



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student : Soumen Das
Roll Number : 166105106
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Name of Thesis Supervisor(s) : Dr. Pratul Chandra Kalita
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SHORT ABSTRACT

Toys are central to supporting cognitive, social, emotional, and physical growth. However, plastic toys, while prevalent, raise serious environmental concerns. The research explores the design and integration of sustainable bamboo toys within Early Childhood Care and Education (ECCE), with the dual aim of fostering holistic child development and promoting eco-friendly practices. A detailed review of ECCE models—such as Montessori, Reggio Emilia, and Waldorf—alongside the Indian National Education Policy (NEP 2020) provided the theoretical foundation for embedding sustainability into ECCE frameworks. The study also examined the current state of ECCE in India, highlighting challenges in the Anganwadi system, such as limited access to developmentally appropriate toys, and identified opportunities for introducing bamboo-based alternatives.

An integrative literature review emphasized the importance of embedding sustainability not only in pedagogical practices but also in educational materials. By using renewable, eco-friendly resources, ECCE can offer children an environmentally responsible learning environment that nurtures both development and ecological awareness from an early age. The study further underscored the need for future research exploring ECCE models where sustainability is treated as a core dimension—an area that remains underexplored.

The study highlights bamboo as a viable alternative—biodegradable, durable, and developmentally appropriate. By designing and prototyping bamboo toys such as puzzles, spindle boxes, and Jenga, the research demonstrated how these eco-friendly products can meet educational goals while contributing to environmental conservation. The work also opens avenues for further innovation in toy design, sustainable packaging, and product diversification.

A major contribution of this thesis is the development of a design management model for introducing bamboo toys into ECCE systems. The model maps the value chain, identifying the roles of artisans, educators, entrepreneurs, and policymakers in fostering an ecosystem for sustainable toy production. It stresses collaboration between stakeholders and highlights opportunities for livelihood generation, entrepreneurship, and local economic development—particularly in the bamboo-rich northeastern states of India.

The research aligns closely with global Sustainable Development Goals (SDGs), including SDG 1 (No Poverty), SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). By linking bamboo toy development to these goals, the study demonstrates how ECCE can simultaneously advance child development, environmental sustainability, and socio-economic empowerment.

The study also recommends leveraging existing Common Facility Centers (CFCs) within bamboo clusters to scale up sustainable toy production. These centers can provide artisans access to modern tools, technologies, and shared resources, thereby enhancing both the sustainability and economic viability of bamboo-based enterprises.

This thesis presents a comprehensive roadmap for integrating bamboo toys into ECCE, addressing critical gaps at the intersection of education, environment, and livelihoods. By combining sustainable design practices with child-centered pedagogy and local resource utilization, the research offers a pathway toward strengthening early education while fostering rural economic growth and environmental responsibility.

