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Ethnomathematics as Culturally Relevant Pedagogical Approach to Enrich Mthematics Teaching-Learning: A Contemplation

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Abstract
One of the major concerns of the 21st century has been related to the integration of multiplicity of cultural roots of humankind in education. According to different studies and researches the major factors contributing the poor achievement of students in mathematics is the student's attitude and perception towards mathematics. So, the investigator intended to find out the advantages of Integration of Ethnomathematics as Culturally Relevant Pedagogical approach to enrich to enrich mathematics teaching-learning. The investigator also stresses upon importance of Integration of Ethnomathematics as Culturally Relevant Pedagogical approach. The study rooted the fact that the Integration of Ethnomathematics as Culturally Relevant Pedagogical approach having a positive impact on mathematics teaching-learning.

Keywords: Ethnomathematics, Culturally Relevant Pedagogical approach

Mathematics has always been associated with cultural knowledge of digits and number words. Student's perception towards mathematics, teaching methodologies and lack of understanding the connections between practical life and subject matter. The narrow thought of the interconnections between the subject mathematics and culture, makes our subject dull in the student's Perspective. That leads the teaching-learning hard in the case of subject mathematics. Most of the students are unaware about the cultural-ethnical- background of the mathematics. In that sense, the recent researches are integrating the cultural aspects into it. The present paper tries to analyse the advantage and importance of Integration of Ethnomathematics as Culturally Relevant Pedagogical approach to enrich mathematics teaching- learning. Through this study the researcher investigates the advantages and proposes a shift in mathematics education toward a more culturally based approach. That means the multicultural approach such as Ethnomathematics into the mathematics curriculum coupled with employing culturally relevant Pedagogical practices will increases the relevance in the mathematics education.
Through this study the researcher seeks to find the answers for the following questions:

- What is meant by Ethnomathematics?
- What is meant by Culturally Relevant Pedagogy?
- What are the advantages of integration of Ethnomathematics as Culturally Relevant Pedagogical approach to enrich mathematics teaching-learning?

Ethnomathematics

Ethnomathematics is the cultural utility of mathematics as science by Harbor-Petrs (2001). Ethnomathematics is an approach of teaching and learning mathematics which builds on the student's previous knowledge, background, the role of his environment plays in terms of content, method and his past and present experiences of his immediate environment and approach could be in a practical way by D'Ambrosio (2001). Ethnomathematics has simply defined as "mathematics of cultural practices" (Presmeg,1 998, p.318). The definition stated by Rosa and Orey (2011), "Ethnomathematics refers to mathematical concepts embedded in cultural practices and recognizes that all cultures and all people develop unique methods and sophisticated explications to understand and to transform their own realities". The above definitions describe Ethnomathematics approach as a legitimate offspring of the interaction between culture and mathematics.

Figure 1 diagrammatically describes the relationships of variables specified in the above definition. Culture affects mathematics, as does mathematics affect culture. The interplay within culture and mathematics is Ethnomathematics.

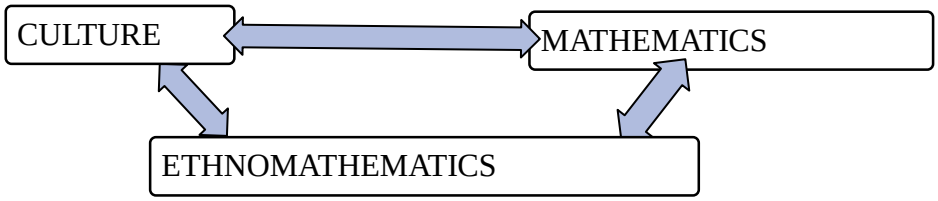

Figure 1

Culturally Relevant Pedagogy (CRP)

The term Culturally Relevant Pedagogy encompasses curriculum content, learning context, classroom climate, student-teacher relationships, instructional techniques, classroom management and performance assessment Gay (2010). In another view, Culturally Relevant Pedagogy (CRP), also known as culturally relevant teaching (CRT). In conceptual approach to mathematics education that influences what, how and why students learn. Culturally Responsive Teaching, an educational framework invented by Ladson Billings in the early 1990s, defined based on three independent pillars. First pillar is Academic Success, as the primary purpose of a teacher's responsibility. Culturally Relevant Teachers hold high and fair academic standards for their students and meet them whatever they are. i.e., Consider what you teach, why you teach and how you teach it, taking into account the student's personality and learning style. Second pillar is Cultural competence which means the responsibility of teachers to understand the culture and community of their students, and to respond in ways specific t their own identity questions. When accessing and learning from the outside world, the students recognize and respect its cultural ideas and practices. And the third pillar is Socio- Political awareness is the ability of educator to actively educate themselves and their students about personal and sociopolitical issues affecting students, communities, and the world, and incorporate that information into teaching. that means students are always encouraged to think and question why things are the way they are, and to consider themselves agents of social change and revolution.

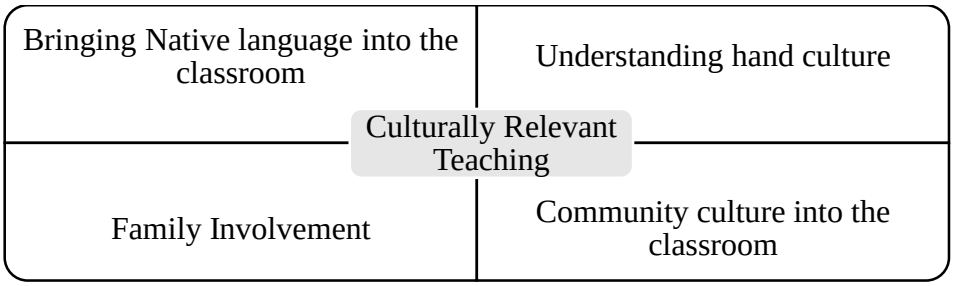

Figure 2
Ethnomathematics as CRP

By analysing various research perspectives on the variables Ethnomathematics and Critically Relevant Pedagogy, in mathematics teaching based on CRP is a collective approach of Ethnomathematics, Critical Mathematics, Indigenous Education, Language diversity and Equity-based approaches. According to various theoretical overview Ethnomathematics is an approach based on cultural perspective. Over past three decades, the development of Ethnomathematics can be categorized in 6 interrelated dimensions: Cognitive, Conceptual, Educational, Epistemological, Historical and political.

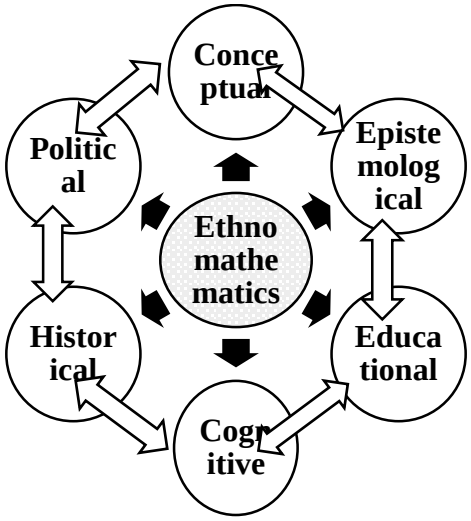

Figure 3

- **Cognitive:** This dimension concerns the acquisition, accumulation and dissemination of mathematical knowledge across generations. Thus, mathematical ideas such as comparison, classification, qualification, measurement, explanations, generalizations, modeling and valuation are understood as social, cultural and anthropological phenomena that trigger the development of systems elaborated by the members of distinct cultural groups.
- **Conceptual:** The challenges of everyday life give members of distinct cultural groups the opportunity to answer existential question by creating procedures, practices, methods and theories based on their representations of reality. These actions contribute a fundamental basis for the development of essential knowledge and decision- making processes.
- **Educational:** This dimension does not reject knowledge and behaviour acquired academically, but incorporates human values such as respect, tolerance, acceptance, caring, dignity, integrity and peace into the teaching and learning of mathematics in order to humanize it and bring it to life. In this

context, Ethnomathematics promotes the strengthening of academic knowledge when students understand mathematical ideas, proceedings and practices in their daily life lives.

- **Epistemological:** This dimension deals with knowledge system, which are sets of empirical observations developed to understand, comprehend, explain and deal and cope with reality. Thus, three questions arise regarding the evolution of mathematical knowledge in relation to diverse forms of generation, organization and dissemination. (a) how to move from adhoc observations and practices to experimentation and methods (b) how to move from experimentation and method to reflection and abstraction and (c) how to proceed towards inventions and theories.
- **Historical:** It is necessary to study links between the history of mathematics and the reality of learners. This dimension leads students to an examination of the nature of mathematics in terms of the understanding of how mathematical knowledge is allocated in their individual and collective experiences. It is necessary to teach mathematics within historical context so students are able to understand the evaluation of and the contributions made by other peoples to the ongoing development of mathematical knowledge.
- **Political:** This dimension aims to recognize and respect the history, tradition and mathematical thinking developed by the members of distinct cultural groups. The recognition and respect for the socio-cultural roots of these members does not imply the rejection of the roots of others, but reinforce these roots through dialogue in cultural dynamism. It also aims to develop political actions that guide students in transition processes from subordination to autonomy in order to guide them towards a broader command of their rights as citizen (Lawrence sherly &Pedro Palhares," Ethnomathematics and its Diverse Pedagogical Approaches").

While integrating these 6 interrelated dimensions as CRP we can collaborate the historical, political, conceptual, epistemological, cognitive and educational relevance of the subject into our classroom. That also leads to the three independent pillars of CRP, Academic Success, Cultural competence and Socio-Political awareness. That makes mathematics more meaningful and curious.

Some Importance Integration of Ethnomathematics as Culturally Relevant Pedagogical approach to enrich mathematics teaching

Ethnomathematics as a Culturally Relevant Pedagogical approach affects not only how people communicate and receive information, but also helps to organize the subject within the culture and develops individual's skills and qualities during teaching learning.

- By bringing ethnomathematics into the classroom, empowering those whose voices and ideas have traditionally been marginalized.

  Eg. the examination of ratios, patterns and symmetry in Pulli Kolam from Tamilnadu, naga Kolam, nizhal pavakoothu, temple statues and idols and mural arts, chance and strategy games and puzzles from various Native tribes. Music is one of the prime examples of ethnomathematics because every culture has their traditional music Ethnomathematics can analyse the various patterns, rhythms, chord progressions, and melodies that are found in music and another example is traditional dance forms like Kadhakali, Mohiniyattam, Tribal dances and Bharathanatyam including their steps and performance.
- Ethnomathematics can help students of all kinds to develop their capacity of thinking "outside box". When students are exposed to different lines of thinking, they begin to see the diversity and can spark creativity. instead of focusing on one right way, students will start asking different questions, which may lead to solutions or develop different ways of presenting and sharing them.

Eg: Concept of Vedic mathematics and method of calculations

- Helps students to develop their creativity to solve problems using variety of strategies, and then be able to express themselves through multiple methods.
- Ethnomathematics also a way to incorporate student's own culture and historical knowledge into mathematics class.
  Eg: Mathematical traditions of Kerala

Advantages of Integration of Ethnomathematics as Culturally Relevant Pedagogical approach to enrich mathematics teaching

- Helps to teach the subject mathematics with curiosity and interest
- Promotes creativity
- Helping pupil to fulfil their potentials.
- Promotes citizenship, transmitting values and understanding rights and responsibilities of society.
- Promotes learner centered education.
- Encourages logical and critical thinking.
- Promotes different strategies and techniques to develop mathematical concepts.
- Helps to change boring classroom traditional methods to innovative methods
- Promotes self learning
- Encourages practical applications of mathematics concepts and theories.
- Enriches and helps to transform culture from one generation to next generation.
- Promotes national and international aims and values.
- Social Media Competence helps students to respect ethnic cultures of our society

Conclusion

After a detailed analysis the researcher ended with an idea of Integration of Ethnomathematics as Culturally Relevant Pedagogical approach helps to enrich mathematics teaching. Also, the researcher founded that Integration of Ethnomathematics as Culturally Relevant Pedagogical approach helps to the holistic development of the child.

Suggestions

- Provide opportunities to create an awareness about Ethnomathematics among educators, researchers and students.
- Curriculum makers should enable a platform to Incorporate Ethnomathematics in the school curriculum
- Teachers should share and enhance the awareness of Ethnomathematics as recent trends in education.

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