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# An Empirical Study into Difficulties Faced By 'Hindi Medium Board Students' in India at Undergraduate Mathematics and Its Social Implications

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**Abstract:**

The research was an attempt to bring out the difficulties which arise majorly due to the transition of language from Hindi to English in the first year of Undergraduate Mathematics in India. The transition is not only linguistic but also social, regional and psychological. The population subject to such difficulties are the Hindi Medium Board Students (HMBS). HMBS here refers to the students who take their final school exam in Hindi Medium. The objective was to find out the kinds of difficulties faced by HMBS when they pursue Mathematics (Major) degree course in University: the frequency of such difficulties and the kinds of facilities, learning environment and resources available to them and used by them. The findings are based on the surveys and interviews with teachers and students.

**Keywords:** Social Implications, Hindi Medium Student, Mathematics

## INTRODUCTION

India has historical significance in education. The ancient texts of Vedas have enlightened the world with its diverse knowledge sphere. Sanskrit was the core language of learning since ancient times (Ramaswamy, 1999). Indian mathematics has contributed a lot to the world of mathematics. The ancient Bākhshāli manuscripts, the great works of Indian mathematicians by Āryabhṭa, Māhāvirācāryā, Mādhava and several discoveries in Indian mathematics were succinctly coded in the form of metrical compositions in Sanskrit (Ramasubramanian, 2012).With the change in time, Sanskrit lost its charm and the number of texts produced in Sanskrit today is fairly low when compared to other languages in India. Sanskrit literature has fared no better (Pollock, 2001). Hindi, being one of the closer languages to Sanskrit is the most popular and widely used language today in India. Moreover, Hindi is the 5th most spoken language across the globe following Arabic, English, Spanish and Chinese (Summary by language size, 2016). In fact, Hindi is the most widely used language across India and it also serves as an important medium of instruction for teaching and learning in schools and colleges of India. In India, Hindi becomes the major language and, according to the census 2001 around 41% people have their mother tongue as Hindi and treat Hindi as their medium of communication (Jain, 2014). The language policy of the Ministry of Human Resource Development, Government of India is intended to encourage the citizens to use their mother tongue in certain domains through some gradual processes. The goal of the policy is also to help all languages to develop into fit vehicles of communication at their designated areas of use. The status as major, minor, or tribal languages

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should notmatter during this development phase (MHRD, 2016). Around 22 majorlanguages are recognized by the constitution of India under the *8thschedule* (Constitutional provisions relating to Eighth Schedule). The *National Policy on Education 1968* also placed emphasis on the use of three language formula for teaching and learning, where the third language could be the regional language apart from Hindi and English. It also placed emphasis on the use of Hindi as a link language (NPE,1968). In India, especially in northern and eastern states, Hindi is the medium of teaching and learning in schools at all levels i.e. from primary level to seniorsecondary level. The majority of these schools are government schools. Mathematics is also taught in Hindi up to class XII. From textbooks tomedium of instruction, all mathematics is covered in Hindi. The finalexamination for class XII is organized by the state examination boards anda majority of the students take their mathematics paper in Hindi language. However, for a vast majority of Indian children, the language of mathematics learnt in school is far removed from their everyday speech (NCERT, 2006). In India while entering the college and university system there is a sudden shift in the formal medium of instruction from Hindi to English, especially in the faculty of sciences. Higher academic research in the sciences and social sciences is often considered impossible to conductin Hindi. This shift also generates an inferiority complex in those whocannot read or write English well (Deshpande, 2000).

The researcher came to realize about this language transition when he was teaching mathematics in a government school in Delhi. The medium of instruction was Hindi and the students were completely unaware of the mathematical terminologies in English. The HMBS pursuing undergraduate mathematics also discussed with the researcher their problems generated due to this transition. Most of the students studying mathematics in Hindiin government schools come from rural backgrounds with little knowledge of English. Their language skills are not good to communicate in English and are prone to miss many opportunities (B.S. Gomathi, 2014).

There is a great diversity of students in the University of Delhi where students come from all parts of India to study. Among such students, there are many who pursue mathematics at undergraduate level. There are large numbers of students enrolled in the University of Delhi who have completed their prior schooling in Hindi medium. Usually English as the medium of instruction is followed across the university especially in the faculty of science. Every student who pursues mathematics, especially as honours at undergraduate level, is a potential human resource in mathematics. However, considering the large number of students coming from Hindi medium board, the present study tries to focus on the HMBS in their first year of undergraduate

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mathematics.

**IMPORTANCE**

The study is relevant to the present scene of undergraduate studies in India. It also tries to present the current status of a socially and politically popular language, Hindi, in higher mathematics. In the Indian context, very little research is available in the area of undergraduate mathematics. Venkatraman, Sholapurka and Sarma (2012) talk about improving mathematics at tertiary level. As every student of mathematics is a potential human resource in mathematics, it is important to provide students with the best educational resources to meet his/her academic needs. Language shouldn't be an obstruction in learning and doing mathematics. Mathematics is a language in itself, but to understand this language of mathematics one has to go through another language. It is important to find out the difficulties faced by students when suddenly shifting from Hindi medium to English medium. Change of language should not create problems for HMBS to meet their full potential in learning and doing mathematics. It is also interesting to see how the social stratum created by language affects the confidence, motivation and self-esteem of HMBS, during the first year of undergraduate mathematics.

**OBJECTIVES**

- To identify the areas of difficulties in mathematics in first year of undergraduate mathematics
- To identify the availability of resources of mathematics used by HMBS
- To explore the status of communication and interaction between teacher and HMBS
- To suggest ways to facilitate learning for the HMBS and create support systems

**RESEARCH DESIGN**

The present study was conducted with first year students pursuing mathematics as honours, teachers and staff from the support department of the university. The reason why the first-year students were chosen for study was simply because first year students are the direct victim students of language transition. Since they come directly from school with experience of learning through Hindi medium, with no intervention program, they can discuss the challenges with a fresh perspective. A total of 67 HMBS were chosen through purposive sampling from various colleges of Delhi University. A detailed questionnaire consisting of 22

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items was used to gather information from students. Four teachers and one official of the Directorate of the Hindi Medium Implementation[1] were also interviewed. The questionnaire for the HMBS was in Hindi language and the questions covered the following major areas:

- Awareness and use of mathematical terms in English
- Types of resources used and awareness related to resources by HMBS
- Communication and interaction between teacher and HMBS
- Difficult topics in undergraduate mathematics
- Narratives describing the problems faced during the first year in undergraduate mathematics

**RESULTS**

The data collected through questionnaires and interviews was analysed qualitatively and quantitatively. The analysis highlighted multiple problems faced by students. On the basis of the survey and interview, the main highlights of results can be described as below.

In response to a question, "*Do you face difficulties in undergraduate mathematics due to change in the medium of teaching from Hindi to English*?" If yes, rate the frequency of your difficulty on a five-point rating scale from Always, Often, Sometimes, Rarely and never; responses of the students were as follows:

90.1% students replied yes, they do face the problem. This means almost everyone coming from Hindi medium background faces difficulties when he or she enters undergraduate mathematics. A majority of 50.8% students rated the frequency of such problem as 'sometimes'. Although the problem may be infrequent, it is significant that the majority of students face it.

Other important findings are discussed in different subheadings below:

- The Directorate of the university publishes textbooks in Hindi

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- **Awareness and Use of Mathematical Terms in English**

77% students did not study any proper English medium textbook of mathematics during their senior secondary level (Class XII), i.e. before entering under graduation. 70.5% said that their textbooks of Class XII did comprise mathematical terminologies in English apart from Hindi also. 75.4% students face difficulties while writing or solving a problem of undergraduate mathematics in English. In undergraduate mathematics,83.6% students were partially aware of the English terminologies used. These results reveal the lack of awareness about use of mathematical terms in English by students during their school level. Whilst there was presence of mathematical terms in English in their Class XII textbooks the majority of students did not study any textbook of mathematics in English and, as a result of this, students did not use or know how to use mathematical terms in English at Undergraduate level. The mere presence of words is not helpful and the communicative gap in transition fromsecondary to tertiary is also revealed. Also Bill Barton (2004) discusses that in order to learn the use of mathematical vocabulary; it is not enough to learn lists of words. The words must be learnt within particular mathematical contexts. Generally, students from non-English background have to jump directly from awareness of mathematical terms in English to completely using them without any prior exposure and training.

**Table 1.** Awareness and Use of Mathematical Terms in English

| Awareness and Use of Mathematical Terms in English | % of Students |
|---|---|
| Students didn't study any English medium textbook of mathematictics during Class XII, i.e., before entering under graduation | 77% |
| Students experienced the presence of mathematical terminologies in English apart from Hindi in mathematics textbooks of class XII | 70.5% |
| Students faced difficulties while writing or solving a problem of undergraduate mathematics in English | 75.4% |
| Students are partially aware of the mathematical terminologies used in English | 83.6% |

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- **Types of resources used and awareness related to resources by HMBS**

Regarding access to resources, 80.3% of students relied on the books and materials refereed by the university, while others relied on internet and books by other authors in undergraduate mathematics. The point to look upon was that the materials and books refereed by the University are all in English. Undergraduate mathematics resources, including the internet, have an abundance of English based texts, but hardly any are written in Hindi. 93.4% students were not even aware of any textbook of undergraduate mathematics in Hindi language. 91.2% students consulted dictionaries to know the meaning in Hindi of mathematical terminologies given in English. 96.7% students were not even aware of the Directorate of the Hindi Medium Implementation. The Directorate of Hindi Medium Implementation is a body of the University which facilitates students with materials and textbooks in Hindi language. There is lack of undergraduate mathematics textbooks in Hindi and even the students and teachers are unaware of it. The textbooks in disciplines of social sciences are easily available in Hindi while the textbooks of mathematics in Hindi are hard to find.

**Table 2**. Types of resources used and awareness related to resources by HMBS

| Types of resources used and awareness related to materials by HMBS | % of Students |
|---|---|
| Students relied on books referred by university | 80.3% |
| Students were not aware of any textbook of undergraduate mathematics in Hindi | 93.4% |
| Students consulted dictionaries to know meaning of undergraduate mathematical terms in English | 91.2% |
| Students were not aware of the Directorate of Hindi medium Implementation | 96.7% |

- **Communication and Interaction between teacher and student**

81.9% of students felt uncomfortable while communicating verbally in class. Only 39.3% of students talked to their teachers about the problems generated due to language transition. Teachers also said that most of the HMBS were introverted and shy in nature. Students' lack of confidence stopped them interacting with them.

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Such issues related to language transition was discussed or raised with teachers only when students initiated the topic themselves.

**Table 3.** Communication between teacher and HMBS

| Communication and Interaction between teacher and HMBS | % of Students |
|---|---|
| Students felt uncomfortable while communicating verbally in class | 81.9% |
| Students talked to their teachers about these issues of language transition | 39.3% |

- **Difficult topics in Mathematics**

The first year of undergraduate mathematics comprises of Calculus, Algebra, Analysis and Differential Equations. Students were asked about the most difficult topics among these from the point of view of language. 82% of students rated Analysis as the most difficult topic. The results reveal that topics in descending order of difficulty were Analysis, Algebra, Differential Equations and Calculus. Some students also expressed that they were unable to use language to write the statements generally used in analysis and algebra. Calculus and Differential Equations have problems often related to calculations, so students were able to understand and solve problems in these topics easily as compared to the use of expressions and terminologies in Analysis and Algebra.

- **Narratives of Students**

Narratives of the students bring out the social and psychological issues generated due to transition. Usually, HMBS use the books referred by the university. The books recommended are mostly by foreign authors and the language is many times more difficult for HMBS to grasp. In order to understand in a simpler way, students also study books of local authors.

"I feel embarrassed to ask anything related to mathematics in the classroom. When I had topped my class XII examination in mathematics, I was so happy to pursue mathematics in my future life. Now, everything has got suddenly changed. I did not expect that I would get troubled by the use of English in college level mathematics." *(Comment by one of the HMBS)*

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Such comments were also made by students who had come from one of the neighbouring states to study in Delhi. Similarly, students talked about the problems while adjusting to English vocabulary.

"In our town, right from the primary level we have studied mathematics in Hindi. When we entered the undergraduate mathematics, terminologies appeared before us like aliens. To expect from us that we already are aware of these terms is unfair. Students from English background are able to score and indulge more in activities of mathematics more than us and we just keep managing ourselves with the vocabulary and the environment." *(Problem shared by one of the HMBS from the neighbouring state)*

A few students also shared their experiences of leaving questions in the examination due to unfamiliarity with terminologies in English.

"I already knew such terminologies in Hindi but because of inability to recognize the same term in English I left the questions unanswered." He further added, "However, I came to realize it later. I could have solved the question". (*Experienced shared by one of the HMBS*)

HMBS had already studied terms like 'reflexive', 'symmetric' and 'transitive' as स्वतुल्य, सममिति and संक्रामित. They were already familiar with such terms in Hindi, but considered them new while facing them in English. They also regretted the loss of time as they came to realize the pre-known concept. A majority of students shared that they had also lost their confidence in mathematics and the classroom which they had earlier. A few even thought of leaving mathematics and opting for some other discipline. Some also talked about feeling embarrassed while presenting or answering the problems in English in front of the class. Most of the highest attaining students in mathematics were from English medium board during the first year undergraduate mathematics. Definitely English gives an advantage to score over the Hindi medium board students in undergraduate mathematics.

**DISCUSSION**

Hindi, being one of the widely-spoken languages across India and various societies, is not given due importance in the curriculum of undergraduate mathematics in India. The study also reveals the lack of interaction between teachers and students about this problem. There is very little demand for Hindi medium books and text materials in Hindi, but when students are asked if they needed such books, the majority of them openly talked about the need and availability of such Hindi medium books in the market. Educators

have not raised this issue of transition seriously and hence the issue is left unaddressed. India is a country where the development in mathematics has historically been in Sanskrit but it has lost the significance of research work in its native languages. Efforts should be made to revive it. A major part of Indian society comprises of students from the Hindi and rural speaking belt who are quite good at mathematics. They experience low-confidence and feelings of embarrassment due to such transition. Venkatraman, Sholapurka and Sarma (2012) talk about creating a pool of students who would continue research in mathematics. Such students should not be discouraged to move out of the field of mathematics.

- Hindi translation for Reflexive.
- Hindi translation for Symmetric.
- Hindi translation for Transitive.

**REFLECTIONS AND SUGGESTIONS**

The mother tongue is the most comfortable medium of communication and understanding. The mother tongue brings ease in understanding even the most difficult context whereas learning through any foreign language compounds the complexities in learning. This belief is more relevant in the Indian context as India possesses huge language diversity with 22 official languages and more than 300 dialects, for example different regional states have different languages. Education in India is the state responsibility with central government only in an advisory role. Most of the students get school education in the regional language of that particular state. So, when a student moves to central university for higher education, he/she suffers from high academic loss due to language transition leading to underachievement and sometimes withdrawal from the course. Since higher education is important to develop academic rigor among students, this kind of loss is detrimental for the student as well as for the nation.

Though the present study looked into the cases of Hindi medium students only, and that too with a limited sample, the findings point to the deep-rooted problem of ignoring learner-centred practices of teaching. Access to knowledge shall be the fundamental right of every student in a democratic country which gives official status to many of its traditional languages. When a child is allowed a school education in the mother tongue then how can he/she be denied the pleasure of learning in higher education?

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India is blessed with a huge quantity of human resources which shall be transformed into a useful national resource by providing academic and skill development. It is therefore important to create a repository of learning resources not only in Hindi but also in all regional languages. Central and State universities should have frequent interactions to share learning resources. National knowledge Network shall be used to maximize the reach of resources. Popular course and research books shall be translated in Hindi as well as in all regional languages. Subject experts from different states shall be invited to write course relevant books in regional languages. There shall be a central core committee of academics who shall be responsible to balance disparity in academic resources dueto language dominance. The committee shall also be responsible to maintain high standards in developing learner responsive learning materials. University teachers shall be trained in multi-lingual teaching in cases where teachers teach learners of more regional languages.

Language differences also exist within a variety of other countries.Such initiatives are important not only for India but for any nation whotakes pride in its tradition and culture.

**OPERATIONAL DEFINITIONS**

HMBS: Hindi Medium Board Students: It refers to those students who have graduated from school by passing class XII exam (which is the final school leaving examination in India) in Hindi medium. It means that their languageof writing in the examination paper is in Hindi. These students have studiedmathematics in Hindi medium.

Undergraduate Mathematics: It refers to the mathematics course taughtat graduation level or college level.

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