



CHALLENGES IN IMPLEMENTATION OF CODING FOR KIDS UNDER NATIONAL EDUCATION POLICY 2020

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ABSTRACT

Introduction: New National education policy is the first education policy of 21st century in India which has been announced on 29th July, 2020 to provide various reforms in all spheres of educational institutions. Integration of coding and analytical thinking from the school level has been one of the reforms which is set to be debarred of old teaching systems to reach new heights in the world of innovation and creativity.

Objectives: Study has been carried out to explore the NEP2020, to investigate the opportunity utilised by private institutions and to evaluate coding for kids as challenge or magic bullet for education system of India.

Methodology: This study is exploratory and descriptive which provides factual evidences to justify the findings in relation to the support or against statement of coding courses incorporated in the new curriculum of school level education.

Results/Findings: Under NEP2020 coding for kids based on various reports articles is being identified as challenge for Government of India at current scenario.

Practical Implication: The suggestions provided in the study needs to be implemented at all levels of education system, to strengthen its core values.

Conclusion: The study is limited to few articles, reports, research papers which provides base for the recommendations to executives of the policy. Though there is a dominance of challenges to provide coding as a subject to children at school level; with right strategies, budget, manpower and efforts, it could emerge as magic bullet of the new education system.

Key Words: *National Education Policy 2020, Coding for kids, Challenges of NEP 2020.*

INTRODUCTION

National Education Policy 2020 is the first education policy of India in 21st century which is aligned with the target of United Nations' SDGs 4 i.e., to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. The policy emphasizes on growth and development of creativity potential and innovation of every individual. It is based on the principle that education not only develops cognitive capacities such as critical thinking and problem solving but also develops social, ethical and emotional capacities of an individual.

Under chapter 4 of part 1 in NEP 2020, the policy makers have reconfigured the curricular and pedagogical structure of school education relevant to the developmental needs and interests of learners at different stages of their development, corresponding to the age as following:

Table 1: Curricular and pedagogical structure of school education

Developmental stages	Classes	Age group
Foundational Stage	3 yr. of Anganwadi/preschool + 2yr. Primary school in grade 1-2	3-8
Preparatory Stage	Grade 3-5	8-11
Middle Stage	Grade 6-8	11-14
Secondary Stage	Grade 9-12	14-18

Source 1: National Education Policy 2020

Introduction of contemporary subjects like Artificial Intelligence, Design Thinking, etc. at relevant stages will be undertaken to develop these various important skills in students at all levels. Activities involving coding will be introduced in middle stage. And students at grade 6-8 will be given hands on experience of an important vocational crafts, such as carpentry, electric work, metal work, gardening, pottery making etc. as decided by state and local communities.

Coding for kids: According to Manches and Plowman (2015) coding refers to “the specific skills of inputting instructions using a particular language” while programming refers to “the wider design and implementation process of using code to solving particular problems” According to L Dionysia, Coding is how humans can talk with computers. Coding involves communicating and giving instructions for different actions we want our computers to perform using a computer programming language. **Programming languages**, like JavaScript, Java, C/C++, or Python, act as the translator between humans and machines. **As per Vedantu.com**, Computer Programming or Coding involves the process where you give instructions to Computers with the help of Programming languages that the machines understand. The computer programme is the sequence of instructions that can range between a two-line code to something that can run into millions of lines. The computer programs are written for specifying individual tasks to the computer. Coding is a subset of programming, which entails the logical reasoning, analysis, and planning out a sequence of instructions for a computer program or application before any coding is done. The popular coding languages are Java, C, C++, Python, PHP, C#, Perl, Ruby etc.

Adding coding to the curriculum has become the need of the hour where learning programming reflects to the understanding of the individuals about the functioning of the devices such as how on response to the input codes the results are displayed over the screen of computer or laptop etc. Interviews of professors across the globe has resulted in understanding of the fact that coding skill is the new age basic skill that is acquired through digital literacy at early age of children, and for this matter it needs to be accommodated with all requisite infrastructural facilities as per Gardiner (2014).

REVIEW OF LITERATURE

Bers MU (2019) this paper outlines the six coding stages, learning pathways, and pedagogical technique known as Coding as Another Language (CAL) for teaching computer science to young children. Unlike conventional STEM classes, it helps young children go through six coding stages, including emergence, coding and decoding, fluency, new information, varied viewpoints, and purposefulness. Ciftci and Bildiren (2019) conducted an experimental study to examine the effects of coding on cognitive and problem-solving skills in four- to five-year children. The findings showed that taking a coding course improved the experimental group students' nonverbal cognitive abilities. However, there was no impact on the ability to solve problems. Derus et al. (2012) this essay explores students' perspectives on the challenges they experience when studying programming. Students reported having trouble learning

programming because of a lack of real-world examples, ineffective teaching methods, and students' lack of motivation, a theory-focused curriculum, and an unfriendly environment.

Duncan et al. (2014) have identified pros and cons related to teaching coding to young students. The benefits include making students learn quickly when they are at age where freedom of thoughts is highly valued. The cons include giving tools to teachers to deliver coding in their classes and time taken away from other subjects. Garcia et al. (2016) the goal of the article was to achieve three objectives: to provide a platform where new concepts and innovations can help with teaching coding; to give worldwide service training courses; and to help and develop confidence in teaching coding. The findings indicate that including coding in the pre-university curriculum is a significant challenge for everyone.

Kumar et al. (2021) The Kothari Commission suggested allocating 6% of the entire GDP to the educational sector, but as of 2021–2022, only 3.1 will be allocated. Opening the doors of the nation's educational system to foreign institutions could be harmful because most private educational institutions are operated solely for financial gain, which is fuelled by middle class individuals who enrol in them. Ng Shui (2017) in his paper presented a case study of a coding training programme designed to educate instructors to teach coding. There, it is said that learning materials and necessary instruments are essential for children's cognitive growth. The difficulties educators encounter is caused by instructors' lack of confidence in their ability to give high-quality STEM lessons because of their lack of pedagogical knowledge. It is a phenomenological study with the goal of fostering coding abilities in both formal and informal contexts. Informal coding environments suggest that learning through robotics is very important for improving students' metacognitive and critical thinking abilities.

NEED FOR THE STUDY

NEP 2020 is a mile stone put forth by the Government of India in response to challenges faced by old education system prevailing for more than 30 consecutive years. The Government has recognized the importance of future oriented vocational education programs for the upcoming generation. Therefore, introduced various new reforms like coding for kids under NEP 2020. But the current scenario of education system has many loop holes to support and encourage these reforms. Hence, there is an urgent need of study to identify the bottlenecks, road blockers in the success journey of NEP 2020.

STATEMENT OF THE PROBLEM

Coding for kids tends to relate with boosting mathematical, computational, and problem-solving skills. There is a widely held view among educationists that coding is fundamental skill of new digital age and therefore, requires proper incorporation of this skill at early stage of learning. NEP 2020 of India have also adopted and prepared roadmap but lacks clarity on achieving its target that is linked with SDGs 4th goal. This opportunity is being utilized by most of the private institutions by offering coding courses at arbitrary prices. This means that it is the private institutions which are reaping the benefits of early riser. Here, the question arises that whether this would reduce the gap between rich or poor and employed and

unemployed as private institutions (Govt. Aided, non-aided, others) contributes 31.34% to the total number of schools in India as per UDISE+ report 2021-22.

OBJECTIVES

The study has been undertaken by keeping in view the following objectives:

- To explore the New Education Policy 2020 in relation to existing education infrastructural facilities.
- To investigate the opportunity utilised by the Private Institutional players in India.
- To evaluate coding skills for kids as a challenge of Education system in India.

METHODOLOGY

This is exploratory and descriptive study where the researcher has provided the factual evidences related to coding courses incorporated in the new curriculum of school level education. More than 30 private institutions online and offline have been studied for gaining insights related to coding courses offered to kids at varying prices, whether based on monthly subscription or annual.

PRIVATE INSTITUTION PLAYERS

Through exploration, the researcher has found out various online platforms which provides basic to advance level courses of coding, AI, Machine learning to kids from grade 1 to 10. The list of online platforms is mentioned below:

Free platforms for coding

- Preschool (8-10): Code combat, Scratch, Stencil
- Middle School (11-13): Code Monster, App inventor
- High School (14-18): Glitch, Code academy etc.

Paid platforms for coding: specifically having at least one month plan

Table 2: Fee structure of different platforms for coding

Pre School (8-10)	Price of course per month (approximate values in Indian rupees)
Code Monkey (11-13)	500
Kodable	17104
Tynker	1650
Middle School	
Codemoji	2450
Lightboat	1100
Code Avengers	2400
High school	
CodeHS	6200
Plural sight	1500
Videocode	650

Source 2: Author

OTHER PLATFORMS

Whitehat Jr. charges approximately 4400rs for coding courses for grade 1-10 by providing 8 classes. And 24000rs by providing 48 classes.

Code karo yaaro charges 1600Rs for 8 session and 9100Rs for 48 classes.

Coding Ninjas and Coding Blocks both charges 20,000Rs for 21 classes.

Byjus charges 25000Rs for 8 classes.

Public Institutions: India has more than **15 lakh schools**, around **97 lakh teachers**, and more than **26.5 crore students**, all these just at the school level alone. And all of these are from varied backgrounds, thus creating assimilation in terms of learning. About 80.7% of schools in India are primary schools. Primary schools in India constitute Primary and Upper Primary divisions. The latest UDISE+ report of 2020-21 mentions that 12,17,670 schools in India are primary schools. It is also worth mentioning here that primary education in India has been made free and compulsory for all children aged 6 to 14, by the 86th Amendment to the Indian Constitution in the year 2002.

HIGHLIGHTS OF UDISE+ REPORT 2021-22:

Table 3: Highlights of UDISE+ report 2021-22

Parameters	2020-21	2021-22	Change in percentage (%)
Schools			
Total number of schools	15,09,136	14,89,115	-1.32
Total Govt. schools	10,32,179	10,22,386	-0.94
Enrolments			
Total number of enrolments	25,38,04,461	25,57,40,623	0.75
Primary to higher secondary			
Total number of enrolments in Govt schools	13,24,25,644	14,04,98,718	5.75
Primary to higher secondary			
Teachers			
Total number of teachers	96,96,425	95,07,123	-1.95
Total number of teachers in govt. schools	49,27,099	48,82,446	-0.9
Gross enrolment Ratio (%)			
GER - primary	103.3	103.39	0.09
GER – Upper primary	92.2	94.67	2.47
GER - Secondary	79.8	79.5	-0.3
Dropout rates (%)			
Primary	0.8	1.45	0.65
Upper primary	1.9	3.02	1.12
Secondary	14.6	12.61	-1.99
Infrastructure facilities (%)			
Electricity connection	86.90	89.34	2.44
Computer facility	41.25	47.51	6.26
Internet facility	24.51	33.91	9.4

Source 3: Department of School Education & Literacy, Ministry of Education, Government of India

ANALYSIS OF UDISE+ REPORT (2021-22)

Existing education system in India:

- In the world, Indian school education system is one of the largest with nearly 14.89 lakhs schools, 26.52 crore students and more than 95 lakh teachers.
- Total number of schools in India as per reports of UDISE+ 2021-22 are following:
 - All management – 14,89,115
 - Government – 10,22,386
 - Government aided – 82,480
 - Private Unaided – 3,35,844
 - Others – 48,405
- The total number of teachers has been declined by 1.95% in 2021-22. And referring to govt. school teachers, the number has declined by 0.9%.
- Gross enrolments ratio is also in decreasing order starting from primary level to secondary level as there is difference of -0.12% in primary and secondary level in terms of GER.
- Dropout rates shows that upper primary and secondary level shows increase in dropout rates starting from primary level.
- All management Schools' infrastructure: Electricity 89.3%, Computers 47.5%, Internet 33.9%. whereas govt schools only accounts for 85.9% functional electricity, 24% internet facility and 35.8% functional computer facility which is considerably low as per the total number of schools i.e. 10,22,386.
- Govt. schools having functional desktops/pc availability accounts for only 1,68,970 (16.5%) out of 10,22,386 schools whereas private school with no aid accounts for 1,64,866 (49%) out of 3,35,844 schools.
- Govt. schools having functional projectors only constitute 11.8% and private schools constitute 27.7% out of their total number respectively.
- Only 14.4% Govt. schools have functional smart classrooms whereas private schools have 18% used for teaching with digital board/smart boards/virtual classroom/smart tv available till 2021-22.
- The Gross enrolment ratio of Primary is 104.8% which showed increase of 3.5%. and upper primary and secondary level shows 6.96% and 2.7% increase respectively.
- At all levels of education Pupil teacher ratio has shown a 2% increase in 2021-22.

CODING FOR KIDS – CHALLENGES OR MAGIC BULLET?

Reflecting Udise+ report and observation of several private institution players on account of projection of future challenges or points of improvement related to implementation in establishing courses of coding for the students of grade 6 to 12th are hereby as:

- **Decreasing number of Schools:** the data shows that almost 1% negative change is visible in number of schools of all types such as govt. govt. aided, non-govt. aided and others.
- **Lack of infrastructure facilities:** Udise+ report shows that approximately 11% schools all over India still lack electricity supply, 52% schools lack computer facility and 64% lacks in internet facility. Only 11.8% schools have functional projectors and 14.4% have functional smart classrooms run by Government. It raises questions that how govt. will tackle this technological problem in improving overall education experience with the changing world.
- **Dropout rates prevalent in old education system.** Due to lack of accessibility of power supply, drinking water, single bread earner in home etc. children start dropping out of school at crucial stages of their cognitive development.
- **Gross enrolment ratio:** although gross enrolment ratio is increasing for primary and upper primary level from 2020-21 to 2021-22 but for secondary level there is decrease evident from given statistics which raises concern over the efficiency and effectiveness in the govt. schools. If this could be increased only than other objectives of NEP 2020 can be attainable.
- **Declining number of teachers from govt. schools:** it shows that Govt. needs more dynamic programmes to engage teachers in govt. schools besides benefits given by private schools.
- **Competition from Private schools:** the statistics indicates that private schools are flourishing and nourishing under the backdrops of Govt. schools, as they are providing best in class infrastructural facilities, smart classrooms, vocational courses to the children which grabs the attention of most of the parents belonging from middle class families. If govt. could create more model schools in the view of increasing demand from parents than only education in these schools would be uplifted.

FINDINGS

UDISE+ report and different articles published under coding for kids suggests that there are various obstacles to learn coding such as lack of infrastructure facilities (electricity, computer facility, internet facility), incompetent teaching staff, lack of curiosity, ignorance to live help, less practice, low engagement of students, dropout rates, lack of dedicated classes for coding etc. these obstacles needs to be reduced to greater extent in order to provide kids this basic skill to build simple websites and games which helps children develop their problem-solving abilities and express their creativity in a new way.

DISCUSSION

This section is divided into three sub-sections which comprises of Drawbacks, Competition, and recommendations. As we observed that currently govt. lacks the infrastructural facility for teaching coding starting from class 6th onwards is a serious concern because this announcement done on NEP 2020 will lead to monopoly of private institutions in the field of coding courses offered to masses across pan India. It is not clear that how much time it will take to improve through launches of different education related schemes. It is evident out of fear that it might widen the gap between employed and unemployed, rich and poor and derived goal of improvement in poverty and employment might not be achieved as projected in the policy.

The strong competition from private institution is improving on day-to-day basis in terms of better-quality infrastructure, excellent teachers, variety in courses offered from primary schools to higher secondary is unbeatable and definitively demands incredible efforts to retain middle class families from shifting their children from govt. schools to private schools, as it may also add up to the cost of running schools without productivity. Govt. needs to adopt aggressive social marketing tactics to receive the attention of mass population. It is not like *Sarv Shiksha Abhiyan* (SSA 2001-02) as in new education system govt. need to adopt new marketing strategies like heavy promotions of their model schools, best performing schools, by updating websites of respective schools on regular basis and this might also require them to recruit some digital marketing experts who will monitor these websites from defined administrative area. Facebook is not sufficient to boost the advertisement of govt. schools' quality of education, Instagram, YouTube, blogging websites also need to be channelise for the same.

Based on analysis of UDISE+ report, articles, journals, and observations based on physical and digital(virtual) world surrounding education system, we have developed the understanding that *Time concept quoted in the Niti shastra of Chanakya* is still fruitful in modern days. Time is the only remedy to inculcate all behavioural changes in the acceptance regime of individuals so that everyone can relate themselves the objective and vision of quality education to all which has been drawn by Govt. of India and leaders of the nation. First, we need to highlight those key areas of education system which needs immediate solution to the prevailing problem and then we need to divide different procedures of NEP2020 in such a way that it becomes easy for executors to follow a simple route and let work get done itself timely. Teachers need to be taught coding first so that they can create curiosity among students as well. Functional computers need to be provided to every govt. school so that at least they will be familiar with the use of device.

Govt. needs to regulate private institutions so that their fee structure does not become arbitrary in common. Coming back to coding- that whether it is a challenge or a magic bullet, we leave it up to readers to decide what to believe as this policy is not for a fixed period which will show results on predefined deadlines. Hence time and collective efforts from

community, Government, students, and teachers will lead to better results. At this moment of time nothing can be said with full conviction though it is highly recommended that govt. will take necessary actions before anybody will create monopoly in the market related to better school education with latest coding courses in demand.

CONCLUSION

Coding is one of the most essential 21st century skills that helps students better understand one aspect of the digital world in which we live and, in some way, become better prepare for it. Coding helps kids to nurture their creativity by exploring ideas, asking questions, making mistakes, and learning from them. It enables strong mathematical thinking, computational thinking, and problem-solving skills in them which they acquire through learning by doing, though they need live support while performing given tasks.

This understanding leads us to backend preparation for proving this basic skill of new digital age. We agree that currently the education administration is not fully equipped with requisite tools and skill set by which this goal of teaching kids basic coding at early stage of learning could be achieved. Hence it is recommended by time and digital community that proper infrastructure must be prepare for gaining this skill to be competitive and aware about the changing technological world's needs.

The NEP2020 is a revolutionary policy to overcome the drawbacks of old education system and hence require support and coordination from all levels of education administration. Coding courses will be fruitful only after full electrification of the schools, equipped with functional computers and high-speed internet. Till then govt. also needs to regulate private players in the field of education sector which provides such courses so that their prices will not eat up the pockets of common man. There is an urgent need to monitor online platforms which charges arbitrary prices for these courses in India and frauds people with false offers.

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