

THE MISCONCEPTION OF INDEX AND LOGARITHME - THE CASE OF PRE-DIPLOMA STUDENTS IN UITM KAMPUS KELANTAN SEMESTER SEPTEMBER 2019 - JANUARY 2020

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Article history

Received date : 2-6-2020

Revised date : 3-6-2020

Accepted date : 4-10-2020

Published date : 9-10-2020

To cite this document:

Wan Bakar, W. N. (2020). The Misconception of Index and Logarithme - The Case of Pre-Diploma Students in Uitm Kampus Kelantan Semester September 2019 - January 2020. *Jurnal Penyelidikan Sains Sosial (JOSSR)*, 3(8), 22 - 27.

Abstract: *Index and logarithms is a subtopic in the subject of essential mathematics, MAT 037 that was taught in University Technology Mara Campus Kelantan. About 120 students taken this subject and they encountered a problem when studying this part of subject in essential mathematics. This research aims to reveal the misconception of index and logarithms among pre diploma students September 2019 To January 2020 At UiTM Campus Kelantan. A set of diagnostic tests on the topic of index and logarithms developed by the experts were given to 120 pre diploma students semester September 2019 to January 2020.the results revealed that the students have problem in perception where they perfected wrongly when it comes to logarithms.*

Keywords: *Index and Logarithms, Essential Mathematics, Misconception*

Introduction

Index and logarithm is a basic mathematical concept that is very important in advanced mathematics (Weber, 2002).It is being taught in the subject of additional mathematics at school level and it is taught again in the subject of Essential Mathematics Mat 037 in University Technology Mara for Pre Diploma Level.

Logarithms is an abstract topic (Chua, 2003). The conceptual understanding of the relationship between the structure of addition and multiplication is the basic understanding of logarithms (Berezovaki, 2004).

Literature Review

Few researchers had been done on index and logarithms. A study initiated by Chua (2005) stated that in a research on secondary school at Singapore found that the student can do the basic part of simple calculation on logarithms but unable to do the solution at higher level.90% of the students unable to change from logarithms to index. 63% of the students are unable to

find the value when given the question of $\log t^{\frac{1}{p}}$. Only 59% of the students knew a correct way in expressing logarithms to index. 18% of the students able to answer question on the value of p and q to fulfill the inequality of $p < \log 500 < q$ the instruction not to use the calculator to get the answer to $\log 500$ is an obstacle for the students to get the answer.

Chai Peng (2006) had done his study on the reliability and validity of self-independent study on algebra among form 4 students. Algebra is the basic part or the fundamental knowledge of exponential and logarithms. He said that students understanding level on the topic of logarithms is very weak.

Ban Liang and Eric (2011) examined the understanding and misconception when working with logarithms using especially designed test instrument administered to 81 students in 2 Singaporean schools. Questions were classified due to their cognitive level of thinking. The students appear to be based on overgeneralization of algebraic rule whereas the real conceptual understanding of algebra is the study of relationship among quantities (Usiskin, 1988). Researches which had been done proved that the capability of the students when on higher cognitive level of exponential and logarithms.

A systematic literature review on the topic of index and logarithms had been done by a group of researches (Siah Hoon, Parmjit Singh, And Khadijah Ayop, 2006). A total of 200 students participated in the study. A test consists of 20 questions were used. The students working and common mistakes in logarithms were investigated. The result shows that the students can work out the routine calculation in logarithms, but they are less capable to solve problems requiring higher level of cognitive thinking. The test measurement named tosu1 that is the tests of students understanding of logarithm consists of 20 items, 9 knowledge or computation test items, 9 knowledge or computation test items, 7 understanding test items and 4 application test items were used. 200 form five students were participated on this study. The result showed that there were few common mistakes done by students in logarithm. They failed to remember the definition of logarithms, wrong application on laws of logarithms confusedness of prior knowledge did not know appropriate base to use while changing bases of logarithms.

From the research too researchers found that the students did not show important steps in working with logarithm. They used wrong algebraic concept or algebraic operation in working with logarithms. The study also revealed the misconception of the first law of logarithm, the second law of logarithm and the third law of logarithm.

Chua (2003) stated that it is vital to use good strategy at the beginning of the lesson for example

$$\log_a N = X$$

The educator should explain about the single numerical value to turn to be the

The exponent where N is a logarithm of number. A is base of a logarithm, x is the log of number corresponding base. From the research, the researcher found that the students did not show important steps in working with logarithm. They too used wrong algebraic concept or algebraic

operation in working with logarithms. The study too revealed about the misconception of first law of logarithm second law of logarithm and the third law of logarithm.

A study done by Nor Aziah Ghani (of university Utara Malaysia Sintok on the understanding level of matriculation students of University Utara Malaysia on the topic of logarithme138 matriculation students of first semester 2011/2012 university Utara Malaysia involved in the study. The study was divided into two phases.at the first phase the objective of the study was about the understanding and the student's level and the students' performance in the topic logarithms. Next at the second phase an interview protocol was developed by a schema done by the researcher and the expert. They found that students have made four major errors that were the generalization of logarithmic law, misconception of the index concept and do not follow the instructions.

Anzar, Muhammad Darwis and Asdar from the Universitas of Makassar Indonesia have started a research to identify the misconception of logarithmic concept among the students of SMA Class X . They are using quantitative technique and the respondents are selected by purposive sampling. A diagnostic test was given. The results showed that there was misconception in the understanding of different varieties of logarithms.

Methodology

The goal of sustainable tourism is to reduce poverty, respect socio-cultural authenticity A diagnostic test on the topic of index and logarithms which consists of 5 questions on index and 5 questions on logarithms were given to 120 students of pre diploma semester September 2019 to January 2020.The first three questions were the combination of the first and the sixth rule of index topics. The fourth and fifth questions were on the index equation. The sixth to eight h questions were the combination of first and second rule of logarithmic equations. The ninth and tenth questions were on the logarithmic equations.

INDEX

First rule:

$$a^m \times a^n = a^{m+n}$$

Second rule:

$$\frac{a^m}{a^n} = a^{m-n}$$

Third rule:

$$(a^m)^n = a^{mn}$$

Fourth rule:

$$(ab)^m = a^m \times b^m$$

Fifth rule:

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

Sixth rule:

$$a^{-n} = \frac{1}{a^n}$$

LOGARITHME

First rule:

$$\text{Log } a + \text{log } b = \text{log } ab$$

Second rule:

$$\text{Log } a - \text{log } b = \text{log } \frac{a}{b}$$

Third rule:

$$\text{Log } x^n = n \text{ log } x$$

Special case 1:

$$\text{Log } a = 1$$

Special case 2:

$$\text{Log } 1 = 0$$

Data Analysis

Table 1: Types of Concept and its Misconceptions

No. Of Question	Question	Concept	Misconception	Frequency
Q1	$\frac{64^{\frac{1}{2}} \times 8^{\frac{1}{3}}}{25^{\frac{1}{2}}}$	Combination of first and sixth rule	No misconception happened	0%
Q2	$\frac{4^{\frac{1}{2}} \times 64^{\frac{1}{3}}}{16^{\frac{3}{4}}}$	Combination of first and sixth rule	No misconception happened	0%
Q3	$\frac{4^{\frac{1}{2}} \times 64^{\frac{1}{3}}}{16^{\frac{3}{4}}}$	Combination of first and sixth rule	No misconception happened	0%
Q4 and Q5	$9^{2x-2} = 81$	Index equations	No misconception happened	0%
Q6 – Q8	a) $2 \text{ log } 8 + \text{log } 5 - \text{log } 2$ b) $2 \text{ log } 3 - \text{log } 2 + \text{log } 5$	Combination of first and second rule of logarithmic equations	There is a problem on BODMAS. The students have their own perceptions.	65%

	c) $2 \log 10 - 2 \log 5 + \log 25$			
Q9	$\log(x + 2) + \log(x - 1) = 1$	Logarithmic equations	The students misinterpret the variable.	65%

It can be analyzed that the students do understand the topic of index and index equation very well. Unfortunately, when it comes to the topic of logarithm, students became confused and the arrangement of BODMAS is not in the appropriate order. Most of the students confused and they have their own interpretation. When they answered the logarithmic equations problem their mistakes happened while interpreting the meaning of the variable.

Conclusion

It can be concluded that the students have problem in perception where they percept wrongly when it comes to logarithms. this scenario happened in logarithmic equation where they misinterpreted the variable. It can be concluded that the process of teaching and learning should be in detail and following the students' phase in order to create an understanding on the topic of logarithms. The educator should emphasize on the organized teaching system to fit in the concept to the student's cognitive schema.

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