Information and Communication Technology for the School System

Curricula for ICT in Education

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1 Overview

Information and Communication Technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding of ICT and mastering the basic skills as part of the core of education, alongside reading, writing and numeracy. The recent efforts of the Government of India (GOI) seek to deepen the use of ICT in almost every sphere of life. The Digital India Campaign (2015) strives to transform India into a digitally empowered society and knowledge economy by focusing on the three vision areas: Digital Infrastructure as Core Utility to Every Citizen, e-Governance and Services on Demand and Digital literacy and empowerment of citizens. The three cardinal principle of the draft New National Education Policy (2016) viz., access, equity and quality could be served well by harnessing the huge potential of ICT.

The present curricula for ICT in education is a step towards realizing the goals of both the National Policy, the National Curriculum Framework (2005) and the recommendations of Digital India Campaign. It has factored in the rapid evolution of technologies and the ground realities of Indian school systems. For the teacher, it is an initiation into exploring educational possibilities of technology, learning to make the right choices of hardware, software and ICT interactions, and more importantly, growing to become a critical user of ICT. For the student, it is an initiation into creativity, problem solving, and an introduction to the world of information and technologies which could also shape career pursuits.

ICT distinguish themselves from other technologies by their rapid evolution, defeating attempts to define a curriculum which can serve the schools for a while. Keeping up with the changes require constant upgradation and at times, unavoidable replacements, which makes it an expensive proposition. Given the dynamic nature of the field, the curricula, emphasising the core educational purposes, are generic by design and focus on a broad exposure to technologies

aimed at enhancing the creativity and imagination of the learners. Recognising that teachers as a group represent varying levels of exposure to ICT, the curriculum for teachers attempts to fast track them into becoming proficient users of ICT by defining milestones and an evaluation system that allows for teachers to assess their readiness and decide their pace through the course.

Based on the size of the school, the infrastructure available and other related issues like availability of electricity, students may have varying access to the ICT facilities and resources. The student's curriculum, therefore, is designed as a three year course spanning 90 weeks with three sessions per week. Schools may opt to begin the curricular programme as early as sixth grade (beginning of the upper primary stage), in any case completing the programme before the student leaves school. The ICT curriculum is a common programme for all students in school. As such it is distinct from any optional subject at the plus two stage and distinct from any vocational education programme under the NSQF.

The curricula are built around a set of guiding principles, enabling any school system to provide the right exposure to emerging technologies to build capabilities in teachers and students, not only to use technology comfortably, but also employ them judiciously to enhance their learning. The requirements of the curricula are not to be hardware or software specific. Undoing the general trend of limiting software to office applications, which are not only ill suited for educational purposes but also tend to narrow down the view of what computers and ICT can achieve, a wide range of software applications specifically designed for education are introduced. Use of proprietary software would become very expensive and make the implementation unviable. Therefore, Free and Open Source software have been suggested throughout the curricula. The use of FOSS applications will also obviate software piracy and enable customisation to suit local needs.

The curricula underscore the need for internet connectivity of adequate band-width, particularly for teachers as access to the internet is no more a matter of

choice. The educational potential of internet resources and interactions are immense. It also serves the essential purpose of connecting teachers and schools to each other and contributing to bridging of divides.

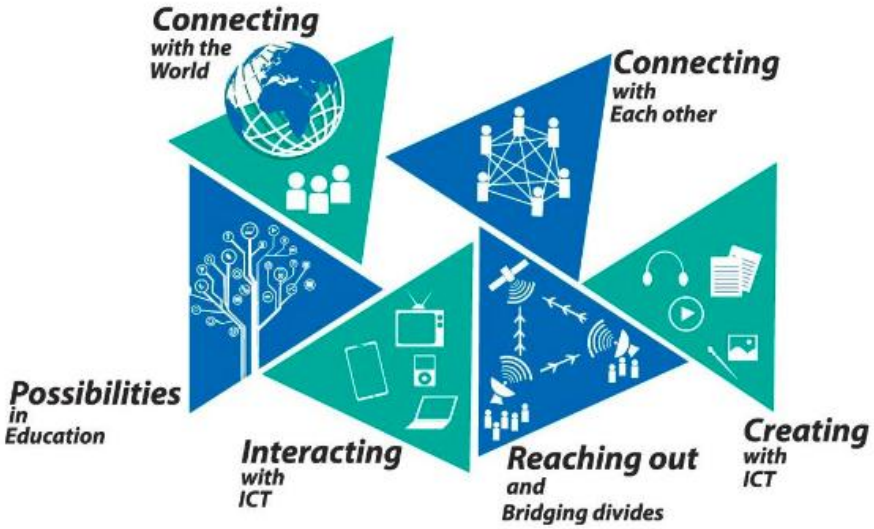
Responding to the National Curriculum Framework's observation that treating e-content as yet another teaching aid trivialises the potential of this medium and has detrimental effects on teaching-learning practices and the role of the teacher, the teachers' curriculum emphasises the involvement of teachers in the creation of e-content, its sharing with peers and its critical evaluation. Taking cognizance of parallel efforts like the National Repository of Open Education Resources, the curriculum encourages the participation of teachers in its collaborative platform to share such evaluated creations.

2 Guiding Principles

1. The curricula shall be generic, drawing upon the features of a wide range of technological applications and focussing on educational purposes.
2. The focus of the curricula shall be on learning to compute, which includes learning to create using a variety of hardware and software tools. ICT literacy, defined as the knowledge and ability to wield tools and devices, shall be an incidental outcome of this learning.
3. The curricula shall provide adequate opportunity for hands on learning and open ended exploration of ICT applications. Sharing of learning and critical evaluation of the learning shall be integral to the strategy.
4. A healthy ICT environment requires heightened awareness of the social, ethical and legal aspects of its use. Software piracy and plagiarism shall be explicitly denounced and discouraged. Creation of original content, taking pride in the creation and duly recognising others' contributions shall be promoted. Safe and secure use of ICT shall also be promoted.
5. The curricula shall promote the full utilisation of infrastructure and resources, integrating it with the school's programme. Universal access and fostering of a sense of ownership shall be encouraged to ensure maximum impact. Innovative ways of reaching the unreached shall be promoted.

3 The Learning strands

The learning strands seek to build capacities to handling today's and tomorrow's technologies appropriate for use in education, capitalizing on technology to master technology, managing the ICT infrastructure, using technology to surmount barriers and to acquiring insights to lead technology educationally. The six strands are:



3.1 Connecting with the World

ICT tools enable anytime, anywhere access to information and resources. Given the proliferation of internet connectivity, the curriculum recognises the fact that being connected to the internet offers tremendous benefits to teachers in terms of capabilities to access information and resources of various kinds and to utilize them in their teaching-learning. Not only will these add to the range of techniques that teachers use, but also make a difference to their students learning. The ability to critically review and use the resources will be an essential input to teachers professional development.

Becoming aware of the range of materials the web offers for the teachers' own learning as well resources for their teaching; critical appraisal of the

information and resources; safe, productive, ethical and legal use of these resources; and protecting oneself and others from the harmful effects of the virtual medium is fundamental to every teacher's learning. Therefore, the strand introduces teachers to the internet and its resources; using browsers and search engines; choosing appropriate sites; search and retrieval of information and resources; different kinds of websites and interactivity; navigating the web, bookmarks, subscriptions to services and products; downloading information and resources; awareness of formats and techniques; copyright and safety issues; uploading and sharing information; and transactions through internet.

3.2 Connecting with Each Other

ICT tools also enable a variety of ways to keep people connected. Synchronous and asynchronous modes increase the degree of interactivity and help create communities, which can then collaborate to form interest groups for a common cause. While at the bare minimum, it enables a very rapid way of communicating with a friend, it can be leveraged to break teachers' isolation and promote professional growth. Becoming aware of various communication possibilities, becoming interested in and participating in professional communities and keeping abreast with newer ways of communicating are essential to keep the teachers in sync with developments of technology and updated about developments in her own discipline and in educational practice.

Learning to create an email ID; send and receive emails; store and manage communication; handle attachments; maintain address books; form or join email forums; participate in discussion forums, wikis, video and audio conferencing, social networks, blogging and micro blogging; become aware of cyber bullying and other social issues are essential parts of teachers' cyber kit.

3.3 Creating with ICT

ICT tools are not seen as an end in themselves but as an opportunity to create and express. Modern ICT employ a variety of media forms – text, graphics, animation, audio and video, enabling a rich communication. Easy, friendly ways have been discovered to interact with ICT. Together they expand enormously the range of learning that can accrue. Software applications and hardware devices have become increasingly versatile and cater to a variety of learning needs. The wider the range of tools, devices, software applications and techniques those teachers are aware of and can productively use, the wider will be the opportunities for developing their imagination and expression. Treating a computer as a mere information delivery device will lead to a gross underutilisation of its capabilities and diminish its use for teaching-learning. With access to a range of tools and devices, the repertoire of communication skills will also increase. The teachers' ability to leverage the interactive features into teaching-learning will also extend the range of activities students can be involved in and learn from.

Creating, curating, managing images and documents; repurposing them into communications; gathering and processing data and presenting them; working with audio and video tools to create media rich communications; learning to program and control devices and processes, become important to teachers.

3.4 Interacting with ICT

ICT are evolving at a very rapid pace. The type of device, its operating processes, and the purpose for which the tool is to be deployed the range of essential learning in ICT is ever increasing. While the computer has evolved to take on more and more complex tasks, the interface itself has become simpler by the day. From the days of a command line interface to an app based touch interface, computers have become extremely productive, finding uses in more and more applications, particularly in the daily routine of every common man.

Understanding how ICT systems operate and an appreciation of the range of ICT tools available today can help identify opportunities for teaching-learning. Extensive use also helps make informed decisions in selecting the most appropriate tools for education. A computer today is not just a large calculator but an integrated communication medium. Expectedly, the more the functions, the more the complexity. The free participatory ways in which this technology has grown has also brought in diverse ways in which different hardware and software achieve similar tasks. Keeping abreast of the technology becomes a challenge. At the same time, trying to learn every new tool in a rote manner would not be fruitful either. A broad conceptual understanding of how ICT devices and tools work, along with an operational knowledge of safe and efficient use of ICT is the aim, together with learning basic ways to troubleshoot and working around problems.

Connecting input and output devices – printers, scanners, webcam, digital camera, sound recorder, projector, headphone; using storage devices and optical disks; mounting and dismounting devices; connecting to the internet – modem, data card, Wi-Fi, LAN; bandwidth and connection speeds; software installation; using , different operating systems; file management; settings and configurations; enabling regional language support; troubleshooting and basic repair; virus protection and safety of equipment and user form the strand's focus.

3.5 Possibilities in Education

ICT capabilities have led to a wide variety of educational applications. Software applications which extend learning, immerse students in experimentation and problem solving, make available data sets to process and retrieve information from are commonly used in education. Online resources – books, courses, media materials have become common. Interactive possibilities, individual users interacting with packaged material or groups of people interacting with each other have opened up ways in which teaching-learning is transacted. While the

glamour and novelty of the medium attracts everyone, becoming a discerning, critical user of ICT is very essential. Sugar coating of information cannot constitute enriching of experience. Learning to acquire insights into how ICT operate and impact teaching-learning, what forms of media and information can be appropriate to learning, how educational goals can become the arbiter of choices made in ICT, assessment and evaluation of ICT tools, devices, information and resources are very important, if cost effective and meaningful ICT has to be promoted. This strand therefore forms the bridge between the aspirations of the education system and the runaway developments in ICT.

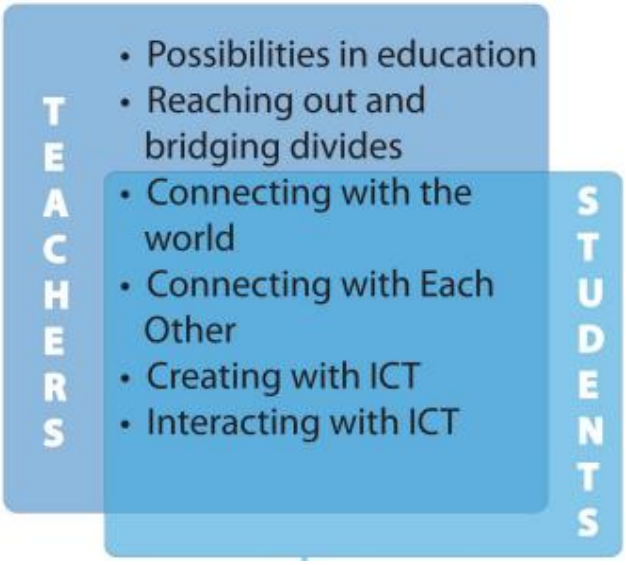
The strand involves exploration and experimentation with open education resources (OER)– access, use and evaluation, creation and contribution of educational resources; research and critical appraisal of the utility and effectiveness of ICT devices and tools; familiarity with virtual environments for self-learning and teaching-learning; familiarity with the web and its range of resources; productivity tools and their meaningful use; tools and forums for planning, organising, teaching-learning, assessment and evaluation; tools and forums for professional growth.

3.6 Reaching Out and Bridging Divides

ICT has become available widely, overcoming geographical and social boundaries. But this has not naturally ensured access to its benefits to all. ICT itself has evolved techniques – a DVD or a music player as examples of portability, forums as examples of public helplines and support, public sharing and open educational resources; a wide range of free and open source software - auguring well for improved access. Language barriers and professional isolation can deny students and teachers access to the wide range of digital information and resources. Becoming aware of, experimenting with, participation in and creation of resources and support aimed at those denied access will help reach out and bridge the divides. Physically challenged,

particularly the visually impaired and the auditory impaired cannot access information as easily.

The theme will involve an exposure to building digital communities; understanding the need for and evolving a shared agenda; creating, sharing, and curating resources for teacher and student communities; community radio; local language tools and local content, translators and translations; subtitling video; disability and assistive technologies – screen readers for the visually impaired; audio books; talking books; collaborative possibilities – wikis, open maps, data repositories and forums.



4 ICT in Education Curriculum for Students

Guided by the National Policy on ICT in School Education (see §3.1), the curriculum for students is designed to promote creativity, problem solving, and introduce students to the world of information and communication technologies with the specific purpose of widening their horizons and better informing them of choices in their career pursuits. In particular, the curriculum focuses on training the student to working with a variety of resources; learning to critically appraise information and resources; and making safe, productive, ethical and legal use of these resources a habit.

Students are also introduced to ICT outside the classroom context. Their curiosity and desire to learn will prompt them to more intensely participate in ICT activities. While introduction to social networks and blogging would become inevitable, making them aware of cyber bullying or other means of violating their rights should become an essential part of the training. While experimenting with hard and software the range of learning is very high. Channelising these tendencies and co-opting them into the teaching-learning process can help teachers create able support to the ICT system in the school.

The impact of ICT on the overall development of the personality can be extremely significant. In particular its effect on the improvement of communication skills is treated as a central goal of the ICT curriculum. Language barriers and isolation can deny students access to the wide range of digital information and resources. Physically challenged particularly the visually impaired and auditory impaired needs additional support. Heightened awareness on the part of the system will help address these students' problems of access.

Based on the availability of ICT infrastructure and the provisioning of an ICT class in the timetable, different schools or Boards of School Education can

exercise the choice to begin the ICT programme with any appropriate class, but ensure that every student completes the advanced stage outlined in the National Policy on ICT in School Education before completing schooling.

This curriculum is recommended for use with students of classes 6-12. It should not be used at the primary stage (classes 1 to 5). A structured ICT programme at the primary stage is not desirable and can be counterproductive. The ICT curriculum for students is also conceived as an important vehicle for the realisation of the goals of the National Curriculum Framework. It attempts to introduce students to a dynamic, immensely popular field, exposing them to a wide range of information and resources, motivating them to explore and participate in. It can not only support learning, but also introduce them to diverse activities which challenge their intellect and imagination.

To this end, the curriculum is organised into four strands:

1. Connecting with the world
2. Connecting with each other
3. Creating with ICT
4. Interacting with ICT

The scope of these strands remains the same as that for teachers. In terms of activities however, the syllabus articulates content differently, taking into consideration the age profile of students, their unique needs and the objective of preparing them for their future.

The ICT curriculum broadly attempts to equip students with an ability to negotiate a range of devices, tools, application, information and resources. The course is offered in chunks of three periods in a week, which include one teacher led session and two hands on sessions. The teacher led session aims to demonstrate techniques and processes and prevent a context to the learning. Following this, students engage themselves with activities which are designed to provide adequate hands on experience.

4.1 Class I to V

As per the recommendations of NCF 2005, ICT is not recommended to be offered as a separate course at primary level. Rather ICT based games will be integrated into core subjects so that students learn ICT incidentally along with learning of their subjects. 130 games have been identified that needs to be integrated across class 1 to 5. These games are all open source that has scope for translation into regional languages, as most of the states prefer the content in regional language for primary level. These games will inculcate the ICT skills in children and also helping them to learn the subjects better with the support of ICT.

4.1.1 Objectives

After the ICT intervention games, the students will be able to:

1. Create digital art and textual materials
2. Use e-resources for learning of curricular subjects
3. Interact with ICT devices confidently
4. Practise safe, legal and ethical means of using ICT

4.1.2 List of Games

S. No	ACTIVITY	DESCRIPTION
1	Make the ball go to tux	Using two keys at the same time
2	Simple letters	Pressing the alphabets in keyboard that are visible on screen
3	No with dice	Typing number using keyboard that is visible on the dice
4	Falling Words	Typing words using keyboard that are visible on the screen
5	Click on me	Selecting objects using mouse

S. No	ACTIVITY	DESCRIPTION
6	Move the mouse	Moving the mouse until all the blocks disappear as it deals with motor coordination
7	Click the mouse	Selecting objects by clicking on the mouse
8	Control hose-pipe	Selecting objects by clicking on the mouse and it deals with motor coordination
9	Mining for gold	Dragging objects using mouse
10	Click and draw	Using mouse to zoom in and zoom out
11	Double click the mouse	Double clicking the mouse on rectangular until all the blocks disappear as it deals with motor coordination.
12	Penalty kick	Selecting objects by double clicking and it deals with motor coordination.
13	The history of Louis Braille	Practicing clicking with mouse
14	Discover the Braille system	Practicing Braille system
15	Braille the falling letters	Practicing Braille codes.
16	Braille lotto	Braille system based games
17	Mixing colors of light	Mixing color using mouse to create a new color
18	Colors	Recognition of different colours.
19	Rebuild the mosaic	Creating patterns by using mouse
20	Mixing color of paint	Creating a perfect match to the cue by mixing the color tube by just clicking on plus and minus sign.
21	Advanced colors	Creating advanced colours by mixing
22	Maze	Moving in maze using keyboard
23	3D Maze	Moving in 3D maze using arrow in keyboard
24	Maze	Moving in maze using arrow keys from the keyboard
25	Maze	Moving in maze using arrow in the keyboard.

S. No	ACTIVITY	DESCRIPTION
26	Memory game with images	Pairing of cards using mouse.
27	Railway	Building train by using keyboard using logic ordering
28	Audio memory game	Identifying audio
29	Audio memory game against tux	Identifying audio and removing wrong ones using mouse
30	Memory game with images against tux	Identifying image and pairing together using mouse.
31	Matching items	Mapping concepts by dragging and dropping
32	Complete the puzzle	Completing puzzles by dragging and dropping
33	Chronos	Telling story by logically arranging the images using drag and drop
34	Find your left and right hands	Distinguishing between various views
35	Algorithm	Moving and clicking the mouse using algorithm
36	Learning clock	Distinguishing between time-units by moving and clicking the mouse.
37	Find the details	Completing the puzzle by dragging
38	Double entry table	Counting by moving using mouse
39	Locate the region	Locating the region by using the mouse.
40	Locate the countries	Locating countries by using the mouse.
41	Explore world animals	Learning about animals by selecting using using mouse.
42	Explore farm animals	Associating the animal sounds with animal name and what the animal looks like by clicking on it.
43	Melody	Listening to the sound sequences played and repeat it by clicking on the elements.
44	Play piano	Listening to the sound sequences played and repeat it by clicking on the elements.
45	Play rhythm	Learning musical notation and musical staff using keyboard and mouse

S. No	ACTIVITY	DESCRIPTION
46	Explore world music	Learning the beat rhythm precisely and accurately based on what is visible and audible using mouse.
47	Music instruments	Recognition of musical instruments by clicking on correct instrument using mouse.
48	Name that note	Learning note position and naming convention using mouse.
49	Piano composition	Music composition with a piano using keyboard using mouse.
50	Parachutist	Safety landing using mouse.
51	Operate a canal lock	Operating a canal lock by using mouse.
52	Learn about the water cycle	Learning water cycle by clicking on different active elements in order to reactivate the entire water system using mouse.
53	Learn about an electrical system based on renewable energy	Building electrical system based on renewable energy by clicking on different active elements using mouse.
54	Intro gravity	Maintaining the spaceship in the middle without crashing into planets or the asteroids using mouse.
55	Land safe	working with up, down, right and left key of the keyboard for the safe landing of the spaceship
56	Place your satellite	Controlling the speed of the satellite and mass of earth using mouse
57	Electricity	Working with electricity
58	Pilots submarine	Handling submarine using mouse
59	Sea race	Giving instructions to computer to perform an action
60	Sea race	Giving instructions to computer to perform an action
61	Learning chess	Playing chess using mouse
62	Enrich your vocabulary	Identifying words using audio, text and image

S. No	ACTIVITY	DESCRIPTION
63	Lower case letter learning	Identifying the alphabet
64	Upper case letter learning	Identifying the alphabet
65	Reading Practice	Matching word and reading
66	Missing letter	Identifying and completing word using keyboard
67	Horizontal reading practice	Matching words by clicking
68	Vertical reading practice	Matching words by clicking
69	Image Name	Matching image with name by drag and drop
70	Word number memory game	Identifying the number name
71	The classic hangman game	Reading and spelling
72	Assemble the puzzle	Solving puzzle by dragging and dropping
73	The tangram puzzle	Solving tangram puzzle by dragging and dropping
74	Build the same model	Building models with motor coordination of using mouse and keyboard
75	Simplified Tower of Hanoi	Dragging and dropping to complete a given tower.
76	Photo Hunter	Identifying differences in the two pictures
77	Animal 4 D	Learning about animals by zooming in and out
78	A Sliding-block puzzle game	Solving puzzle using mouse click
79	Tower of Hanoi	Moving and stacking disc using mouse to find solution
80	Sudoku	Solving problems logically
81	The fifteen game	Clicking and swapping blocks to identify path
82	Lights off	Switch off all the lights by clicking on mouse
83	Practice the addition operation	Performing addition and recognition of written numbers.

S. No	ACTIVITY	DESCRIPTION
84	Practice the subtraction operation	Performing subtraction and recognition of written numbers
85	Practice the multiplication operation	Finding product of two numbers in limited time
86	Equality Number Munchers	Games on of addition, multiplication, division and subtraction
87	Inequality Number Munchers	Games on of addition, multiplication, division and subtraction
88	Multiple Number Munchers	Identifying multiples
89	Factor Number Munchers	Identifying factors
90	Prime Number Munchers	Identifying prime number
91	Addition memory game	Addition game
92	Addition and subtraction memory game	Games on addition and subtraction
93	Subtraction memory game	Subtraction game
94	Multiplication memory game	Multiplication game
95	All operations memory game	Games on addition, multiplication, division and subtraction
96	Division memory game	Division game
97	Multiplication and division memory game	Games on multiplication and division
98	Addition memory game against tux	Addition game
99	Addition and subtraction memory game against tux	Games on addition and subtraction
100	Subtraction memory game against tux	Subtraction game

S. No	ACTIVITY	DESCRIPTION
101	Multiplication memory game against tux	Multiplication game
102	All operations memory game against tux	Games on addition, multiplication, division and subtraction
103	Division memory game against tux	Division game
104	Multiplication and division memory game against tux	Multiplication and division game
105	Balance the scales	Balancing using keyboard and mouse by doing mental calculation and arithmetic equality
106	Practice addition with a target game	Throwing darts at a target and counting the score using mouse
107	Match the given value with the right combination of numbers and operations	Match a given value by doing set of arithmetic operations
108	Balance the scales and calculate the weight	Balancing using keyboard and mouse by doing mental calculation, arithmetic equality and unit conversion.
109	Simple Vector drawing tool	Drawing basic shapes using mouse
110	Redraw the given item	Drawing images by moving and clicking a mouse
111	Mirror the given item	Copying images by moving and clicking a mouse
112	Practice money usage	Counting money
113	Give tux his change	Counting money
114	Give tux his change, including cents	Counting money
115	Money	Counting money
116	Count the items	Counting using keyboard and mouse
117	Enumeration memory games	Numeration using keyboard and mouse
118	Number with pairs of dice	Counting using keyboard

S. No	ACTIVITY	DESCRIPTION
119	The magician hat	Subtraction of numbers
120	The magician hat	Adding numbers
121	Numbers in order	Ordering number using drag and drop
122	Practice subtraction with a fun game	Counting the number on the dice and practice subtraction
123	Count the items	Counting numbers from 1 to 1000
124	Draw number	Counting 1 to 50 and drawing the picture by clicking on each number in the right order
125	The football game	Playing football by clicking and dragging mouse
126	Tux Paint	Creating digital art
127	Hexagon	Moving and clicking on objects to follow logical thinking
128	Word Processor	Using word processor for inputting text
139	Create a drawing or an animation	Fast use of mouse to create drawings based on basic shapes
130	Chat and draw with your friends	communicating with others through chatting

Flexibility is provided to identify more relevant games based on subjects and to be included at primary level. Also the interactive activities developed by NCERT and shared through NROER will also be integrated contextually.

4.2 Class VI to VIII

A separate ICT in Education course is recommended for class VI to VIII and it attempts to equip students with an ability to negotiate a range of devices, tools, application, information and resources. The course is offered offered in chunks of three periods a week, which include one teacher led session and two hands on sessions. The teacher led session aims to demonstrate techniques and

processes and present a context to learning. Following this, students engage themselves with activities, which are designed to provide adequate hands on experience. Each activity has an associated deliverable to be recorded. The student also has to submit various assignments as part of the courses. This should facilitate a comprehensive and continuous assessment. Provision for improving upon one's performance is also built in. A summative is designed at the end of each year. This evaluation also includes an exhibition and peer review of the work done throughout the year. An e-portfolio to capture all learning and complements the periodic summative assessment through the course.

The curriculum expects an allocation of three sessions per week and thirty weeks per year for the course work. The course spans three years. This course will be the foundation courses for the vocational courses that may be delivered for class 9 to 12 or for further learning into core computer science. This course can also be expanded as 5 year course or delivered to different range of class like class 8 to 10 according to the need of the school boards.

4.2.1 Objectives

After undergoing the course, the students will be able to:

1. Develop digital literacy skills that will enable them to function as discerning students in an increasingly digital society
2. Access various tools and applications for learning and skill development
3. Operate a variety of hardware and software independently and troubleshoot common problems
4. Use the ICT facility with care, ensuring the safety of themselves, others and the equipment
5. Create a variety of digital products using appropriate tools and applications and saving, storing and managing digital resources
6. Practise safe, legal and ethical means of using ICT

4.2.2 Course Structure

The session wise break up of topics to be covered in the three year course:

YEAR 01

Week	Theme	Course Title	Description
01	Internet and the ICT Environment 01	Playing with ICT	Orienting to the ICT environment by playing interactive games
02 - 04	Programming 01	Creating images with logo programming - Basic	Learning to give instructions logically through LOGO programming and getting and image as output using basic commands
05 - 06	Graphics 01	Creating digital art - Basic	Learning to create digital art (raster images)
07 - 09	Internet and the ICT Environment 02	Navigating the Web for accessing information	Learning to access textual information from web
10 - 12	Data Representation and Processing 01	Working with Spreadsheet - Basic	Learning to work in spreadsheet to collect, organise, read and manipulate data
13 - 15	Audio Visual Communication 01	Creating audio communication	Learning to creates audio based communications by integrating audio and music
16 - 19	Programming 02	Creating images with logo programming - Advanced	Learning to give instructions logically through LOGO programming and getting image as output using advanced commands
20- 24	Data Representation and Processing 02	Creating Textual communication - Basic	Learning to create mind maps and text document by inputting text and doing the necessary formatting
25 - 28	Audio Visual Communication 02	Creating Audio-Visuals for Communication	Learning to create digital stories by combining text, image, audio and video

29	Project -1	Creating digital story	Developing a digital story based on the curricular subject by applying all the skills developed in year 01
30	Exhibition of portfolios and evaluation	Assessment 1	Output created for assignments will be evaluated based on the rubric. Best works will be showcased

YEAR 02

Week	Theme	Course Title	Description
01 - 04	Graphics 02	Creating digital art - Advanced	Learning to create digital art (vector images)
05 - 07	Programming 03	Creating Audio-Visuals Communication with LOGO programming	Learning to give instructions logically through LOGO programming and getting simple animation as output
08 - 09	Internet and the ICT Environment 03	Mining the web for educational resources	Learning to search for educational resources like image, audio and video
10 - 13	Data Representation and Processing 03	Working with Spreadsheet - Advanced	Learning to work in spreadsheet to organise and represent data graphically
14 - 17	Audio Visual Communication 03	Creating 2D animation	Learning to create 2D animations by using basic tools
18- 20	Programming 04	Creating animations using LOGO programming	Learning to create 3D animations with audio and visuals using multiple characters
21 - 22	Software application 01	Working with interacts - Basic	Learning to create mathematical images using interactive tools like geogebra
23- 26	Data Representation and Processing 04	Creating textual communication - Advanced	Learning to create textual communication by combining text, image, table,

			media etc
27-28	Software application 02	Creating Infographics	Learning to create subject based infographics combining image and text
29	Project 2	Creating 2D animation	Developing a 2D animation based on the curricular subject by applying all the skills developed in year 01 & 02
30	Exhibition of portfolio and evaluation	Assessment 2	Output created for assignments will be evaluated based on the rubric. Best works will be showcased

Year 03

Week	Theme	Course Title	Description
01 - 04	Graphics 03	Working with graphics editor	Editing images using basic tools
05 - 07	Software Applications 03	Working digital Maps and Globes	Learning to use digital maps and globes for mapping and understanding locations
08 - 11	Software application 04	Working with interacts - Advanced	Learning mathematics by construction and manipulation using interactive tools like geogebra
12 - 14	Software application 05	Working with simulations	Learning Science using simulations tools like Stellarium
15 - 17	Internet and the ICT Environment 04	Connecting with each other	Learning to connect with each other through mails and forums
18 - 20	Graphics 04	Creating with graphics editor	Editing images to create a piece of communication
21- 23	Software application 06	Working with web based applications	Working with online tools

			like PhET, games, apps etc.
24-25	Programming 05	Creating interactive games with LOGO programming	Learning to create interactive games using multiple characters
26-28	Internet and the ICT Environment 05	Creating and learning online	Learning to share information online through blogs and learns through MOOCs
29	Project 03	Creating interactive games	Developing an interactive game based on the curricular subject by applying all the skills developed in year 01 to 02
30	Exhibition of portfolio and evaluation	Assessment 3	Output created for assignments will be evaluated based on the rubric. Best works will be showcased

4.2.3 Assessment

Each session of the course involves a teacher led session followed by a hands on session, during which the student undertakes a number of activities. Each activity has an associated deliverable to be recorded. The student also has to submit various assignments as part of the courses. This should facilitate a comprehensive and continuous assessment. Provision for improving upon one's performance is also built in. A summative evaluation is designed at the end of each year. This evaluation also includes an exhibition and peer review of the work done through the year. An e-portfolio attempts to capture all learning and complements the periodic summative assessment through the course.

4.2.4 Certification

As the course may not be immediately available across all schools, owing to the ICT infrastructure not being in place, the State Board of Secondary Education may evolve a mechanism of a separate examination, following which a Certificate can be awarded. Once all schools are equipped, this could form a part of the School Leaving Certificate.

4.3 Class IX to XII

As vocational education is part of class 9 to 12, this ICT course will be extended as vocational course which will follow the rules and norms of vocational education courses with respect to time allocation, certification, and methodology etc. 11 courses has been identified which is mapped to minimum of 15 job roles prescribed by NSQF. This course will be offered as Level 1 to 4 as per NSQF recommendations.

4.3.1 Objectives

ICT based vocational course are offered with the following objectives:

1. Enabling the students to identify their skills in the specific for choosing their higher education.
2. Providing an opportunity to have a job oriented certification for making their livelihood.
3. Developing a skillful youth community to address the needs of the digital society.
4. Creating awareness on social, ethical and legal use of ICT.

4.3.2 Courses

Course	Job Roles
Graphic designing	Graphic designer/ Graphic artist/ Graphic designer Multimedia
User interface and user experience design (UI & UX design)	Web designer
DTP	DTP operator
2D and 3D animation	Animator
Web application development	Junior software developer
Software and Hardware system administration	Junior software administrator
Graphic designing and DTP	Graphic designer and DTP operator
Web development	Web developer
Audio video production	Multimedia content developer
Data analysis and data visualisation	Data analytics
Mobile application development	Junior software developer

If a student or school is not opting for vocational education, even then ICT should be integral part of class 9 to 12 curriculum. Hence ICT based projects will be identified for each subject which will enable the students to use ICT for learning the core subject in a better way. These projects can be used by teachers for formative assessment of the core subjects and also by ICT teachers to assess the ICT skills. These projects will be designed based on the subject specific tools appropriate for the level of the students

4.4 ICT integration across Class I to XII

Every teacher is expected to integrate ICT with content and pedagogy from class 1 to 12. For this teachers will be trained on ICT in Education and this will enable the integration of ICT in classroom. Students of class 1 to 12 will learn to use ICT for searching, collecting, collating, creating, saving, manipulating, sending and receiving digital information. This will enable the student to use ICT for learning in better way. ICT could be integrated across classes by use of econtent (images, audio, video, text, animations, simulations, interactive games, mobile apps etc), Learning Management System (MOODLE, Google classroom etc), and devices (interactive board) for teaching, learning and assessment.

5 ICT in Education Curriculum for Teachers

The teachers' curriculum is considered a significant vehicle for the realisation of the goals of the National Curriculum Framework and consequently is designed to provide an enhanced exposure to information and resources for ongoing professional support, improved teaching-learning-evaluation-tracking, and increased productivity. The National Policy on ICT in School Education organises the competencies for ICT Literacy into three broad levels, basic, intermediate and advanced, and the curriculum subsumes them.

Stage 1

Basic Basics of computers and basic use of tools and techniques – operate a computer, store, retrieve and manage data, use a computer to achieve basic word and data processing tasks; connect, disconnect and troubleshoot basic storage, input and output devices. Connect to the internet, use e-mail and web surfing, use search engines; keep the computer updated and secure; operate and manage content from external devices (sound recorders, digital cameras, scanners etc.); connect, disconnect, operate and troubleshoot digital devices.

Stage 2

Intermediate Create and manage content using a variety of software applications and digital devices; using web sites and search engines to locate, retrieve and manage content, tools and resources; install, uninstall and troubleshoot simple software applications.

Stage 3

Advanced Use different software applications to enhance one's own learning – database applications, analysis of data and problem solving, computing, design, graphical and audio-visual communication; undertake research and carry out projects using web resources; use ICT for documentation and presentation; create and participate in web based networks for cooperative and collaborative

learning; become aware of issues of cyber security, copyright and safe use of ICT and take necessary steps to protect oneself and ICT resources

The content of the curriculum involves activities which simultaneously draw upon competencies from different levels, such that a completion of all levels is ensured. The ICT in Education curriculum broadly attempts to equip teachers with ICT competencies to strengthen their own professional capacities and to effectively use ICT tools and devices in their teaching- learning. Teacher will also be trained to manage the ICT environment in the school and function as a local coordinator for organising capacity building programmes.

The curriculum therefore is rolled out as a series of short courses, spanning the six strands and ensuring together the basic, intermediate and advanced levels of competence. Three induction and twenty refresher courses leading to a diploma in ICT in Education is proposed. Induction courses are to be conducted in face to face mode whereas State (SCERTs/ SIEs) may chose to conduct the refreshers in face to face or in online mode.

- Induction 01* (For beginners) – 10 days (4 credits)
- Refresher 01 -10 (For all teachers) – Each refresher 40 hours: 24 hrs of transaction and 16 of project & presentation (20 credits)
- Induction 02 (For all teachers) – 5 days (4 credits)

(*Note – A large number of teachers are likely to have been trained or acquired qualifications making them advanced users of ICT. Such teacher shall be permitted to complete all activities and assignments populating their e-portfolio at their own pace without attending the face to face training.)

In addition, advanced refreshers (11-20) and induction 03 are available to extend teachers a range of exposure to ICT. State may choose some or all based on the availability of time/ resources. Refresher 14 to 17 will include optional courses; a number of subject specific courses will be offered under the advanced refreshers so that the teacher may choose minimum of any four courses from

them. Based on developments in the field of ICT and ICT in Education, newer modules will be continuously added and teachers can be encouraged to undertake the module.

5.1 Objectives

After undergoing this course the teacher will be able to:

1. Effectively use ICT tools, software applications and digital resources
2. Integrate ICT into teaching-learning and its evaluation
3. Acquire, organize and create her own digital resources
4. Participate in the activities of teachers' networks
5. Participate in the evaluation and selection of ICT resources
6. Practice safe, ethical and legal ways of using ICT
7. Use ICT for making classroom processes more inclusive and to address multiple learning abilities

5.2 Course Structure

Course structure is organised as three inductions and twenty refreshers.

5.2.1 Induction 01 - Basics (10 days)

Ses. No	Session Title	Description
1	Registration and Entry level assessment	Registering in course port, introducing to the co-learners and filling the entry level competency questionnaire
2	Creating with ICT – Media : Images	Creating/ capturing images as piece of communication in multiple ways using mobile
3	Creating with ICT – Media : Audio and video	Creating audio and video as piece of communication in multiple ways using mobile
4	Creating with ICT – Text	Creating text as a piece of communication by inputting and formatting text.

Session No	Session Title	Description
5	Inputting in regional language	Creating text as a piece of communication in regional language by inputting and formatting text
6	Creating with ICT – Data	Understanding forms of data, different formats in which data can be captured - images, numbers, text, audio, video etc and various ways of representing data. Reading data and making meaning out of it
7	Bringing together hardware and software	Acquainting with the functionalities of a system and general features of operating system. Connecting and configuring the hardware for specified purpose.
8	Introduction to browser and browsing	Accessing relevant information from the web using URL
9	Accessing information through web	Accessing textual information using search engines
10	Exploring Web resources I	Accessing images in several ways and using various techniques
11	Communicating through Email	Communicating through email using the web in a safe and responsible manner
12	Exploring Web resources II	Accessing media resources by exploring various repositories
13	Working with data – Exploring spreadsheet 1	Working with spreadsheets to input, organise, classify, order and analyse data – text and numeric
14	Working with data – Exploring spreadsheet 2	Working with spreadsheets to extend and represent data using graphs.
15	Creating with ICT - Textual Communication	Creating textual communication and enhancing with tables, various media, special characters, symbols and formulae
16	ICT in the classroom – hardware and software	Practising various possibilities of using hardware and software in classroom environment

Session No	Session Title	Description
17	Introduction to Assistive technologies	Understanding assistive technologies and ICT based assistive devices
18	Collaborating and transacting with Web	Collaborating with others through e-groups. Acquainting with web based courses platforms and transacting through web
19	MIS systems for educational management	Understanding the need, important, structure and functioning of School based MIS
20	Exhibition and Evaluation of e-portfolio submission	Output created for assignments will be evaluated based on the rubric. Best works will be showcased

5.2.2 Basic Refreshers (Each refresher for 40 hours)

Refresher No	Refresher Title	Description
1	ICT for teaching-learning – 1	Appreciate the potential of ICT in Education, specifically in teaching and learning. Releasing the importance of learner analysis and classroom analysis. Analyzing curriculum to identify areas for ICT infusion (analyzing and abstracting, evaluating and problem solving). Determining the ICT resources for teaching-learning.
2	Digital storytelling	Capturing information in non-textual ways; appropriate media choices for a given communication need. Combining text, graphic and audio visuals to create a communication. Developing a story and scripting by combining multiple digital media. DEveloping digital stories for communication in classrooms. Evaluating digital stories. Exploring possibilities for inclusive using digital story telling.

Refresher No	Refresher Title	Description
3	Internet as a learning resources	Exploring the internet and Identifying appropriate resources for personal enrichment, professional learning, teaching learning ideas and creation of multiple learning spaces. Organizing the identified resources. Evaluating resources for use in specific contexts
04 – A/B/C/D	ICT for teaching of Languages/ Mathematics/ Sciences/ Social Sciences	Understanding the scope of using ICT in teaching of subjects. Exploring range of ICT tools such as subject specific FOSS, internet based resources, mobile apps etc for teaching and learning of specific subject.
05 – A/B/C/D	Simulations for teaching of Languages/ Mathematics/ Sciences/ Social Sciences	Exploring various simulation based tools/ resources for teaching specific subject. Creating e-resources for specific subjects using simulation tools. Building personal libraries of content resources.
06 – A/B/C/D	Interacts for teaching of Languages/ Mathematics/ Sciences/ Social Sciences	Exploring various interactive tools/ resources for teaching specific subject. Creating e-resources for specific subjects using interactive tools. Building personal libraries of content resources.
07 – A/B/C/D	Games and Apps for teaching of Languages/ Mathematics/ Sciences/ Social Sciences	Exploring various mobile apps and games for teaching specific subject. Creating e-resources for specific subjects. Building personal libraries of content resources.
8	ICT for teaching-learning – 2	Designing and organizing learning environments for classrooms. Mapping skills to be built and the content. Identifying applications, media and materials to enhance teaching learning process. Developing ICT infused instructional plan and build personal libraries of classroom ideas and resources.

Refresher No	Refresher Title	Description
9	ICT for teaching-learning – 3	Deconstructing ICT for teaching-learning (Using ICT in the classroom, technologies and methods. Organizing learning and designing learning environments (classroom organisation and adaptation for ICT). . Interacting with hardware and software. Building personal libraries of classroom resources.
10	ICT for evaluation	Exploring ICT based tools and techniques. Building personal libraries of evaluation resources. Applying ICT tools for evaluation of teaching-learning process.

5.2.3 Induction 02 - Intermediate (5 days)

Session No	Session Title	Description
01	Trouble shooting and seeking help	Solving problems while working with ICT tools. Getting assistance on solving the issues from web.
02	Installing hardware and software	Identifying the requirement for installing software. Understanding the process of installation.
03	Synchronous communication on web	Communicating with other at real time. Exploring various tools for communicating with others at real time
04	Uploading to the web	Sharing resources in web for wider dissemination
05	Advanced text processing 01	Creating blogs for sharing information.
06	Advanced graphics 01	Exploring various tools for editing images. Creating graphics by applying editing images
07	Advanced spreadsheets 01	Analysing data using advanced formulae and functions. Working with multiple worksheets

Session No	Session Title	Description
08	Storage and backup	Exploring various ways storing resources offline and online
09	Evaluation of e-portfolio	Output created for assignments will be evaluated based on the rubric.
10	Showcase of e-portfolio	Best works will be showcased

5.2.4 Advanced Refreshers (Each refresher for 40 hours)

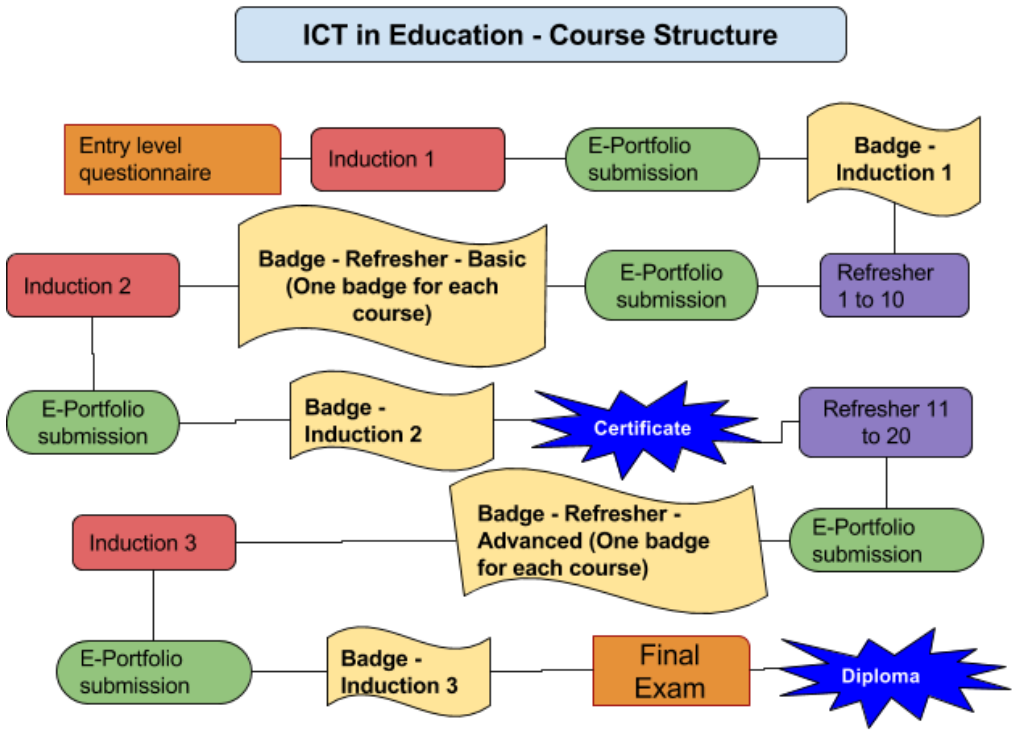
Refresher No	Refresher Title	Description
11	ICT for Documentation and Communication	Deconstructing documentation, communication and media. Exploring tools and techniques for documentation and communication. . Interacting with appropriate software and building personal libraries of documentation and communication resources
12	Data Analysis	Looking at data, reading data and making meaning (using a variety of data sets). Plotting the data set and reading the graph. Querying data sets and plots for analysis, including multiple data set. Using data visualization. Exploring data collection, data capture and analysis formats 6. Evaluating data, data sources and visualizations 7. Using data tables and graphs for communicating
13	Building Communities and Collectivising	Exploring online communities and participating in them. Integrating communities into teaching-learning. Participating in online communities and collectives
14	Social, ethical and legal aspects of ICT & cyber safety	Explore legal aspects of handling issues in cyberspace. Understand the social and ethical behaviour in cyberspace.

Refresher No	Refresher Title	Description
15	Assistive & adaptive technologies	Explore various assistive and adaptive technologies to support teaching and learning.
16	Game Based Learning	Exploring educational games and game source. Creating games infused learning environments. Building personal libraries of gaming resources
17	Data management	Exploring various MIS systems and tools for managing data safely and securely
18	ICT for teaching learning - 4	Exploring various Learning Management Systems (LMS). Understanding the ways and means of delivering courses through LMS. Conducting various activities through learning management system.
19	ICT for Educational Administration and Management	Exploring tools and techniques for administration and management. Interacting with appropriate applications and data source. Participating in ICT based educational administration and management
20	Handling ICT course for students	Explore the ICT course for students. Understand the ways and means of conducting the course.

5.2.5 Induction 03 - Advanced (5 days)

Session No	Session Title	Description
01	Safe and clean ICT environment	Understanding the security measures to safeguard the system in the school
02	Updating and upgrading software	Getting and installing updates operating system and application software
03	Exploring educator communities	Exploring various educational groups for sharing informations, ideas and resources

Session No	Session Title	Description
04	Exploring social networks	Exploring various social networking websites and apps. Communicating through social networking sites and apps in safe mode
05	Advanced text processing 02	Development of text based interactive resources
06	Advanced graphics 02	Development of graphic based interactive resources
07	Advanced spreadsheets 02	Understanding analytics based on school data. Analysing and interpreting school based data
08	Creating a web communication	Identifying ways of communicating through web and being connected to the world
09	Evaluation of e-portfolio	Output created for assignments will be evaluated based on the rubric.
10	Showcase of e-portfolio	Best works will be showcased



5.3 Assessment

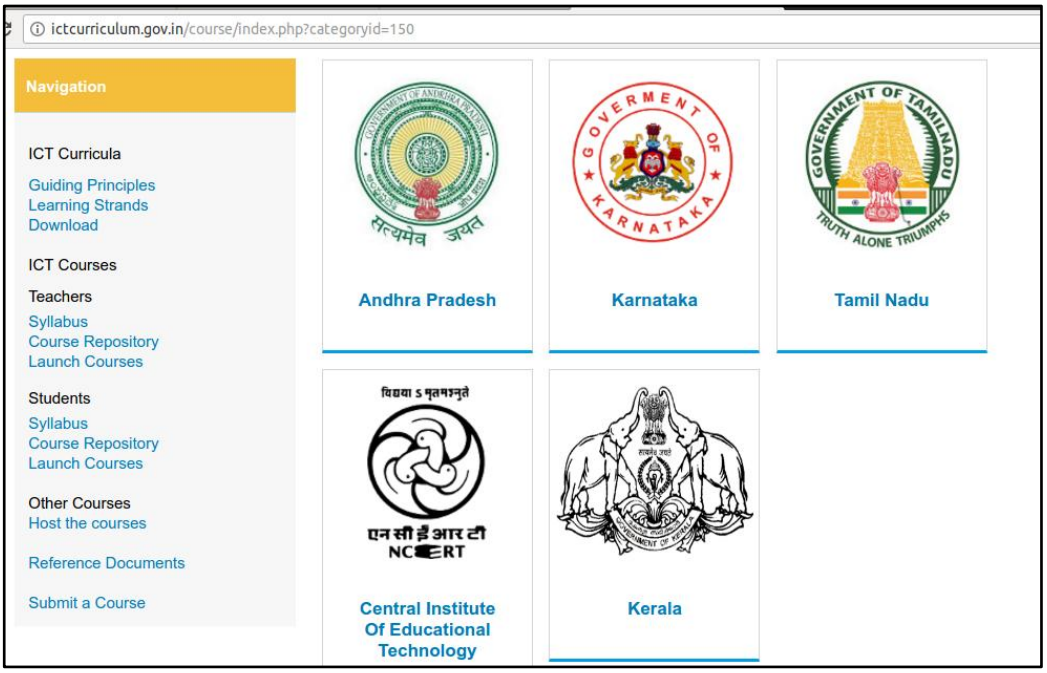
Each session of the induction and refresher courses involves an instructor led session followed by hands on session, during which teachers undertake a number of activities. Each activity has an associated deliverable to be recorded in a portfolio (an e-portfolio). Teachers also have to submit various assignments as part of the courses. The cumulative record in the portfolio, representing their achievements during the courses provides comprehensive and continuous assessment. Provision for improving upon one's performance is also built in. Each of the induction and refresher courses also has a summative evaluation. The portfolio attempts to capture all learning and complements the periodic summative assessment through the course.

5.4 Certification

Together, the courses constitute Forty eight credits for a Diploma. Any teacher completing two induction and ten refresher courses becomes eligible to receive a certificate of course completion by SCERTs/ SIEs. Any teacher completing the three induction and the twenty refresher courses becomes eligible to take an examination leading to a Diploma in ICT in Education. This Diploma would be awarded by the NCERT.

6 Course Portal

A dedicated course portal is developed and can be accessed at www.ictcurriculum.gov.in.



This course portal is an open source LMS which enables the instructor to share resources, conduct sessions and the students to submit their assignments. A separate space will be created for each state/ organisation to manage and run their courses.

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