously listed in the following table:

Table: Test Significance Partial Correlation Coefficient between (X₁) with (Y) with the control (X₂) and (X₃)

Table: Test Significance Partial Correlation Coefficient between (X ₁) with (Y) with the control (X ₂) and (X ₃)	Table: Test Significance Partial Correlation Coefficient between (X ₁) with (Y) with the control (X ₂) and (X ₃)	Table: Test Significance Partial Correlation Coefficient between (X ₁) with (Y) with the control (X ₂) and (X ₃)
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Description: **: highly significant coefficient on the real level $\alpha = 0.05$, with T_{count} > T_{table} = 1.66

Based on the significance test is concluded that (1) by controlling the perception of heavy metal pollution Environment (X₂), still there is a positive relationship between the level of Admission Information heavy metal pollution Environment (X₁) with the understanding of heavy metal pollution Environment (Y), (2) by controlling the knowledge of heavy metal pollution environment (X₃), still

there is a positive relationship between the level of Admission Information heavy metal pollution environment (X₁) with the understanding of heavy metal pollution environment (Y), (3) by controlling the perception of heavy metal pollution and environmental knowledge of heavy metal pollution of the environment there is a positive relationship between the level of acceptance of heavy metal

pollution environmental information (X_1) with heavy metal pollution understanding environment (Y).

2. The relationship between the perception of heavy metal pollution of the environment (X_2) with the understanding of environmental heavy metal pollution (Y)

In this study, the proposed hypothesis is that there is a positive relationship between the perception of heavy metal pollution of the environment (X_2) with the understanding of environmental heavy metal pollution (Y). And this would apply otherwise if the perception of heavy metal pollution of the environment a little then made to the understanding of heavy metal pollution of the environment will also be low. From the calculation and regression analysis of the data pairs between the perception of heavy metal pollution of the environment X_2 with an understanding of heavy metal pollution of the environment Y then obtained the following regression equation $Y = 88.93 + 0,223X_2$ regression to determine whether the pair can be used to draw conclusions or not it is performed significance test (Test-F) and a linearity test with the following summary:

source of variance	df	JK	RJK	F _{count}	F _{table} (0,05)
Total	250	3683515	-		
regression (a)	1	3638261	-		
regression (b/a)	1	2209,94	2209,94		
residual	248	43044,06	173,56	12,73**	3,89
Tuna Cocok	48				
error	200				

(ANOVA), Significance and linearity for regression $Y = 88.93 + 0,223X_2$

Based on the test results and the significance of linearity obtained results for the regression equation $Y = 88.93 + 0,223X_2$ very significant and linear. Thus for this regression equation can be concluded that any increase in the independent variable X_2 scores one unit will cause an increase of the value of the dependent variable Y direction of 0.223 which is equal to the amount of 88.93 constant visual connection between the perception of heavy metal pollution in the environment with pollution Understanding heavy metal environment.

Understanding the strength of the relationship between the heavy metal pollution of the environment indicated by $r_{y,2}$ correlation coefficient of 0.23. Correlation coefficient test can be seen in the table below:

Table: Significance Tests Correlation Coefficient between the perception of heavy metal pollution Environment (X_2) with heavy metal pollution Understanding Environment (Y)

Degree of freedom	Correlation Coefficient	T _{count}	t _{table}
248	0,230	4,13**	1,645

Description: **: highly significant coefficient on the real level $\alpha = 0.05$ $t_{count} = 4.13$ and $t_{table} = 1.645$

Based on the results of correlation coefficient significance test mentioned above, it can be concluded that the coefficient of correlation between the perception of heavy

metal pollution Environment (X_2) with an understanding of heavy metal pollution of the environment (Y) is very significant with a correlation coefficient of $r_{y,2} = 0.23$. Of the correlation coefficient can be obtained coefficient of determination $r^2_{y,2} = 0.06$ or 6%. This showed that 6% the proportion of variation understanding of heavy metal pollution of the environment can be explained by the perception of heavy metal pollution of the environment.

Table: Test Significance Partial Correlation Coefficient between the perception of heavy metal pollution of the environment (X_2) with an understanding of heavy metal pollution of the environment (Y) with controls (X_1) and (X_3)

Partial Correlation Coefficient	t _{count}	t _{table}
$r_{y,2,1} = 0,090$	1,69*	1,66
$r_{y,2,3} = 0,140$	2,33*	1,66
$r_{y,2,13} = 0,081$	1,70*	1,66

Remarks: *: significant coefficient on the real level $\alpha = 0.05$
 $T_{count} > t_{table} = 1.66$

Based on the significance test is concluded that 1) to control the level of heavy metal pollution Admission Information Environment (X_1), still there is a positive relationship between the perception of heavy metal pollution of the environment (X_2) with the understanding of environmental heavy metal pollution (Y); 2) by controlling the X_3 , still there is a positive relationship between X_2 (Y); 3) by controlling the X_1 and X_3 still there is a positive relationship between (X_2) and (Y).

3. The relationship between heavy metal pollution environmental knowledge (X_3) with an understanding of heavy metal pollution of the environment (Y)

In this study, the third hypothesis put forward is that there is a positive relationship between knowledge of heavy metal pollution with heavy metal pollution environmental understanding. From the calculation and regression analysis of data between a pair of heavy metal pollution environmental knowledge with an understanding X_3 environmental heavy metal pollution Y then obtained the following regression equation $Y = 70.64 + 3,32X_3$ regression to determine whether the pair can be used to draw conclusions or not it is performed significance test (Test-F) and the linearity test. Analysis of variance (ANOVA), significance test and linearity can be seen in the table below.

source variance	Degree of freedom	JK	RJK	F _{count}	F _{table} (0,05)
Total	250	3683515	-		
regression (a)	1	3638261	-		
regression (b/a)	1		2209,94		
residual	248		173,56	12,73**	3,89
Tuna Cocok	48				
Error	200				

(ANOVA), Significance and linearity for regression $Y = 70.64 + 3,32X_3$

Based on the test results and the significance of linearity obtained results for the regression equation $Y = 70.64 + 3,32X_3$ very significant and linear. Thus for this regression equation can be concluded that any increase in the independent variable X_3 scores one unit will cause an increase of the value of the dependent variable Y of 3.32

with the same direction with constant magnitude 70. The strength of the relationship between the level of heavy metal pollution Admission Information Understanding the environment with heavy metal pollution Environmental $r_{y,3}$ indicated by a correlation coefficient of 0.96. Correlation coefficient test can be seen in the table below:

Table: Coefficient Significance Tests Correlation between the level of knowledge of heavy metal pollution of the environment by heavy metal pollution Understanding Environment.

Degree of freedom	Coefficient correlation	T_{count}	t_{table}
248	0,96	75,5**	1,645

Description: **: highly significant coefficient on the real level $\alpha = 0.05$ at $t_{count} = 75.5$ and $t_{table} = 1.645$

Based on the results of correlation coefficient significance test mentioned above, it can be concluded that the coefficient of correlation between the knowledge of heavy metal pollution of the environment (X_3) with the understanding of environmental heavy metal pollution (Y) is very significant with a correlation coefficient of 0.96. Of the correlation coefficient can be obtained coefficient of determination $r^2_{y,1} = 0.92$ or 92%. This shows that 92% of the proportion of variation understanding of heavy metal pollution of the environment can be explained by the knowledge of heavy metal pollution of the environment.

Table: Knowledge Test Correlation Coefficient Significance of heavy metal pollution of the environment (X_3) with the understanding of environmental heavy metal pollution (Y) with controls (X_1) and (X_2)

Correlation Coefficient Partial	T_{caunt}	T_{table}
$r_{y,3,1} = 0,090$	1,69*	1,66
$r_{y,3,2} = 0,11$	1,74*	1,66
$r_{y,3,12} = 0,081$	1,68*	1,66

Remarks: *: significant coefficient on the real level $\alpha = 0.05$ with $T_{count} > t_{table} = 1.66$

Based on the significance test was concluded that: 1) the control (X_1), still there is a positive relationship between (X_3) (Y); (2) the control (X_2), still there is a positive relationship between (X_3) with (Y); 3) by controlling the X_1 and X_2 still there is a positive relationship between (X_3) with (Y).

4. The relationship between the level of acceptance of information, perception and knowledge of heavy metal pollution of the environment by understanding the environment of heavy metal pollution.

Based on the calculation of research data resulted in the form of the relationship between the variable rate of receipt of information of heavy metal pollution environment (X_1), the perception of heavy metal pollution environment (X_2), and knowledge of heavy metal pollution environment (X_3), with the understanding of heavy metal pollution environment (Y) multiple regression equation $Y = 55.63 + 0.42 + 0.12 X_2 X_1 - X_3 0.91$. To determine whether the regression equation can be used to draw conclusions, the analysis of variance significance test (Test-F). Analysis of variance (ANOVA) multiple regression equation significance test can be seen in the following table:

Table: ANOVA test Significant regression equation $X_1 = 55.63 + 0.42 + 0.12 X_2 - X_3 0.91$

source of variance	dk	JK	RJK	F_{-count}	$F_{-table} (0,05)$
Total	249	45253,88	-		
Regression	3	20012,11	20012,11		
residual	246	25241,77	102,61	195,03**	3,89

Description:

df = degrees of freedom

JK = sum of squares

RJK = average number of squares

** = Very significant multiple regression ($F_{-count} = 195.03$ and $F_{-table} 3.89$ at real level 0,05)

Based on the significance test mentioned above, it can be concluded that the multiple regression equation $Y = 55.63 + 0.42 + 0.12 X_2 X_1 - X_3$ very significant 0.91. Thus the multiple regression equation can be used to draw three independent variables explain together against the dependent variable, which can be interpreted that any change in score variable (X_1) by 1 unit will be followed by a rise in the score variable (Y) of 0.42 unit, every change in score (X_2) 1 unit will be followed by a rise in the score variable (Y) by 0.12 units, and any increase in scores (X_3) will be followed by a rise in the score variable (Y) of 0.91 units together in the same direction with constant intercept of 55.63.

Results of calculation of the variable (X_1), (X_2) and (X_3), simultaneously with (Y) obtained by the correlation coefficient plural $R_y. 123 = 0.21$. Multiple correlation coefficient significance test can be seen in the following table:

Table: (X_1), (X_2), (X_3) test with (Y)

Multiple correlation coefficient	F_{-count}	$F_{-table} (0,05)$	$F_{-table} (0,01)$
248	5,00**	3,65	3,88

Description: **: significant coefficient on the real level $\alpha = 0.05$ $F_{count} > F_{table} = 3,65$ on the real level of 0.05 and 3.88 on the real level of 0.01.

Based trials plural correlation coefficient significance of the above, it can be concluded that the correlation coefficient between the plural X_1, X_2 and X_3 with Y highly significant correlation coefficient plural of $R_y. 123 = 0.38$ correlation coefficient obtained from the coefficient of determination $R^2_y. 123 = 0.38$ or 38%. It shows an understanding of heavy metal pollution of the environment can be described jointly by the three independent variables.

6. Discussion of Results

Based on the analysis of correlation and simple and multiple regression and partial correlation, then all statistical hypothesis proposed in this study are all accepted at the real level $\alpha = 0.05$. This means that there is a positive correlation significantly between (1) The receipt of information of heavy metal pollution environment with an understanding of heavy metal pollution environment, (2) Perceptions of heavy metal pollution environment with understanding of heavy metal pollution the environment and (3) Knowledge of

heavy metal pollution environment with the understanding of heavy metal pollution of the environment and (4) Acceptance rate Information, Perceptions and Knowledge of heavy metal pollution of the environment by understanding the environment of heavy metal pollution.

Some interpretation and in-depth discussion in this study can be expressed as follows:

First, the results of the first hypothesis testing we concluded that there is a positive relationship between the rate of acceptance of heavy metal pollution environmental information to the understanding of heavy metal pollution in the environment. The correlation coefficient that describes the relationship of these two variables for $r_{Y.1} = 0.403$ with determination coefficient $r^2_{Y.1} = 0.16$. This figure can be interpreted that without control of other variables, the proportion of variance (X_1) which is a source of answers to the what, why and how to provide information about the understanding of heavy metal pollution the environment is good and right and avoid the polluted environment of heavy metals to provide information understanding of environmental pollution.

Although variable (X_2) and (X_3) in a state of constant (ceteris paribus) turned out to be a correlation between the variables X_1 (Y) still showed a significant level with $r_{Y.1.23} = 0.10$.

Through regression analysis, the study showed regression equation variable (X_1) with (Y) of $Y = 117.09 + 0,044X_1$, the regression is significant at the 0.05 significance level. The regression equation can be interpreted, that any change in the level of acceptance scores of heavy metal pollution environmental information by 1 unit it will be followed by a rise 0,044 units in the same direction with a constant of 117.09.

Second, the results of testing the second hypothesis can be concluded that there is a positive relationship between the perception of heavy metal pollution of the environment (X_2) with an understanding of heavy metal pollution Environment (Y) The results of the study Perceptions of heavy metal pollution of the environment is nothing new. This variable study provide new information in order to increase awareness for environmental understanding of heavy metal pollution and the environment in general.

The magnitude of the correlation coefficient that describes both variables $r_{Y.2} = 0, 23$, and coefficient of determination $r^2_{Y.2} = 0.06$, this figure can be interpreted that without control of two other independent variables, Although variable (X_1) and knowledge of heavy metal pollution in of an environmental (X_3) in a state of constant (ceteris paribus) turned out to be a correlation between the variables X_2 (Y) still showed a significant level with $r_{Y.2.13} = 0.081$.

Through regression analysis, the variables were obtained regression equation (X_2) .with (Y) of $Y = 88.93 + 0.22 X_2$, the regression is significant at the 0.05 significance level. The regression equation can be interpreted, that any change in perception scores of heavy metal pollution of the

environment by 1 unit will be followed with an increase of 0.22 units in the same direction with a constant of 88.93.

Third, the third hypothesis testing results can be concluded that there is a positive relationship between (X_3) with (Y). The magnitude of the correlation coefficient that describes both variables $r_{Y.3} = 0, 96$ and the coefficient of determination $r^2_{Y.2} = 0.92$, this figure can be interpreted that without control of two other independent variables While variable (X_1) and (X_2) in a state constant (ceteris paribus) turned out to be a correlation between the variables knowledge of heavy metal pollution of the environment by understanding the environment of heavy metal pollution (Y) still showed a significant level with $r_{Y.3.12} = 0.081$.

Through regression analysis, the variables were obtained regression equation of heavy metal pollution environmental knowledge (X_3) with an understanding of heavy metal pollution in the environment (Y) of $Y = 70.64 + 3.32 X_2$, the regression is significant at the 0.05 level of significance , The regression equation can be interpreted, that any change in knowledge score of heavy metal environmental pollution by 1 unit will be followed with an increase of 3.32 units in the same direction with a constant of 70.64.

Fourth, based on the test results the fourth hypothesis can be concluded that there is a positive relationship between (X_1), (X_2) and (X_3) with (Y). It means that the higher the students who have high levels of acceptance of information heavy metal pollution environment, the perception of heavy metal pollution the environment and knowledge of heavy metal pollution environment will impact the greater the understanding of heavy metal pollution the environment and will certainly lead also concern in environmental management is better for students and individual.

$R_{Y.123}$ plural correlation coefficient = 0.64 with a coefficient of determination of $R^2_{Y.123} = 0.38$ indicates the proportion of variation can be explained by the three independent variables in this study to the understanding of heavy metal pollution of the environment by 38%. While the other 62% by other variables not examined.

Furthermore, based on simple correlation coefficient and the coefficient of each variable can be sorted in the following order: (1) Knowledge of environmental heavy metal pollution $r_{Y.3} = 0, 96$ and the coefficient of determination $r^2_{Y.3} = 0.92$, (2) Level acceptance of heavy metal pollution environmental information $r_{Y.1} = 0.403$ and the coefficient of determination $r^2_{Y.1} = 0.16$ (3) Perceptions of students about heavy metal pollution environmental $r_{Y.2} = 0.21$ and coefficient of determination $r^2_{Y.2} = 0.044$. While based on partial coefficient that controls each variable can be sorted in the following order: (1) Level of Acceptance of heavy metal pollution environmental information $r_{Y.1.2} = 0.172$ and $r_{Y.1.3} = 0.15$ $r_{Y.1.23} = 0.10$ (2) knowledge of heavy metal pollution environmental $r_{Y.3.1} = 0.09$ and $r_{Y.3.2} = 0.099$, $r_{Y.3.12} = 0.081$ (3) Perception of environmental heavy metal pollution and $r_{Y.2.3} r_{Y.2.1} = 0.09 = 0.14$ $r_{Y.2.13} = 0.08$.

Seeing the results of this study are still many other factors that have an influence on the understanding of the

relationship or berate metal pollution environment, it is still numerous and extensive other factors should be developed and researched further.

7. Limitations Research

The whole procedure and process of this research since the early done carefully, however, not all the ideas and thoughts of researchers can be contained within the framework of this study, so research conducted still have limitations. Limitations were primarily related to the following matters:

First, the instrument used in this study has not been a standard instrument for research on heavy metal pollution Environmental Understanding, though, researchers are trying to the maximum to eliminate the deficiencies caused by lack of codification of the instruments used.

Secondly, the measurement variables can not cover all of the indicators that should be. This is due to the limited knowledge of qualified researchers in the qualitative data. In addition to measuring the perception of the variable heavy metal pollution Environmental concerns only those aspects of media availability posters limited involvement of emotional and mental as well as physical responsibilities, which is supposed to be concerning aspects of perception overall.

Third, the possibility of bias caused by the influence of researchers who have the same capabilities that are not in the digging of data from respondents.

Fourth, in this study the way the data retrieval can also be limited where the methods used are not fully understood by the questionnaire respondents making less maximal respondents in completing questionnaires given as data retrieval tool. However, the researchers relied on the seriousness and honesty of respondents in providing answers to the questionnaire, conducted this study has its limitations, however, with great hope that this research can be used as information material for teaching in the selection methodology, the use of media as well as learning support.

8. Conclusions and Recommendations

8.1. Conclusion

Discussion of the results of this study can be summarized:

First, there is a positive relationship between the level of acceptance of heavy metal pollution environmental information to the understanding of heavy metal pollution of the environment.

Secondly, there is a positive relationship between students' perception of heavy metal pollution of the environment with an understanding of heavy metal pollution of the environment.

Third, there is a positive relationship between students' knowledge of heavy metal pollution of the environment with

an understanding of heavy metal pollution of the environment.

Fourth, there is a positive relationship between the level of acceptance together information, perceptions and knowledge of heavy metal pollution of the environment with an understanding of heavy metal pollution of the environment.

8.2. Recommendations

Results of this study have implications are quite clear that the need for the selection of methods and selection of media for proper formal learning processes and intelligent, so that outcomes for individual students can establish a conversation with the mastery of materials science and character. There are several things that need to be done in order to make the learning activities of students in the school environment to accelerate the development of the students psychologically and qualified skills that encourage students to take advantage of the motivation and creativity in achieving educational goals and to be aware of the cita2 to achieve.

For the implementing agencies of education, need to be sustained to facilitate the development of the school by proactively entered into a collaboration with higher education institutions and research institutes in order to utilize the results of research as a source of student learning.

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