Original Article

PRIMARY SCHOOL CURRICULUM AND IMPACT ON COGNITIVE LEARNING – A REVIEW BASED ANALYSIS

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Abstract

Objective: During initial phases of a child's life, there are 4 main areas of development: motor, communication, social/emotional and cognitive (thinking ability, knowledge, skill, and activities related to brain). We aim to study the primary school curriculum and its impact on the cognitive learning/development.

Methodology: Piaget's theory is one of the theories of paramount importance, while we discuss on cognitive development in the children.Huitt and Hummel (2003) studied the implications of this theory that segregates cognitive development into 4 stages namely 1. Sensorimotor stage 2. Pre-operational stage 3. Concrete operational stage, and 4. Formal operational stage. Marwaha et al. (2017) studied the implication of Piaget's theory in children and their correlation with IQ. Basis Piaget's theory it is recommended that the student's abilities should be challenged by teachers, but they should not present a curriculum which is beyond the child's level as that can adversely impact the cognitive development of the child. The current study has been carried out by analyzing the secondary data available through various research papers to derive a correlation between primary school curriculum and child's cognitive development. We also studied the deficiencies of the current primary school curriculum in getting the desired cognitive impacts on children.

Results and Implications: The study will help understand the primary school curriculum in India, studying the impact of curriculum on cognitive development and identification of important factors/aspects in the curriculum ((content, teaching pedagogy etc).

Introduction

Education in Latin refers to Educare, "means to nourish, to bring up". Aim of education is character formation and personality development. Eating, sleeping, mating and defending are common activities for man and animal; but what separates human beings from animal is education.

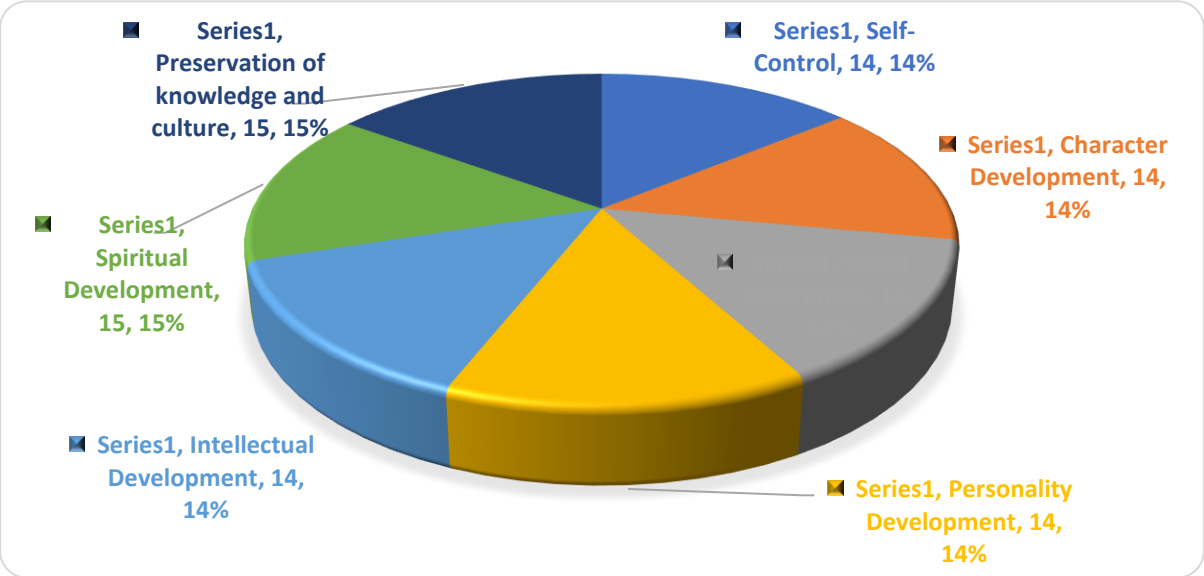
India has a rich tradition of education and learning that starts more than 5000 years ago. The world acknowledges our great past and often has learnt from it. Acknowledging the contribution of Indian education system; Albert Einstein says, "We owe a lot to the ancient Indians, teaching us how to count. Without which most modern scientific discoveries would have been impossible."

History of Education: Vedic Era and During British India:

The education system of ancient India had a very unique feature which no other country in the world ever had; called Gurukula. Students used to live in the *kula* (family) of their *Guru* and learnt *Vedas* (Sacred Scriptures) and other subjects under the guidance of Guru for a minimum duration of 9 to 12 years. The teacher (Guru) recognized capability of his students and as per the capability of the students' knowledge was imparted. Students were taught Shastras and *Vedas* (Kurian, 2003).

In the Gurukula, the curriculum included the 'whole' Veda (Ṛigveda, Sāmaveda, Atharvaveda and Yajurveda) along with withRahasyas, Education means the scholars understand the four Vedas with six vedangas (Veda + Angas). These vendangas were first described in the Muṇdaka Upanishad: "Siksha (Phonetics), Chandas (Metrics), Kalpa (Ritual), Nirukta (Etymology), Jyotisha (Astrology) and Vyakarana (Grammar). The students were also taught sciences like Dharmasastra (LAWS), Arthasastra (Economics), and Sastra-vidya (Warfare), Kala (Fine Arts). 'Rahasyas' means esoteric treatises, Upanishads, or the secret explanations of the Veda. Thus, the students emerging from this system, emerged as responsible citizens. Gurukula provided an all-round personality development of the student (Selvamani, 2019).

Figure-1; All-round development of student in Gurukula system



(Source: Self).

The concepts of zero, numeral notations, the decimal system, , binary numbers, algorithm, atom theory, helicocentric theory, Ayurveda, plastic and cataract surgery, metallurgy are all originated from India. Bharat (India) was the first nation to derive zinc by the distillation process, a technique from ancient alchemy.

During the British era, western pedagogy ushered in two major changes in the Indian education system- it brought in print technology to replace the oral method and removed the teacher from the centre bringing in the academic administrators. The British uprooted the Gurukula system as it would have retained the primacy of the indigenous teacher, the traditional notion of the Guru, which was beyond their ken and eluded their control. In 1835, Lord Macaulay (in 1835), gave his point of view for the Indian Education System known as Macaulay's Minute. Macaulay advocated English over Arabic or Sanskrit as a medium of education. Macaulay mentions in his famous Macaulay minutes that "It is, I believe, no exaggeration to say that all the historical information which has been collected from all the books written in the Sanscrit language is less valuable than what may be found in the most paltry abridgments used at preparatory schools in England." It is not wrong to say that his statements were motivated to prove supremacy of British culture and education system over Indian education system.

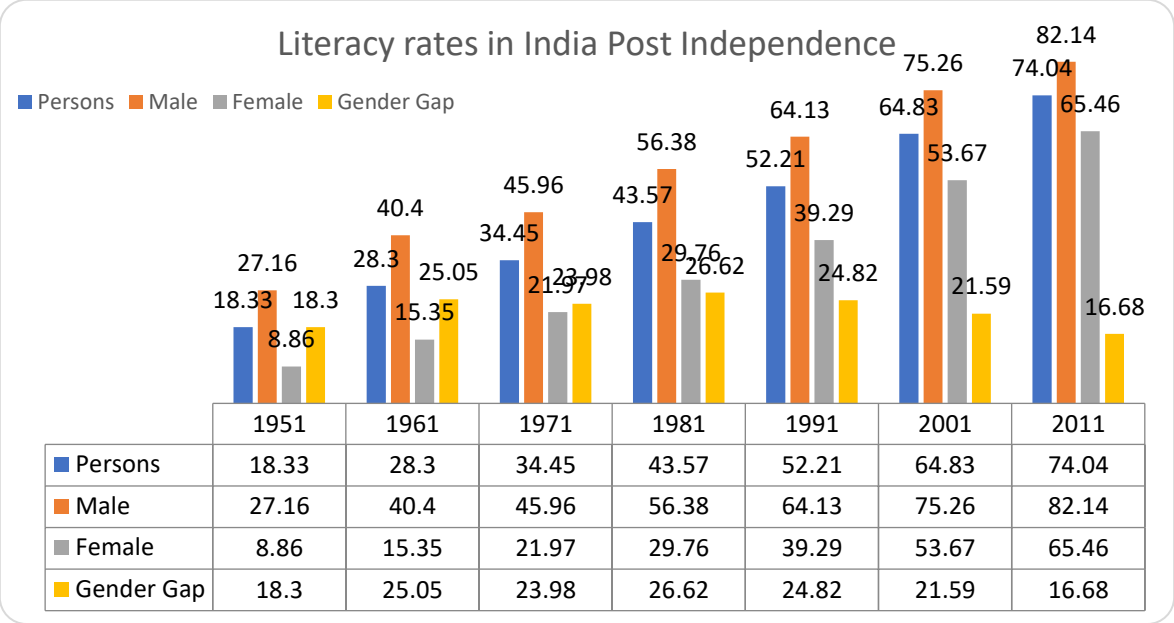
Literacy rates during the British era was significantly low and rose at a very miniscule pace. In 1881 it was 3.2 % and it rose to 7.2 % in 1931 and 12.2 % in 1947 (Shah, 2013).

Education System in India Post-Independence:

Soon after gaining the independence in 1947; making arrangements for the education was a great challenge. It was required that the learning content is given a practical basis as it was of a theoretical and general nature from the very start of the British rule. The number of colleges at the time of Independence was very low (591 colleges) and same was the enrolment of the students. (Komow et al., 2012).

Over the years India changed globally, socially, and economically. Literacy rate rose to 74.04% and it was evident from the 2011 census. The below table shows the literacy rates over the years. For the census 2011, literacy was defines as a person aged 7 and more, who is capable of reading and writing with understanding in any language. Consensus 2021 data is currently not available; however, as per the National Statistical Office (NSO) data India's mean are of literacy is 77.70% (male 84.70% and female 70.30%)

Figure 2: Literacy rates in India as per Census, 2011



	1951	1961	1971	1981	1991	2001	2011
Persons	18.33	28.3	34.45	43.57	52.21	64.83	74.04
Male	27.16	40.4	45.96	56.38	64.13	75.26	82.14
Female	8.86	15.35	21.97	29.76	39.29	53.67	65.46
Gender Gap	18.3	25.05	23.98	26.62	24.82	21.59	16.68

(Source- Census of India, Office of Registrar General, India, 2011).

Over the years a number of commissions or policies were drafted for improvement in education sector: The University Education commission (year 1948-1949), Report of Education Commission (year 1964-1966), National policy on Education (year 1968), Draft policy on Education (year 1978), National Policy on Education (year 1986), and National Policy on Education (year 1992), were a few major landmarks that India saw during this time period.

Present Status of School Education, India

India followed a uniform system of school education, known as 10+2 system. It contained different stages with pre-primary, primary, middle, and secondary stages counted as the first 10 years of general educations and 2 years of subject oriented senior secondary education.

With a vision of strengthening its education system, India has implemented National Education Policy 2019. Quality education to all at early childhood level, fundamental literacy and numeracy by 2025, introduction of a new education system (5+3+3+4), flexible curriculum choice to students are some of the salient features of the policy (National Education Policy 2019).

Curriculum Development and Implementation Bodies in India

Kumari and Perumalil (2018) define curriculum as the academic content/syllabi imparted in a school. In total, it comprises of the knowledge and skills, a child is supposed to learn in class or outside class as a part of systematic formal education. John Franklin Bobbitt explains curriculum as the course of experiences and deeds that prepares the students for their future. He was of the opinion that people should not be taught what they would never use.

The requirement of curriculum lies in its concept that focuses on relating education to the social, economic, political, environmental, and technological demands of the society; applying effective teaching and learning methods, and; evaluation of teaching and learning processes in a society (Chaudhary & Kalia, 2015). The key institutional bodies responsible for curriculum development and implementation are listed below:

Figure 3: Institutional bodies responsible for curriculum development and implementation

National Council of Educational Research and Training – NCERT
Apex Body for curriculum related mattters
Advices state and central government

Central Board of Secondary Education – CBSE
Comes under the purview of central government
Board of Education for Public and private schools

Council of Indian School Certificate Examination – CISCE
Private, non-governmental board of school education in India

State Government Education Boards
Created to serve the education needs of the people at the state level

National Institute of Open Schooling Board
Educational board of national level established by the Government of India and the Ministry for Human Resource Development
This board meets the educational needs of students who cannot attend regular schools

International Schools
International schools in India are affiliated txxo the International Baccalaureate Programme and/or the Cambridge International Examinations
Follows different examination systems and boards from that of the Indian Boards

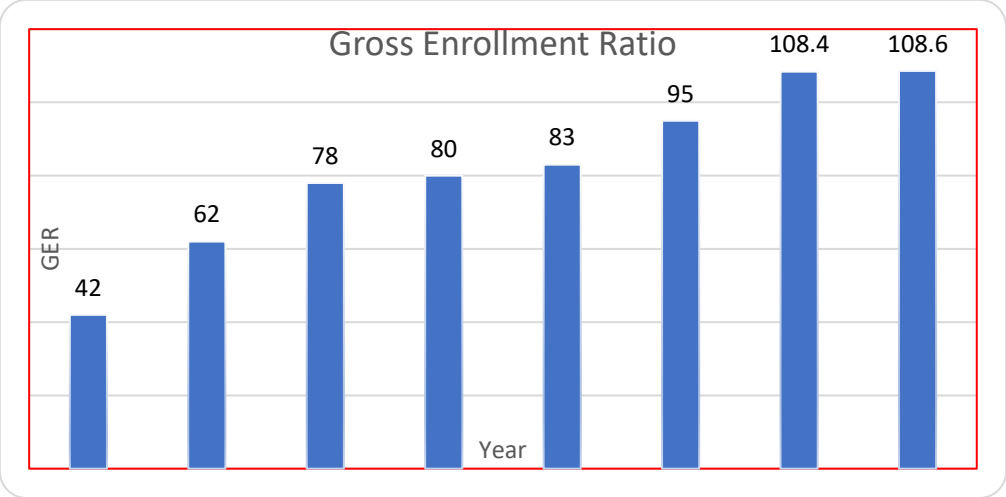
(Source: Self)

Enrolment Ratio at Primary Education Level

Gross Enrollment ratio: number of students enrolled in a given level of education divided by population of age group that officially is corresponding to the given level of education.

A higher GER indicates higher degree of enrollment.

Figure 4: Gross Enrollment Ratio at Primary School Level



(Source: CEIC data, 2015, latest data available)

Cognitive Development

Cognitive development can be defined as development in mental or emotional, pattern of thinking -reasoning abilitiesthat are involved in attention, language, thinking/ reasoning,learning, memory and creativity (Witt, 2009).

Cognitive skillsare of two types:

-lower order (skills required/related to recalling some information) and

- higher order (skills required for classifying, categorising, synthesising, analysing, and critical thinking)

While Cognitive strategies involve complex actions, that require completion of a number of steps, like decision-making, problem-solving, and conceptualising (Sangwan &Chhikara, 2003).

Neuroscience provides the strongest evidence to support wholesome development inclusive of cognitive development during early childhood. For the time-period (0 to 9 years) brain cells grow rapidly. Hence, this age period is apt for addressing problems related to cognitive development and to provide and prepare for robust development conditions(Lerner & Johns, 2009). Children of this age group need cognitive as well as metacognitive skills (well-developed) and approaches to think, comprehend, solve problems, comprehend and memorise effectively, and efforts should be put in to develop the skills (Bolani et al., 2007).

Through this article we aim to study the effect of primary school education on cognitive development of the children along with different stakeholders and other influential factors.

Objective

Following are the objectives of this literature review article:

1. To study the various components of curriculum at the primary school level.

2. To study the cognitive development milestones and learning ability in children based on Piaget's theory.

3. To analyse the quality of curriculum and curriculum delivery at the primary school level and its impact on cognitive learning.

4. To ascertain the determinants in quality school education at primary level with respect to various stakeholder groups.

5. To recommend a set of activities that can be helpful for setting up an effective curriculum at primary school level.

Methodology

The current study has been carried out by analyzing the secondary data available through various research papers. We searched our relevant research papers using combinations of the terms pedagogy, Primary schools education. Teachers, cognitive abilities, intelligence, cognitive skills, cognitive characteristics, academic attribute, factors influencing primary education, stakeholders in Primay school education. academic characteristics, teaching effectiveness, teacher effectiveness, teaching performances, academic performances, studentachievements etc.

Cognitive Development and Learning Ability in Children

Children as they grow undergo cognitive development and this corresponds to their ability to learn certain specific things. Piaget in his theory of cognitive development segregates the cognitive development into 4 stages namely Sensorimotor (stage I), Pre-operational stage (stage II), Concrete operational stage (stage III), and Formal operational stage (stage IV) (Huitt & Hummel, 2003).

Table 1: Cognitive development and learning ability in Children based on Piaget's theory

Stages	**Age Range**	**Description**
Sensorimotor (Infancy)	Up to 2 years	- Intelligence demonstrate through motor activity (without use of symbols) - Knowledge based on physical interaction and experience. - Memory acquired at about 7- months. - Mobility permits a child to develop new intellectual ability - Some symbolic abilities start developing by end of this stage
Preoperational (Toddler & early childhood)	2 years to 7 years	- Intelligence is demonstrated via use of symbol

		- Language use matures - Imagination and Memory gets developed - Non-logical thinking and non-reversable - Egocentric thinking
Concrete Operational (elementary & early adolescence)	7 years to 11 years	- Intelligence shown via logical and systematic use of symbols related to concrete objects - Conversation in 7 patterns (length, weight,number, area, volume, mass, liquid) - Development of operational thinking (reversable thinking) - Egocentric thoughts diminishes
Formal-Operational - (adolescence and adult)	11 years - onward	- Intelligence shown via use of symbols that seem logical related material concepts. - Egocentric thoughts return during the early stages - Create hypothesis and test

(Source: Huitt and Hummel 2003)

Many pre-primary & primary schools have been modelled basis theory of cognitive development. The learning should be constructive with discovery learning & developing interest of child as the key focus areas. Basis this theory it is recommended that the students abilities should be challenged by teachers and students but they should not present a curriculum that is beyond the child's cognitive level.

Cognitive Development Milestones in Children

Centers for disease control and prevention (US) publishes cognitive developmental milestones.

Dosman et al (2012) worked on a developmental surveillance program within intention to develop a process of observing/monitoring a child's development over-timefor promoting healthy development, to identify and mitigate possible problems. Misirliyan and Huynh (2022) also speaks about the developmental milestones in a child's growth years. There is quite a similar type of observations made by all the above mentioned three sources and the key developmental milestones are as listed below:

Table 2: Cognitive Development Milestones in Children (Source: Dosman, Andrews and Goulden, 2012)

Age	Gross Motor	Fine Motor	Speech Language	Cognitive	Social Emotional
NewBorn	Posture is fixed	Primitove reflexes	variable cries, orients to sound	Reacts to visual stimuli	cries when any other infant cries (empathy)

Up to 2 years	Walks up/down stairs Jumps, Runs and kicks Throw ball and objects	Stacks cubes, Starts using spoons, helps in dressing	50 words, twoword phrase starts talking and not just gestures Nods 'yes or No,' blows kisses, and highfive	Functional object use (brushes hair with brush, pushes toys, cars) Imitates with real props (e.g. with broom) Symbolic representation, simple pretend (toy broom, toy cup to self/doll, pushes car to work) Strategies without rehearsal Tries to make toys work	Imitates peers, tantrums Points to commenst, seeks information Gives Social referencing (which thing belongs to whom) Comforts others
Up to 5 years (Kindergarton)	Pedals tricycle, Hops, can Walkin backward direction, can catche ball Balances one foot	Can colour between the lines, pencil grasp tripod can wash and dry hands completely	Follows 2-3 step commands Recall some parts of a story, Speech becomes 100% intelligible	Self-talk and solve problem Can counts up to 10 objects remembers four colournames.- Preliteracy/numeracy/writing skills: rhymes,	Role play (eg, 'house', 'doctor') can play away from parents, discussion on emotions become more elaborate focuses on group rules
6 - 7 ys (Ist grade)	Can kick a rolling ball can jump over objectsthat are 10 inches high Rides bicycle, throws with accurate placement	Can builds small structures by using blocks Puts puzzles together can cut well with use of scissors can use a a knife and cut food	Uses Prepositions Answers more complex "who", "what", "where",etc. Can match sounds with written letters and names (there is correspondence in grapheme/phoneme) Reads about 100 words by sight Reads 60 words per minute Begin sentences using capital letters and can use end punctuations	Can concentrate on a task for at least 15 minutes Understands that a print is read from left to right; and top to bottom Is able to identify few words by seeing identifies and write uppercase/ lowercase letters	Can starts and take turns during conversations Sticks to topic Use of expression to express needs and wants. Ask questions or provide information

8 -9 ys (second/3rd grade)	Balances better. Can move intentional ly Locomotor and motor skills (turning/sp inning/ and jumping) become more fluid.	Fine motor skills becomesprec ise around age of 8 years Handwriting becomes small, neat, and all the letters used will likely to be of same size. Small muscles have more stamina. Child may write full story with precision in handwriting.	Listens attentively in when in group situations Follows 4-step or more/ higher directions can read 100 words/ minute can read 300 sight words can write stories. Write lettersand simple explanations, and even brief reports Can spell simple words precisely, corrects many spellings independently or with help of a dictionary Can write cursive writing	By age of 8 years, the kids begin to do more abstract thinking. "Eight-year-old students are beginning to understand numbers in a more complex way	Opens and closes conversations appropriately Stays on topic, takes turns, and uses eye contact during conversation Clarifies and explains words and ideas when conversation breaks down, gives background information or definitions of words Uses language to inform, persuade, and entertain Ability to take others' perspectives increases which also increases the ability to persuade (7-9 years) Uses language to establish and maintain social status (7-9 years)
9- 10 ys (4th Grade)	Nine-year-olds generally grow stronger and more coordinate d. They have had time to perfect their gross motor skills, such as jumping, skipping, or running, and you may now see a new ability to move more gracefully and purposely. Enhanced coordinati on and improved fine-motor skills	Writing becomes faster, smaller, and more fluid. Kids at this age will generally fasten snaps, buttons, and zippers with ease, and they are able to dress and groom themselves. At this age, children may enjoy utilizing their refined hand abilities by working with tools like a hammer or a screwdriver, sewing, or drawing detailed images with a pencil.".	Uses a subject's area information and vocabulary for the purpose of learning multiple-meaning words (analogies) Listens and understands information provided by peers. Forms opinions based on available evidence Paraphrases content and able to retain main idea with details Can read 120 to 150 words/minute	learns to mentally combine/ separate/order and transform objects and actions. Concept of conservation of mass, area, volume becomes more firm. Ability to apply logic and reasoning increases along with attention.	Can open and close conversations in appropriate manner Clarify and explain words Uses language to notify/inform, or entertain Ability to understand others' perspectives also increases along with ability to persuade others (7-9 years) Uses language to support establish and maintain the social status (7-9 years)

10-11 ys (5th Grade)	Begins to present signs of puberty (oily skin, increase ofsweating, growthof hairs in the genital area and underarms	Can use adult-type of tools such as saws and hammers. Can construct simple structures and can-do basic sewing. Handwriting more fluid, and with less efforts. Writing well without ruled lines.	Can reports about information from group activities. Use of more abstract and specific vocabulary. Understands jokes and riddles even with ambiguous words Read 120-150 words/ minute. can vary sentence structures Revises written things for clarity and can edit to produce final copies	Developed independence Attention span increased Learns using good judgment	Maintains eye contact, uses gestures and facial expressions. Use of appropriate voice in group discussions/presentations Clarifies and explain words and ideas when conversation somehow breaks down. Can provide background information and definition of words

Impact of Primary School curriculum on Cognitive learning:

Simatva (2010)researched on Piaget's theory implication at the school level. At the pre-operational stage (2-7 years) which covers some portion of our primary schooling, the children learn to associate words and symbols with objects. Let us take an example to understand the cognitive growth in this period. If some colored water is poured back and forth between a 100 ml beaker and 300 ml beaker; a 4-year-old will maintain that the beaker with a high level has more water. A somewhat grown up child will become upset to see what he believed and what is the result. A more mature child in this age group will be able to understand why the levels are appearing different (Principle of conservation). The child should be able to comprehend the principle of conservation before he can be taught the concept of numbers. The curriculum during this time should focus and encourage the teacher to talk more to the child and read to them. The child should be encouraged to speak up but only when their turn comes up; this helps them to be active listeners as well.

The major portion of our primary schooling falls in the concrete operation stage. The two basic objectives of curriculum at this level should be:

1. the child should be able to demonstrate basic skills (read, write and calculates simple arithmetic).

2. The student should develop and accept his/her own aptitude for schooling

At this level the child also starts developing the concept of right and wrong and any act should be discussed as it occurs. The teacher should encourage the students to think why certain act is good or bad.

Further, Sankaran (2015) in his article on Indian Education crisis mentions about the development of curriculum based on different phases of child development using Steiner education model. For the first 7 years, a child learns by using skills of imitation (in this phase a child imitates whatever he sees). The next phase as per Steiner model is from 8-14 and their primary way of learning during this phase is by imagination. In the last 7 years cycle from 15 -21 the main motivation to learn is the search for value and truth. In the early phase of life the child learns naturally, and we should avoid bothering them with a curriculum and routines to distract them from natural process of learning. The article says that the current curriculum is not essentially enabling but is somehow burdening the students. The article puts stress on teaching values and skills with use of as limited subjects as possible.

These studies show that learning is a function of cognitive development and as the child grows it enables him to gain some specific skill sets. While preparing and delivering curriculum the level of cognitive development should be taken care of; so that it becomes more palatable to the students.

Goswami and Bryant (2010) also bolsterthe value of cognitive development during early childhood. They are in contract to the Piaget's theory of developmental stages of thinking, and they state that some of the structures for cognitive thinking are already in place from a very early age. Further, they endorse that collaborative activities must take place. Further, the teacher should be able to bring understanding by thoughtful guidance.

Esterhuizen and Grosser (2014);study showed the effects and impacts of a curriculum-based (researcher-developed) intervention programme.In the qualitative phase data captured was related to the participants' application of cognitive processes for input, explanation/elaboration, and output phase of the learning process, further involving the characteristics related to functions of inhibitory-control. The results were striking and showed significant improvement in the child's cognitive flexibility, working memory, and inhibitory control.

The Department for children, school and families in their project named "Effective Pre-School and Primary Education 3-11 Project (EPPE 3-11)"studies the Influences of Classroom procedures on cognitive and behavioral Development. To explore potential impact of classrooms and schooling analysis was done using value added multilevel models. A description of the models used and their impact is delineated below:

Table 3: Effective Pre-School and Primary Education 3-11 Project (Source: EPPE 3-11)

Model	Parameters Analyzed	**Outcome**
COS-5, Pianta 2001 **(**Classroom-Observation System concerning5th grade	Influence of teaching quality (overall)	Firstly, measure (overall) of Teaching quality was derived from the COS-5 and it proved to be importantpredictor of Reading and Mathematics progress. Secondly, Teaching quality (overall) proved to be an important indicator of cognitive progress in children from 1st year to 5th year. Schools where the Teaching quality (overall) was high; the students did better in both Mathematics and reading.
	Quality of Pedagogy	This is a better indicator of the student's Mathematical progress. Important for the student's progress while it comes to minimizing Hyperactivity andadvancingProsocial behavior and self-regulation.
	Dis-organization	Behavioralenvironment /climate of the classroomsupports a school become more effective. It proves that a peaceful and orderly environment

Model	Parameters Analyzed	**Outcome**
		helps in facilitating learning &teaching.
	Attention/consideration& control	Attention &control has a significant impact on both measures (cognitive as well as social or behavioral measures. There was a direct correlation and schools with high levels of these factors performed well and students progressed more in Mathematics, and they had better regulation.
	Child Positivity	Child positivity had again significant impact on reading capabilities from 1st year to 5th year.
	Positive engagement	Students with higher positive engagement had greater Pro-social behavior. Children with high positive as compared to schools with medium or low positive engagements.
Instructional Environment Observation Scale (IEO, Stipek)	Pedagogy (Literacy)	Significant for better cognitive progress between 1st to 5th year. The effect was evident in both maths and reading.
	Pedagogy in Numeracy`	It was more Significantly associated with the student's progress in mathematics.
	Development of Subject in Numeracy	This had greater impact on the children's progress in reading than his progress in reading.
Teacher Survey Results	Asurvey was conducted among teachers to knowandexplore their perception and views on different parameters of pedagogy/classroom processes	It was evident that schools that promote good communication with parents (for e.g. regular parent teachers meetings/ identifying progress of each child's progress and conveying these to parents) have their students make better progress. .
Ofsted judgements and Cognitive and Social/behavioural development	Effectiveness (School)	Significant and positive indicator of better progress for the EPPE 3-11 sub-sample of children for both cognitive outcomes.
	Improvement post inspection	The results indicated that schools improved their effectiveness post

Model	Parameters Analyzed	Outcome
		inspection and that had a significant impact on cognitive development of the children.
	Leadership	Ofsted judgements of leadership were also similarly tested in a multi-level model. The schools that were judged better by the Ofsted had greater impact on the cognitive development of the children.
	Quality of assessment	Students attending a school with effective and quality education showed greater progress in social/cognitive/behavioraloutcomes.

Borghans et al. (2015) studied the impact of school quality over development of cognition between age 4-6. They measured the school quality by schools average age achievement test scores. The results indicated students who were enrolled in high-qualityschools were able to develop cognitive skills significantly faster than the students who studied in low-quality schools. The results were robust as they also included parameters likeparental background, initial ability, andother neighboringcontrols.

In a study conducted in Spain over Content and language integrated learning (CLIL); CLIL teacher's view on primary education and its effect on cognitive development was studied (Ferrer et al.,2020). The study concluded that it is of imperative importance to invest in action plans that support and sustain trained and experienced teaching workforce.

Bardach and Klassen (2020) in provide a systematic review (Smart teachers, successful students) on teacher's cognitive abilities and its impact on student learning. They reviewed 27 studies conducted between 2000 and 2019. They established a positive correlation between teaching effectiveness and development of cognitive abilities in children.

Kort and Reilly (2019) presented a balanced pedagogical approach for effective cognitive development and advocated delivery of knowledge from a model based domain.

Conventional classroom pedagogy

Figure 5: Pedagogy through a model based domain

Motor enriched/Physical education program learning in school curriculum: It has been identified that incorporation of physical education programs in school curriculum has positive effects on motor and pre-literacy skills.

Geji and Malling (2022) conducted a PLAYMORE randomized control trial among children aged 5-6 years and found that inclusion of motor enriched learningimproves pre-reading and word recognition skills.

A positive correlation was also observed in fundamental motor skills and pre-literacy skills concerning visual analysis and spatial orientation abilities in a group of students (Battaglia et al., 2019).

Bluma and Lipowska (2018) established a positive co-relation between physical activity and cognitive activity among students.

Engaging in sports has a positive impact on all systems: the motor, cardiovascular, respiratory, hormonal, immunologic, and nervous systems. Thus, it influences the motoric development and increases the speed of the conductance of nervous impulses (Lambrick et al., 2016)

School-age children who give minim an hour each day to physical activity showsbetter cognitive functioning, and researchers emphasize that, despite these proven benefits, only about 1/3 of children regularly engage in sports (Drygas et al., 2022)).

Contemporary Models of Education

Let us now see what primary school curriculum other countries have adopted. Below is a comparative analysis of the curriculum adopted by India, USA and Japan. We can see that although all these countries have a structured system of education; the curriculum in USA and Japan seems more focusing on skill and ability development and it encourages the students to express their feelings and opinions from a very early age.

Table 4: Curriculum in India, USA and Japan

Features	**India**	**USA**	**Japan**
System of Education	5+3+2+2 (5 years, Primary education + 3 years of middle, 2-2	5+3+4 as most common system (5 years, primary	6+3+3 (6 years, primary education, 3 years, mid

	years of secondary and senior secondary school)	education, 3 years, mid years and 4 years, high school)	years and 3 years, high school)
School type	Private + Public schooling	Private + Public schooling	Private (0.01%)+ Public schooling
Status	Comes under free and compulsory education	Comes under free and compulsory education	Comes under free and compulsory education
Books	Provided for free in Public schools	Provided free of charge	Provided free of charge
Meals	Depending on school may be provided by school or by parents	Depending on school may be provided by school or by parents	School lunch is an integral part of school life as well as educational activities
Curriculum	**Grades 1 & 2** -1 language -Maths -Art of healthy & productive living **Grades 3 to 5** -1 language -Maths -Environmental Study -Art of healthy & productive living. Traditional Nature. Emphasize more on core subjects. Sports and extracurricular activities are optional (do not hold the same importance).	For the elementary education the student usually learns: -basic arithmetic & sometimes rudimentary algebra in maths -English (such as basic grammar, spelling, and vocabulary) -maths, -social studies subjects, -science, -Physical development study, -fine arts, -and reading. Sports and extracurricular activity hold equal importance as core/main subjects.	**Grade 1 & 2** -Japanese language -Arithmetic -Living environment studies -Music -Art and Handicrafts -Physical Education -Moral Education -Special activities **Grade 3 and 4** (subjects in addition to that of Grade 1 and 2) -Social Studies -Science -Period for integrated studies **Grade 5 and 6** (subjects in addition to Grade 3 and 4) -Home Economics -Foreign language activities

(Source: Self)

While we see that the Indian curriculum seems more theory based; the curriculum in USA has more focus on the social studies, physical development and fine arts. The curriculum for Japan is more structured and involves

subjects like music, art and handicrafts, physical education during the early years. Moral education is an integral part of Japanese education system.

Current State of Primary Education curriculum and delivery in India

The usual question that is asked is why students are not able to follow the curriculum or are so far behind the curriculum? But the more burning question is "why the curriculum is so much ahead of the students?

As per a report published in Times of India Jan 30, 2014; UNESCO finds Indian syllabi too ambitious. As per the report, India's curriculum, which outpaces what pupils can realistically learn and achieve in the time given, is a factor in widening learning gaps.

Pritchett and Beatty (2012) analyzed the negative consequences of overambitious curricula in developing countries in primary education. The neglect of cognitive development stages while designing the curriculum results in curricula gap (gap between learning potential and curriculum pace) Pritchett and Beatty showed that majority of children spend years of education and instructions with no progress on basics. They used a simulation model to show that if the pace of curricula is faster than the learning ability of the students then it can adversely affect the learning process. The simulation showed that just because of a gap between curricular and actual pace; two countries with exactly the same potential learning could have massively divergent learning outcomes. The country which goes faster had much lower cumulative learning. Further, learning could go faster if curricula and teachers were to slow down. As per the study four out of five Indian children who enter a grade unable to read, leave at the end of the school year without gaining any reading skills. They further concluded that 7 out of 8 students make no skill-based progress in an academic year. This is a colossal waste of the resources allocated to 'educate' India's millions of students.

The teacher is accountable for completing the curriculum and focuses on completing the prescribed syllabus. If a child falls behind, he stays behind, and the entire class moves ahead. Rather, during primary schooling focus should be on mentoring and developing a personal relationship with the children. This is the stage where the child should be taught the basis life skills and it is critical that the teacher listens carefully, observes and finds out the needs for the children. If the children are helped at this stage, they will be stronger and will be way ahead during their middle and high schools. However, in the current scenario mentorship in primary schooling is a missing factor.

ASER is an annual citizen-led household survey that has been collecting data on children's learning levels across rural India since 2005. ASER 2019 suggests that a large proportion of children in the age group of 4 and 5 are unable to perform cognitive tasks expected of them. As children progress to Standard I, their performance on cognitive tasks is still well below curricular expectations. Just 67 percent of children in Standard I could order by size, 60 percent of the children could recognise a three-item pattern, and only 55 percent children were able to solve a puzzle. According to the National Council for Educational Research and Training (NCERT) learning outcomes, children are expected to be able to do all these tasks by the end of pre-school. Even in Standard III, close to half the children are still unable to perform all three cognitive tasks.

Result and Implication

The literature review focussed on and provides information of research done on the cognitive development of the children across different age groups, contemporary models of education, the quality parameters for effective education and delivery and the key stakeholders in curriculum and education effectiveness. We see that primary education is the founding base and determining factor for overall growth of a person. We also see that in the developed countries the formal education begins at a later stage and more focus is on the skill development; while in India, we are following a very conventional way of pedagogy thus burdening the students with overambitious curriculum and hindering their natural learning process..

The primary curriculum seems unbalanced in its approach in feeding too much abstract knowledge to the students while ignoring the overall personality development of the child that is anticipated; thus, leaving the students less innovative and more theoretical. From the literature review we see that the learning abilities depend on the cognitive development. A child of a certain age group is receptive for some specific set of skills and mode of teaching/mentoring and this should be taken care of while designing the curriculum and delivering it to that age group. If too much is fed to the student in the name of curriculum then that will lead to curricula gap and the child would not be able to perform good in the subsequent stages. The new education policy (2019) has provision for reducing the curriculum content to enhance essential learning and critical thinking and improving the overall pedagogy to improve cognitive development and we are yet to see the impacts this policy will make on the primary school system and thus impacting cognitive development of the children.

Further, we have seen that if we go by the Piaget's stages of development and include the activities/teaching strategies that support the development of these stages; it can have long lasting positive impacts.

Table 5: Activities that should be a part of School curriculum (source: Self)

Stage	**Age Range**	**Activities that should be a part of School curriculum**
Sensorimotor (Infancy)	Up to 2 years	Provision of enriching and stimulating environment Play with toys that make sound when squezed (like duck). Initially the child feels surprized; gradually he becomes aware that it is he who is squezing the toy and causing the sound (cause and effect) Use of rattle or peek a boo
Preoperational (Toddler & early childhood)	2 years to 7 years	one property of this stage is egocentrism. Children should be helped by providing situatonsehere they face another person's perspective. Encourage the child to take up characters Hands on activities Play with toys that change shape; this will help in developing the concept of conservation. Use cut out letters to build words Avoid lessions that are very different from the child's world and stay away from using pencil or paoeractovities very often

Concrete Operational (elementary & early adolescence)	7 years to 11 years	Children evolve to a more regulated type of thinking. One such activity which a child enjoys is cooking with mom. Cooking involvers measurement, concepts of conservations, numbers come into play with the different types of ingredients used. Provide them chance to manipulate things. Perform simple experiments with the help of students Avoid dealing with more than 3-4 variables; example reading should have limits characters; or experiments should have less number of steps. Group sentences on piece of Papers; use of analogies. Use of Props and Visual aids (presenting information in multiple ways allows concepts to become more meaningful).
Formal Operational (adolescence and adult)	11 years - onward	The students apply their knowledge directky on real objects or situations. Use of charts; more sophitticated diagrams or graphs. Step by step explanations Explore various hypothetical situations. Students should be encouraged to work in groups to facilitate discussions on any hypothetical situations. Write short stories. Encourage students to explain hpw they solved a particular problem. Work in pairs; one can act as listener and another as problem solver. Use material and ideas relevant to the student like use of popular song lyrics to teach a poetry.

References

1. Bardach L, Klassen RM. (2020). Smart teachers, successful students? A systematic review of theliterature on teachers' cognitive abilities and teacher effectiveness. *Educational Research Review*. 301-21.
2. Battaglia G, Alesi M, Tabacchi G, Palma A, Ballafiore M (2019). The Development of Motor and Pre-literacy Skills by a Physical Education Program in Preschool Children: A Non-randomized Pilot Trial. *Frontiers in Psychology*.9, 1-10.
3. Brewer JA. (2007). Introduction to early childhood education: Preschool through primary grades. *London: Pearson Education*.

4. Chaudhary GK, Kalia R (2015). Development curriculum and teaching models of curriculum design for teaching institutes. International.*Journal of Physical Education*, 1(*4*), 57- 59.
5. Chauhan, K (2016). Education system in ancient India. International.*Journal of History and Research*, 6(*2*), 1-4.
6. De Witt M. (2009). The young child in context: A thematic approach. *Perspectives from educational psychology and sociopedagogics*. Pretoria: Van Schaik.
7. Deb P (2014). British Education Policy in India.: The legacy still continues. *Education*. 4(*10*), 202-3.
8. Drygas W. Skiba A, Bielecki W, Puska P (2001). Physical activity estimation among the inhabitants of six European countries. Project "filling the Reducing East-West Health Gap". *Med. Sport*. 5, 119–125.
9. Drygas W, Skiba A, Bielecki W, PuskaP (2002). Assessment of the physical activity of inhabitants of six European countries. The "Bridging East–West Health Gap" project. *Pol. J. Sports Med*. 18, 169–174.
10. Ferrer JMC, Martinez PM, Ibanez RS. (2020). CLIL teacher's view on cognitive development in primary education. *Palgrave Communications*. 1-7.
11. Fisher R. (2005). Teaching children to think. (2nd edition). Boston: Nelson Thornes.
12. GoswamiU and Bryant P. (2010). Children's cognitive development and learning. In Alexander, R. (ed.). *The Cambridge primary review research surveys*.. Cambridge: Cambridge University Press.141–169
13. Govinda, R. (2002). India Education Report: A Profile of Basic Education. OxfortdUniversity Press.
14. Kachappilly, K. (2003). Gurukula: A family with difference-- an exposition of the ancient Indiansystem of education –3rd International 'Soul in Education' Conference; ByronBay, NSW, Australia
15. Grover S, Singh NH (2002). The quality of primary education: a case study of Madurai andVillupuram districts in Tamil Nadu, India.
16. Guide to Education System in the United States. Retrieved from: https://isss. umn.edu/publications/USEducation/2.pdf
17. Huitt W, Hummel J (2003). Piaget's theory of cognitive development. *Educational Psychology Interactive*, 1-5.
18. Illinois Learning Standards. https:// web.archive. org/web/201004 1401 4841 /http://www.isbe.state.il.us/ils/
19. Illinois State Board of Education – Illinois Learning Standards". Isbe.state.il.us. Archived from the original on 2010-04-14. Retrieved 2010-04-1.
20. India Gross Enrolment ratio: Primary Schools. Retrieved from India Gross Enrolment Ratio: Primary School: https://www.ceicdata.com/en/india/gross-enrolment-ratio-primary- school/gross- enrolment-ratio-primary-school.
21. India-Gross enrolment ratio in Primary Education. Retrieved from:https ://knoema.com/atlas /India/ topics /Education/Primary-Education/Gross- enrolment-ratio-in-primary- education.
22. Kaushal M (2012). Implementation of Right to Education in India: Issues and Concerns. *Journal of Management & Public Policy*, 4(*1*), 42-49.
23. Komow B, Khanna R, Sharma RK (2012). Journey of higher education in India: an analysis of post-independence era. *Asian Journal of Multi-dimensional Research.* 1(*1*), 96-115.
24. Kumar DS. (2012). Recent reforms in education in India- achievements and unfinished tasks. *International Journal of Social Science & Interdisciplinary Research*, 8(*1*), 82-94.
25. Kumari N andPerumalli T (2018). Effectiveness of Elementary Education Curriculum in some CBSE schools of Patna with respect to teacher motivation and student achievementBhatter College.*Journal of Multidisciplinary Studies*, 8(*1*), 18-30.
26. Lambrick D, Stoner L, Grigg R, Faulkner J (2016). Effects of continuous and intermittent exercise on executive function in children aged 8–10 years. *Psychophysiology*, 53, 1335–1342.
27. Lerner, J. & Johns, B. (2009). Learning disabilities and related disorders: Characteristics and teaching strategies and new directions. (11th edition). Belmont: Wadsworth Cengage.
28. Lerner J. (2006). Learning disabilities and related disorders: characteristics and teaching strategies. (10th edition). Boston: Houghton Mifflin.
29. Levin H. and Lockheed M.E. (1993). Effective Schools in Developing Countries.*London/Washington D.C.: The Falmer Press.*

30. Lockheed ME andVerspoor AM (1991). Improving Primary Education in Developing Countries. *New York: Oxford University Press.*
31. MajumdarM andMooij J. (2011). Education and Inequality in India: A classroom view. *Routledge.*
32. Mehrotra S. (2006). Reforming elementary education in India: A menu of options.*International Journal of Education Development*, 261-277.
33. Mooij, J. (2008). Primary education, teachers' professionalism and social class about motivation and demotivation of government school teachers in India. International. *Journal of Education Development*, 508-523.
34. Parasuraman A, Zeithaml VA, Berry LL (1985). A conceptual model of service quality and its implications for future research. *Journal of Marketing*, 49, 41-50.
35. Pianta RC. (2000). Enhancing relationships between children and teachers. Washington, D.C.: *American Psychological Association.*
36. Pianta RC. (2003). A day in third grade: Classroom quality, teacher, and student behaviours.' National Institute of Child Health and Human Development Early Child Care Network. University of Virgina.
37. PrimarySchools in Japan. Retrieved from:https://www.nier.go.jp/English/educationjapan/pdf /2011098E.pdf.
38. Primary Stage. Retrieved from: http://ncert.nic.in/html/pdf /syllabus/syllabus/primary_stage .pdf
39. Pritchett L, Beatty A (2012). The Negative Consequences of Overambitious Curricula in Developing Countries. Retrieved from:https://www.cgdev .org /sites/default /files /1426129_file_Pritchett_Beatty_Overambitio us_FINAL_0.pdf.
40. RademeyerA. (2008). Net 46% gr. 1's vorder tot gr. 12. Die Beeld 13 Augustus.
41. Rajkhowa SC (2005). Ancient European and Indian universities. *Encyclopaedia of higher education*, 3, 1-6.
42. Sangwan S and Chhikara S. (2003). Cognitive abilities of pre-school children of Bagar zone of Haryana. *Anthropologist*, 5(*2*), 75–78.
43. Sankaran (2015). Indian Education Crisis: Challenges in Curriculum Building. Retrieved from https://ssrn.com/abstract=2572741 or .
44. Selvamani, P (2019). Gurukula system- an ancient educational system of India. *InternationalJournal of Applied Social Science*, 6(*6*),1620-22.
45. Shah and Navinchandra R (2013). Literacy rate in India. International. *Journal of research in allsubjects in multi languages*, 1(*7*),12-16.
46. SimatwaEnose MW (2010). Piaget's theory of intellectual development and its implication for instructional management at presecondary school level. *Educational Research and Reviews*, 5(*7*), 366-371.
47. Stipek D. (1999), Instructional Environment Observation Scale. University of California: MacArthur Pathways through Middle Childhood Network.
48. StipekD. (2000). Impact of School Quality on Children's School Success. *Paper presented at the Head Start's Fifth National Research Conference., Washington, DC.*
49. WegerifR (2006). Literature review in thinking skills, technology and learning. *ThinkingSkillsReview.*
50. Yadav A, Makwana S, Jain DK (2016). Regulatory Bodies of education in India: Review.*European Journal of Pharmaceutical and Medical Research*, 3(*3*), 112-9.