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Enhancing STEAM Culture at the Foundational Stage: Moving From a Pedagogical Imposition to Praxis Oriented Curriculum

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Abstract: STEAM is more than simply a trendy term or an afterthought to STEM. It's an educational approach that develops critical thinking and creative problem-solving abilities among students that are required in the workforce of the twenty-first century. It might also hold the answer to resolve some of humanity's most pressing problems in the years to come. This paper explores the necessity of enhancing the STEAM (Science, Technology, Engineering, Arts, and Mathematics) culture at the foundational stage of education. It focuses on the need for shifting the pedagogical imposition approach curriculum delivery to a praxis-oriented approach. The traditional approach to education often involves a top-down teaching style where the students passively receive knowledge. However, this study argues for a more student-centered and experiential approach that encourages active engagement and practical application integrated with STEAM principles. The paper discusses the importance of nurturing a STEAM culture from the early stages of education and the benefits it brings to students' holistic development. It emphasizes the need for a shift from rote memorization to critical thinking, problem-solving, and creativity. By adopting a praxis-oriented approach, students are encouraged to actively explore and experiment with STEAM concepts through hands-on activities, projects, and real-world applications. The significance of collaboration and teamwork in STEAM education and how they foster effective communication and cooperation skills. It also emphasizes the integration of the arts into the curriculum to promote creativity and innovation among younger minds. By developing a deep understanding of STEAM disciplines and their practical applications, students are better equipped to meet the demands of a rapidly evolving technological world. By emphasizing the importance of creating a supportive and conducive learning environment that encourages curiosity, exploration, and the freedom to make mistakes. It underscores the role of educators in facilitating this transformation from pedagogical imposition to a praxis-oriented approach, empowering students to become active participants in their own learning. This exploration also concludes on the potential possibility of enhancing the STEAM culture at the foundational stage and suggests some measures to materialize the same by adopting a praxis-oriented approach.

Keywords:STEM, STEAM, foundational stage, pedagogical imposition, praxis-oriented approach, holistic development, experiential learning

1. Introduction

India is home to over 26.5 crore students belonging to different regions, cultures, and socio-economic backgrounds [1]. Every year, as more students enroll in one of the 15 lakh schools across the country, India's educational landscape develops and becomes more intricate. 99 million children in India are eligible for ECCE services [2]. This number is expected to increase in the upcoming census, as per the experts. This statistic shows the magnitude of importance we need to give to the foundational stage. Foundational stage refers to children in the age group of 3 to 8 years, across the entire range of diverse institutions in India [3]. The traditional education system often focuses on rote memorization and standardized tests, leaving little room for creativity and hands-on exploration. To cater to the needs of this upcoming generation, teachers and other educational stakeholders should be well equipped. Imposing a top-down approach is not a solution for these pedagogical and learning gaps. An innovative and interdisciplinary approach to thinking like STEAM can improve the understanding as well as the creative level of the young mind. Young children have an innate and insatiable curiosity about the outside world and a need to comprehend everything they see, hear, and do. The never-ending questions are merely a first step in a child's learning process, and reflects child's genuine thrust to learn. Early STEAM education integration can result in a more positive and productive learning environment. The existing pedagogical impositions in curriculum transactions hinder this kind of learning and limit it to mere rote learning. Hence, a praxis-oriented approach is to be adopted as a solution to this issue.

2.1 Why STEAM education at the foundational stage?

Through the integration of many disciplines, STEAM education fosters students' overall development. It promotes innovative thinking, creativity, and problem-solving techniques, all of which are essential for the workforce of the future. Students who are exposed to STEAM topics early on are more likely to become interested in them. It gives them the chance to investigate and interact with scientific phenomena, technology, engineering principles, and mathematical concepts, creating a solid foundation for subsequent learning and potential career pathways. Hands-on learning opportunities through projects, experiments, and other activities are emphasized in STEAM education. With the help of this strategy, students may actively engage in their own learning, which encourages curiosity, engagement, and a deeper comprehension of subjects. The significant fact is that this approach helps to sustain the natural inquisitiveness of the learner.

STEAM education ties academic learning to practical applications. It aids students in comprehending the relevance of STEAM fields in various fields of employment. They are inspired to seek further studies or professions in these disciplines because they can now see the application of their education. Students frequently work in teams on collaborative projects in STEAM classes. This encourages teamwork, cooperation, and good communication. In order to succeed in the future, students must develop the abilities of active listening, the sharing of ideas, and cooperative problem-solving.

Creativity and innovation are fostered by the inclusion of the arts (the "A" in STEAM). It enables pupils to think creatively, consider several approaches to a problem, and communicate their thoughts through the visual arts, design, music, or other forms of expression. This multidisciplinary approach promotes students' capacity for creative problem solving and fosters their imagination.Furthermore, interdisciplinary integration prepares students for the multifaceted challenges they will face in their future careers. In the workforce, professionals rarely work in isolation; they collaborate across disciplines to tackle complex issues. By experiencing this collaboration in school, students are better equipped for the demands of the real world. Competence in STEM subjects is highly prized as technology and innovation take center stage in society. Students have more time to acquire fundamental abilities and information by integrating STEAM education at the elementary school level, better preparing them for future job options in STEM-related industries.

2.2 Present educational landscape of elementary curriculum: A Critical analysis

The elementary education system forms the bedrock of a nation's educational framework, providing a strong foundation for children's holistic development. In India, where education is considered a fundamental right, it is imperative to assess and understand the present-day educational landscape of the elementary curriculum. Children in India's wide range of diverse institutions between the ages of 3 and 8 are referred to as being in the foundational stage. Based on NEP 2020. The National Curriculum Framework for the Foundational Stage 2022 [4] was created as envisaged by the NEP 2020. The curriculum and pedagogical restructuring of school education begin with the new 5+3+3+4 system. This new system by NEP 2020 has the utmost significance for the child at the very foundation stage. The NEP 2020 also encourages concepts like design thinking and artificial intelligence (AI). A scoping review of STEM, STEAM, and makerspace experiences for children aged birth to eight found that STEAM holds more relevance for early childhood learning. The review suggests shifting STEAM experiences to infants, toddlers, and preschoolers, and focusing on informal and community contexts to encourage broader participation. Further research is needed to understand the professional learning needs of early childhood educators as well [5]

Kim, R. [6] conducted a study to create a STEAM teaching model and program for links between kindergarten and elementary schools using smart devices. The model was finished after being altered and improved. The objective was to foster young children's interest in STEAM, creativity, and convergent thinking skills. The methodology featured three iterations of the current situation, imaginative design, emotional experience for the material, and problem-solving. The creation of this approach might have an impact on linkages between kindergarten and elementary school.

In the foundational stage (beginning at age 6), there will be a focus on arithmetic and computational thinking for AI, machine learning (ML), and data science. These are carried out using creative techniques, such as the regular application of games and puzzles that make mathematical thought more interesting and engaging. Coding-related activities will be introduced in the middle stage (beginning at age 11). But since the new educational policy is still in the formulation stage, it may take time to get implemented at the ground level.

In a study on how primary school kids' perceptions toward creativity and science are affected by STEAM education. There were two experimental groups and forty comparator groups in the study, which covered four classrooms of fourth graders in Busan. The study discovered that STEAM-based scientific lessons dramatically increased students' creativity and enhanced their attitudes toward science. The report emphasizes the value of STEAM education in developing future leaders of society [7]

The growth of each child's creative potential is emphasized heavily in the new education policy. In order to create an equal, inclusive, and pluralistic society, it tries to create engaged, productive, and contributing citizens for the future. The curriculum design in Indian elementary schools reflects a blend of national and state-level guidelines. The National Council of Educational Research and Training (NCERT) provides a framework that emphasizes a child-centric and activity-based approach to learning. However, challenges remain in the implementation of the curriculum, with discrepancies in content delivery and variations in quality across different regions.

In recent years, there has been a slow shift towards more interactive and experiential pedagogical approaches in Indian elementary schools. The traditional rote learning method is gradually being replaced with innovative techniques, including group activities, project-based learning, and the integration of technology. These approaches aim to enhance students' critical thinking, problem-solving skills, and creativity. But India needs to work harder in all spheres to make it practical at the ground level. The goal of a study conducted to create a STEAM teaching model and program for links between kindergarten and elementary schools using smart devices. The model was finished after it had been altered and improved. The objective was to improve young children's interest in STEAM, creativity, and convergent thinking skills. Three instances of the current circumstance, imaginative design, emotional response with the material, and problem-solving were all incorporated in the model. The creation of this paradigm might have an impact on links between kindergarten and elementary school [8]

Assessment methods in Indian elementary schools have witnessed a transition from solely examination-based evaluations to a more comprehensive assessment framework. While examinations still play a significant role, there is an increasing emphasis on continuous and formative assessments. These methods focus on evaluating students' overall progress, including their understanding, application of concepts, and social-emotional development.

Despite progress, several challenges persist in the Indian elementary education landscape. One key challenge is the wide disparity in the quality of education between rural and urban areas. Access to quality infrastructure, trained teachers, and learning resources remains a concern in many regions. Additionally, the issue of high student-teacher ratios poses obstacles to personalized attention and individualized instruction. Limited teacher training and professional development opportunities further hinder effective implementation of the curriculum.

Recognizing the need for improvement, the Indian government has undertaken various initiatives to enhance the elementary education landscape. Programs like the Sarva Shiksha Abhiyan (SSA) and the Rashtriya Madhyamik Shiksha Abhiyan (RMSA) aim to improve infrastructure, increase enrollment rates, and enhance teacher training[9][10]. Furthermore, the integration of technology, such as digital classrooms and e-learning platforms, holds promise for bridging the urban-rural divide and enriching the learning experience.

The critical analysis of the current educational environment for India's basic curriculum indicates both advancements and obstacles. The transition to experiential learning, comprehensive evaluations, and child-centric pedagogies shows progress in raising the standard of education. However, it is still vital to address the issues of regional inequality, teacher preparation, and infrastructure. India can work towards a more inclusive and successful elementary education system by integrating a STEAM culture that equips pupils for a dynamic and competitive world by continuing to invest in teacher development, ensuring fair access to resources, and encouraging innovative teaching techniques.

2.3 The possibilities and ways to integrate STEAM education at elementary level

STEAM education at the elementary level focuses on integrating science, technology, engineering, the arts, and mathematics to provide students with a well-rounded and interdisciplinary learning experience. Here are some examples of STEAM education activities and projects for elementary students:

An excellent approach to introduce pupils to scientific ideas is by conducting practical science projects. Students might investigate the characteristics of magnets, engineer chemical reactions, or construct easy circuits to comprehend electricity, for instance. Students can use programmable robots like Bee-Bots or Lego Mindstorms for easy robotics exercises. When building and programming robots to perform certain tasks, they can learn about coding, problem-solving, and design. The "talking doll' or robot Shiksha was recently unveiled in Karnataka, India [11]. The robot includes built-in programming for rhyming, matching equations, storytelling, and spelling in its minicomputer. The robot is now being developed to teach pupils in fourth grade and lower. The robot's potential is not fully realized. Exposure to the new pathway can spark interest in and a favorable attitude towards the engineering and technology aspects. Robot technology has been used to acquire students' STEM competencies, such as digital competence and creativity. This study focuses on using a robot with a camera colors sensor to teach children about robotics and cognitive skills. The robot can be used as a selector in multiple choice games and as an educational tool for elementary school children[12].

Students can participate in engineering challenges where they are given a problem to solve using simple materials. For instance, they might be tasked with designing and building a bridge or a tower that can withstand certain weights or forces.

Encouraging students to combine art and design with scientific concepts can enhance their creativity and critical thinking skills. They can create models of the solar system, design and build their own simple machines, or use art to depict scientific concepts like photosynthesis.

Introducing students to coding at an early age can foster computational thinking skills. There are several age-appropriate coding platforms available, such as Scratch or code.org, that allow students to create interactive stories, games, and animations.

Engaging students in math puzzles, brain teasers, and problem-solving activities can develop their mathematical reasoning and logic. They can work on tasks like building geometric shapes with tangrams, solving math riddles, or exploring patterns and sequences.

Students can learn about environmental science and sustainability by engaging in projects such as creating a composting system, designing eco-friendly buildings, or investigating renewable energy sources like solar power.

Students can collect and analyze data on various topics and then present their findings using graphs and charts. This can involve conducting surveys, measuring and recording observations, and interpreting the results.

These examples represent just a few of the many possibilities for incorporating STEAM education into elementary classrooms. The aim is to promote inquiry-based learning, hands-on exploration, and interdisciplinary connections across the subjects of science, technology, engineering, the arts, and mathematics.

2.4 Moving from a pedagogical imposition toPraxis oriented curriculum

Elementary education plays a crucial role in shaping the foundation of a child's learning journey.

It is imperative for India to move away from pedagogical imposition and towards a praxis-oriented curriculum that promotes active learning, critical thinking, and practical application of knowledge. We need to explore the significance of transitioning to a praxis-oriented curriculum at the elementary level in India and suggest strategies for its implementation.

A praxis-oriented curriculum fosters holistic development by engaging students in experiential activities that enhance their cognitive, social, emotional, and physical skills. By encouraging hands-on learning experiences, group projects, and interactive discussions, a praxis-oriented curriculum promotes active student engagement, motivation, and a love for learning. Emphasizing critical thinking, creativity, and problem-solving from an early age equips students with essential skills to tackle real-world challenges and become lifelong learners. Integrating real-life examples, local context, and practical applications of knowledge into the curriculum enhances its relevance and makes learning meaningful for students [13].

We need to focus on the implementation strategies as well. Provide comprehensive training programs to elementary school teachers, focusing on praxis-oriented teaching methodologies, activity-based learning, and effective classroom management techniques. Teachers must receive training in pedagogical strategies that encourage inquiry-based learning and critical thinking among children. Programs for professional development can aid educators in learning the required abilities and it will foster a better teaching learning environment.

In addition, schools should also invest in STEAM resources like labs, tools, and technology for preparing the future learners.Revise the existing curriculum to include project-based learning, hands-on experiments, field trips, and interactive learning materials. Align the curriculum with national standards while ensuring flexibility to adapt to local needs and interests. Develop and provide age-appropriate teaching aids, digital resources, and educational materials that support experiential learning and cater to diverse learning styles. Shift from rote memorization-based assessments to authentic assessments that evaluate students' understanding, critical thinking, and problem-solving abilities. Assessments should focus on the practical application of knowledge rather than mere recall. Fostering partnerships with local communities, NGOs, and parents to create opportunities for students to connect their learning with real-life experiences Collaborate with experts and professionals from various fields to provide mentorship and guidance.

Transitioning to a praxis-oriented curriculum at the elementary level in India is a progressive step towards nurturing well-rounded individuals equipped with critical skills for the 21st century. By prioritizing active engagement, critical thinking, and the practical application of knowledge, we can empower young learners to become active contributors to society. STEAM education enables Through targeted teacher training, curriculum redesign, adequate learning resources, appropriate assessments, and community involvement, India can lay a strong foundation for lifelong learning and prepare its children for a dynamic and evolving world.

3.Conclusion

STEAM education at the elementary level offers numerous benefits, including holistic development, early exposure to STEAM, hands-on learning, real-world relevance, collaboration, creativity, and career readiness. By incorporating these elements into the curriculum, schools can help to foster a generation of well-rounded individuals with a solid foundation in critical disciplines. With the help of STEAM, educators can engage students early in the arts and sciences and foster a love of learning that will last a lifetime. The fields of study of science, technology, engineering, math, and the arts all contain creative processes and don't all rely on one method of research and analysis. By enhancing the STEAM culture at the elementary level in India and moving towards a praxis-oriented approach, we can empower young learners to become lifelong learners, critical thinkers, and problem solvers. This transformation in education will not only benefit individual students but also contribute to the overall development and progress of the nation, fostering innovation, economic growth, and societal advancement.

References

[1]. National University of Educational Planning and Administration, 2022
[2]. Census of India (2011), Primary Census Abstracts, Registrar General of India, Ministry of Home Affairs, Government of India, http://www.censusindia.gov
[3]. NationalEducational Policy,2020, https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
[4]. National Curriculum Framework Foundational Stage 2022
[5]. Johnston, K., Kervin, L., & Wyeth, P. (2022). STEM, STEAM and Makerspaces in Early Childhood: A Scoping Review. *Sustainability*.
[6]. Kim, R. (2021). The Development of STEAM Teaching Model and Program based on Smart Device for Connection of Kindergarten-elementary School. *İlköğretim Online*.
[7]. Lee, S., & Lee, H. (2013). The Effects of Science Lesson Applying STEAM Education on the Creativity and Science Related Attitudes of Elementary School Students.
[8]. Kim, R. (2021). The Development of STEAM Teaching Model and Program based on Smart Device for Connection of Kindergarten-elementary School. *İlköğretim Online*.
[9]. Sarva Shiksha Abhiyan (2011), Department of School Education and literacy, Ministry of Human Resource & Development, Government of India. https://dsel.education.gov.in/sites/default/files/2019-05/Manual_Planning_and_Apprisal.pdf
[10]. Rashtriya MadyamikShiksha Abhiyan (2013) https://www.education.gov.in/rmsa
[11]. Ys, T. (2023). Meet Shiksha the robot teacher. YourStory.com. https://yourstory.com/2023/05/shiksha-robot-teacher-walmart-india-women-wild-instagram
[12]. Elsheikh, M., Mousa, A.A., & Ismail, T. (2022). Aneducational robot to elementary school children for acquiring STE(A)M competences.
[13]. Chaudhary, M. (2020). The Effect of STEM Technology Program on Academic Achievement of Elementary SchoolStudents An Experimental Research. University. https://shodhganga.inflibnet.ac.in:8443/jspui/handle/10603/415791

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