IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.301

Volume 3, Issue 3, June 2023

A Study on Robotic Education in Schools at Coimbatore

Dr. Kamala Saravanan[1] and Abishek C P[2]

Professor, Department of Management Sciences[1]

II MBA Student, Department of Management Sciences[2]

Hindusthan College of Engineering and Technology, Coimbatore, India

Abstract: *Abstraction is a valuable approach to teaching robotics to students in Coimbatore. It simplifies complex concepts, making them more accessible. Modular design breaks down robots into parts, helping students understand how they work. Simulations provide a safe environment for studentsto experiment with robot behaviors. Simplified programming focuses on key concepts, making coding more accessible. Abstraction inspires students and prepares them for careers in robotics, benefiting Coimbatore's growing industry.*

Keywords: Robotic learning, 4TH level Technological learning and other technologies using for teaching students in schools

I. INTRODUCTION

Robotic learning in Coimbatore schools offers students valuable skills in engineering, programming, and problem-solving. It fosters creativity, teamwork, and critical thinking. Students learn about robot components, programming languages, and applications. Resources like robotics kits, simulations, and online courses facilitate learning. Robotic learning benefits students through interdisciplinary education, practical application, career opportunities, and ethical considerations. It promotes creativity, teamwork, and adaptability while fostering entrepreneurship and community engagement. Additional support includes guest lectures, clubs, industry partnerships, maker spaces, and teacher training programs. Embracing robotic learning empowers students and contributes to regional technological advancement.

Robotic learning in Coimbatore schools prepares students for diverse industries and fosters problem-solving skills, creativity, and collaboration. It bridges theory and practice, promotes innovation, and offers future career opportunities. Students explore ethical considerations and engage in community outreach. Robotic learning is inclusive, cultivates adaptability and resilience, and encourages research and global collaboration. Initiatives like guest lectures, competitions, industry partnerships, maker spaces, and teacher training enhance the learning experience. Coimbatore schools embracing robotics empower students and contribute to technological advancement in the region.

1.1 Statement of the Problem:

Robotic education integrates robotics into the curriculum, fostering problem-solving, critical thinking, and creativity. It provides hands-on experience in designing, building, and programming robots, preparing students for STEM careers. Challenges in Indian schools include limited resources, high costs, lack of trained teachers and curriculum, resistance to change, limited awareness, and gender disparity. Overcoming these challenges requires resources, teacher training, scalability planning, changing perceptions, promoting inclusivity, and creating an engaging learning environment.

- Limited resources
- High cost of equipment
- Lack of trained teachers
- Lack of curriculum
- Emphasis on traditional subjects
- Limited Awareness and Perception
- Resistance to Change:
- Teacher Training and Professional Development:

- Integration with Existing Curriculum:
- Accessibility and Equity
- Sustaining Interest and Engagement
- Limited Industry Collaboration
- Limited Scalability
- Cultural and Societal Perceptions
- Gender Disparity

Limited resources: Many schools in India have limited resources when it comes to teaching robotics. This makes it difficult for students to learn and experiment with new technologies.

High cost of equipment: The cost of robotics equipment is quite high, which makes it difficultfor schools to invest in the necessary tools and resources

Lack of trained teachers: There is a shortage of trained teachers who can effectively teach robotics. Many schools in India do not have teachers with the necessary skills and knowledge to teach robotics.

Lack of curriculum: There is no standardized curriculum for teaching robotics in Indian schools. This makes it difficult for schools to know what to teach and how to teach it.

Emphasis on traditional subjects: In India, there is often a greater emphasis on traditional subjects like math, science, and language, which can lead to a neglect of emerging technologies like robotics.

Limited Awareness and Perception: One of the challenges is the limited awareness and perception of robotic education among students, parents, and educators. There may be a lack of understanding about the benefits and career opportunities associated with robotics, which can hinder the adoption and support for robotic education initiatives.

Resistance to Change: Introducing robotics into the curriculum may face resistance from traditional teaching methods and established educational systems. Some educators and administrators may be hesitant to incorporate robotics due to concerns about curriculum overload, lack of familiarity with the technology, or resistance to change in teaching methodologies.

Teacher Training and Professional Development: Providing adequate training and professional development opportunities for teachers is crucial for the successful implementation of robotic education. However, there may be a shortage of training programs or workshops specifically tailored to robotics in Coimbatore, limiting the number of qualified teachers who caneffectively teach robotics concepts and skills.

Integration with Existing Curriculum: Integrating robotics seamlessly into the existing curriculum can be a challenge. Aligning robotics activities with the learning objectives of varioussubjects can require careful planning and collaboration among teachers, subject coordinators, andschool administrators.

Accessibility and Equity: Ensuring equal access to robotic education for students from all socioeconomic backgrounds is essential. However, the cost of robotics kits, equipment, and resources can be a barrier, particularly for schools with limited financial resources. Efforts should be made to make robotic learning more accessible and inclusive, such as seeking funding or grants, exploring partnerships with industry or non-profit organizations, or implementing shared resources programs.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 3, June 2023

Sustaining Interest and Engagement: Maintaining long-term interest and engagement in robotic education programs can be a challenge. Students may initially be excited about robotics, but without continued support, opportunities for progression, and engaging activities, their interest may wane over time. Schools should consider creating a variety of engaging projects, competitions, or extracurricular activities to sustain students' interest and motivation.

Limited Industry Collaboration: Collaborating with local industries, research institutions, and robotics experts can greatly enhance robotic education. However, there may be limited industry partnerships or engagement opportunities in Coimbatore, which could restrict access to real-world applications, mentorship, and internships for students.

Limited Scalability: Scaling up robotic education initiatives across schools in Coimbatore can be a challenge. The availability of resources, such as robotics kits, trained teachers, and infrastructure, may not be sufficient to cater to a larger number of schools and students. Without proper scalability planning, it can be difficult to ensure widespread access to robotic education.

Cultural and Societal Perceptions: Cultural and societal perceptions of vocational or technical education can influence the acceptance and integration of robotics in schools. There may be a prevailing bias towards traditional academic subjects, leading to limited recognition and support for vocational education, including robotic learning. Changing these perceptions andpromoting the value of robotics education as a viable career path may require advocacy and awareness campaigns.

Gender Disparity: Encouraging gender diversity in robotic education can be a challenge. There may be a gender disparity in participation, with fewer girls showing interest in robotics. Addressing this issue requires promoting inclusivity and creating a supportive environment that encourages girls to explore and engage with robotics. Efforts should be made to challenge stereotypes and provide equal opportunities for all students to participate and excel in robotic education.

1.2 Objective of the Study:

- To study the awareness among school teachers toward robotic education
- To study the usage of robotic education in Coimbatore schools
- To analyze the outcome of robotic education in schools

1.3 Scope the Study

The scope of a study on robotic education in Coimbatore would typically encompass various aspects related to the integration of robotics in educational institutions within the specificgeographical area of Coimbatore, India. The study could explore the following dimensions:

- **Educational Institutions:** Identify and select a representative sample of schools, colleges, or educational institutions in Coimbatore that have implemented or are planning to implement robotic education programs. The study could focus on both public and private institutions across different levels of education.
- **Robotic Education Programs:** Investigate the nature and extent of robotic education programs offered in Coimbatore. This could include examining the types of robotics courses, curriculum content, teaching methodologies, and practical applications of robotics in the educational setting.
- **Infrastructure and Resources:** Assess the availability and adequacy of infrastructure and resources for robotic education in Coimbatore. This may involve evaluating the accessibility of robotics kits, hardware, software, laboratories, and other necessary facilities for hands-on learning and experimentation.
- **Pedagogical Approaches:** Explore the teaching and learning strategies employed by educators in Coimbatore for robotic education. This could involve understanding how robotics is integrated into the existing curriculum, the role of project-based learning, and the use of educational robotics platforms or tools.

- **Teacher Training:** Investigate the level of training and professional development provided to teachers in Coimbatore for implementing robotic education. Assess the effectiveness of teacher training programs in enhancing their knowledge, skills, and confidence in teaching robotics.
- **Programming and Coding:** Robotic education emphasizes programming skills, teaching students how to code robots to perform specific tasks. This includes learning programming languages such as Python, C++, or visual programming environments specifically designed for robotics.
- **Electronics and Mechanics:** Students can learn about the electronic and mechanical components of robots, such as sensors, motors, actuators, and microcontrollers. Understanding these components enables students to build and control robots effectively.
- **Robot Design and Construction:** Schools can provide hands-on experience in designing and constructing robots using kits or modular platforms. Students learn about mechanical assembly, wiring, and integration of various components to create functional robots.
- **Problem Solving and Critical Thinking:** Robotic education promotes problem-solving skills and critical thinking through robot challenges and competitions. Students learn to analyze problems, devise strategies, and implement solutions using their robots.
- **Interdisciplinary Applications:** Robotics education can be integrated into various subjects like science, technology, engineering, and mathematics (STEM). It also has applications in fields like healthcare, agriculture, manufacturing, and space exploration, providing opportunities for interdisciplinary learning.

It's important to note that the scope of robotic education may vary depending on the age group, educational institution, and available resources. Schools can adapt and expand the scope basedon their specific goals and constraints.

II. RESEARCH METHODOLOGY

Research methodology is the specific procedures or techniques used to identify, select, process, and analyze information about a topic. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability. The methodologysection answers two main questions: How was the data collected or generated? How was it analyzed?

2.1 Research Design

Research design is a conceptual structure within which research should be conducted. Thus the preparation of such a design facilitates research to be as efficient as possible and will yield max information.

2.2 Descriptive Research Design

Descriptive research design includes surveys and fact findings, enquiries of different kinds. The major purpose of Descriptive research is description of state of affairs, as it exists at present. In social business research we quite often use the term Ex post facto research for descriptive studies. The main characteristic of this method is that the researcher has no control over the variable; he can only report what has happened or what is happening. Most Ex post facto research projects are used for descriptive studies in which the researcher seeks to measure such items, for example, frequency of shopping, and consumer preferences on products orservices. Descriptive Research methods will be applicable to the existing problem.

2.3 CHI-SQUARE TEST

The chi-square test is a statistical test used to determine if there is a significant association between two categorical variables. It is commonly used in data analysis to assess the independence or dependence between variables.

In SPSS (Statistical Package for the Social Sciences), you can perform a chi-square test using the Crosstabs procedure.

The chi-square test helps you determine if there is a significant relationship between the variables based on the p-value.

A small p-value (typically less than 0.05) suggests that there is evidence to reject the null hypothesis of independence, indicating a significant associationbetween the variables.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 3, June 2023

Remember that the chi-square test assumes certain assumptions, such as the variables being categorical and the observations being independent. It is essential to understand the context of your data and interpret the results appropriately.

2.4 ANOVA

ANOVA (Analysis of Variance) is a statistical test used to analyze the differences between group means in a study involving three or more groups. It is often used to determine if there are significant differences between the means of different treatments or conditions. In SPSS(Statistical Package for the Social Sciences), you can perform an ANOVA using the General Linear Model (GLM) procedure.

The p-value in the ANOVA table indicates whether there are significant differences between the group means. A small p-value (typically less than 0.05) suggests that there are significant differences, while a large p-value suggests that the group means are similar. It's important to note that ANOVA assumes certain assumptions, such as normality of the data, equal variances between groups, and independence of observations. It is crucial to evaluate these assumptions and interpret the results accordingly. Additionally, post-hoc tests, such as Tukey's HSD (Honestly Significant Difference) or Bonferroni correction, may be conducted to identify specific group differences if the overall ANOVA test is significant.

III. LITERATURE REVIEW

(Harry A. Pierson, 2017) A study on Deep Learning in Robotics: Advances in deep learning over the last decade have led to a flurry of research in the application of deep artificial neural networks to robotic systems, with at least thirty papers published on the subject between 2014 and the present. This review discusses the applications, benefits, and limitations of deep learning vis-à-vis physical robotic systems, using contemporary research as examples. It is intended to communicate recent advances to the wider robotics community and inspire additional interest in and application of deep learning in robotics.

(A. M. Cox, 2021) A study onExploring the impact of Artificial Intelligence and robots on higher education through literature-based design fictions: Artificial Intelligence (AI) and robotics are likely to have a significant long-term impact on higher education (HE). The scope of this impact is hard to grasp partly because the literature is siloed, as well as the changing meaning of the concepts themselves. But developments are surrounded by controversies in terms of what is technically possible, what is practical to implement and what is desirable, pedagogically or for the good of society. Design fictions that vividly imagine future scenarios of AI or robotics in use offer a means both to explain and query the technological possibilities. The paper describes the use of a wide-ranging narrative literature review to develop eight such design fictions that capture the range of potential use of AI and robots in learning, administration and research. They prompt wider discussion by instantiating such issues as how they might enable teaching of high order skills or change staff roles, as well as exploring the impact on human agency and the nature of datafication.

(Omar Mubin, 2013) A review of the applicability of robots in education: Robots are becoming an integral component of our society and have great potential in being utilized as an educational technology. To promote a deeper understanding of the area, we present a review of the field of robots in education. Several prior ventures in the area are discussed (post-2000) with the help of classification criteria. The dissecting criteria include domain of the learning activity, location of the activity, the role of the robot, types of robots and types of robotic behavior. Our overview shows that robots are primarily used to provide language, science or technology education and that a robot can take on the role of a tutor, tool or peer in the learning activity. We also present open questions and challenges in the field that emerged from the overview. The results from our overview are of interest to not only researchers in the field of human–robot interaction but also administration in educational institutes who wish to understand the wider implications of adopting robots in education.

(Jan Peters, 2016) A study on Robot Learning: Machine learning offers to robotics a framework and set of tools for the design of sophisticated and hard-to-engineer behaviors; conversely, the challenges of robotic problems provide both inspiration, impact, and validation for developments in robot learning. The relationship between disciplines has sufficient promise to be likened to that between physics and mathematics. In this chapter, we attempt to strengthen the links between the two research communities by providing a survey of work in robot learning for learning control and behavior generation in robots. We highlight both key challenges in robot learning as well as notable successes. We

IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.301

Volume 3, Issue 3, June 2023

discuss how contributions tamed the complexity of the domain and study the role of algorithms, representations, and prior knowledge in achieving these successes. As a result, a particular focus of our chapter lies on model learning for control and robot reinforcement learning. We demonstrate how machine learning approaches may be profitably applied, and we note throughout open questions and the tremendous potential for future research.

(Jens Kober, 2013) A study onReinforcement Learning in Robotics: Reinforcement learning offers robotics a framework and set of tools for the design of sophisticated and hard-to-engineer behaviors. Conversely, the challenges of robotic problems provide both inspiration, impact, and validation for developments in reinforcement learning. The relationship between disciplines has sufficient promise to be likened to that between physics and mathematics. In this article, we attempt to strengthen the links between the two research communities by providing a survey of work in reinforcement learning for behavior generation in robots. We highlight both key challenges in robot reinforcement learning as well as notable successes. We discuss how contributions tamed the complexity of the domain and study the role of algorithms, representations, and prior knowledge in achieving these successes. As a result, a particular focus of our paper lies on the choice between model based and model-free as well as between value function-based and policy search methods. By analyzing a simple problem in some detail we demonstrate how reinforcement learning approaches may be profitably applied, and we note throughout open questions and the tremendous potential for future research.

(Iain M. Cockburn, 2018) A study on the impact of artificial intelligence on innovation: Artificial intelligence may greatly increase the efficiency of the existing economy. But it may have an even larger impact by serving as a new general-purpose "method of invention" that can reshape the nature of the innovation process and the organization of R&D. We distinguish between automation-oriented applications such as robotics and the potential for recent developments in "deep learning" to serve as a general-purpose method of invention, finding strong evidence of a "shift" in the importance of application-oriented learning research since 2009. We suggest that this is likely to lead to a significant substitution away from more routinized labor-intensive research towards research that takes advantage of the interplay between passively generated large datasets and enhanced prediction algorithms. At the same time, the potential commercial rewards from mastering this mode of research are likely to usher in a period of racing, driven by powerful incentives for individual companies to acquire and control critical large datasets and application- specific algorithms. We suggest that policies which encourage transparency and sharing of core datasets across both public and private actors may be critical tools for stimulating research productivity and innovation-oriented competition going forward.

IV. ANALYSIS AND FINDINGS OF STUDY

4.1 Percentage Analysis

- Majority (53.5%) of respondents belong to the 25-30 group
- Majority (57.4%) of respondents are Female
- Majority (28%) of respondents are belongs to Middle schools
- Majority (66.3%) of respondents are answered as Yes for the awareness level of robotic education in Coimbatore
- Majority (34.7%) of respondents were aware by their Colleague
- Majority (68.3%) of respondents as Yes for the question they were knowledgeable aboutthe types of robots used in the field of educational settings
- Majority (63.4%) of respondents were respondents as highly Visulazied
- Majority (51.5%) of respondents were respondents as limitedly in conceptual learning
- Majority (51.5%) of respondents were respondents as Limitedly supporting in doubt clearance
- Majority (55.4%) of respondents were respondents as Limitedly Helps to guid in learning
- Majority (43.6%) of respondents were respondents as Highly effectiveness of roboticeducation
- Majority (53.5%) of respondents were respondents as Limitedly Robotic training
- Majority (50.5%) of respondents were respondents as Limitedly used robots inCoimbatore schools
- Majority (60.4%) of respondents were respondents as highly in Academic performance
- Majority (53.5%) of respondents were respondents as highly in Level of adoption ofknowledge

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 3, June 2023

- Majority (46.6%) of respondents were respondents as limitedly in extra curricularperformance
- Majority (46.5%) of respondents were respondents as limitedly in the level of gain softskills
- Majority (45.5%) of respondents were respondents as limitedly in Opportunities forhigher education & highly in opportunities for higher education
- Majority (41.6%) of respondents were respondents as limitedly in aware about futurecareer opportunities

4.2 Findings Of Chi-Square Test

Gender of the Teacher:

The observed data showed that there were 43 male teachers and 58 female teachers. Theexpected values, based on the assumption of an equal distribution, were 50.5 for both genders. The residual values indicate a difference between the observed and expected values, with a negative residual of -7.5 for males and a positive residual of 7.5 for females. However, the chi- square statistic of 2.228 with 1 degree of freedom did not reach statistical significance ($p > 0.05$) at the 0.136 level.

Awareness:

The observed data indicated that 67 teachers were aware, 20 were not aware, and 14 were partially aware. The expected values, assuming an equal distribution, were 33.7 for each category. The residuals show a positive difference of 33.3 for "Yes," and negative differences of -13.7 and -19.7 for "No" and "Partially," respectively. The chi-square statistic for awareness was 50.04 with 2 degrees of freedom, and the test reached statistical significance ($p < 0.001$).

In summary, there was no significant difference in the distribution of male and female teachers based on gender. However, there was a significant association between awareness levels and teacher gender ($p < 0.001$), indicating that awareness was not evenly distributed among the gender categories.

4.3 Findings Of Anova

- There is no significant difference between the age and level of visualization
- There is no significant difference between the age and level of conceptual learning
- There is no significant difference between the age and level of helping to guide inlearning
- There is no significant difference between the age and level of helping to guide inlearning
- There is no significant difference between the age and level of supporting in doubtclearness
- There is no significant difference between the age and level of effectiveness of robotic education in Coimbatore
- There is no significant difference between the age and level of robots extensively used inCoimbatore schools
- There is no significant difference between the age and level of academic performance inCoimbatore schools
- There is no significant difference between the age and level of adoption of knowledge in Coimbatore schools
- There is no significant difference between the age and level of robotic training in Coimbatore schools
- There is no significant difference between the age and level of gain of soft skills in Coimbatore schools
- There is no significant difference between the age and level of opportunities for higher education in Coimbatore schools
- There is no significant difference between the age and level of awareness about future career opportunities in Coimbatore schools
- There is no significant difference between the age and level of extra curricular performance in Coimbatore schools

V. SUGGESTIONS

To improve robotic education in Coimbatore, the following suggestions can be considered:

1. Enhance teacher training: Provide comprehensive training programs to educators on robotics and its integration into the curriculum. This will equip teachers with the necessary knowledge and skills to effectively teach robotics to students.

2. Increase availability of resources: Ensure access to quality robotic kits, tools, and materials in schools. This includes providing funding and support for schools to acquire robotics equipment and maintain up-to-date resources.
3. Foster partnerships: Collaborate with industry experts, universities, and research institutions to establish partnerships that can provide guidance, mentorship, and resources to schools. These partnerships can offer real-world applications of robotics and expose students to cutting-edge technology.
4. Encourage hands-on learning: Promote experiential learning by incorporating practical activities and projects that allow students to design, build, and program robots. This approach fosters creativity, problem-solving skills, and critical thinking.
5. Organize robotics competitions and events: Encourage participation in robotics competitions and events at the school, regional, and national levels. These platforms provide students with opportunities to showcase their skills, learn from others, and foster a sense of healthy competition.
6. Integrate robotics across disciplines: Encourage interdisciplinary collaboration by integrating robotics into various subjects like science, technology, engineering, arts, and mathematics (STEAM). This approach highlights the practical applications of robotics in different fields and promotes a holistic understanding.
7. Promote robotics clubs and extracurricular activities: Establish robotics clubs or extracurricular activities where students can explore their interest in robotics outside of the classroom. These clubs can facilitate teamwork, problem-solving, and creativity while fostering a passion for robotics.
8. Create awareness and parental involvement: Conduct awareness campaigns and workshops for parents and the community to highlight the benefits of robotic education. Encourage parental involvement and support in students' robotic learning journeys.
9. Continuous professional development: Provide ongoing professional development opportunities for teachers to stay updated with the latest trends and advancements in robotics. This can include workshops, seminars, and online resources.
10. Research and evaluation: Encourage research and evaluation of robotics education programs to identify best practices, assess student outcomes, and make informed decisions for future improvements.

VI. CONCLUSION

Improving robotic education in Coimbatore will create a strong ecosystem for robotics learning. This can be achieved by enhancing teacher training, providing quality resources, and fostering partnerships with industry and research institutions. Hands-on learning, competitions, and interdisciplinary integration will develop critical skills and promote innovation. Robotics clubs, involvement of parents and community, and continuous professional development for teachers are vital. Research and evaluation will drive improvement. Coimbatore's investment in robotic education will empower students, fuel technological advancements, and shape a future-ready workforce.

BIBLIOGRAPHY:

[1].https://robomatiic.in/
[2].https://www.irobochakra.com/
[3].https://sproboticworks.com/maker-lab/tamilnadu/coimbatore
[4].https://www.sulekha.com/robotics-training/coimbatore
[5].https://www.urbanpro.com/coimbatore/robotics-classes/240177
[6].https://dir.indiamart.com/coimbatore/educational-robotic-kits.html
[7].https://systechgroup.in/robotics-class-for-school-kids-children-coimbatore/
[8].https://in.linkedin.com/jobs/view/robotics-teacher-required-for-a-school-in-coimbator e-at-educohire-3576155307
[9].https://timesascent.com/job-detail-518957/Delhi-Public-School-Coimbatore/Coimbat ore/Robotics-Teacher
[10].https://www.psgtech.edu/hme.php?var=RAE
[11].https://systechgroup.in/robotics-class-for-school-kids-children-coimbatore/