Visually Challenged Students' Proficiency in the Use of Abacus

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Abstract

Abacus is a device, useful for visually challenged students as it presents mathematical operations in tactile form. Training in the use of abacus is a must at elementary level. Proficiency in the use of abacus is essential to visually challenged students, not only for learning higher level mathematics but also for their independent living. This study has been carried out with an objective to study elementary level visually challenged students' proficiency in the use of abacus. Findings of the study show that their level of proficiency is very low. Although students in the given sample are little aware of the history of the abacus very few of them know about basic operations like addition and subtraction. They were totally unaware of the functions like multiplication, division, decimal and fraction. It also shows that learning to use an abacus is a big challenge for them.

Introduction

The lack of ability to see imposes several difficulties in the learning process of visually challenged students. Visually impaired learners rely on sequential observations i.e. only part of an object can be seen or felt at a time. Presenting concepts in concrete form is the best way to teach them. Mathematics has always been considered a tough subject due to its abstract, speculative, cumulative and reflective nature. It is a creative science with its own specific language capable of nurturing the imagination and reasoning ability

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of learners. The difficulty of learning mathematics is often mentioned by highlighting its nature. But Mathematics occupies a central place in the curriculum as it has strong roots in every discipline. Not only in science, but mathematics also plays a very significant role in subjects like geography, history etc. Thus, every discipline uses vivid branches of mathematics to make the learner understand their concepts easily. This problem solving tendency of Mathematics imparts the learners' psychological support and philosophical attitude.

Students with visual impairment require appropriate devices for learning mathematics in order to compensate their deficiency of vision. Abacus is an important device in teaching basic mathematical calculations to the visually challenged. It provides concrete mathematical experiences to visually challenged students. It is a tactile as well as faster mathematical calculating device. It is a simple device with a frame and a rod horizontally attached to the frame and beads placed on the parallel rods. The horizontal rod divides the frame into two parts. It assists through performing calculations by sliding, representing various values, along a set of rods. Additionally, it plays an important role in solving the problem in a concrete manner. The standard abacus can be used to perform addition, subtraction, division and multiplication, decimal etc. One of the advantages of abacus is that learners can calculate simple mathematical problems rapidly and accurately. In addition, they acquire the ability to do mental calculations utilising the abacus image, which allows quick calculation without actually using the abacus. Abacus is a true assistant for an individual who wants to perform calculations quickly. It enhances understanding as well as mastery in certain mathematical concepts and enhances the effective learning of operations.

Need and Relevance of the Study

Learning mathematics is as important for visually impaired children as it is for students who can see. As mentioned, abacus is a calculative device by which visually impaired a students can learn basic mathematical concepts while other students learn the same things using paper. Several researches have shown the importance of the abacus in teaching of mathematics. Pui Yee

(1982) found "Abacus students are found to be superior in the accuracy of their memory and the number of digits they are able to memorise when compared with non– abacus learners of the same age. According to Stigler, Chalip, and Miller, (1986) "skills and conceptual knowledge of the numeration system...this device is useful for improving calculation skills as well as abstract concepts. Abacus Learning will improve numerical memory, spatial arrangement and progress in solving general mathematical problems taught in elementary school. Training in abacus will be helpful for visually impaired children to do basics calculation and computation. Proficiency in abacus creates a solid background to learn mathematics at secondary and higher level. Abacus should be introduced as early as possible in schools.

After extensive and intensive review of related study on this topic, it is found that not even a single study has been conducted in the recent past in local context to study the competency of visually challenged students in the use of abacus at elementary level. Hence, the need and relevance of this study is justified.

Statement of Problem

The problem of this study has been stated as, "Visually Challenged Students' (Elementary Level) Proficiency in the Use of Abacus."

Operational Definitions of Terms Used

Proficiency in Use of Abacus: It refers to knowledge of effective use of abacus in solving basic arithmetical problems using calculation and solving decimals and fractions.

Visually Impaired Student: It refers to both totally blind as well as low vision students.

Elementary Level: Those visually impaired students who are studying in classes 5 to 8.

General Objective: To study the competency level in the use of abacus among visually challenged students at Elementary Level.

Specific Objectives

1. To study the visually challenged students' general awareness about abacus.
2. To study proficiency in use of abacus to do fundamental arithmetic calculations i.e. addition, subtraction, multiplication and division.
3. To study proficiency in the use of abacus to solve decimals and fractions.
4. To study the challenges faced by visually challenged students in learning abacus.

Methodology

The descriptive survey method was used in the present study to know the proficiency of students with visual impairment in use of abacus.

Sample

The sample size of the present study was N = 36; which were obtained from blind students of two different districts of Lucknow city in Uttar Pradesh. Random purposive sampling technique has been used.

S. No.	*Name of the School/ Itinerant Camp*	*Locality*	*No. of Students*
1	Rajkiya Sparsh Balak Inter College	Lucknow	10
2	Rajkiya Sparsh Balika Inter College	Lucknow	12
3	Nav Jyoti Blind School	Mohanlal Ganj	14

The concise idea of the selected sample is as follows–

Tool Employed

A mixed type questionnaire was developed by the researchers to obtain complete information about awareness, proficiency and challenges encountered by students with visual impairment.

Interpretation and Discussion of Result

1. The study of the visually challenged students' general awareness about abacus.

The first objective of this study was to study the visually challenged students' general awareness about abacus. The data obtained in this respect has been reported with frequency (F) and percentage (%). The related results based on them have been given below in Table 1.

Table 1

Summary of item, frequency and percentage regarding visually challenged students' general awareness about abacus

S.No.	*Item*	*Positive attempt*	*%*	*Negative attempt*	*%*
1.	In which country was abacus used first?	10	28	26	72
2.	Who was the inventor of abacus?	00	0	36	100
3.	How many wires are there in abacus?	26	72	10	28
4.	How many beads are there on one wire in the lower half?	26	72	10	28
5.	What is the place value of one bead on a wire in the upper half?	10	28	26	72

Interpretation and Discussion

Table No.1 reveals that a majority of the students are aware of the parts of abacus and their functions. Twenty-six (72 per cent) students were aware of the number of wires and number of beads in one wire in the lower half whereas 10 (28 per cent) were unaware. Only 10 (28 per cent) out of 36 responded positively regarding place value of one bead in an upper wire whereas 26 (72 per cent) responded negatively. None of the 36 students was aware of the inventor of abacus and only 10 students (28%) knew the name of the country in which abacus was first used. They exhibited a huge ignorance of the knowledge related to history of abacus, which is quite disappointing.

2. Proficiency in the use of abacus

The second objective of this study was, 'to study the proficiency in use of abacus to do fundamental arithmetic calculation i.e. addition, subtraction, multiplication and division. The data obtained in this respect has been reported in Table 2.

Interpretation and Discussion

The above table reveals the proficiency of visually challenged students in four basic mathematical operations – addition, subtraction, multiplication and division. Proficiency in the use of abacus for doing basic operations is essential as these four basic computative operations form the basis of higher level computation. The finding of the study shows that average score in addition and subtraction is only 2.11 and 1.8 respectively. None of the students were able to do multiplication and division with an abacus. Conclusively, the status of proficiency in use of abacus is very dismal and needs urgent initiatives to improve it. Findings of this study

Table 2.

Findings Related to the Proficiency of Students in Performing Basic Operations-Addition, Subtraction, Multiplication and Division on Abacus

S. No.	*Operations*	*Total*	*Average Score*
1.	Addition	10	2.11
2.	Subtraction	10	1.8
3.	Multiplication	10	00
4.	Division	10	00

are corroborated by the findings of Tripathi (2007) which reported that visually impaired students face problems in learning mathematics due to lack of pre-requisite skills of handling mathematics devices and non-availability of resource teacher.

3. Proficiency in use of abacus to solve decimals and fractions

The third objective of this study was to study proficiency in use of abacus to solve decimals and fractions. The data obtained in this respect has been given below in Table 3.

Table 3

Findings Related to the Proficiency of Students in Performing Decimal and Fraction on Abacus

S. No.	*Operations*	*Total*	*Average Score*
1.	Decimal	10	00
2.	Fraction	10	00

Interpretation and Discussion

The above table reveals that none of the students was able to solve problems related to decimal and fraction with abacus.

4. Challenges faced by visually challenged students in learning to use an abacus

The last objective of this study was to study the challenges faced by visually challenged students in learning to use an abacus. The data obtained in this respect has been reported with frequency (F) and percentage (%). The related results based on them have been given below in Table 4.

Interpretation and Discussion

The above table reveals the challenges faced by visually impaired students in learning to use an abacus. Out of 36 students, 28 (78 per cent) reported

Table 4

Summary of Item, Frequency and Percentage Regarding the challenges faced by students with Visual Impairment in Learning to use an abacus

S. No.	*Items*	*Yes*	*%*	*No*	*%*
1	Have interest in learning to use an abacus	28	78	08	22
2	Abacus is useful for you	30	83	06	17
3	Teacher's attitude positive toward abacus	24	67	12	33
4	Teacher motivates you to use an abacus	15	42	21	58
5	Teachers are trained in use of abacus	24	67	12	33
6	Teacher provides sufficient time in teaching abacus	06	17	30	83
7	Proper place of abacus in time-table	06	17	30	83
8	You feel difficulty in displacement of beads due to visual impairment	21	58	15	42

9	School provides abacus	6	17	30	83
10	Have own abacus	12	33	24	67
11	Find difficulty in learning abacus	12	33	24	67
12	Calculating with abacus is tedious	15	42	21	58

that they have interest in learning to use an abacus whereas 08 students (22 per cent) reported that they don't have any interest in learning abacus which itself is a big challenge. 30 out of 36 i.e 83 per cent students consider that abacus is useful for them. Majority of students are aware that abacus is a useful device for computing. A total of 24 students i.e. 67 per cent of the students spoke in favour of the teachers' positive attitude towards use of abacus i.e. majority of the teachers are aware of the significance of abacus in teaching- learning process of mathematics to visually impaired children. Moreover, emphasising the use of abacus motivates the students to learn abacus but only 15 students, accounting for 42 per cent respondents, said that teachers motivate the students to learn abacus. 24 students responded that teachers are well trained in use of abacus whereas 12 students i.e. 33 per cent responded they were not. Satisfying responses obtained regarding the competency of teachers in use of computer. But only 6 out of 36 respondents i.e. 17 per cent reported that teachers did provide sufficient time in teaching abacus and time table did not have proper time for abacus. In this regard, Sharma (2009), in his study, stated that 60 per cent of the teachers opined that there are some areas in the mathematics curriculum, where the visually impaired children may not be able to learn correctly. 21 (58 per cent) students faced difficulty in displacement of beads. This problem can only be removed through practise on abacus but only 6 (17 per cent) reported that school provided abacus and only 3 (08 per cent) students had their own abacus. In this support Agarwal (2000) stated in her book that unfortunately appropriate tactile material and aids are not readily available in schools to help children in developing fundamental mathematical concepts and skills like counting, concept of shapes, size and spatial relations, measuring computation etc. 12 (33 per cent) students agreed that abacus is tough to learn and 15 (42 per cent) reported that calculation with abacus is tedious.

Conclusion

On the basis of the findings of this study it can be said that proficiency level in the use of abacus is not up to the mark. Students had little

awareness about the history of abacus and could do little in addition and subtraction. They could not do multiplication, division, decimal and fraction at all. The result indicates that although visually challenged students had satisfactory knowledge regarding parts of abacus and their functioning, yet their knowledge of basic mathematical operations was very unsatisfactory and disheartening. They were inquisitive enough about abacus and considered it an important device but faced several challenges in learning to use an abacus.

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