



## **Challenges in Mathematics Learning: A Study among Pando Tribe of Chhattisgarh**

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### **Abstract**

The study deals with the difficulties of Pando children face in learning mathematics at primary level. The other objectives of the study were to find out the ways they learn mathematics after coming in contact with formal mathematics curriculum and attitude they develop thereafter. The study found that Pando children face the adverse situation of ridicule from teachers and their non-Pando peers. They encounter alien curriculum, alien learning environment, alien language and lack of mathematics teachers in their pursuit of learning mathematics. Due to these most Pando children have negative attitudes towards mathematics and mathematics learning. Yet Pando children learn basic mathematic calculation (counting and table), addition and subtraction in their family from parents, grandparents, siblings and game they play.

*Keyword:* Pando Tribe, Ethnomathematics, cultural interwind mathematics curriculum

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### Introduction

Mathematics is an important area of knowledge in human civilization. It is considered as the creator and nurturer of culture and civilization. It is the pillar upon which our past, present and future human civilisation stands. Mathematics play a vital role in all aspects of human life. The atmosphere of present world is surcharged with mathematics and one can not escape from mathematical convolution of life and livelihood (Papola, 2001). The world at present and future would be driven by science and technology. Every person therefore requires a minimum knowledge of mathematics to lead a successful life (Lakshmi and Jyothi, 2015). In the absence of knowledge of mathematics, a person would fail to fulfil his personal, familial and social responsibility. Indeed, it would be very tough, maybe even impossible, to live a standard life without using some kind of mathematics (Cockcroft, 1986). Similarly, Ernest (2000) says that Mathematics in essence has been closely intertwined with our lives. He further says that the entire spectrum of human activity and institutions conceived and structured numerically. Our daily life; viz sports, media, health, education, government, politics, commercial production, market, bank, the construction of the building etc. are based on mathematics. In contemporary era every turn of our lives is full of mathematics.

Mathematical knowledge is essential for personal, social, political, economic development. Writing about quality involvement of individuals in the affairs of the world Reys and Stanning (1988) say that in order to participate in present socio-political processes and have unhindered opportunities in economic affairs, every member of society must be capable of applying mathematical ideas.

In order to understand and explain stuff and phenomenon or nature and space of the universe, we need the help of mathematics. It said that the natural world everywhere is lace with patterns that can be described with mathematics (Wigner, 1960). No doubt therefore, maths is considered as a language or a tool that describe the world. Nevertheless, for philosopher like Sam Baron the world is made of mathematics and existed before human invented it because mathematics explains so many things of the world with precision. Similarly, Max Tegmark holds that the entire external reality to be purely mathematical or universe is a gigantic mathematical object to put in a direct word (Tegmark, 2007). Therefore, the universes and everything in them is based on the bedrock of mathematics, therefore the universe is mathematical. This idea comes from the Greek philosopher Pythagoras, who identified mathematics and music as two languages to explain the edifice of nature. For him everything in the universe was made up of numbers. Perhaps this is the reason why Galilio said that the nature is written in mathematical language and thus, to understand the world we need mathematics.

Mathematics is used as essential tools in in many fields of study for acquiring knowledge in any branch of science and social science. For example, psychology uses mathematics through statistics; and statistics without mathematics cannot take a step forward. In biology, mathematics is used for the classification of substances, inspection etc. Many mathematical concepts like differential geometry, infinite series, calculus, complex algebra, functional analysis, linear algebra, operator algebra, etc. are used in physics (Bora, 2016). Comte observes as follows, "Any science lesson that does not start with math is necessarily defective at its root". Roger Bacon observes "Math is the gate and key to knowledge. The neglect of mathematics impairs all knowledge. Whoever ignores mathematics therefore, cannot acquire knowledge of other sciences or the things of the world. Moreover, ignorant people are incapable to perceive their own ignorance and therefore seek no remedy."

Soon after independence India realised that the economy of the country in future would depend on the ability of citizens to compete in mathematics and science dominated industries. Thus, policymakers, researchers, educators etc. of the country have prioritised improving mathematics and science education. Kothari Commission (1964–66) mentioned "The importance of mathematics for science, education and research cannot be overstated. It has always been like this, nevertheless mathematics has never been more important than it is today. Consequently, a conscious effort should be made to put India on the world map of mathematics as early as possible." National policy on education (1986) has emphasised to visualise mathematics as the vehicle to train a child to think, reason, analyse and articulate

logically. In leaning mathematics therefore, the goal of the development of ability and attitude of child to think mathematically, formulate and solve problems have been highlighted by NCF (2005).

Despite the emphasis in place to popularised Mathematics among all students the subject generally appears to be unpopular among scheduled tribe learners. The learners from scheduled tribe communities have not shown promising progress in acquiring mathematical knowledge.

The study of Sujatha (1999) recorded average score of 34.94 in mathematics test among ST students of Andhra Pradesh. Similarly, Chaudhari (2010) found average achievement among the students of Ashram schools of Gujarat. Pattanaik (2012) says that 39.40 per cent ST students of Odisha scored less than 30 per cent marks in mathematics. The study of Akula (2016) reveals that the academic achievement of 37.7% ST children of Telangana were below 30 per cent. Muneer V. (2020) administered fundamental knowledge test in Mathematics among residential school students of Kerala in which 65.8 per cent students performed poorly. The analysis of IHDS-II data by Lakshmanasamy (2022) found lower arithmetic and mathematical ability among ST children at primary level. Further, the National Achievement Survey in 2015 of class 5, NAS in 2017 of class 8 and NAS in 2018 of class 10 Class VIII show poor performance of ST children in Mathematics. In the era the entire world is inclined towards mathematics ST children doing less well is of great concern. The learning difficulties in mathematics in context of scheduled tribe is a serious issue. Thus, a study was undertaken among school children of Pando tribes. The main objective was to find out the difficulties of Pando children in learning mathematics at primary level. The other objectives of the study were to find out the ways they learn mathematics after coming in contact with formal mathematics curriculum and attitude they develop thereafter.

### **The Setting of the Study**

The study was carried out among the elementary level students of Pando communities. The **Pando tribe** is one of the tribes of Chhattisgarh. The community has been identified as Particularly Vulnerable Tribal Group<sup>1</sup> (PVTG) by the government of Chhattisgarh. According to census 2011 the population of Pando tribe (including Bharia Bhumia, Bhuinhar Bhumia, Bhumiya, Bharia, Paliha) is 1,13,967 (Male 57,370 and Female 56,597). However, according to the Pando development agency the total population of Pando community is

<sup>1</sup> PVTG is the sub-category within scheduled tribes. The communities at the lower level of development have been placed in the sub-category. The constitution of India has identified 75 communities as PVTGs. Chhattisgarh, has 7 PVTGs, of which 5 communities (Baiga, Abujhmadia, Birhor, Kamar, Pahari Korwa) have been recognised by central government and 2 communities (Bhunja, Pando) by state government.

31814 (16522 male and 15292 Female) (as in <https://cgtrti.gov.in>). They possess a unique cultural tradition, complete with rhythmic folk music, dances and dramas.

The community mainly inhabits in the Surguja and Korea districts of the state. Surrounded by natural beauty, the Pando are on the lower rungs of prosperity. They do small scale farming for their living. Daily labor, cultivation, cattle, birds and forest produce supplement their income. They speak Pando dialect which comes under “Indo-Aryan” language family.

An in-depth study was carried out in a government middle school of Pando Nager, a village inhabited by the Pando communities. The village is in Surajpur tehsil of Surajpur district. Though the school is situated in the areas inhabited by Pando community children from other community were also enrolled in the school. However, 8 students from Pando community of class 8 and teachers of the school were interviewed and observed. The interview and observation were centred around the problem Pando children face in learning mathematics and the ways they learn amidst problems. The information received from the students have been analysed and discussed below.

### **Problems in Learning Mathematics**

The problems Pando children face in their effort to learn mathematics are diverse. The problems are related to curriculum, language, teachers, classmates, parents, self. Some of the problems are described below.

#### ***Alien Curriculum and Learning Environment***

The curriculum, textbook and teachers all are alien to the Pando. Neither of them are able to establish link with the daily life of Pando children. Mathematics textbook do not contain any example from the life of Pando children. Teachers too failed to provide any example from the life and culture of Pando children even though culture<sup>2</sup> of tribal communities have an extensive and rich knowledge of mathematics (Panda,2006).

A students said in this regard “...I do not understand maths in the school. What I know from the village are different from the way it is taught in the school. Entire learning environment isolated from the Pando communities. On the contrary scholars say that the learning environments cannot be isolated from the communities in which they are entrenched (Rosa & Orey, 2011). When students come to school, they bring with them values, norms, and concepts that they have acquired in their sociocultural environment some of which are mathematical in nature (Bishop, 1993).

#### ***Language Problem***

<sup>2</sup> The scholars like D’Ambrosio (1985), Bishop (1991), Rios (2000), Rosa & Orey (2007) etc. around the world also consider mathematics as cultural construct.

The language of teachers and the students are different. It was observed that the instruction and explanation of teachers was in Hindi which Pando children hardly followed. Above this teacher used English terminology for maximum technical concepts. Concepts like 'chakona', 'chakri', 'tikona' in their local language have exactly the same practical definition for mathematical concepts quadrilateral, circle, triangle yet teachers used quadrilateral, circle, triangle while teaching.

The children interviewed agreed to possess knowledge and understanding of Hindi. However, children failed to answer the questions investigator asked. Due to lack of understanding the language children answered "yes", "no" and 'I don't know' to most questions. However, as soon as the researcher started asking question in locally used language (Sargujia) the children began to provide answers to questions. Thus, teachers teaching in different language than language acquired by Pando children is an important factor obstructing their efforts to learn mathematics for mathematics taught in acquired language help children to understand quickly (Pellas et al.,2019).

#### ***Perception of Teachers about the Ability of Students***

For many unknown reasons most Pando children remain silent in the class. The teachers levelled the silence as inability and lack of knowledge. Teachers neither made efforts to know the reason of their silence nor break their silence by questioning or any other way. Teachers covered up their act of neglecting by blaming the Pando children themselves. The responses of teachers were 1) they mostly remain absent from school 2) they are not able to solve any mathematical problems 3) after two days they will definitely stop coming to school. Thus, the idea of teachers that Pando children are unknowledgeable coloured their behaviour towards them. Teachers do not make any effort to teach them. The attitude of teachers discourages the study mathematic, arouse fear of mathematics and often push them out of school.

One of the Pando children on the other hand informed that whenever he asked question the made him shut up by calling either 'donkey' or 'you do not know anything'.

#### ***Scarcity of Teacher and Teaching Material***

Maths teacher has join the school recently. This mean that children learnt maths with teacher of non-mathematic background. It was learnt that teaches were completing the syllabus and not making children learn. Teachers with non-mathematical background brought neither any kind of teaching material nor provided example from the daily life of Pando children. The teacher was unable to connect mathematics with the life of Pando children. So, the Pando children had hard time to learn maths.

***Discouragement From Classmate***

In the school Pando children go about, sit in class, play and study mostly among themselves. It is because the non-Pando children refuse to mingle with them. The Non-Pando children do not mingle with Pando children saying that *'they are dirty'*.

In the same way the non-Pando discourage the Pando learners in maths class. They were reported to have said *"you are not made to study Hindi but how will you study maths"*. They have further said about Pando children *"you can neither memorize a mathematics formula nor remember table of 5 but want to study maths"*. Still further, the inability of Pando children to answer question of maths or a wrong answer win only laughter from non-Pando children and teachers. These incidents push Pando children out of mathematics class and make it difficult for them to learn mathematics.

**Ways Pando Children Learn Mathematics**

Despite difficulties and hindrance Pando children make much effort to learn mathematic. In order to know the other ways through which Pando children to learn mathematics the researcher beside interview observe them in and out of class. They were observed inside school/classroom in formal set up as well as outside school at their play. After the observation interview with children and their mathematics teachers were also held. The data gathered have been reduced into five major themes of Family, Peer/Friends, Everyday Games and Practice of Culture. That is these are the means through which Pando children learn mathematics.

***The Family (Parents and Sibling)***

It is the general fact that family for every child irrespective of race, religion, region, caste, ethnicity is the first school. Similarly, the family of Pando children acted as first school. Most Pando children learnt basics of life in their family school. As per the interview with the Pando children same was true with regard to learning mathematical concepts. The children said that them learn the concept of calculation, addition, subtraction etc. from family; their parents, baba (grandfather), grandmother and brother and sister.

The responses of the Pando children reveal that their parents acted as first mathematics teachers. They helped them learn math, especially the basic concepts such as counting and tables which are introduce at primarily level at formal school. This finding is in line with the findings from some older studies which suggests that children whose parents encourage math and science activities with their positive importance are more likely to learn mathematics and science with much interest (Eccles et al., 1982; Jacob & Bleeker, 2004). One of the Pando

children narrated the way he learnt the concept of subtraction from his parents. The boy said that *his parents often send him to shops with instruction of the money the shop keeper would return after giving the required goods since he very young. He made mistake but his parents corrected him patiently.* The beliefs, expectations, constant motivation of his parents helped the boy to learn mathematics. This result of the study is strengthened by the study of Fiskstrand (2022) who said that involvement of parental in the study of children promote early childhood reading and mathematics activities positively.

The responses of the Pando children have also brought the fact of elder sibling helping younger ones. Pando children with elder sibling have reported the fact of being help by their elder brothers and sisters in solving some mathematics problems. A boy of class 8 said that he taught his younger brother multiple tables, addition, subtraction, how to count on fingers, watching the time on a clock etc. Siblings, positivity influence achievement in mathematics says Poisall (2021). Thus, we can expect better mathematics learning from Pando children even though their parents are illiterate. However, the number children with elder sibling with ability to help mathematical problems was negligible. The other side of the picture/fact different. Most Pando children are first generation learners.

#### ***The Peer/Friends***

Pando children learnt mathematics among themselves. Better in mathematics children helped other children finding difficult to solve maths problems. Peer/friend play a very important role in learning mathematics says the study of Gottfrid et. al. (2017). However, in case of Pando children the peer most of the time means friends from their own community. They helped the comparatively weaker students but they themselves required equal attention.

#### ***The Everyday Games***

The educational games act as solutions to innovative learning (Pramuditya et al., 2019). In a similar tone, Hwa (2018) says that digital games can significantly enhance children's learning. However, one will be forced to change his/her mind after meeting the Pando children. The traditional games played by Pando children is equally educational, and can be instrumental in learning many concepts of mathematics. Mathematics is a logical and systematic method of learning. Similar logical and systematic rule was observed in the games played Pando children. Perhaps this is the reason why the children good at play learns mathematics quickly and well. Pando children found to play and or reported to play the tradition economical games like "Bati Khel" and "Goti Khel". In Bati game, children learn counting and multiple table and concept of distance with the help of marble ball (Kancha itself is called Bati) which is called Bati.



The game, as reported by the children was learned in the village through their elders. Mathematical concept of counting can very well be learnt through the game. Ten, twenty, thirty...counting up to a hundred, and then strike on each other bati and take down. The one who reach hundred at the earliest wins and the one who do not get a hundred, loses. Then, by step count the winner put his marble at a distance and all other aim to hit at the winners' bati with their bati. If it falls, then it measures step by step and distributes it. In this way the game goes on. If not, then the game starts again, then by speaking ten, twenty, they target each other's bati. Thus, the concept of counting, distance, multiply can be learnt through the games.

Another game named Goti is also helpful in learning maths. This game is played mostly by girls. The games required at least two players. Both players include equal number of pebbles, -let us says 20 pebbles (number is not universal); for the game. The target of the game is to get back their pebbles. The game goes as follows; the forty pebbles are scattered on the floor. There after the first player picks up one, throws it up, picks up the scattered ones again (one or two or three or even more) and catches the marble which she had thrown up. All these processes have to be completed without touching other marble which is not being picked, and without dropping the thrown-up ones. If successful she continues playing otherwise second player take the turn while also receiving reward of pebbles (as many pebbles as the previous player touches or shake) from previous players' store. In this way the games go on for five, six or even more rounds until all pebbles have been picked by both players. Then they count to check whether they have reached their target to get back their pebbles (20 pebbles in this game). If unable to get the target, loan is taken and or repaid to start next round of game. The game goes on and on.

With the help of this game, children can learn the concept of adding, subtracting and borrowing or giving. The educational games can be a learning media that fun, has a series that is able to motivate the student. Thus, the statement or responses of the Pando children that they learn mathematics through games can be accepted as true and must be used to make mathematics teaching lively.

### ***The Practice of Culture***

Pando children learn many concepts of mathematics through the cultural activities that are enacted in their community. The structure of their traditional house, the roof of their house, door, the musical instruments, hunting weapons etc. are build on mathematical principles and concepts. Sari et. al. (2021) in their research found geometrical concepts rectangle, trapezoid, triangle etc. inherent in the traditional Tenian lanjjang house. Thus, the children of Pando

community learn logical thinking, critical thinking etc. which mathematics strive for, from the cultural practices. This is in agreement with the view of Maryati and Prahmana (2019) learning of mathematics with cultural activities is part of the innovation to train critical thinking, develop an understanding of concepts, and the generation of mathematical concepts.

### **Attitude Towards Learning Mathematics**

This section deals with the attitude of the Pando children towards mathematics and the reasons for the development of such attitudes. The attitudes are notably positive and negative. However, the focus here is more on the negative attitudes developed by Pando children.

### **Reasons For a Like or Dislike of Mathematics**

Students in general tend to dislike mathematics more than other subjects (Poffenberger & Norton, 1959). This study also found the similar result. Pando children openly expressed their dislike towards mathematics and mathematics learning. The reason behind dislike has been discussed below.

### ***Difficult Subject to Study***

The Pando children opined that mathematics is a difficult subject to learn. While making such statement about the subject they looked confident. They seemed to have internalised that mathematics is not meant for them. “... *Mathematics is difficult*” ... *despite much of my efforts I do not understand ...*” to quote the response of one of the respondents. For other Students 'mathematics is a difficult subject because he received much lower grade even though he spends lot of time in studying it.

### ***Discouraging Comment from Teachers and Students***

Pando children developed negative attitude towards mathematics due to the discouraging comments received from teachers and their peer for being weak in mathematics. To quote a response of a respondent “...*I don't like maths because whenever I fail to answer questions asked by teachers, my friends laugh at me and the teacher scolds me ...*”

### ***Teachers' Behaviour***

The researcher observed, teacher teaching mathematics to the Pando children. The behaviour of teacher towards Pando student unable to solve the math problem or answer the question raised by her was inappropriate. There came a time when the teacher shouted at the student 'donkey' and the rest of the class laughed. Thus, it can be concluded that main reason of Pando children disliking mathematics is not because, the subject is difficult to study, or lack of self-confidence but the rude behaviour of teacher towards Pando children. It is the inappropriate

behaviour of teachers and students are responsible for developing negative attitude on Pando children towards mathematics.

### ***Teacher's Teaching Practice***

First of all, teachers do not take daily classes. They keep themselves busy in official work than teaching. The method of teaching adopted by teachers is unattractive. Most of the teaching of teachers begin with reading the textbook and end with reading the textbook. No attractive activities were carried out between reading. Teacher affective support, and classroom instruction say Devadas & Lay (2017), Marchis (2011) are significant predictors of attitude toward mathematics. Thus, teachers' teaching fails to withhold the interest of Pando children in mathematic class. Thus, teachers' teaching practices is one contributing factor for developing negative attitude among Pando children towards mathematics.

### ***Unrelatedness to Life and Culture***

The Pando children pointed out the fact that they disliked mathematics because they do not know where to use mathematical knowledge. One respondent's answer supports the finding "...Other topics do not relate to actual societal needs, like those of Decimal lesson...". This illustrates the importance of emphasising on the application of mathematics in real-life experiences and culture. These aspects have been emphasised by Bakalevu (1998) and Rosa (2010) who say that lack of cultural harmoniousness in curriculum leads to low attainment in mathematics.

### **Major Findings of the Study**

Pando children face the adverse situation of ridicule from teachers and their non-Pando peers. They encounter alien curriculum, alien learning environment, alien language and lack of mathematics teachers in their pursuit of learning mathematics. The teachers taught from books with use a any other teaching materials or connecting to the daily life of Pando children.

Yet Pando children learn basic mathematic calculation (counting and table), addition and subtraction in their family from parents, grandparents and siblings. Pando children also learn mathematical concepts such as distance, measurement, addition, profit, loss in goti & bati game. Geometry concepts like cylinder, circle, and quadrilateral from their houses and cultural instrument.

Most Pando children have negative attitudes towards mathematics and mathematics learning. The negative attitude of the teacher and their non-Pando students about their silence and wrong answer cultivated aversion towards mathematics learning. The teachers teaching

mathematics divorced of their culture and daily life and alien language all contributed in developing negative attitudes.

### **Discussion of Results**

The study has disclosed many factors affecting the mathematics learning of Pando children. Demotivating Teachers and peers, alien curriculum and learning environment, the irrelevant teaching practices, lack of teachers with mathematics background etc. are the challenges in the mathematics learning efforts of Pando children. These barriers distress the children of Pando community and leading to withdrawal from mathematics and even school. Therefore, all stakeholders involve in the education of Pando children should work towards creating an instructional environment for mathematics that would accommodate Pando students in mathematics classrooms (Rosa & Orey, 2011). Effort should be made to engrain mathematics classrooms and learning environments with Pando culture and or the way they learn back home.

Teachers therefore, must focus on encouraging and motivating these children to achieve by eliminating negative environment of mathematics class. They must be aware of the mathematics learning ability of Pando children. They should make efforts towards providing conducive and positive environment that would allow Pando students to learn mathematics comfortably for the lack of success hamper the capacity manage challenges of particular subject, schooling, life etc. (Lange, 2009). Every effort must be made by stakeholders to develop a positive attitude in Pando learners towards mathematics. In conclusion, all mathematics learning challenges, obstacles and difficulties must be adequately addressed in order for Pando students to continue their daily progress in mathematics.

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