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Exigency of Computer Science Subject in School Education in Uttarakhand

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Abstract: *The present paper aims at the logical implementation and increasing the efficiency and quality of the school education system. The reason for developing this paper is that, the existing school education policy does not scale up to handle better quality in computer subject. This paper describes a project whose aims are to develop the links between higher and secondary education. Computer education is a part of the school and college curricula since it is essential for today's child or adult. The intention of this paper is to emphasize the role of computers in school education.*

Keywords: Computer Science, Digital Literacy, Education Policy, NEP, School Curricula, Teacher Training

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1. Introduction

The goal of this paper is to introduce a new methodology of work, highlighting the most important difference between secondary and higher education in the field of computer science. There is some possibility to use it in addition of sets of facts, sets of rules, and to derive new facts and its implementation in school education.

In this paper, we explore deductive inference, where computer is a tool that individuals use in student careers. An increasing number of people are currently being benefited from computers. In the 1960s, the advancement of semiconductor technology laid the groundwork for the creation of personal computers (Bell 1989).

The history of computers in education has been variously characterized as an "accidental revolution" or "unthinking man and his thinking machines." Others have said that the computer revolution has changed the fact that "necessity is the mother of invention" to "in a computer world; invention is the mother of necessity." However characterized, it is clear that innovators in this field have created some of the most provocative and stimulating ideas in the history of education.

The various ways computer technology can be used to improve how and what children learn in the classroom, some of these are: (1) active engagement, (2) participation in groups, (3) frequent interaction and feedback, and (4) connections to real-world contexts (Roschelle et al. 2000).

In this paper we had done a field survey and collect the different-2 160 student's response/feedback and conclude with database at invoke of over-generalization, their subjects had simplified their learning pertaining to the system, current educational theories advocate for more agency and personalization (Collins and Halverson 2010).

In this research paper, for this concept, we derived a method, for query evaluation through students in deductive databases presented in this work and it is based on discovering of axioms and facts relevant to a given query (Lozinskii 1992).

The significance of this paper is that if we choose to maintain our current standard of living, our knowledge workers must compete in an international market and must have a good understanding of science (Bayrak et al. 2010). They highlight how CS education paves the way for developing computational thinking skills, which are essential for problem-solving in various domains. According to the survey we conclude that there are several benefits of integrating CS in School Education i.e. enhancing critical thinking skills, problem-solving, computational thinking skills & Promoting creativity, innovation, and entrepreneurship. Thereby,

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expanding career opportunities and addressing the digital skills gap Encouraging diversity and inclusivity in the technology field.

Computer science (CS) education has become a critical element of the US' efforts to keep pace with the growing number of CS jobs available in this country (National Science Foundation, 2012). Computing skills are not only limited to CS jobs; computing now plays a role in every sector, and processes employed in CS such as problem-solving and algorithmic thinking, are crucial for success in many occupations (Stephenson and Dovi 2013). Further, computing skills are becoming essential tools for managing all aspects of our personal lives including finance, communication, and health, and for simply navigating the world we live in (Wing 2006) And yet, public schools do not provide equitable access to quality CS education (Wilson and Moffatt 2010). Elementary schools are a natural entry point to CS education as the prevalence of technology has resulted in young learners having a familiarity with computers long before they enter the classroom (Born Digital 2010)]. Research has suggested that students as young as five years old have demonstrated the capability of learning programming and computational thinking concepts (Bers et al. 2014). The elementary school education is also critical for forming positive attitudes toward CS subject. Elementary school students have demonstrated a higher interest in CS (Lambert and Guiffre 2009). As expectations related to standards and standardized testing heighten, finding time in the school day for anything new is challenging at all grade levels. The elementary school day is particularly full (Repenning et al. 2015) with literacy and mathematics instruction taking priority over other subjects. Thus, the challenge of bringing CS to the elementary School education is especially difficult. This research paper sought to address these challenges. This has prompted the schools to take up initiatives to boost students' enrollment in CS related courses. According to the National Science Survey of India, math has remained the most preferred subject for secondary school students pursuing careers in the Sciences.

The report (Google Inc. and amp; Gallup Inc. 2016) presents findings from the second year of Gallup and Google's multiyear, comprehensive research effort to better understand perceptions of CS and access to CS learning opportunities in secondary schools in the United States. More than sixteen thousands, 7th- to 12th-grade students, parents of 7th- to 12th-grade students and 12 teachers, principals and superintendents were surveyed for this study.

This research paper explores the importance of integrating computer science (CS) into school education and its potential impact on empowering students and preparing them for the future. With the rapid advancement of technology and its pervasive influence on various aspects of our lives, equipping students with CS skills has become imperative. The paper examines the benefits, challenges, and effective strategies for integrating CS in school curricula, highlighting the positive outcomes for students, educators, and society as a whole.

2. Methodology

In this paper, we present a methodology by comparing students' response/feedback of higher education that what they feel about school education and what enhancement should be implemented.

NEP is introduced in higher education, and if student is of humanities, commerce etc. without CS background, and during their graduation course they opt CS as their compulsory subject, after opting this they felt it very hard. We conclude in this paper that, the two major functions of education are to transmit the culture, values and lessons of the past to the current generation; and to prepare our children for the world in which they live. Preparing children for the world in which they will live is becoming more difficult than ever. In retrospect, there has been a confluence of changes that have significantly impacted the direction of modern CS subject in school education.

Modern, high-speed computers and telecommunications have facilitated the rapid movement of financial resources, goods and services, and have created interdependence among the world economies. To benefit from these markets, nations must be competitive, and to be competitive they must have a well-educated work force.

3. Designing Tools Used in Query Optimization

Design is the process of creating a plan or solution to a problem by which design intentions are transformed into design descriptions and has identifiable phases or sub processes. Although the phases may not be

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addressed hierarchically for the entire design cycle and are often carried out recursively, there is an inherent order in the way in which designers approach represents decomposition.

In the modern era, computer science (CS) education plays a crucial role due to several reasons:

- **Digital Transformation:** The world is experiencing a rapid digital transformation, and CS education equips individuals with the skills and knowledge needed to navigate and contribute to this digital landscape. It empowers learners to understand and utilize technology effectively in various domains.
- **Job Opportunities:** CS education opens up a wide range of job opportunities. The demand for professionals with CS skills continues to grow across industries, including software development, data analysis, cyber security, artificial intelligence, and more. CS education prepares individuals for these high-paying and future-proof careers.
- **Problem-Solving and Computational Thinking:** CS education promotes problem-solving skills and computational thinking. It enables learners to break down complex problems into smaller, manageable parts and develop algorithmic solutions. These skills are valuable not only in computer science but also in other disciplines and everyday life.
- **Innovation and Entrepreneurship:** CS education fosters innovation and entrepreneurship by encouraging individuals to think creatively and develop new technologies and solutions. It nurtures an entrepreneurial mindset that can lead to the creation of startups and innovative ventures, driving economic growth and societal progress.
- **Digital Literacy and Citizenship:** CS education cultivates digital literacy, ensuring individuals have the knowledge and skills to critically evaluate information, protect their online privacy, and engage responsibly in the digital world. It promotes digital citizenship, ethics, and responsible use of technology.
- **Equity and Inclusion:** CS education plays a pivotal role in promoting equity and inclusion. It aims to bridge the digital divide by providing access to CS education opportunities for individuals from diverse backgrounds, genders, and underrepresented groups. It helps create a more inclusive and diverse tech workforce.
- **Technological Advancements:** CS education prepares individuals to understand and adapt to technological advancements. It enables them to stay updated with emerging technologies, such as artificial intelligence, block chain, internet of things, and quantum computing, which are shaping the future.

4. Framework

We have presented an Interface based on the static approach. It is interesting to compare its advantages and drawbacks with regard to the dynamic approach. In the following, we did a comparison between two different criteria:

The number of interactions between students' data interpretation relates to query and the answers obtained from the data. The differences are significant only in the case of the queries whose evaluation involves predicates which are defined.

This study demonstrated that trans-disciplinary problem-based modules that integrate the study of CS with other subject areas are a feasible way to bring more CS opportunities to younger learners. Moreover, it showed that implementing such modules is linked to more positive student academic achievement outcomes. The survey featured in this paper may be useful for elementary schools students'. These findings have implications for researchers, school district administrators, seeking ways to bring CS to all elementary school education. The study focused on the strategy for bringing CS to elementary school education.

5. Modifying the Framework

In this research paper we can conclude that the concept of Knowledge-based system for truth values and Computer Science has become an essential subject in today's world, with the increasing use of technology in almost all areas of life. The inclusion of Computer Science in school education has become a necessity to

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prepare students for the challenges of the modern world. Uttarakhand, like many other states in India, has recognized the importance of this subject and has taken steps to promote it in schools.

The revolution of Computer Science in school education in Uttarakhand involves the integration of technology in the classroom and the adoption of modern teaching methods. This includes the use of computers, software, and other digital tools to facilitate learning. The goal is to make students comfortable with technology and prepare them for a future where technology will be an integral part of their lives.

In this research paper, references provide an overview of the background and significance of computer science (CS) education in the modern era:

They discuss the importance of bringing computational thinking to secondary education and the role of the CS education community. They highlight how CS education paves the way for developing computational thinking skills, which are essential for problem-solving in various domains. They define computational thinking and emphasize its relevance in addressing complex problems. They review the current state of CS education in secondary education and its impact on students' learning outcomes. They present the scope and nature of computational thinking and its implications for education.

Defining the vision for computer science education in Uttarakhand: Set clear goals and objectives for transforming the subject in school education. Curriculum Development Review and update the computer science curriculum to align with current industry trends and technological advancements.

Introduction of new topics such as artificial intelligence, data science, cyber security and robotics emphasize practical application and hands-on learning experiences. Teacher Training and Professional Development provide comprehensive training programs for computer science teachers to enhance their pedagogical skills and subject knowledge.

Incorporate workshops, seminars and mentoring opportunities to support continuous professional development. Ensure access to adequate infrastructure, including computer labs, internet connectivity, and necessary software and hardware resources.

Establish partnerships with technology companies, universities and organizations to leverage their expertise and resources. Offer extracurricular activities, coding clubs, and competitions to engage students and nurture their interest in the subject. Develop a robust assessment framework to evaluate students' knowledge, skills, and competencies in computer science.

Incorporate both formative and summative assessments to provide feedback and track students' progress. Summarize the key points of the framework and emphasize the potential impact of revolutionizing computer science education in Uttarakhand. Highlight the importance of continuous improvement and adaptability to meet evolving educational needs.

6. National Level Policies Related to This Project

- There are some important National Level ICT Policy and Program related to exigency of computer education that took Initiatives in Indian education policy:
- 1972 Educational Technology Scheme was introduced.
- 1984 CLASS program (Computer Literacy and Studies in Schools).
- BBC microcomputers—12,000 were distributed to secondary and senior secondary schools 1986 National Policy on Education (NPE) Formulated. 1992 CLASS was folded into 8th 5-year plan; 4,898 schools given BBC microcomputers programme.
- 1998 National Task Force on IT—made recommendations for “IT for All by 2008” scheme; Vidyarthi.
- Computer Scheme—financial aid for students; Shishak Computer Scheme—financial aid for teachers; School.
- Computer Scheme— Internet for everyone by 2003.

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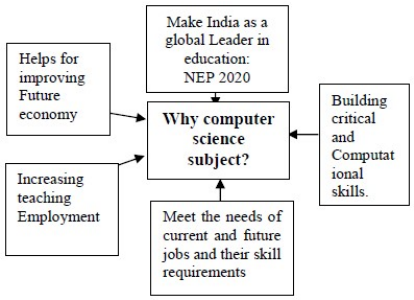
- 2000 Public-Private Partnerships began to boom; Intel Teach India program; National Curricular Framework.
- 2002 National Working Group on Elementary and Adult Education—recognized need having computer facilities and made the decision to support one or two schools in areas of 7–8 km radius.
- 2004 ICT@Schools program launched (CLASS and ET were combined into this).
- Establishment of SMART schools; EDUSAT (Education Satellite) launched.
- 2005 National Curricular Framework (NCF) 2005 published; National Knowledge Commission (NKC) was established.
- 2009: Right to Education (RTE) bill passed; "Rashtriya Madhyamik Shiksha Abhiyan" program started that laid emphasis on quality of secondary education; National Mission on Education through ICT launched.
- 2010 National Knowledge Network (NKN) to provide connectivity to educational institutions launched.
- 2012 National Policy on ICT for School Education launched.
- National Science Foundation (2012). NSF joins in commemorating computer science education week 2012: America's top computer scientists proclaim the virtues of computer science education today. [Press Release 12-227].

7. Background of the Work

Students apply English Language standards as they read, write, and present orally about the topic of study, there is less knowledge of CS to students in Secondary education so why computer science subject is necessary in secondary education we represent this by following diagram:



8. Results & Conclusion

To study such structures, especially to check recent database and to search for solutions may be made faster using a computer, CS education in the modern era is significant for digital transformation, job opportunities, problem-solving, innovation, digital literacy, equity, and inclusion, and staying abreast of technological advancements. It empowers individuals to thrive in a technology-driven world and contribute to its development.

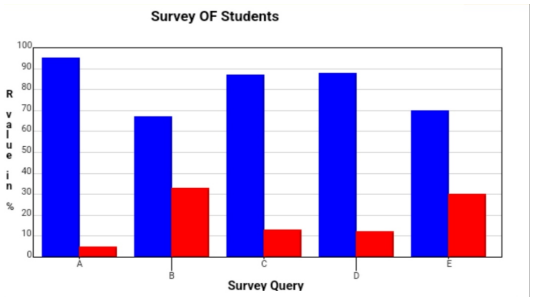


Figure 1: Bar Graph

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In Figure 1:

A- Do you agree that computer science subjects should be taken as compulsory subjects in secondary education i.e. from 5th to 8th and from 9th to 12th? **(Y/N).**

B- Adoption of new technologies of computer science should be implemented in secondary education as: **(Compulsory / Optional).**

C- May secondary education is connected through computer science. **(Y/N).**

D- Should Industrial visit be added in computer science curricula of secondary education? **(Y/N).**

E- Should secondary education students of arts streams be allowed to opt computer science as a compulsory subject? **(Y/N).**

In this research paper the importance of Computer Science in Secondary Education is being concluded by the Matplotlib library of python (Bar Chart) and it is totally dependent upon the survey of students' who are in higher education.

Y- Axis presents: - Resultant value in Percentage (%).

X- Axis presents: - Questions Asked by the students.

In figure Blue color bars' shows YES/Compulsory percentage of students according to questions asked.

In figure Red color bars' shows No/Optional percentage of students according to questions asked.

```
df.describe()
```

	QA	QB	QC	QD	QE	Output
count	160.000000	160.000000	160.000000	160.000000	160.000000	160.000000
mean	0.950000	0.662500	0.875000	0.875000	0.700000	0.712500
std	0.218629	0.474342	0.331757	0.331757	0.459696	0.454018
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	1.000000	0.000000	1.000000	1.000000	0.000000	0.000000
50%	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
75%	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
max	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

Figure 2: Data Describe

In Figure 2:

It describes mean, standard deviation and many more mathematical functions by using Numpy and Matplotlib python libraries. The revolution of Computer Science in school education in Uttarakhand is a positive step towards preparing students for the challenges of the modern world. It will equip them with the skills and knowledge they need to succeed in an increasingly technology-driven world and highlight the importance of continuous improvement and adaptability to meet evolving educational needs.

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