

Impact of Vedic Mathematics in Education for Development of Sustainable Technologies

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ABSTRACT

It is a proven fact that Mathematics plays a major role in various fields. It is an important subjects of study and thereby an integral part of education. Unfortunately, a lot of students face problems with the subject. Some circumstances at a young age may lead to disliking of the subject throughout. Thus, it becomes essential to ensure that alternatives are designed to make sure that the students develop a liking towards the subject. Vedic Mathematics is the best solution for this. Vedic Mathematics is the name given to the ancient system of Indian Mathematics which was rediscovered from the Vedas between 1911 and 1918 by Sri Bharati Krishna Tirthaji. The most striking feature of this system is its coherence where a set of unrelated techniques is interrelated and unified into one. Interest in the Vedic system is growing in the field of education where the stakeholders are looking for innovative methodologies and have realised that the Vedic system is a primitive answer. Vedic Mathematics is being taught in schools from an elementary level. Brain Development has been observed to be better in students who practice Vedic Mathematics. Research is also being carried out in many areas including the effects of learning Vedic Mathematics on children, developing powerful applications of the Vedic Sutras in different fields etc. Our paper highlights the power of Vedic Mathematics and also provides a survey on the impact of Vedic Mathematics in Education. Further, we stress on the fact that Vedic Mathematics, if made an integral part of education from an elementary level, can help in enormous growth of technology. At the same time, performance of students becomes more efficient thereby becoming a pathway for creating Sustainable Technologies.

KEYWORDS

Vedic Maths; Sustainable Technologies; Brain Development; Impact on Education

INTRODUCTION

Vedic Mathematics is the name given to the ancient system of Indian Mathematics which was rediscovered from the Vedas between 1911 and 1918 by Sri Bharati Krishna Tirthaji. It is a field which teaches observation of patterns, making calculations faster etc. The underlying base for this is the set of sixteen ‘Sutras.’ These give techniques to perform calculations faster than the conventional ways, generally taught at schools.

The most outstanding feature of this system is its coherence. It makes the understanding of the whole mathematical system easier by interrelating and unifying various parts which are assumed to be unrelated. For example, simple cube roots are reversed to give one line cube

roots and general multiplication is reversed to allow one line division. This unifying quality makes the subject simple, easy and enjoyable. Using this system, huge and time consuming sums, or the so-called difficult sums can be solved in an easier way. The methods are direct and easy. In the field of education, it encourages innovation to a great extent.

USE OF VEDIC MATHEMATICS IN SCHOOLS

After gaining knowledge on Vedic Mathematics, various schools and curriculums have adopted it as a part of their syllabus. They realise the importance of the same in Education. Some schools of Madhya Pradesh and Uttar Pradesh have Vedic Mathematics taught during middle and high school. Organizations run by Hindu nationalist groups, including those outside India, have also included Vedic Math techniques in their curriculum. Apart from this, the Indian Certificate for Secondary Education(ICSE) also has Vedic Maths taught in classes 6 and 7 of their affiliation.

Further, it has been said that these techniques aren't just mathematical tricks but there is an underlying psychology as it describes personal approaches to problem-solving. As educational tools, the methods are useful because they invite students to deal with strategies and hence its use is slowly increasing in schools.

LITERATURE REVIEW

SV Mogre and DG Bhalke (2015) have proposed the implementation of high speed matrix multiplication on FPGA using "Urdhava Trigyaagbhyam" Sutra. This design shows the significant reduction in Area/Speed Ratio, increases the running frequency of the multiplier and also makes the system energy efficient.

Aditi Tadas and Dinesh Rotake (2015, pp.317-320) have given a comparative study of Nikhilam, Dhvajank and Paravartya Sutras in designing a 64 Bit Divider and have analyzed the impact of these three Sutras against the factors which decide the performance of the processor such as consumption of power, hardware complexities, space utilization and Speed. They have also proposed a new algorithm using Vedic principles, which is far more efficient and economical as compared to the three Sutras.

Kunal Jadhav, Aditya Vibhute et al., (2015) have suggested Vedic principles as a solution to increase the speed of the Arithmetic Logic Unit (ALU), which was designed by employing reversibility in the circuits, in order to reduce power dissipation at the cost of reduced speed. Thereby coming up with a power efficient and faster ALU.

Inspired by the working of human brain, Anshika, Yamuna et al., (2015) have designed a Vedic neuron, using "Urdhava Trigyaagbhyam" Sutra, which outperforms the standard neurons in terms of speed and energy efficiency. The use of Vedic neurons in Artificial Neural Networks is also presented in the paper.

Jubin Hazra (2012) has demonstrated the use of Vedic mathematics in the implementation of circular convolution circuit and has achieved around 74-97% improvement in terms of Power-Delay-Product (PDP) as compared with the conventional circuit.

Ramalatha , Dharani et al., (2009) have addressed the computational complexities in the cubing circuits by using “Anurupya” Vedic Sutra as a solution. The simulation results show that there is an enormous improvement in circuit performance with the use of Vedic principles.

Shantanu Oke, Suraj Lallu and Prathamesh Lad (2014) have made a comparative study in the designing of VLSI based Distinctive Divider. SRT division, ‘Newton Raphson’ method and ‘Dhwajam’ Sutra techniques are compared and analysed. The results clearly indicate that the Vedic principles are the easy solutions to complex divisions and also maximize the system performance.

Anuradha Savadi and Raju Yamanshetti (2016) reviewed papers on design of digital signal processors. It discusses about the different algorithms used for designing high speed DSP processors. After the comprehensive review of about thirteen papers, they concluded that the multiplier designed using “Urdhava Trigyaagbhyam” Sutra and binary dividers implemented using “Nikhilam navatascaramam Dasatah” and “Paravartya” sutra are superior in terms of speed, area, complexity as compared to the existing methods.

Himanshu Thapliyal and M.B Srinivas (2005) have addressed the major time consuming operations in Elliptic Curve Encryption- such as point addition and doubling- by using ancient Vedic mathematics and have come up with an efficient solution for the same.

A project by Anjana R, Abishna B et al., (2014) shows the implementation the Vedic multiplier using Kogge-Stone adder. Their simulation results validate that their design is the fastest multiplier and adder of the time.

In view of reducing the computation time in conventional Fourier Transforms -which finds enormous applications in the field of digital signal processing - the FFT algorithm was introduced. Anvesh Kumar , Ashish Raman et al., (2010) in their paper, have further reduced the hardware complexity in implementing FFT algorithm by adopting Vedic Mathematics, which resulted in significantly reducing the number of adders and multipliers.

Further exploiting the advantages of vedic mathematics, Panwit Tuwanuti and Noppagaw Thongbai (2014) have extended its use in multicore processors. It deals with the divide and conquer approach, in which long multiplier digits are split into sub-blocks, these sub-blocks are simultaneously multiplied in different cores using Vedic Sutras and the final result is obtained by the concatenation of all the product terms. This method rapidly computes multiplication of long numbers.

Emphasizing the need for data security in communication, M Senthil Kumar and S Rajalakshmi (2014) have highlighted the use of Vedic mathematics in designing an optimal architecture for accomplishing mix columns operation, which is an important step in the

Advanced Encryption Standards of Cryptography. Their design proves to be far more effective than the conventional architectures.

Diganta Sengupta, Mahamuda Sultana et al., (2012) have exhaustively compared the speed of conventional Non Restore type division algorithm with the Vedic division algorithm which uses “Urdhava Trigya bhyam” Sutra and “Nikhilam” Sutra, on the low end processors. Their results show that the conventional division takes 49.3 μ s to compute the division of a 15 digit dividend, while Vedic division does the same in 2.3 μ s thereby increasing the speed by multifold!

S Hemalatha and V Rajamani (2014) have demonstrated the use of Vedic mathematics in the design of Wireless sensor networks (WSN). The paper describes how the use of Vedic principles successfully produces highly economical and improved information security systems as compared with the traditional method.

Khuraijam Nelson Singh and H. Tarunkumar (2015) have reviewed the various multiplier designs in VLSI. From their survey it is clear that the Vedic multiplier outperforms several other multipliers such as array multiplier, Wallace multiplier, Bypassing Multiplier and Booth multiplier in several aspects.

A paper by Lavanya M and Kalaiselvi A, (2016) shows the use of Vedic principles in designing an Adaptive FIR filter which is used in RADAR for detecting weak RADAR signals.

IMPACT OF VEDIC MATHEMATICS ON HUMAN BRAIN

Human brain is a paired organ. It consists of two cerebral hemispheres connected by a bundle of cells – the corpus callosum. Each hemisphere has unique functional specialities and neural mechanisms for different activities are concentrated chiefly in one half of the brain. This fact makes the study of Brain Hemisphere Dominance a very important one. Brain dominance is the natural preference of one hemisphere of the brain over the other for processing information, perceiving data, reasoning etc.

We find that there are two variants in humans: Right brain dominated and Left brain dominated. Right brained people are more likely to be creative and expressive while Left brained people tend to be more analytical and logical. Neurologists have found that efficiency of doing a given task is better when the entire brain is used even for things that are typically associated with a certain area of the brain.

A research was conducted (Parvinder Singh, 2015) to test the brain dominance of students using the SOLAT (style of learning and thinking) tool considering a sample of around 600 students from Classes 11 and 12 from the Government and Non-Government Schools of Hoshiarpur, Jalandhar and Nawanshahar districts of Punjab. It was found that about 73% of

the students were right brain dominated, 15.7% were left brain dominated and 11.3% of the total students were whole brain dominated. Also, it was only about 40% efficient usage of this dominance which was observed. These figures emphasize the need for using teaching techniques that stimulate the whole brain and not just one of the hemispheres.

According to a special report by Summiya Yasmeen (2007), Vedic math methodologies not only improve mathematical proficiency, but also integrate the functions of the neocortex and limbic segments of the brain which stimulates the dormant or under-utilised learning skills of children. Also, it is scientifically proven that Vedic math techniques arouse both the cerebral hemispheres of the brain and sharpens the cognitive skills of the children. In addition, learning mathematics the Vedic way improves concentration, reasoning, listening ability, visualisation and analysing capabilities.

A SURVEY ON IMPACT OF VEDIC MATHS ON SCHOOL STUDENTS

As a part of the research on impact of Vedic Maths in education, a pilot study with fifty students of classes 6 and 7 from a private ICSE school in Bangalore was conducted by us. The students were initially given a set of 20 problems of multiplication and squaring to solve in a span of 35 minutes. It was observed that only 33 students were able to attempt all the problems in the given time out of which only 24 got the right answers for all questions. This number was below half the strength.

Following this, three sessions of about 45 minutes each, teaching them concepts of Vedic Mathematics was conducted with title for the sessions being, 'Maths with Smiles.' Various concepts taught included multiplication by series of 9's, series of 1's, multiplication using base 10, 100 sub multiple bases, squares of numbers ending with 5 etc.

After the sessions, a similar test was conducted with 20 problems. The students solved them within 16 minutes with over 90% right answers. The fastest accurate completion was done in 9 minutes. This huge difference between 35 and 9 minutes is a striking one, showing the power of Vedic Mathematics and its huge impact on Human Brain.

CONCLUSION

Mathematics is a subject which involves thinking. It is a common observation that students are generally able to solve problems in class whereas they find it hard to apply the concept and solve a similar problem or a problem with a slightly higher complexity. To add to this, Mathematics is not like the other subjects which has illustrations and pictures for concepts. It requires solving of problems. It is essential for one to have a good thinking ability to excel in the subject. This is where Vedic Mathematics comes into the picture.

It is a system whose concepts are easy to practice and remember. It also relates various concepts which increase the lucidity of the subject. It offers multiple methods to solve a problem and thus can be learnt easily by students. The technique appear like magic to students and this creates an interest in them. Two important skills are developed because of this, Thinking and Observation. This further adds to analytical skills of the student.

This creates a base for further thinking and innovation and has a huge impact on education. As we have discussed in the Literature Review section, there are a lot of innovations done with the help of Vedic Mathematics. Thus, if it is made an integral part of Education, there is no doubt that wonders will be created.

The effectiveness of Vedic Mathematics cannot be fully appreciated unless it is made an integral part of education. If done, it will play an important role in triggering students to come up with sustainable technologies by making use of Vedic Mathematics and its concepts ranging from building solutions to various unsolved problems to designing algorithms to solve complex problems in their education as well as profession.

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