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MATH FOR EQUITY & JUSTICE IN AMBEDKAR'S VISION

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Abstract:

This paper analyzes how math education and data literacy can become powerful tools for promoting equity and justice for marginalized communities in India, drawing inspiration from Dr. B.R. Ambedkar's vision of social transformation through education.

It recognizes that historically, caste-based discrimination has limited access to STEM, creating a barrier for marginalized groups in accessing job opportunities and how traditional curricula often alienate students by ignoring their lived realities. It also honors the efforts of reformers from marginalized backgrounds who fought to make education more inclusive and accessible.

To move forward, the paper suggests connecting math learning to real-world issues—like caste and gender inequality, wage gaps, and unequal access to resources—making math meaningful and relevant. It draws on ideas from thinkers like Paulo Freire and highlights both local and global examples where math has been used to drive social change. By weaving Ambedkarite values into classrooms, this study offers practical ways to create a more just and sustainable future—empowering students not just to solve equations, but to challenge injustice and imagine a better world.

Keywords: *Mathematics, Social Justice, Ethnomathematics, Ambedkar's Philosophy, Indian Education System, Mathematical Citizenship, Information Literacy, Data Literacy, Financial Literacy, Sustainable Development, Inclusive Development, Critical Pedagogy.*

Objective of the Paper

The paper examines how Dr. B.R. Ambedkar's views on economic justice, social empowerment, and education could motivate the incorporation of mathematics and information literacy into the curriculum of the current education system. In particular, it aims to:

1. Analyze the role of mathematical and data literacy in addressing systemic inequalities, like caste, class, and gender.
2. Explore how Ambedkar's emphasis on education as a means of liberation can shape curriculum development for inclusive and sustainable development.
3. Identify practical pedagogical models and case studies that exemplify mathematics as a tool for social justice and economic empowerment.
4. Recommend policy and institutional interventions to embed social equity in mathematics and information literacy education in India and beyond.

Research Questions:

- What are the hurdles to mathematics awareness for marginalized communities?

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- How can Ambedkar's economic ideas and philosophy of education be incorporated into mathematics and information literacy?
- In what ways can mathematics education promote social equity and sustainable development in line with Ambedkar's vision?

Introduction:

Dr. B.R. Ambedkar, India's foremost advocate for social justice, viewed education as the cornerstone for dismantling caste hierarchies and achieving economic democracy. His assertion that "education is the greatest weapon for social change" underscores its transformative potential in empowering marginalized communities. In contemporary India, mathematics and information literacy serve as critical tools for navigating a data-driven world, yet they often function as gatekeepers, perpetuating systemic inequities. This paper explores how Ambedkar's philosophy can inform mathematics education to foster social equity and sustainable development.

Historically, India's educational landscape has been fractured by caste and gender. Precolonial systems, while rich in mathematical traditions such as Kerala's calculus and Jain combinatorics, were exclusionary, reserving advanced scholarship for upper-caste men. Colonial rule superficially democratized access to education but failed to address entrenched inequities. Post-independence policies such as the 2009 Right to Education Act and affirmative action (reservation) policies sought to bridge these gaps but faced backlash from dominant castes weaponizing "merit" to preserve privilege (Batra, 2020; Kumar, 2019).

As a result, there is still great underrepresentation: Brahmin men make up only 2.5% of India's population yet hold more than 25% of teaching posts in top STEM universities; women and underprivileged castes stay marginal (Banerjee & Mulay, 2007).

This disparity mirrors broader structural failures in education policy. Critics of the National Education Policy (NEP) 2020 claim it gives market-driven skilling top priority over social justice, therefore sidelining Ambedkar's emphasis on education as liberation (Rampal, 2020; Govinda, 2020).

Traditional math teaching often focuses on memorizing steps to solve problems, without linking them to real-life situations (Skovsmose, 2011). This "exercise paradigm" encourages students to follow rules instead of thinking critically. Gutstein (2006) argues that this method supports a system that trains students to be obedient workers, rather than active thinkers. Even though schools talk about creativity, most classrooms still rely on repetitive tasks that leave out marginalized students and widen inequality.

To change this, we can bring Dr. B.R. Ambedkar's ideas of economic and social justice into math education. By using real-world examples—like caste-based wage gaps, unequal resource distribution, or gendered labor—teachers can make math more relevant and empowering. This approach turns the classroom into a space where students not only learn math but also learn to question injustice and imagine a fairer society.

1. Caste as a Social Structure: Implications for Mathematics Education

Caste remains a deeply entrenched social structure that shapes access to education and opportunities in India. This is particularly evident in STEM fields where dominant castes are overrepresented. For instance, of the 6,043 faculty members employed across the 23 Indian Institutes of Technology (IITs), only 149 (less than 2.5%) are from Scheduled Castes (SC), and a mere 21 (0.3%) belong to Scheduled Tribes (ST) (Sahoo, 2021). Such disparities illustrate How caste privilege continues to promote exclusionary practices despite constitutional safeguards.

Historically, India's caste system restricted access to education, reserving scholarly knowledge for upper-caste men while relegating marginalized castes to

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menial labor. Despite colonial-era reforms introducing formal schooling for all castes, systemic barriers persisted (Rawal & Swaminathan, 2011).

Today, marginalized castes remain overrepresented in poorly paid informal jobs like cleaning and scavenging (Rawal & Swaminathan, 2011). Educational inequities exacerbate this issue, with inadequate infrastructure, poor teaching quality, and social stigma contributing to higher dropout rates among marginalized groups (Rawal & Swaminathan, 2011; Deshpande, 2000).

Addressing these systemic issues is crucial to ensure education promotes social mobility rather than reinforcing inequalities. By acknowledging and addressing these disparities, efforts can focus on creating a more equitable educational landscape.

To address these disparities, affirmative action policies such as reservations for SCs and STs were introduced in higher education during the 1950s and extended to Other Backward Castes (OBCs) following the Mandal Commission recommendations in the 1990s. While these measures enabled greater representation of marginalized groups in institutions like IITs, they also sparked widespread protests from dominant castes who argued that merit should determine access rather than caste identity. Scholars like Kancha Ilaiah (1990) and Ajantha Subramanian (2019) have critically engaged with the notion of "merit," exposing how it often serves as a euphemism for entrenched caste privilege.

Subramanian's *Caste of Merit* (2019) documents how IIT Madras transitioned from a space where caste was invisible to one where it is openly acknowledged due to increased representation of marginalized groups through reservation policies. This shift underscores the importance of policy interventions in challenging systemic inequities.

2. Mathematics as a Gatekeeper

Mathematics education often acts as a "filter" that determines who gets access to higher education and good jobs (Black et al., 2009; Wolf, 2002). According to Bourdieu (1998), schools tend to favor the cultural habits of dominant groups. Middle-class students, who are used to abstract thinking and academic language, have an advantage (Noyes, 2008). Grouping students by ability (streaming) may seem fair, but it often hides deeper inequalities and puts marginalized castes and classes at a disadvantage (Jorgensen et al., 2014).

In India, math is a gatekeeper subject that blocks many marginalized students from completing school or pursuing higher education. Although the National Focus Group on Teaching Mathematics (2005) called for equal access to quality math education, barriers like caste discrimination, regional and language gaps, and social stigma continue to exclude marginalized groups. These students often face a curriculum that doesn't reflect their lives or meet their needs.

Students' social conditions shape their hopes and expectations from education (Skovsmose, 2018). Many marginalized children grow up in poverty and struggle with poor learning environments. Free or low-cost schools often lack resources and fail to use relatable teaching methods. As a result, these students fall further behind, and inequality in education continues.

3. Critical Pedagogy in Mathematics Education

Education should be a tool for freedom, helping students become active thinkers who can question and change the world around them . In traditional "banking model" of education, students are treated like empty containers to be filled with information, which only strengthens existing power structures. There is a need for a more interactive and critical pedagogy based on students' real-life experiences(Freire,1968).

This vision closely aligns with Dr. B.R. Ambedkar's call for education as a means of achieving **social and economic democracy**. For Ambedkar, education was not merely academic—it was a tool for emancipation,

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self-respect, and resistance against caste-based exploitation (*Annihilation of Caste*, 1936). His vision of justice, outlined in *States and Minorities* (1947), demanded structural changes in the economy and society through state-led welfare, equitable resource distribution, and labor rights.

Integrating Freirean pedagogy within **Ambedkarite principles** in mathematics education involves:

- **Culturally Responsive Teaching**: Embedding math problems in real-life contexts such as caste-based wage gaps, unequal land distribution, or access to welfare schemes, reflecting Ambedkar's concern with material inequalities.
- **Critical Data Literacy**: Equipping students—especially from marginalized communities—with the skills to analyze and question data that perpetuate caste, class, or gender disparities.
- **Equity-Driven Curricula and Policies**: Reforming math education to prioritize inclusive content, adequate resourcing for disadvantaged schools, and recognition of socio-political hierarchies in classrooms.

4. Ambedkar's Vision of Economic and Social Democracy

Dr. B.R. Ambedkar believed that political democracy is incomplete without economic and social equality. In States and Minorities (1947), he called for government control of key industries, fair distribution of resources, protection of workers' rights, and welfare programs to end caste-based exploitation and uplift marginalized communities. His earlier work, The Problem of the Rupee (1923), critically examined colonial economic policies and emphasized the need for financial stability, fair monetary policy, and state responsibility in ensuring economic justice—especially for the poor and disadvantaged.

For Ambedkar, education was a powerful tool to promote equality, encourage critical thinking, and build self-respect. In Annihilation of Caste (1936), he stressed the importance of challenging unjust social systems. His famous call to "Educate, Agitate, Organize" shows how education can empower people to fight for justice and bring lasting change.

Social Justice Mathematics: Aligning with Ambedkar's Vision

Gutstein and Peterson (2013) propose **social justice mathematics** as a transformative alternative. Key principles include:

- **Universal Relevance**: Rigorous, culturally relevant math for *all* students, not just marginalized groups.
- **Critical Literacy**: Using mathematics to analyze power structures (e.g., caste-based wage gaps, resource inequality) and advocate for change.
- **Beyond Cultural Capital**: Moving past tokenistic inclusion to equip students with tools to "tear down gates" of oppression (Gutstein & Peterson, 2013: xii).

This approach mirrors Ambedkar's emphasis on education as liberation. For instance, contextualizing math problems around land redistribution or labor rights echoes his economic advocacy, while fostering rational inquiry aligns with his call to dismantle caste through critical thought.

5. Mathematics and Information Literacy as Agents of Empowerment

Mathematics and information literacy are not merely academic subjects but essential life skills in the 21st century. For Ambedkar, knowledge had to be actionable—capable of confronting injustice and dismantling systems of exclusion.

Key Dimensions:

- **Critical Data Literacy**: The ability to collect, analyze, and interpret data to uncover social injustices (e.g., disparities in education, income, health).

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OPEN ACCESS Original Research Article

- **Financial Literacy**: Understanding budgeting, banking, taxation, and welfare schemes is crucial for economic independence.
- **Mathematical Citizenship**: Equips individuals with the tools to participate in democratic processes by interpreting graphs, percentages, and trends in policy documents and media.

This holistic approach aligns with Ambedkar's philosophy—mathematics and information literacy can sharpen one's ability to analyze structures of oppression and act upon that knowledge.

6. Case Studies: Grassroots and Global Approaches to Equity in Math Education

India:

- **Eklavya Foundation (Madhya Pradesh):** Involves students in solving math problems related to land, caste, and rural economy. This enables learners to use data for advocating fair land reform. *(Eklavya Foundation, 2020)*
- **Pratham's Learning Camps:** Uses games and real-life activities to build basic math skills among first-generation learners, boosting confidence for household budgeting and reading job contracts. *(Banerji et al., 2016)*
- **Azim Premji Foundation Initiatives:** Contextualizes math in lessons on water use, crop planning, and budgeting, helping rural girls engage in family and community decisions. *(Azim Premji Foundation, 2021)*
- **NIOS Financial Literacy Curriculum:** Provides open modules on interest calculation, digital payments, and government programs, equipping Dalit and tribal students with tools to manage finances and avoid exploitation. *(NIOS, 2022)*

Global:

- **Brazil's Ethnomathematics:** Integrates traditional crafts like weaving into math, teaching geometry and logic and validating indigenous knowledge.*(D'Ambrosio, 2001)*
- **RadicalMath (USA):** Connects algebra and statistics to social justice issues like policing and housing, fostering civic engagement.*(Gutstein, 2006)*
- **Ghana's Sustainable Farming Projects:** Applies math concepts to irrigation and crop planning, empowering women's groups to better manage resources.*(Darko & Quansah, 2008)*

7. Challenges and Barriers

Despite promising models, several obstacles persist in integrating social justice into mathematics education:

- **Diverse Student Populations**: Students from varied backgrounds have different needs and access to resources. Limited access to technology and materials hinders engagement (Panthi et al., 2021).
- **Curricular Rigidity**: Standardized textbooks often exclude social justice and environmental issues from mathematics content. (Gutstein & Peterson, 2005).Persistent disparities in math performance marginalize disadvantaged groups (Esmonde & Caswell, 2010). Discussions on caste or gender inequities are often considered inappropriate in traditional classrooms.(Taylor & Luitel, 2005).
- **Teacher Preparedness**: Many teachers lack training to connect math with social issues or use technology effectively (Panthi et al., 2021). Teacher-centered methods also limit students' critical thinking (Belbase, 2006).

Addressing these challenges requires systemic reforms, community collaboration, and culturally

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OPEN ACCESS Original Research Article

responsive approaches rooted in Ambedkar's vision of education as a tool for liberation and equality.

Policy and Pedagogical Recommendations:

Aligning Mathematics Education with Dr. B.R. Ambedkar's Vision

Dr. B.R. Ambedkar viewed education as a powerful tool for social transformation and economic empowerment, particularly for marginalized communities. His vision provides a compelling framework for mathematics education to promote equity and sustainable development. Key approaches include:

1.Teaching Math through Real-Life Social Issues

- **Ambedkar's Belief**: Education should address inequality and uplift marginalized groups.
- **Application**:
  - Use data to analyze caste-based wage gaps or literacy disparities (Thorat, 2009).
  - Teach geometry or calculus through real-world topics like farming or clean energy projects, fostering self-reliance (Gutstein, 2006).

2. Financial Skills for Independence

- **Ambedkar's Belief**: Education should enable economic self-reliance.
- **Application**:
  - Teach practical skills like savings, interest calculations, and budgeting (SEWA, 2020).
  - Use math to study wages and labor rights, aligning with Ambedkar's focus on workers' empowerment (Ambedkar, 1947).

3. Respecting Cultural Knowledge through Ethnomathematics

- **Ambedkar's Belief**: Traditional knowledge must be valued and integrated into education.
- **Application**:
  - Incorporate indigenous practices, such as Adivasi land measurement methods (D'Ambrosio, 2001).
  - Design culturally relevant math problems based on local histories and traditions (Gutstein & Peterson, 2013).

4. Using Data to Drive Change

- **Ambedkar's Belief**: Education should empower individuals to challenge injustice.
- **Application**:
  - Teach students to analyse social data like census statistics to advocate for fair policies (Gutstein, 2006).
  - Use climate data to explore solutions for environmental challenges, linking education to social good (Skovsmose, 2011).

5. Policy Recommendations for Inclusive Education

- Update curricula to address justice and sustainability through practical examples like household budgeting or land ownership statistics.
- Train teachers to integrate critical thinking and ethnomathematics into lessons.
- Ensure equitable access to resources and technology for marginalized students.
- Collaborate with community organizations like Eklavya and Pratham to develop inclusive learning materials.
- Use local languages and cultural contexts to make math more accessible and meaningful.

Conclusion:

Dr. B.R. Ambedkar emphasized that true freedom and equality cannot exist without social and economic justice. This paper suggests that math and information literacy can support this vision—if taught in ways that encourage students to think critically and advocate for their rights. Inspired by thinkers like Freire, Gutstein, and Skovsmose, this paper presents simple methods to integrate Ambedkar's values into math teaching, such

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Volume–XIV, Special Issues –I March – April 2025

OPEN ACCESS Original Research Article

as using math to examine wage gaps, develop financial skills, and apply data to promote social change. By connecting math to real-life issues like caste and gender discrimination, education can become a catalyst for change.

Social reformers like Jyotiba Phule and Savitribai Phule fought for equal access to education for everyone. However, true equality also demands altering the system—by creating inclusive curricula, training teachers to confront bias, and recognizing the contributions of leaders from marginalized communities in making education more equitable. Consequently, the classroom transforms into a space for challenging injustice and advocating for social justice rather than merely a venue for learning.

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