

# APPLICATION OF VEDIC MATHEMATICS ON MULTIPLICATION AND DIVISION PROBLEMS FOR STUDENTS OF PGSD STUDY PROGRAM

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<b>Riwayat Artikel</b> Artikel diterima: Artikel direvisi: Artikel disetujui:	
<b>Kata Kunci:</b> <i>Matematika Veda</i> <i>Open-Ended</i> <i>Perkalian dan Pembagian</i>	<b>Abstrak</b> <p>Matematika Veda adalah nama yang digunakan secara khusus untuk membahas solusi/rumus lain yang lebih cepat dari solusi umum dalam menyelesaikan permasalahan matematika. Istilah matematika Veda didasarkan pada sistem matematika yang bersumber dari kitab suci Atharvaveda. Pada penelitian ini, sutra (rumus) dalam matematika Veda yang diaplikasikan adalah Nikhilam sutra bagian dari 16 sutra yang ada pada matematika Veda. Nikhilam sutra dimanfaatkan dalam menyelesaikan operasi perkalian dan pembagian. Subjek penelitian ini adalah mahasiswa pada Program Studi Pendidikan Guru Sekolah Dasar (PGSD) Sekolah Tinggi Agama Hindu Dharma Sentana (STAHDs) Sulawesi Tengah. Metode penelitian yang digunakan adalah metode penelitian Open-Ended yang dikembangkan oleh Takhasi yang bertujuan untuk mengetahui bagaimana penerapan matematika veda dan peningkatan hasil belajar serta respon mahasiswa terhadap metode tersebut. Dari penelitian diperoleh hasil bahwa terjadi peningkatan rata-rata nilai dari 68 menjadi 80 setelah diterapkan Nikhilam sutra dalam pembelajaran materi Perkalian dan Pembagian. Selain itu, dari angket yang diberikan 90% mahasiswa sangat setuju dengan penggunaan matematika Veda dalam pembelajaran.</p>
<b>Keyword:</b> <i>Vedic mathematics</i> <i>Open-Ended</i> <i>Multiplication and Division</i>	<b>Abstract</b> <p>Vedic mathematics is uniquely named for formulae to solve problems faster than general solutions. Term of Vedic mathematics based on old Hindu scripture namely Atharvaveda. In this research, sutra (formulae) that applied is the Nikhilam sutra part from 16 sutras on Vedic mathematics. Nikhil sutra is formulae to solve problems about multiplication and division. Research subject on this research is a student of the PGSD Study Program from STAHDs Central Sulawesi. The method that used in this research is Open-Ended who developed by Takahashi, which aims</p>

	to know how are applying Vedic mathematics, how far the result of student achievement and also what are student responses after got new formulae came from Vedic mathematics. The result of this research is mean of student achievement increase from 68 to 80. On the other hand, data from the questionnaire shows that 90% of the students very agree to apply Vedic mathematics to learning.
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## Introduction

The Ancient Indian Vedic Mathematics comprises of sixteen Sutras and thirteen corollaries. The four elementary, namely addition, subtraction, multiplication, and division, have been extensively dealt with in the sixteen sutras of Vedic Mathematics (Sengupta, Sultana, & Chaudhuri, 2013). Vedic mathematics also mention as Vedic math introduces by Swami Bharati Krishna Tirthaji Maharaj. He was born in March 1884 to highly learned and pious parents. His father, Sri P Narasimha Shastri was in service as a Tahsildar at Tinnivelly (Madras Presidency) and later retired as a Deputy Collector (Kandasamy & Smarandache, 2006).

Multiplication and division is an important fundamental function in arithmetic operations (Kumar & V.Charishma, 2012). Multiplication and division are needed not for the student who learns mathematics at primary, secondary, or university but also in any branch of science. For example, It can be used Computation- Intensive Arithmetic Functions(CIAF) currently implemented in many Digital Signal Processing (DSP) applications such as convolution, Fast Fourier Transform(FFT), filtering and in microprocessors in it's arithmetic and logic unit.

Vedic Mathematics allows the student to find a solution about multiplication and division faster than a general solution. Sutra on Vedic mathematics helps to solve mathematical problems very much faster than the traditional methods of solving problems (Shukla & Singh, 2017). Application of Nikhilam sutra especially on multiplication and division, improves the computational skills of the learners in a wide area of problems, ensuring both speed and accuracy, strictly based on rational and logical reasoning. So mathematics should be shown as a way of thinking, an art or form of beauty, and as a human achievement, and it can be achieved easily through Vedic mathematics as it not only helps in generating interest and concept clarity in students but also stabilizing the knowledge for the longer duration too. Besides that, there are some advantages to introduce Vedic mathematics for student i.e. 1) Mathematics, derived from the Veda, provides one line, mental and superfast methods along with quick cross-checking systems. 2) Vedic Mathematics converts a tedious subject into a playful and blissful

one which students learn with smiles. 3) Vedic Mathematics offers a new and entirely different approach to the study of Mathematics based on pattern recognition. It allows for the constant expression of a student's creativity and is found to be easier to learn. 4) In this system, for any problem, there is always one general technique applicable to all cases and also a number of special pattern problems. The element of choice and flexibility at each stage keeps the mind lively and alert to develop clarity of thought and intuition, and thereby a holistic development of the human brain automatically takes place. 5) Vedic Mathematics with its special features, has the inbuilt potential to solve the psychological problem of Mathematics-anxiety.

To apply Vedic mathematics in learning, the researcher used the Open-ended approach to the student. The open-ended approach came from Japan during 1971 and 1976 (Inprasitha, 2006). The open-ended approach is allowing the student to find the solution in more than one way (Wu, 1994). The open-ended approach also makes the student more creative and active in learning. The openness means that the process is open, the end product is open, and the ways to develop are open (Dahlan, 2004).

Based on the reason above, to spread out Vedic Mathematics in Indonesia, the researcher interested to apply Nikhila sutra as part of Vedic Mathematics. The researcher introduces it to a student who going to be a teacher in the future. The research conducted on PGSD Study Program from STAHDS Central Sulawesi. It aims to know how are applying mathematics Vedic, how far the result of student achievement and also what are student responses after got new formulae came from Vedic mathematics.

## Method

Takashi (Muhsinin, 2013) established that to apply the Open-Ended approach on learning used the figure below:

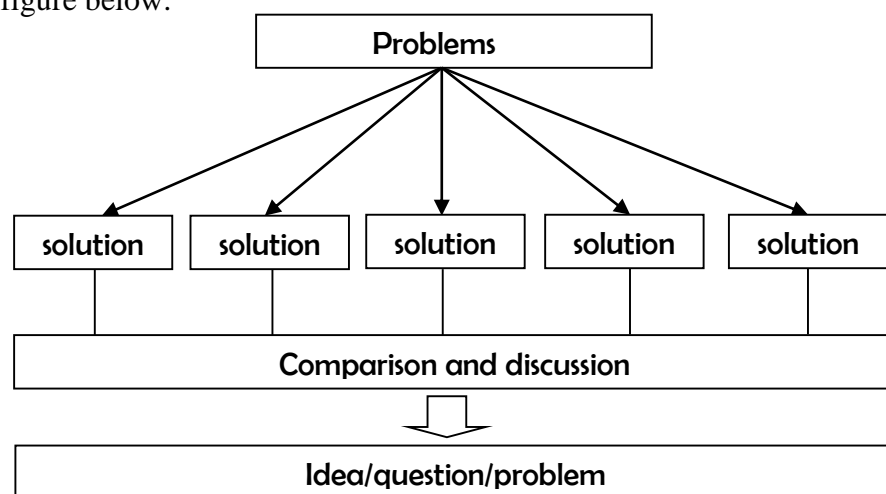


Figure 1. Design of Open-Ended Approach

The table above shows that the problem creates many solutions. On the open-ended approach, the solution can be a different process to find the result. After there are some solutions, the student can make comparisons and discussions to find out the true answer. On the other hand, the student also is able to conclude the fastest solution to find the correct answer. From the comparison and discussion, it will be a new trigger for the student to ask, why the formula can be. From the answer, create a new question, so the knowledge of students widely develop.

## **Result**

The subject of this research is the student PGSD Study Program from STAHDS Central Sulawesi, with nine students on basic mathematics courses. Firstly, the researcher gave a pretest to know initially knowledge of the student. Then, the researcher has been doing an experiment by using Vedic mathematics. After that, Posttest gave the student to know the final result. The comparison table will be shown below.

**Table 1. Pretest and Posttest score**

<b>Nu.</b>	<b>Name</b>	<b>Pretest Score</b>	<b>Posttest Score</b>
1	A	70	80
2	B	70	70
3	C	70	80
4	D	50	100
5	E	80	80
6	F	60	70
7	G	70	80
8	H	70	90
9	I	70	70
Average		68	80

Besides that, to support data from Table 1, the student worksheet figure will be shown as a sample.

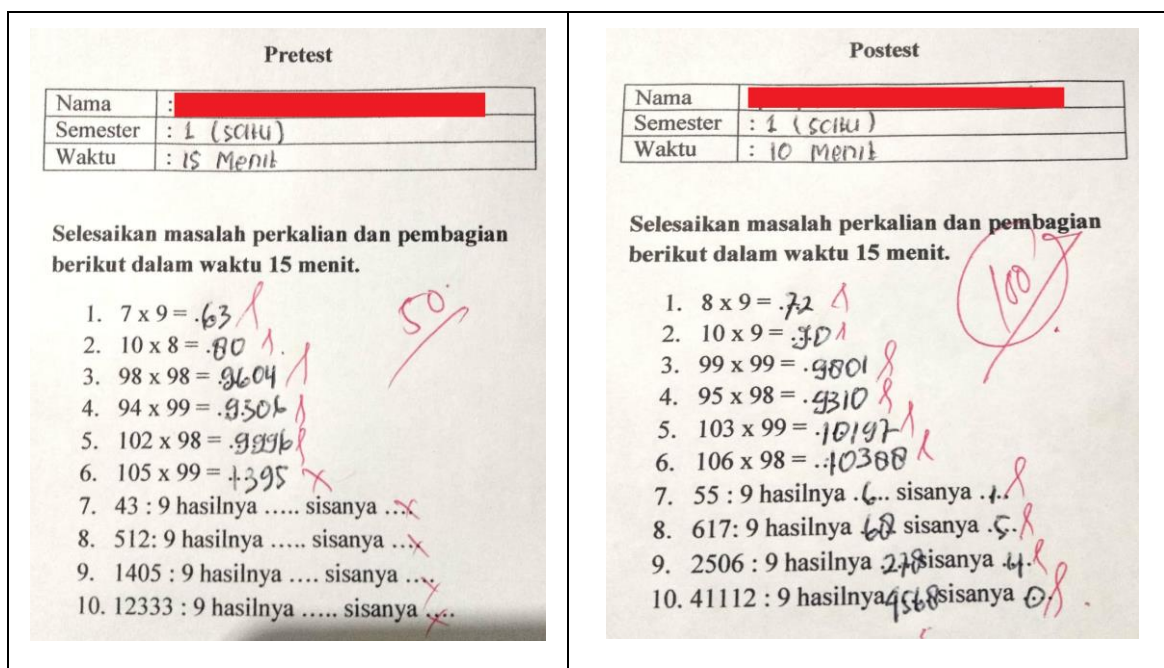


Figure 2. Pretest and Posttest sample

The significant student achievement showed in Figure 2, by using Vedic mathematics, the student able to find the solution faster than traditional ways. Nikhalam sutra as a formula to solve multiplication and division problems is easy to understand. So, student marks after having knowledge about Vedic mathematics increased dramatically. Addition, data from the questionnaire also shows that 90% of the students are very agreeing to apply Vedic mathematics to learning. They also agree that Vedic mathematics easy to understand.

## Discussion

In this study, the experiment group is all PGSD students who take a basic mathematics course in the first semester. Based on Table 1, the average score pretest compare with the posttest is 68 to 80. This score shows that Vedic mathematic effective to increase ability of students on multiplication and division. This finding is supported by many studies only on the multiplication operation (e.g., Sharma, 2014).

Nikhalam sutra as a formula to find out the result of multiplication and division has able to reduce using of time. It occurs caused by Vedic mathematic easy to use, faster to get the answer. Reducing time makes mathematics a tedious subject into a playful and blissful one which students learn with smiles. Easy to use, make students can actively participate in solving problems. The student also prefers to use nikhalam sutra than the general method of solve problems.

Based on figure 2, reveals that nikhalam sutra understandable, faster solution, more efficient, and more fun than conventional ways. The higher scores, less of time are needed for Indonesian student. Many examinations on Indonesia have limited by time. For example National Test (UN: Ujian Nasional), the student only is given 120 minutes to answer 40 multiple choice mathematics problems. The students are not allowed use a calculator. So Vedic mathematics is one of the strategies to face its problem in Indonesia.

## **Conclusion**

The result of the study reveals that learning multiplication and division Nikhalam sutra passed three steps; pretest, experiment, and posttest. After doing experiment through nikhalam sutra, student achievement increases from 68 to 80. Comparison student average score before and after the experiment also supported by student questionnaire. Data from the questionnaire shows that 90% of the students are very agreeing to apply Vedic mathematics on multiplication and division material.

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