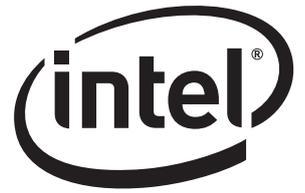




ARTIFICIAL INTELLIGENCE INTEGRATION ACROSS SUBJECTS



ARTIFICIAL INTELLIGENCE INTEGRATION ACROSS SUBJECTS FOR CBSE CURRICULUM

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About the Book

Artificial Intelligence (AI) is a Cognitive Science and the history of its evolution suggests that it has grown out of the knowledge derived from disciplines such as Science, Mathematics, Philosophy, Sociology, Computing and others. Hence, it is fair for any education system to recognize the importance of integrating AI Readiness to maximize learning across other disciplines.

AI is being widely recognized to be the power that will fuel the future global digital economy; and has gained geo-strategic importance. A large number of countries are striving hard to stay ahead with their policy initiatives to get their youth ready to function in an environment driven by AI and other emerging technologies.

India's own AI Strategy identifies AI as an opportunity and solution provider for inclusive economic growth and social development. The report also identifies the importance of skills-based education (as opposed to knowledge intensive education), and the value of project related work in order to "effectively harness the potential of AI in a sustainable manner" and to make India's next generation 'AI ready'.

CBSE has introduced Artificial Intelligence as an optional subject at Class 9 from the Session 2019-2020 onwards and has been conducting trainings for Teachers on how to use AI in the Classroom. A Training Video has also been prepared to assist the same.

CBSE is now announcing AI as a multi-disciplinary integrated pedagogical approach to further enhance teaching and learning across classes 6 to 12. This document is an attempt to propose how schools may train the trainers to match relevant topics/ themes from the curricula with AI concepts. It contains details on the importance of Artificial Intelligence and Artificial Intelligence Tools as a pedagogical support for experiential learning. Guidelines for Teachers can be found in the form of Lesson Plans integrating AI in Classroom Teaching.

How this Integration Document was created:

In keeping with the vision of CBSE to introduce and train Teachers on AI readiness, and the usage of AI in classroom teaching and learning practices; a discussion was initiated with AI experts and Teachers of various Subjects from CBSE Schools.

Lesson Plans in each Subject were discussed and written, and a suggestive list of activities and projects integrating Artificial Intelligence into regular subject teaching was curated and compiled for reference, as an AI Glossary, which accompanied each Lesson Plan to facilitate ease of reference and usage.

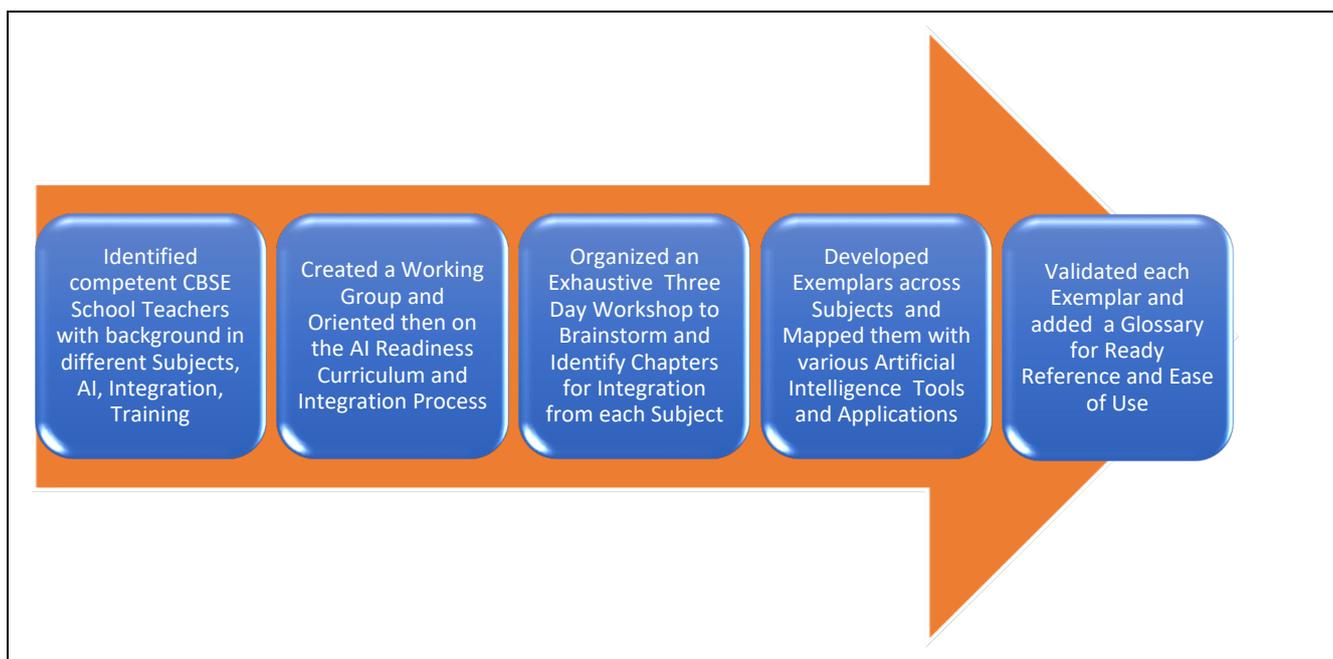


Figure 1: How this Integration Document was created

It is important to understand that AI is one of the cognitive science disciplines that provides tools to build intelligence in contrast to other disciplines that just study and analyze the external behavior of intelligent agents. Realizing this need, it has been decided that all teachers teaching in CBSE schools should familiarize themselves with the prevalent AI knowledge and use it to make learning of their subjects more effective and student centered. It is visualized that such a step would help to build larger understanding of AI among teacher and student communities.

It is highly recommended that teachers explore the Exemplar Lesson Plans and Glossary in this document, and go beyond what has been showcased, to develop more such exemplars and teaching methodologies integrating Artificial Intelligence in day to day learning across subjects, for students.

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Chapter 1

AN INTRODUCTION TO ARTIFICIAL INTELLIGENCE

1.1 What is Artificial Intelligence?

Artificial Intelligence has always been a term which intrigues people all over the world. Artificial Intelligence (AI) refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making; it is inspired by the ways people use their brains to perceive, learn, reason out and decide the action.

Various organizations have coined their own versions of defining Artificial Intelligence. Some of them are mentioned below:

NITI Aayog: National Strategy for Artificial Intelligence

AI refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making. Initially conceived as a technology that could mimic human intelligence, AI has evolved in ways that far exceed its original conception. With incredible advances made in data collection, processing and computation power, intelligent systems can now be deployed to take over a variety of tasks, enable connectivity and enhance productivity.

World Economic Forum

Artificial intelligence (AI) is the software engine that drives the Fourth Industrial Revolution. Its impact can already be seen in homes, businesses and political processes. In its embodied form of robots, it will soon be driving cars, stocking warehouses and caring for the young and elderly. It holds the promise of solving some of the most pressing issues facing society, but also presents challenges such as inscrutable “black box” algorithms, unethical use of data and potential job displacement. As rapid advances in machine learning (ML) increase the scope and scale of AI’s deployment across all aspects of daily life, and as the technology itself can learn and change on its own, multi-stakeholder collaboration is required to optimize accountability, transparency, privacy and impartiality to create trust.

European Artificial Intelligence (AI) leadership, the path for an integrated vision AI is not a well-defined technology and no universally agreed definition exists. It is rather a cover term for techniques associated with data analysis and pattern recognition. AI is not a new technology, having existed since the 1950s. While some markets, sectors and individual businesses are more advanced than others, AI is still at a relatively early stage of development, so that the range of potential applications, and the quality of most existing applications, have ample margins left for further development and improvement.

Encyclopedia Britannica

Artificial intelligence (AI), is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize or learn, from past experience.

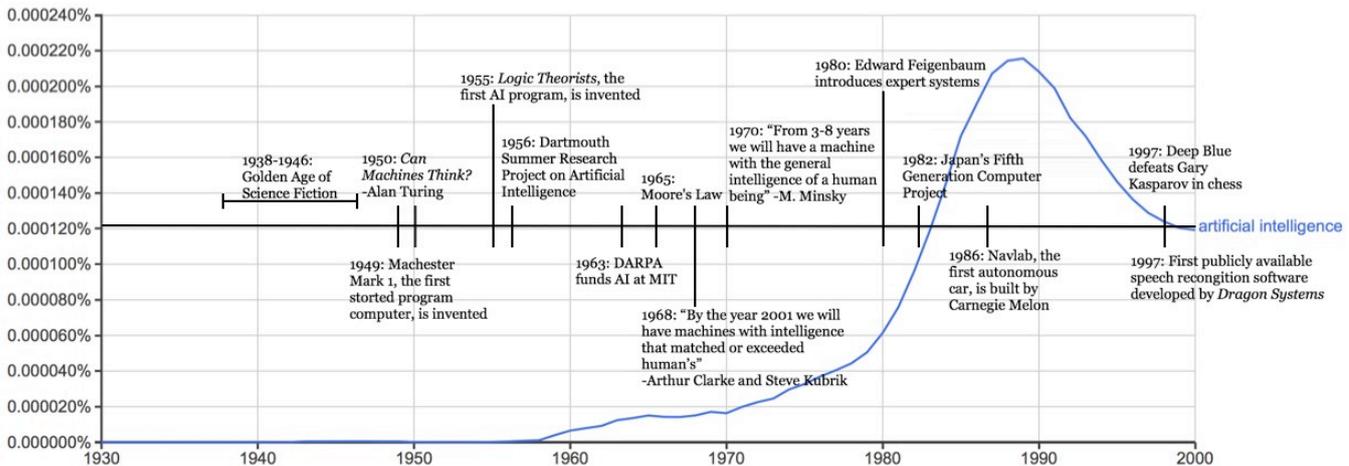
In other words, AI can be defined as:

AI is a form of intelligence; a type of technology and a field of study. AI theory and development of computer systems (both machines and software) are able to perform tasks that normally require human intelligence. Artificial Intelligence covers a broad range of domains and applications and is expected to impact every field in the future. Overall, its core idea is building machines and algorithms which are capable of performing computational tasks that would otherwise require human like brain functions.

1.1.1 History of AI – Live Science

The beginnings of modern AI can be traced to classical philosophers' attempts to describe human thinking as a symbolic system. (see Annexure 4.5) But the field of AI wasn't formally founded until 1956, at a conference at Dartmouth College, in Hanover, New Hampshire, where the term "**Artificial Intelligence**" was coined. The graphic below appropriately explains why AI is a live science, what are

ARTIFICIAL INTELLIGENCE TIMELINE



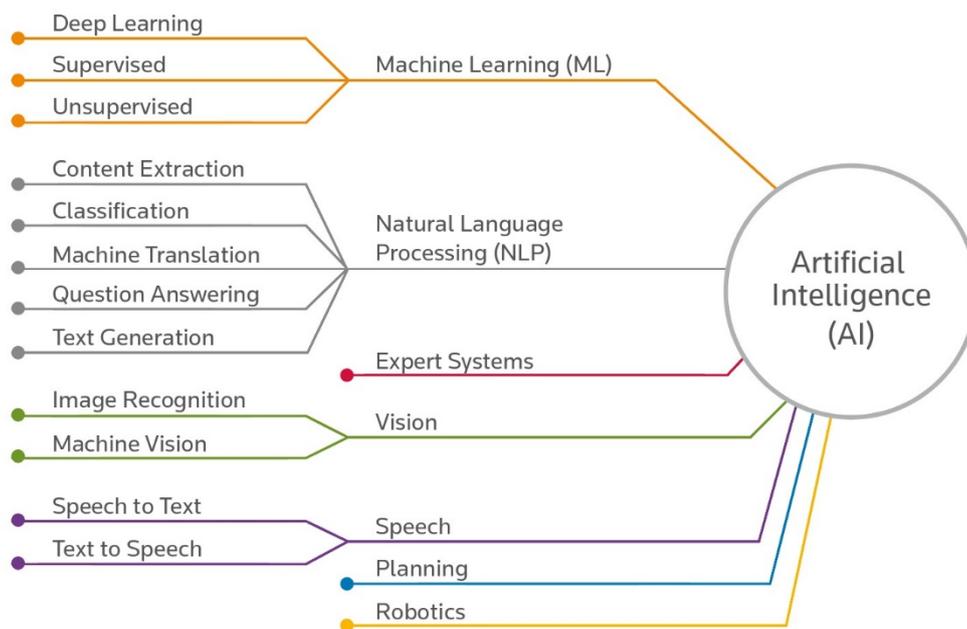
the ups and downs in the pace of AI journey and how AI progressed in this domain from the year 1930-2000.

<http://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/>

1.2 What do we understand by AI in EDUCATION?

An effective education system has the dual responsibility to develop the most critical resource (i.e. the human resource) of a nation. One, that the younger generations must be educated in a way that they are 'ready for life' and are positive contributors to the advancement & enrichment of their nation. Second, they must be exposed to such learning environments with the help of updated tools and enlightened teachers so that their learning outcomes could be maximized and suited to the potential of every learner. In order that modern-day education achieves its goals of making its students 'AI Ready', it is imperative to know what K-12 learners must experience and confront in their day to day life.

AI is underlying the multitudes of its applications in the world; it encompasses and works on an array of capabilities which have universal application in different areas of study and operations. Some of the most important AI competencies with significant commonalities and connections with those of the other fields of study are shown in the graphic below.



<http://www.fullai.org/short-history-artificial-intelligence/>

A careful study of the above graph would lead us to believe that many of the technologies and the underlying principles that each of these follows, have a strong correlation with the teaching learning processes at school as well as college levels. Hence it is necessary that AI should not only be introduced as a subject in the school curricula, but also should become a link to teach other subjects at all the levels. Many of the AI based applications are now available to facilitate a learner to learn in his own unique way and at his own pace.

1.3 What is CBSE's new initiative encompassing Artificial Education?

Making school students 'AI Aware' or forging 'AI Readiness' among students is a huge task indeed. Central Board of Secondary Education under the guidance of Ministry of Human Resource Development has taken a '*twin initiative*' in this regard.

First is to introduce AI as an elective subject in classes 8,9 and 10. To begin with, schools have to apply to CBSE and be approved to run this course. AI curriculum for classes 8 and 9 has been chalked out and a Facilitators' Handbook has been produced. CBSE is also supporting extensive teacher training for the teaching of AI in schools.

The **Second** part of *CBSE* initiative deals with the premise that AI is a Cognitive Science which can be linked to various subjects that concern themselves with cognition and reasoning. Almost every one of the school subjects would fall in this domain. Be it - Mathematics, Computing, Neuro-Sciences, Psychology, Physics, Economics, Sociology, Philosophy, Languages and some others. It is, therefore, mandated by CBSE that all its schools would begin to integrate AI with other disciplines from classes 1 -12.

1.4 What is the rationale for this Twin Initiative? Initiative 1: Artificial Intelligence permeates the length and breadth of the world we live in today. Our young generation is witnessing many uses of AI every day. While Google manages our mail accounts, it also makes suggestions about what words to use to respond to a given email and/ or project follow up reminders. Facebook not only connects us with friends but also makes suggestions about our priorities, personal needs and preferences. Today we witness smart parking spaces as well as have cars that park themselves. In many advanced countries the traffic is monitored, controlled and managed by using the data collected of moving traffic and prevalent weather conditions. Chat bots collect data for big and small businesses to assess the market requirements of their products and also support the respective business houses in interaction with the customer and resultant satisfaction. There are also AI powered devices to support households in simple tasks such as cleaning etc. All the domains of life - from medicine to manufacturing to national security and defense – are currently getting impacted by the use of Artificial Intelligence. Space missions, which extensively use unmanned space shuttles and unmanned vehicles to traverse the unknown areas of other planets, collect tremendous data not only to understand the planet they go to but also to acquire intelligence about the betterment of their own operations in future. Hence, it is essential that students of today should study this domain to understand and later be able to expand this knowledge in their own interest and in the interest of humanity.

Initiative 2: It is important to understand that AI is one amongst the cognitive science disciplines that provides tools to build intelligence in contrast to other disciplines that just study and analyze the external behavior of intelligent agents. Realizing this need, it has been decided that all teachers teaching in CBSE schools should familiarize themselves with the prevalent AI knowledge and use it to make learning of their subjects more effective and student centered. It is visualized that such a step would help to build larger understanding of AI amongst the teacher and student communities.

This document is an attempt to suggest how schools may train the teachers of class 6–12 to relate to the relevant topics/ themes from their respective curricula with technologies that AI deploys. The document will also showcase to the teachers the AI based tools that can support and augment learning across disciplines, in and out of the classrooms. The extensive AI glossary and the App Matrix is an effort to include a list of varied resources for teachers to extend the integration activity to other topics of their respective subjects.

1.4 What do we mean by AI Integrated Education?

AI integration with the other school disciplines is to be viewed from two different perspectives.

Perspective 1: While exploring the possibilities to integrate subjects with AI, it was felt that it can be a two-way process. The teacher may select a topic from the subject that easily lends itself to any one of the AI concepts. He/she would, then, either select the AI concept as a tool to teach the subject topic chosen by him/her or using the understanding of the topic, he/she may be able to show a linkage to AI knowledge and usage.

For example: 'Data Collection' is a familiar task in Mathematics and 'Data Acquisition' is an important basic AI concept. The teacher may use an AI based app to demonstrate Data collection in a Mathematics Class or teach the concept and functionality of the AI application through their understanding of the Data Collection operations in Mathematics.

Perspective 2: A practicing teacher may consider one subject +AI integration with it, which is a simpler and more functional approach. Example 1 is one such sample given below, in which a Physics topic is integrated with AI concepts.

The other approach could be to have inter disciplinary integration, in which the teacher may pick up one such topic from her own subject that has relevance to other subjects also. Then, in consultation with other teachers, the four of them could explore the same topic to achieve the learning outcomes of their respective subjects, while at the same time integrating each subject with AI. (see example 2 below)

The former approach is feasible in normal classroom teaching, the later would have to take the shape of a project and would have to be conducted in large class groups over a span of time.

Example 1:**Science – Class 9 Integration with AI****PHYSICS CLASS: 9**

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter 12 - Sound (Frequency, Amplitude & Velocity)	
Name of the book	NCERT Science Text Book for Class 9	
Subject & Artificial Intelligence Integrated	Frequency, Amplitude & Velocity integrated with the infinite Drum Machine experiment	
Learning Objectives	To understand and apply the principles of sound - wavelength - oscillation - amplitude - pitch - frequency of sound - concept of velocity (speed) of sound - concept of 'intensity' of sound & be able to differentiate it from 'loudness' to appreciate the role of medium of sound in the above phenomenon to experience the AI concept of 'unsupervised learning'	
Time Required	Two periods of 40 min each.	
Classroom Arrangement	Normal Classroom	
Material Required	laptop/ desktop or smart mobile phone with internet connection, chalk, blackboard	
Pre- Preparation Activity	Materials for sound experiments as given in NCERT text book	
Previous Knowledge	Students know the concept of how sound is produced and propagated through a medium	
Methodology	<ul style="list-style-type: none"> • Lead the students to an understanding and application of the following principles of sound by relating it with demonstration of different sounds and wave diagrams - wavelength (pg. 164) - oscillation (pg. 164) - frequency of sound (pg. 164) - pitch (pg.165) - amplitude (pg. 165) 	Sound operated devices Infinite Drum machine

	<ul style="list-style-type: none"> • Explain the concept of velocity (speed) of sound & the role of medium of sound by diagrams and through formulas • Make them understand the concept of 'intensity' of sound & be able to differentiate it from 'loudness' (pg. 166) • Help them to differentiate between amplitude and frequency which otherwise seem to be very similar characteristics of sound • Direct the students to The Infinite Drum Machine activity • <i>Link how different sound sensors work in one and multiple directions by giving examples of different sound operated devices eg. a door being opened and closed in movies and an instrument turning on and off by clapping.</i> 	
Learning Outcomes	<p>Students will be able to</p> <ul style="list-style-type: none"> • Differentiate between amplitude and frequencies of sound waves. • Relate performances of different musical instruments with amplitude and frequencies • understand and relate how sound is applied in AI based solutions • demonstrate that the unsupervised machine finds its own ways to make a representation of the data. 	
Follow-up Activity	<p>Hold a brief class discussion on the following topic and observe what the students say and which concepts are still not clear to them.</p> <p>Ask them to award a score to themselves based on how much they could contribute to the discussion</p> <p>"Guess which sound has a higher pitch and why - a car horn or flute."</p>	
Reflections	Discuss the AI basis of Infinite Drum Machine.	

GLOSSARY:

1. AI Related Terminologies

Infinite Drum Machine: An infinite drum machine is an AI experiment developed by Google for people to understand how unsupervised-learning works. In this machine, thousands of sounds found in our surroundings have been randomly fed for the machine to make sense out of them. The sounds are not labelled in any way nor does the machine have any other information about that sound. All that it knows is the sound clip itself. Using one of the unsupervised learning algorithms, the machine analyses the data fed to it and tries to cluster similar sounds together. These clusters are then visible with the help of colors on the user's screen. All the dots appearing on the screen are sound clips and they have been clustered together on their basis of their sound properties like amplitude, frequency and pitch with the help of which the machine is able to understand the similarity amongst different clips.

Link to Infinite Drum Machine: <https://experiments.withgoogle.com/ai/drum-machine/view/>

Video to know more: <https://youtu.be/9x-My5yjQY>

2. AI Activity Description:

Ask the students to go to the link: <https://experiments.withgoogle.com/ai/drum-machine/view/> and click on start playing.

Ask the students to do the following:

Move the circles appearing on the map all over. When they move the circles, they will hear various sounds. Ask them to notice the difference in their frequencies, amplitude and pitch.

Now, move a circle in just one area, where the dots are of the same color. Ask them to observe if the sounds are similar. They will notice that the sounds from the same color dots have similar properties. With the help of this experiment, explain the unsupervised learning concept to the students where the machine is interpreting sounds on the basis of various parameters like amplitude, frequency and/or pitch.

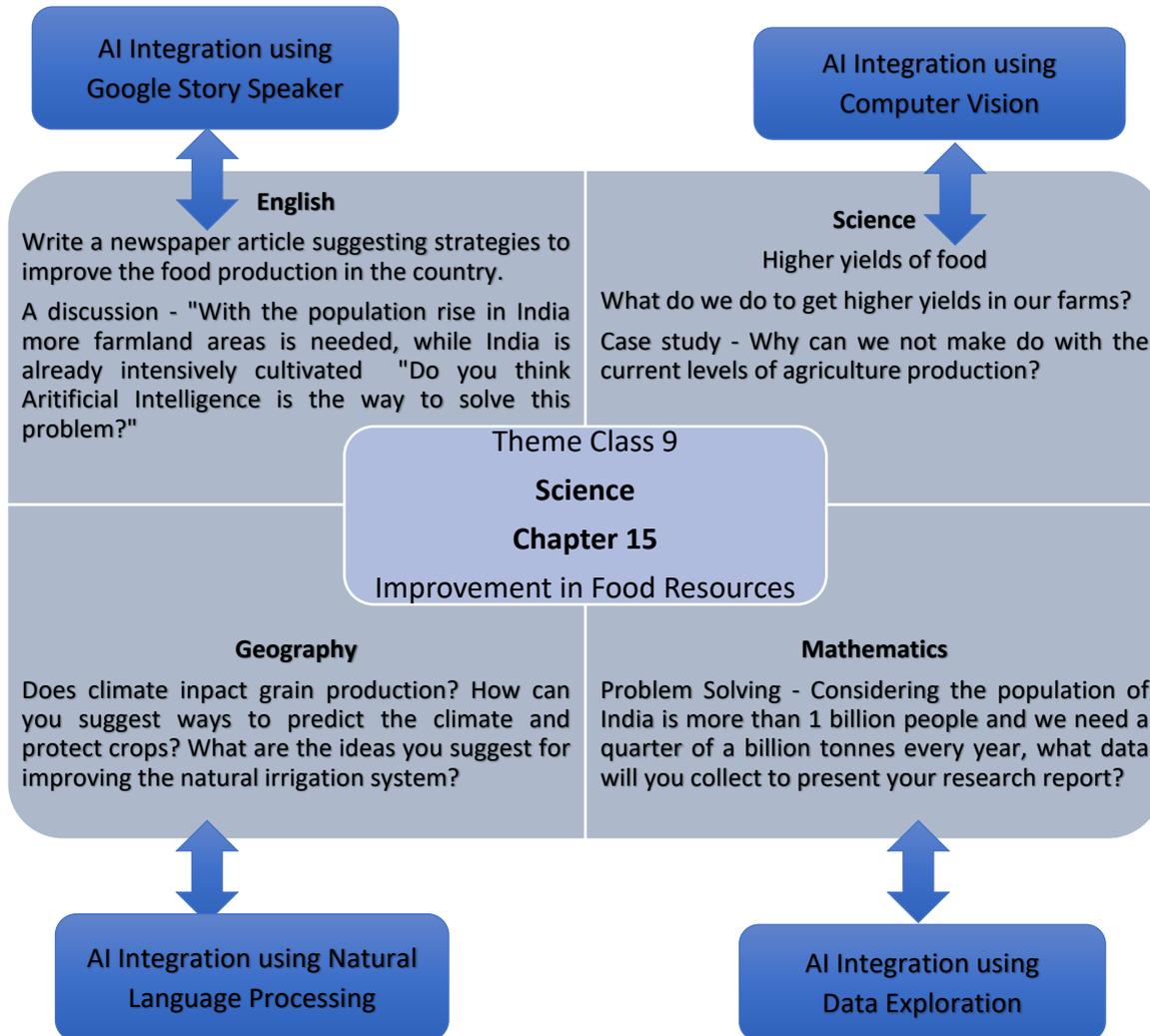
On the basis of this analysis, demonstrate that the machine is able to group similar sounds and is able to cluster them together in the same color.

Mention to the students that random sounds were recorded from the surroundings and were fed to the unsupervised machine learning model. The machine itself, identified the pattern out of them and clustered them in different groups.

Ask students to create their own beats by selecting any 4 sounds and pressing the play button shown at the bottom left corner. They can also select a filter which will highlight all those sounds which come under it.

Example 2:

Interdisciplinary Integration with Artificial Intelligence - Class 9



Since, Artificial Intelligence is a Cognitive Science and the history of its evolution suggests, it has grown out of the knowledge systems derived from other disciplines like Science, Mathematics, Philosophy, Sociology, Computing and others, it is fair for students to see the linkages. Hence, it is fair for any education system to recognize the importance of its integration with the teaching of other disciplines, to maximize learning.

1.6 What would the students do in an AI integrated Class?

A working group at CBSE has put together 7 Big Markers that may be adopted to develop a structured action plan by the teacher for K-12 learners.

#Marker 1. *Identifying the problem is the starting point of the learning cycle; students of all levels without any exception must be exposed to the skill of scoping and identifying the problem. Having done so, the learners of all ages must learn the way to state the problem to their parents/ teachers/ themselves/ community/ team, they are working with or working for.*

Marker 2. *Data acquisition related to the identified problem is another big domain for learning and it is a logical next step to proceed with. Such an exercise will prepare the students to attempt the nuances of problem solving which is also an important aspect of the AI project cycle.*

Marker 3. *Computers are machines which can also ‘see’, ‘hear’ and ‘speak’. So, as such, they can be used to collect data for us. Many applications are now available which make our machines very useful for this purpose. An exposure to such capabilities of the machine needs to be explained to students of all grades. By using AI in teaching, the expectation is that the teacher will lead students to identify these tools and consequently use them to improve the learning process.*

Marker 4. *Learners must learn to represent the collected data in the form of identifiable models. Once the students have the data to solve the problem, they can progressively be made to develop the skill of representing the collected data in visual presentations in the form of graphs, charts etc. The understanding and skill to build such comprehensible models is critical learning for a 21st century student. Computers are the given machines which help store data and represent models.*

Marker 5. *Computers also learn by themselves from the newer data acquired by them to build newer and better models in the future. With interaction of inputs from the training data available to the machines, just like the human mind, the machines are able to produce entirely different models/ representations. Students of all grades need to be made aware of such capabilities which make machines “intelligent”.*

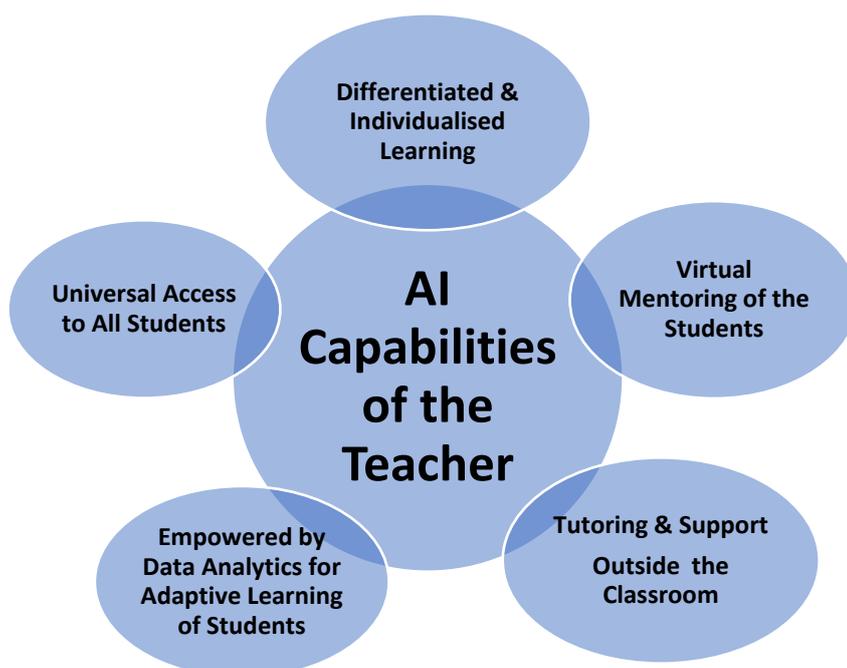
Marker 6. *For training the machine, it needs to interact with humans (intelligent agents); Though such interactions make the machine more and more intelligent, it can never be presumed that the machine would ever be as intelligent as humans are. It is highly impossible for the machine to reach the capabilities of the human mind. The Robots (as these machines are sometimes called), would at their best be able to improve the efficiency of human beings and never really be able to replicate it. Such debates need to be part of discussions in the class when AI is integrated with other subjects.*

Marker 7. *AI applications can be beneficial or harmful in the long run.* What, when, where and to what extent should these AI applications be built? At what stage and in what ways can an AI based application be used or not used? Students of all age groups in class 1-12 should be sensitized to AI ethics through different simulations, role plays, discussions and debates.

1.7 How can AI integrated teaching help teachers to achieve the desired learning outcomes?

While the debate regarding how much screen time is appropriate for children rages on among educators, psychologists, and parents, Artificial Intelligence and Machine Learning are additional emerging technologies that are beginning to alter education institutions and changing how education may happen in the future. Even though most experts believe the critical presence of teachers is irreplaceable, there have to be many changes to the way a teacher’s job is done and to educational best practices.

As AI educational solutions continue to mature, the hope is that AI will help fill need gaps in learning and teaching and allow schools and teachers to do more than ever before. AI can drive efficiency, personalization and allow teachers some extra time to deploy their understanding and adaptability—uniquely human capabilities, to teach, where machines would struggle. By leveraging the best attributes of AI machines and teachers, the education system will be driven towards the best outcome for students. Since the students of today will need to work in a future where AI is no longer a notion but is the reality, it’s important that our educational institutions expose students to updated technologies and their usage. No one can deny the fact that AI capabilities would help teachers to achieve desired learning outcomes, in the following five-fold ways:



Once AI tools are in operation, the teacher will be facilitated, to have more spare time in the classroom. So, she/he can now focus on unique learning styles of her students. Having assumed the AI capabilities, she/he can also in turn, focus suitably on the challenge of developing the skills of language processing, reasoning and cognitive modelling.

1.8 Does AI integration in Education promote ‘Effective Pedagogy’ in the class room?

Since all cognitive domains of education relate very closely to the concept of AI, it offers ample opportunities for student engagement that cannot be found in lecturing out of the text books within the fixed four walls setting of the classroom. In an era termed as AI SPRING, AI and machine learning are growing dynamically, they each have the potential to propel the other forward and accelerate the learning frontiers in a synergistic fashion, along with the creation of newer innovative technologies. It is universally acknowledged that AI would be the source and the cause of improving the teaching- learning methodology in the class room.

In many parts of the world, especially in advanced nations, Machine Learning algorithms in the education space, have already begun helping teachers fill the gaps, in the Subjects students are struggling with the most.

As of today, the list of such AI based pedagogical practices is long. A motivated and enlightened teacher would come across many such tools and practices during her research which can be profitably used by her from time to time in the interest of her students.

1.9 What is the role of Schools in the success of CBSE directive for AI integrated Learning?

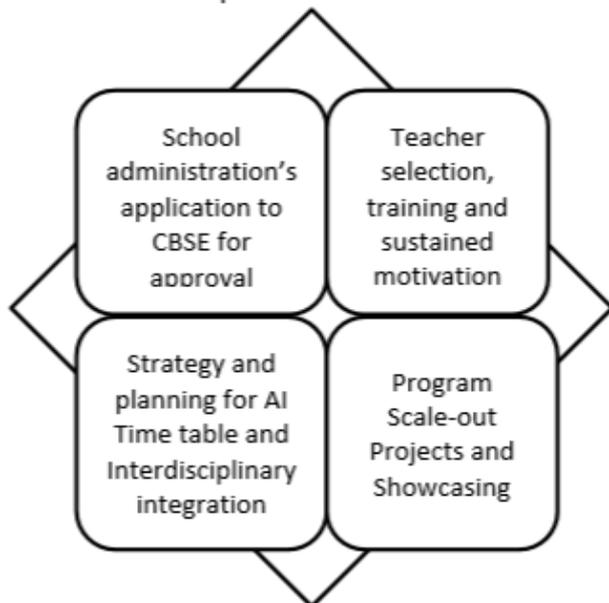
Much of the professional world which today’s student is going to face 10 or 15 years from now, will be increasingly based on and derived from AI technologies. Hence there is dire need for the present generation of young students to be exposed and empowered enough to understand and practice AI competencies in order to remain relevant to the times they live in. In doing so, while they benefit from an AI embedded world now, later in their lives, they must also learn how to identify and perceive the challenges that extensive use of AI may pose. Taking a cue from proactive thinking of CBSE about its responsibility towards the students studying in its affiliated schools, it is high time that the leadership in CBSE schools in particular, pledge their support to the task of sensitizing their students about AI in their lives and teach them to be positive contributors towards AI development in the larger interest of the society they live in.

The outcome of the twin initiatives of CBSE would depend on the way schools perceive and implement it, the way teachers engage with it and plan some of their lessons, so that the resultant understanding about AI amongst the students is logical. Once the trigger is positive, we believe a large population of students would go on an ‘auto’ mode to explore AI domains and get sensitized to AI applications. It has been observed that some teachers suffer from a complex that anything that is technology is computer based and anything that is computer based is beyond their comprehension or reach. It is important to reiterate here that once the teacher accepts the reality of AI inevitability

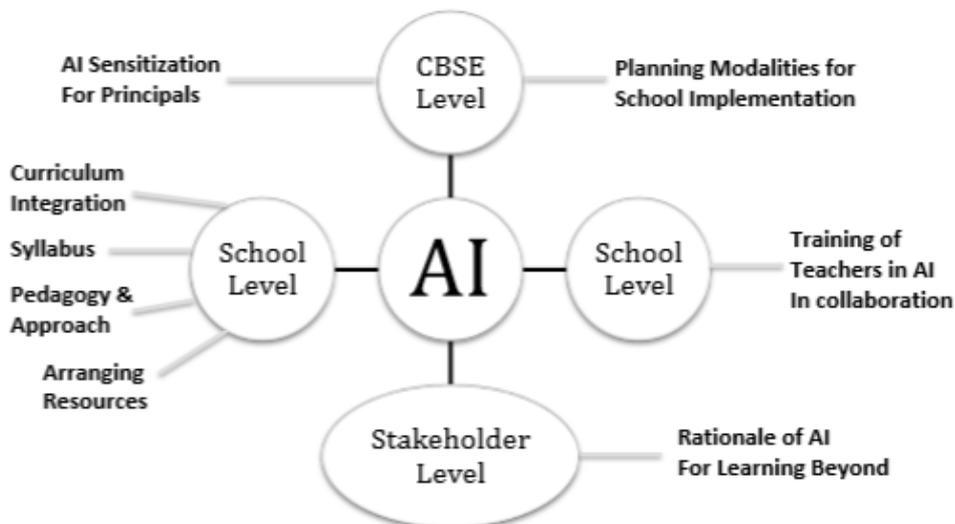
in modern day living and its enhanced role in the future, she/he would view this document and the suggestions made herein with an open mind. We hope that the support material and examples provided in this document will serve as a useful trigger for practicing teachers to use AI as a tool to enhance learning. With such a positive mindset, the schools and teachers would not only augment their own AI awareness, but will also be seen empowering their students with the requisite AI capabilities. They will find umpteen examples in their respective environments to connect the knowledge of individual subjects to AI technologies. It won't be an exaggeration to state that many scenarios will be created in such a collaboration of the teachers and the learners that AI integration will be an important case in study maximizing student learning outcomes in such schools.

AI IMPLEMENTATION PROCEDURES

School Procedures for AI Implementation



AI Implementation Procedures



1.10 How would this AI integrated Learning help meet the national goals-NCF/ NCERT/ NA

This thought process is completely in sync with the National Policy stipulated by NITI Aayog in ‘**Skilling for the AI Age – Getting India Ready for the AI Wave**’. Even the National Curriculum Framework developed as far back as 2005, and the Position Paper on Education Technology have echoed similar outcomes that AI integration is expected to achieve.

NITI Aayog Vision

“The Education sector needs to be realigned in order to effectively harness the potential of AI in a sustainable manner. In primary and secondary schools, there is a need for transition to skill-based education in subjects relevant to AI. Often criticized for being overly knowledge intensive, Indian education is in urgent need of transition in subjects relevant to STEM, or computer-based education. As jobs based on technology become prominent, so will the need to develop applied skills in a continuously changing environment.

Increased amount of project work across education levels, promoting schemes like Atal Tinkering Labs (ATL) in schools, necessary changes in curricula in schools, are some of the steps that need to be considered.”

The National Curriculum Framework 2005

The aims of education as stated in the NCF are as follows:

Seeking guidance from the Constitutional vision of India as a secular, egalitarian and pluralistic society, founded on the values of social justice and equality, certain broad aims of education have been identified in this document. These include:

- *Independence of thought and action*
- *Sensitivity to others’ well-being and feelings*
- *Learning to respond to new situations in a flexible and creative manner*
- *Pre-disposition towards participation in democratic processes, and*
- *The ability to work towards and contribute to economic processes and social change.*

NCF has laid down five guiding principles for curriculum development:

- *Connecting knowledge to life outside the school*
- *Ensuring that learning shifts away from rote methods*
- *Enriching the curriculum so that it goes beyond textbooks*
- *Making examinations more flexible and integrating them with classroom life, and*
- *Nurturing an overriding identity informed by caring concerns within the democratic polity of the country.*

And for the aims of teaching, NCF states that:

- *No system of education can rise above the quality of its teachers, and the quality of teachers greatly depends on the means deployed for selection, procedures used for training, and the strategies adopted for ensuring accountability*
- *Teaching should aim at enhancing children's natural desire and strategies to learn*
- *Knowledge needs to be distinguished from information, and teaching needs to be seen as a professional activity, not as coaching for memorization or as transmission of facts.*
- *Activity is the heart of the child's attempt to make sense of the world around him/her. Therefore, every resource must be deployed to enable children to express themselves, handle objects, explore their natural and social milieu, and to grow up healthy.*

The NCERT Position Paper on Education Technology (2.6) in its section 6.4.5 on In School Education states that:

- *"Move from a predetermined set of outcomes and skill sets to one that enables students to develop explanatory reasoning and other higher order skills.*
- *Enable students to access sources of knowledge, interpret them and create knowledge rather than be passive users.*
- *Promote flexible models of curriculum transaction.*
- *Promote individual learning styles.*
- *Encourage use of flexible curriculum content, at least in primary education, and flexible models of evaluation."*

It further clarifies that:

"Computers are programmable devices. This very fact makes it possible for users to make demands on these machines. This implies two things: first, that the computer ought to be capable of responding to intuitive demands, and second, that the user communicates in a language that the computer can interpret." and that "The creative potential of the computer, and the liberating potential of the internet can only be unleashed when we actively make these kinds of demands of these technologies. The students of the future should be oriented to this possibility, allowing them to stand their ground amidst the technology mediated onslaughts of the modern world. Integrating ICT into education will require that these aspects of the technology are catered to as a whole."

It is important to note that NCF observations were made as early as 2005 when the noise about AI was not heard much, yet the 'writing on the wall' lends itself to endorsing the recent developments of AI in Education.

Hence, **CBSE in its Circular No 14/ 2019** dated 09-03-2019 has clearly communicated that:

“Artificial Intelligence (AI) is being widely recognized to be the power that will fuel the future global digital economy. AI in the past few years has gained geo-strategic importance and a large number of countries are striving hard to stay ahead with their policy initiatives to get their country ready. India’s own AI Strategy identifies AI as an opportunity & solution provider for inclusive economic growth and Social development. The report also identifies the importance of skills-based education (as opposed to knowledge intensive education), and the value of project related work in order to “effectively harness the potential of AI in a sustainable manner” and to make India’s next generation to be ‘AI ready’.

As a beginning in this direction, CBSE is introducing Artificial Intelligence as an optional 6th subject at Class 9 from the Session 2019-2020. To enhance the multidisciplinary approach in teaching learning and also to sensitize the new generation, it has been decided that Schools may start AI “Inspire module” of 12 hours at Class 8 itself.

1.11 OPTIMISM

It is interesting to present the following content of “Optimism” from the History of evolution of AI to add to the reader’s understanding that seemingly unimaginable and impossible events actually happen due to human effort, if a streak of positivity and optimism is maintained during the course of action.

*The Optimism

The first generation of AI researchers made these predictions about their work:

- 1958, [H. A. Simon](#) and [Allen Newell](#): "within ten years a digital computer will be the world's chess champion" and "within ten years a digital computer will discover and prove an important new mathematical theorem."^[57]
- 1965, [H. A. Simon](#): "machines will be capable, within twenty years, of doing any work a man can do."^[58]
- 1967, [Marvin Minsky](#): "Within a generation ... the problem of creating 'artificial intelligence' will substantially be solved."^[59]
- 1970, [Marvin Minsky](#) (in [Life Magazine](#)): "In from three to eight years we will have a machine with the general intelligence of an average human being."^[60]

https://en.wikipedia.org/wiki/History_of_artificial_intelligence

The ‘Optimism’ showcased by the researchers above, has to be simulated by the practicing teacher in terms of AI Integration in their classrooms making their pedagogy more effective and maximizing the learning outcomes of their students.

Chapter 2

HOW to INTEGRATE AI in SCHOOL TEACHING – A CALL TO TEACHERS

2.1 AI is NOT ALONE

AI does not operate in silos nor is it a stand - alone field of study or practice. Many a times in Chapter 1, it has been said that it draws its knowledge as well as has its applications across other domains of knowledge. See below how the school domains of study (both formal and informal) interact with the concepts that Artificial Intelligence follows.

AI CROSS BREEDS WITH OTHER SUBJECTS

Subject Domain	What is Common with AI domain
Psychology	How people perceive information, process it and build knowledge; how they behave
Philosophy	Mind as a physical entity, methods of reasoning, basis of learning, foundations of language, rationality and logic
Neuro-Science	How the basic information processing units - neurons process information
Mathematics	Algorithms, computability, proof, methods of representation, tractability & decidability
Statistics	Learning from data, uncertainty/ certainty of modelling
Economics	Rational economic agents, usefulness of data & models, decision theory
Linguistics	Grammar, syntax, knowledge representations
Computer Science	Building computers
Cognitive Sciences	Processes & things in nature, interpretation of different phenomena & their impact

2.2 PRINCIPLES of AI INTEGRATED LEARNING

AI creates some Essential Learning Experiences which are:

- Experiences of creating through the process of problem solving
- Experiences of informed decision making
- Experiences of self-reflection, values and ethics.
- Experiences for exploring future career opportunities
- Experiences of demonstrating responsible citizenship

2.3 OBJECTIVES of AI INTEGRATED LEARNING

AI integrated learning would help to develop Key Competencies for Lifelong Learning, some of which are:

- Acquiring subject knowledge using AI as a tool
- Learning problem solving
- Innovativeness and taking initiative
- Application across key disciplines
- Developing interaction and Learning to Be
- Assuming Social responsibilities and applications
- Learning Vocational ethics
- Applying Communication skills

2.4 PRACTICE 'AI+X' PARADIGM for INTEGRATION

So, this could be the starting point for a practicing teacher. The teacher needs to go through the following steps to integrate her normal lesson plan with AI.

Step 1- Identify the topic from the subject for which the subject teacher has certain teaching pedagogy; let us call it 'X'

Step 2- Research to find 'AI' concepts that show conceptual commonality with the subject and the topic. Research to find 'AI' can be done with the help of any of the four resources given below

- A) through online search
- B) from the exemplars provided in this document
- C) from the list of support material provided in this document in terms of 'Additional Resources' 'AI Concepts' and 'Glossary'

Step 3- Attach this 'AI' to 'X' in your lesson planning.

- A) Discuss your lesson plan related requirement with your department colleagues or the computer faculty. This now becomes X+AI or AI +X, where X is your subject topic.

Such "**AI+X**" or "**X+AI**" **paradigm** is advocated in our national policy document also.

ARTIFICIAL INTELLIGENCE CONCEPTS PERVADE MAINSTREAM DISCIPLINES

Artificial Intelligence cannot be divorced from other disciplines; its evolution and development is mutually interlinked as shown in the table given below. Hence both the fields need to be linked for mutual benefit. As educators, it is the right step to consider integration of AI with the other school disciplines where two different approaches are possible:

- a) *AI as a tool to learn Mathematics, English, Science or Social Science or*
- b) *Language or Mathematics and other disciplines as a tool to learn Artificial Intelligence*

2.5 A SAMPLE LESSON PLAN EXPLAINED

Look at the following lesson plan for class 6 Mathematics. As you browse through the lesson plan, notice the following:

1. This follows the X+AI paradigm – the subject teacher chooses a topic which is related to an app that predicts and draws an image.
2. She/he plans the sequence of activities in the class.
3. She/he, first transacts her normal subject plan (X) and as a class activity on the second day, she/he brings in the (AI) based app. She/he conducts this class either in the computer lab or by arranging for laptops in the class room. The +AI activity is expected to bring fun, to reconfirm to the students the concept about symmetry and brings her/his students face to face with AI in context.
4. Such lessons must be followed by *Reflections for 10 minutes* in the end so that students get an opportunity to talk about their experience with AI in the class. They should also be encouraged to share their knowledge, if any, about alternative AI they may know of, for the topic studied. The teacher must create an environment where her/his students are motivated to extend such a learning beyond the classroom; it would activate the whole class group to contribute to the learning of the group.

SAMPLE LESSON PLAN

Mathematics – Class 6

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter No. 13: Symmetry	
Name of the book	Mathematics Text book for Class 6	
Subject and Artificial Intelligence Integrated	Understanding the concept of Symmetry using AI Experiential Applications	
Objectives	<p>To understand the concept of Symmetry.</p> <p>To understand the difference between symmetrical and unsymmetrical articles/ Objects using an AI game.</p> <p>To identify the number of lines of symmetry in any object. (one line, two lines and more than two lines)</p> <p>to know and understand the AI based application to draw symmetrical and unsymmetrical images</p>	Autodraw.com
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, Black Board chalk, Laptops/ desktops and Internet connections.	
Pre- Preparation Activity	The Students would be asked to collect some objects e g a leaf, a book, a piece of chalk, a piece of paper and observe their pattern of symmetry.	
Previous Knowledge	The students are asked to collect any four or five objects whose halves can be mirror images and draw the line of symmetry on the object.	

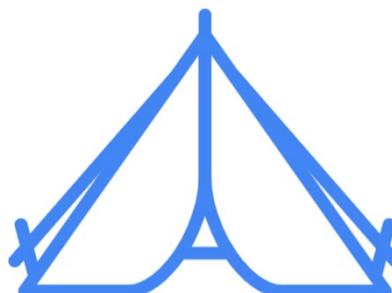
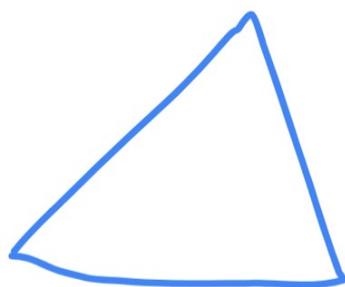
Introduction	The teacher will introduce the concept of symmetry with the help of objects brought by students.	
Methodology	<p>Divide the class into two teams. Activity I: Draw the line of symmetry.</p> <p>Ask students to draw one or more lines of symmetry on the collected objects using a marker or a pen, depending upon the nature of object. The students would be able to identify symmetrical and unsymmetrical articles.</p> <p>Ask students how many lines can be drawn through each object that would divide the object in two equal/ symmetrical halves</p> <p>Activity II: Reflection and symmetry</p> <p>Ask students to observe the symmetrical objects from the earlier set of objects in the mirror and observe that though the image shown in mirror is inverse but the symmetry of the objects does not get affected.</p> <p>Activity III: Practice Activity</p> <p>Ask students to apply their understanding of Symmetry to attempt questions of 13.1 and 13.2</p> <p>Activity IV: Autodraw!</p> <p>For this activity, ask the students to go to https://autodraw.com.</p> <p>Once they land on this website, ask the students to select the first icon from the left side toolbar. This icon activates the AI element of the tool.</p> <p>Now, ask the students to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions will appear in the top row.</p> <p>After looking at the predictions and analyzing how accurate the machine is, ask them to keep an image in mind (say of a monument or a vehicle or thing etc.) and then start drawing it roughly.</p> <p>Ask them to notice, at what step the machine is able to predict the image. Once the correct image comes on the screen, ask the students to observe the line of symmetry in it and describe it to the whole class.</p>	Computer Vision enabled AI application Autodraw.
Discussion on the Text	<p>Open discussion and presentation on:</p> <p>Symmetry and its application in real life like Road signs, patterns on Board games like Ludo, Chess etc.</p> <p>More examples of Reflection and Symmetry.</p>	

Learning Outcomes	<p>The students will:</p> <ul style="list-style-type: none"> - Understand and apply the concept of Symmetry in solving the problems. - Understand the lines of Symmetry. - Know the relationship between Reflection and Symmetry. - Apply their understanding to draw images and lines of symmetry on autodraw.com. - Know and reason out that the machines can predict. 	
Self-Evaluation and Follow-Up	<p>Ask students to make a chart with different figures showing symmetrical patterns and lines on symmetry.</p> <p>Ask them to present to small groups.</p> <p>Let them assess how accurate they are in their presentations.</p>	
Reflections	<p>Discuss with students:</p> <p>How do you like the site – autodraw.com?</p> <p>Do you know of any other tool/ app that can predict & draw?</p> <p>Would you be able to try this activity at home also?</p>	

GLOSSARY:

AI Related Terminologies

Autodraw.com: Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example. if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine would compare his drawing and would show the possible outcomes for the same. The user can then select out of them which one is the most appropriate form for him/her.



AI Activity Description

Ask the students to go to <https://autodraw.com>.

Once they land on this website, ask the students to select the first icon from the left side toolbar. This icon activates the AI element of the tool.

Now, ask the students to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions would appear in the top row.

After looking at the predictions and analyzing how accurate the machine is, ask them to keep an image in mind (say of a monument or a vehicle or thing etc.) and then start drawing it roughly.

Ask them to see at what step the machine is able to predict the image.

Once the original drawing comes into picture, ask the students to observe the line of symmetry in it and describe it to the whole class.

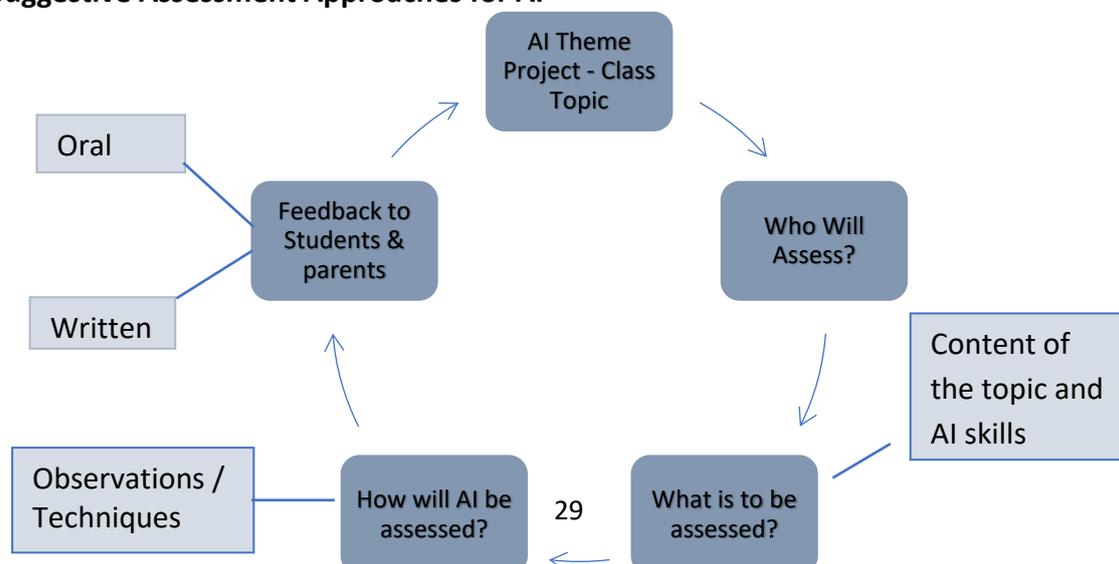
2.6 ASSESSMENT at the end of AI integrated Learning

2.6.1 Skills Assessed

After completion of each unit, the students may be evaluated for the following skills:

Conceptual Skills	Technical Skills	Life Skills
<ul style="list-style-type: none"> - Problem Scoping - Problem statement - Data Acquisition - Data Exploration - Graphical Representation of data/ building models - Neural networks - 3 domains of AI – Data, Computer Vision & Natural language Processing - AI Applications 	<ul style="list-style-type: none"> - Ability to use AI powered Tools - Identifying linkage of AI Applications with knowledge systems 	<ul style="list-style-type: none"> - Thinking skills - Problem Solving skills - Decision making Skills - Social Skills- Teamwork - Leadership - Effective Communication Skills - Oral & Written Presentation Skills

2.6.2 Suggestive Assessment Approaches for AI



2.6.3 Assessment Rubrics

SKILLS	SUB SKILL ASSESSED (from 2.6.1 above)	Highly Proficient	Proficient	Beginner	Teacher's Comments
AI CONCEPTS					
THINKING SKILLS					
LIFE SKILLS					

Chapter 3

AI Integrated Activities – Exemplars

4 ENGLISH

4.1 Class 6

ENGLISH

CLASS 6

Chapter Covered	Unit 1 A Tale of Two Birds	AI Concepts Integrated
Name of the book	A Pact with the Sun, Class 6, NCERT	
Subject and Artificial Intelligence Integrated	Integration of Awareness of Artificial Intelligence & Teaching of English	
Objectives	<ul style="list-style-type: none"> ● To build an appreciation and awareness of Artificial Intelligence ● To practice reading aloud in groups ● To develop skills of imagination; creativity and writing. ● To try and predict probability by using Artificial Intelligence and by linking this to why the Poet chose the road he did. ● To draw parallels of the story with AI as it exists in our life 	Introduction to Google Story Speaker
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, blackboard, chalk, smartboard/screen and projector & laptops	
Pre- Preparation Activity	The students are divided into groups for a discussion in preparation for the topic.	

<p>Previous Knowledge</p>	<p>Students are asked to discuss on Artificial Intelligence as they recognize it and to make a list of where they have encountered it in day to day life.</p> <p>Each group will then present a summary of their discussion</p>	
<p>Introduction</p>	<p>The teacher leads students to recognize Chatbots powered by Artificial Intelligence. She/He asks them to keep this in mind while reading out the story aloud in their groups.</p>	
<p>Methodology</p>	<ul style="list-style-type: none"> ● The students are divided into groups of 4 and asked to read aloud the unit The Tale of Two Birds. ● They are also shown a video on how chatbots are being developed and used in day to day interactions 	
<p>Discussion on the Text</p>	<ul style="list-style-type: none"> ● There is an open discussion on: <ul style="list-style-type: none"> (i) Characters identified in the story (ii) Identify if any Human or Animal can be equated with a modern day Chatbot <p>The students are then asked to answer the questions as a group exercise:</p> <ul style="list-style-type: none"> a) What is the difference in the way the two Birds welcome the traveler? b) How important is the social environment/company we keep on personality development? c) Is this also seen in the way that Artificial Intelligence is trained and developed? d) Is there any similarity between the way the birds interact and any artificial intelligence you have come across? 	<p>Students are asked to explore how Artificial Intelligence is trained and developed</p>

	ii) Each pair group is then asked to share a summary of their discussion with the larger group.	
Learning Outcomes	(I) Students will appreciate Literature (iii) Develop an interest in reading aloud and discussion (iv) Develop Awareness about AI (v) Infer the moral of the story (vi) Dan awareness of ethics in the context of AI	A discussion on Ethics regards Artificial Intelligence is initiated
Self-Evaluation and Follow-Up	<ul style="list-style-type: none"> The teacher analyses the responses and flow of thoughts of students 	
Follow-up Activity	<ul style="list-style-type: none"> The students will be asked to identify five different areas where Ai enabled devices are interacting with humans. 	Students are encouraged to explore areas of AI and Human interactions

GLOSSARY:

AI Activity Description:

Ask the students to think of the following scenarios:

1. As Artificial Intelligence gets incorporated in various industries, the employability of unskilled labor reduces day by day. A lot of global reports and surveys have predicted mass unemployment in the near future due to emerging technologies. Is it ethical to fire people with limited skills or no skills due to technology upgradation?
2. Most of the virtual assistants like Google Assistant, Cortana, Siri, Alexa, etc. have female voices? Do you consider this as a bias? Why is a female voice chosen over any other and why are other voices not so popular?
3. If a person develops an AI algorithm, would his/her bias get reflected in the AI algorithm? For example, if an American developer develops an AI algorithm which is trained for his accent only, is it not a bias for people with different accents?
4. If an AI machine makes a mistake, who should be held responsible for it? The Developer, The AI developing firm, The User, or The AI machine itself?

Explain to the students that these questions do not have a right answer. What might be correct for one might not be correct for the other. Hence, it is the perception which matters in such issues.

To summarize this activity, tell the students that there are a lot of ethical issues which exist around AI since AI is a domain which is boundless at this point of time. Hence, it is important to have ethical guidelines which can guide us in such conditions where there is no clear definition of what is right and what is wrong.

4.2 Class 7

ENGLISH

CLASS 7

Chapter Covered	Unit 1 The Tiny Teacher	AI Concepts Integrated
Name of the book	An Alien Hand, Class 7, NCERT	
Subject and Artificial Intelligence Integrated	Application of Artificial Intelligence & Teaching of English	
Objectives	<ul style="list-style-type: none"> ● To use AI tools to practice story telling – open source AI tool ● To practice silent reading and develop comprehension skills ● To develop skills of imagination creativity and writing. ● To build a narrative story about the layout of an Ant hill using Google story speaker ● To write the story and share it in a larger group 	
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, blackboard, chalk, smartboard/screen and projector, Google Story Speaker & laptops	
Pre- Preparation Activity	The students are divided in pairs asked to download Google story speaker app in preparation for the topic.	Students are asked to download Google story speaker app in preparation for the topic.

<p>Previous Knowledge</p>	<p>Students are asked to discuss and draw the insides of an Anthill as comprehended by them after silently reading the story 'The Tiny Teacher'.</p> <p>They will mention the various rooms/spaces in the Anthill as allocated to each particular sect of Ants.</p>	
<p>Introduction</p>	<p>The teacher introduces students to how Google Story Speaker can be used to create a narrative based on the picture that they have drawn.</p>	
<p>Methodology</p>	<ul style="list-style-type: none"> ● The students are shown a video on how story speaker works. ● The students work in pairs to create a story based on the drawing they have created of the Ant hill. ● They then share their story with the other groups. 	<p>Students learn how to use Story Speaker to present their story</p>
<p>Discussion on the Text</p>	<p>There is an open discussion on:</p> <ul style="list-style-type: none"> ● How the life of an ordinary ant in an anthill is like a book which many of us seldom open. ● What are grubs? ● Why do ants carry these grubs with them? ● In what way is an Ant's life peaceful? ● Does this reflect in the way they create their Anthills? ● What other creatures live in Ant hills? 	
<p>Learning Outcomes</p>	<ol style="list-style-type: none"> 1. The Students will be able to learn to use AI tools to practice story telling 2. They learn to develop comprehension skills 3. They learn to develop skills of imagination creativity and writing. 4. They learn to build a narrative story about the layout of an Ant hill using Google story speaker 	

	5. They understand that following rules leads to a peaceful life	
Self-Evaluation and Follow-Up	<ul style="list-style-type: none"> The teacher analyses the responses of the students regards three things which they have learnt from the Tiny Teachers – the Ants 	
Follow-up Activity	<ul style="list-style-type: none"> The students will be asked to complete the poem with the words given in the box and recite the same in the class. 	

GLOSSARY:

1. AI Related Terminologies:

Story Speaker: It is an AI experiment which is available as an add-on to Google Docs. Story Speaker lets anyone create an interactive story with no coding required. It is an easy to install and easy to use tool and comes in handy when the user wants to create a story which changes according to the user's input.

Link to install Story Speaker extension for Story Speaker:

<https://chrome.google.com/webstore/detail/story-speaker/ohfibfhfhfbhknfdkipjdopbnegkbkiji>

Introduction to Story Speaker:

<https://www.youtube.com/watch?v=wsrzvYYvhH8&feature=youtu.be>

Link to read more about Story Speaker:

<https://docs.google.com/document/d/1hFrBtsBbF2LoZ1FFpXEH7L6fWH1lj24W1-itXnKSXK8/edit>

Basic Template of Story Speaker: https://docs.google.com/document/d/1rXPSayQVVQ-T5cWlhxPbOCC2UJEZTbVWkxqOnC_RnDE/edit?usp=sharing

Steps to install Story Speaker:

- Login in to your Google account
- Go to google.com
- Search for story speaker addon download
- Go to the first link of experiments.google.com
- Click on Launch Experiment
- To install this addon, click on free.
- Give the required permissions to get the addon.
- Once it is installed, go to docs.google.com → Add-ons → Story Speaker → Open Story Speaker

Ask the students to first load in the basic template and play it. To play the story, go to Add-ons → Story Speaker → Open Story Speaker, as soon as the story speaker window opens at the right, click

on Play your Story → scroll down to Play story in chat preview. The basic template will start playing where once the story pauses, the user needs to give input according to the question asked. According to the response fed either by typing or by speaking, the story will change.

Basic Template of Story Speaker:

Title: The Tale of The Pig Monster ← Title of the story (can be changed)

By: Your name ← Author's Name (can be changed)

START HERE ← Depicts the Start of the story to the machine (CANNOT be changed)

Intro ← Start of the story (CANNOT be changed)

You're standing in a forest. There are two roads in front of you. Do you go to the left or the right?

← Introduction to the story. Students can make it their own way

[1] **If you say "left"** ← Conditional Statement. Can only change the text in "" according to what input do they expect from the user to diverge their story.

You hear a fearsome growling. A pig monster approaches. It eats you. I'm sorry. [[END]] ← The story diverges as the user gives appropriate input. The text here can be changed according to the story. [[END]] depicts that the story would end at this point.

If you say "right"

You walk down a darkened path. You come to a house. There's a light on inside. Do you go inside? ← The statement where you want the user to respond should end with a question like this.

[2] **If you say "yes" or "go inside"**

You knock on the door. It opens, revealing the pig monster. This is the pig monster's house. It eats you. I'm sorry. [[END]]

If you say "no" or "keep going" or "don't go inside"

You keep walking. The story would keep going. But you'll have to write it. [[END]]

Otherwise ← If user enters any input other than the expected ones, the story lands at this point. This is for the [2] if condition. (CANNOT be changed)

Do you want to go in the house? Say "yes" or "no." It's getting cold out here. ← (can be changed)

Otherwise ← The story would land at this point if the user gives an unexpected response to the Intro question. (CANNOT be changed)

You've got to go to the left or the right. The pig monster isn't going to wait all day. ← (Can be changed)

Anytime you say "where is the pig monster" ← Optional Statement. Text in "" can be changed
I don't know. It could be anywhere. ← (can be changed)

Fallback ← This statement gets executed for any erroneous response which does not get covered in any Otherwise statements. (CANNOT be changed)

Sorry, I didn't get that. Try asking again. ← (can be changed)

NOTE:

- The statements written in **BOLD** are interpreted by the machine for specific purposes. Thus, in most cases, they cannot be changed as they describe a specific function to the machine.
- Wherever one wants the story to diverge, the statement should end with a question which the user can answer so that according to his/her response, choices can be made. There can be more than one choice for the user to make but it is advisable that whichever choice the user has should be mentioned in the question itself to bring more clarity.
- Indentation is very important in writing an interactive story using story speaker. It lets the machine understand the flow of the story. Indentations are given with the help of TAB key. As you can see, the If statement [1] in the template has been tabbed after the intro part as it shows that this If statement comes under intro. While the other If statement [2], has been tabbed again to show that it comes inside the **If you say “right”** statement.

2. AI Activity Description

Ask the students to draw a basic layout of how an anthill would look from inside on the basis of the findings they have out of the chapter. They layout should be made in such a way that it can be described in a story. Once the layout is complete, ask the students to explore the basic template and try playing it before they start working on their story. After they understand how to use the tool, ask them to make an interactive story to describe the layout they have made for the anthill and let them interact with the story. At the end of this activity, the students should be able to describe the whole anthill layout in the form of an interactive story.

4.3 Class 8

ENGLISH

CLASS 8

Chapter Covered	Unit2 The Tsunami	AI Concepts Integrated
Name of the book	Honeydew, Class 8, NCERT	
Subject and Artificial Intelligence Integrated	Exploration of Data Collection using Artificial Intelligence & Teaching of English	
Objectives	<ul style="list-style-type: none"> To use AI tools to Explore data available on Tsunami at three different places To practice group work in order to explore available data sets to compare impact of Tsunami. To develop report writing skills based on facts and figures. 	Use of AI tools to Explore data available on Tsunami
Time Required	3 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, blackboard, chalk, smartboard/screen and projector, internet websites for data acquisition & laptops	
Pre- Preparation Activity	The students are divided into three groups and asked to collect information about the 2004 Tsunami in Andaman & Nicobar; Sri Lanka and Thailand.	
Previous Knowledge	Students are asked to research about natural Calamities and call out what they know about a Tsunami and the devastation caused by it.	

Introduction	The Teacher leads the discussion on Tsunamis and assigns case study of one place i.e. Sri Lanka; Thailand; Andaman& Nicobar to each group.	
Methodology	<ul style="list-style-type: none"> ● The students are shown a video on how Tsunamis occur and the devastation caused as a result. ● The students work in their group to source data on the Tsunami hit region they have been assigned. ● They are asked to present pictorial representation of data on <ul style="list-style-type: none"> ○ Lives lost ○ Homeless ○ Food Scarcity after Tsunami ○ Infrastructural losses ● A report on the above along with Visual representation of Data will be presented by each group 	Students are encouraged to search, acquire and explore Data and represent it according to the desired parameters.
Discussion on the Text	<p>There is an open discussion on:</p> <ul style="list-style-type: none"> ● How the behavior of animals was a clear warning of the Tsunami. ● What other warning signs were experienced by people of the regions? ● Why do Tsunamis happen? ● Is there a way to predict them? 	
Learning Outcomes	<ol style="list-style-type: none"> 6. The Students will be able to learn to collect data and use data exploration to understand facts and represent them. 7. They learn to work in groups and develop team spirit. 8. They learn to develop skills of factual representation of data 9. They learn the skill of report writing. 	
Self-Evaluation and Follow-Up	<ul style="list-style-type: none"> ● The students compare the situation in all three places through a presentation by each group ● They understand the enormity of Natural disasters such as Tsunamis 	
Follow-up Activity	<ul style="list-style-type: none"> ● The students will be asked to write a report stating facts and using pictorial representation of Data collected and analyzed. 	

GLOSSARY

1. AI Related Terminologies

Data Acquisition: Data acquisition refers to acquiring authentic data crucial for the AI model from reliable sources. The data acquired could then be divided into two categories: Training Data and Testing Data. The AI model gets trained on the basis of training data and is evaluated on the basis of testing data.

There can be various ways in which you can collect data. Some of them are:

- Surveys
- Web Scraping
- Sensors
- Cameras
- Observations
- Application Program Interface

Data Exploration: After acquiring data there comes the need to analyze the data. For this, they need to visualize the acquired data in some user-friendly format so that they can:

- Quickly get a sense of the trends, relationships and patterns contained within the data.
- Define strategy for which model to use at a later stage.
- Communicate the same to others effectively.

To visualize data, various types of visual representations can be used by the students like diagrams, charts, graphs, flows, etc.

2. AI Activity Description

For this activity, divide the students in 3 groups. Each group will be given a case study out of the three tsunamis of Sri Lanka, Thailand and Andaman & Nicobar. Students need to acquire information regarding their case study on the basis of the following parameters:

- o Lives lost
- o Homeless
- o Food Scarcity after Tsunami
- o Infrastructural losses

After students have acquired data, they would be asked to visualize the same in the form of a graphical representation. The students will present their case study to the whole class. They should be able to draw some conclusion out of their research. Students will also be asked to brainstorm on how AI can be used to help in such situations or even in predicting tsunamis.

4.4 Class 9

ENGLISH

CLASS 9

Chapter Covered	Unit 2 The Road Not Taken by Robert Frost	AI Concepts Integrated
Name of the book	Beehive, Class 9, NCERT	
Subject and Artificial Intelligence Integrated	Artificial Intelligence & English	
Objectives	<ul style="list-style-type: none"> ● To build an appreciation of nature and the changing seasons as described by the poet ● To draw on the symbolism of the roads as mentioned by Robert Frost ● To prompt decision making and analysis of the consequences of the decisions made ● To try and predict probability by using Artificial Intelligence and by linking this to why the Poet chose the road he did. 	
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, sticky notes blackboard, chalk, smartboard/screen and projector, laptops, internet connection & Google Story Speaker add-on for Google Docs.	
Pre- Preparation Activity	The students are divided into pairs for the Pre-Preparation activity.	
Previous Knowledge	Students are asked to play an online game called Rock Paper Scissors in pairs – to understand probability and prediction. Each pair will then explain what they have understood about choices and whether there is a pattern to them. The students will also explain how the AI in the game either defeated them or not and why.	Artificial Intelligence Game - which is based on Data collection and analyses

Introduction	<p>The teacher asks students to think about various occasions when they are faced with decision making and the probability of choosing something they may regret later. She /He introduces them to Google Story Speaker and asks them to build a story based on the choices they make and the path they take.</p>	<p>Introduction to Google Story Speaker - discussion and creation of a chat bot</p>
Methodology	<ul style="list-style-type: none"> ● The students are asked to listen to a reading on the unit The Road Not Taken by Robert Frost to absorb the depth in the seemingly simple verses. There is an open discussion on what the poet meant by the following: <ul style="list-style-type: none"> (i) a yellow wood (ii) it was grassy and wanted wear (iii) the passing there (iv) leaves no step had trodden black (v) how way leads on to way 	
Discussion on the Text	<ul style="list-style-type: none"> i) After the Pre preparation activity the class retains its pairs and students are asked to re-read the poem and then answer the questions as a pair exercise: <ul style="list-style-type: none"> e) Where does the traveler find himself? What problem does he face? f) Is there any difference between the two roads as the poet describes them (i) in stanzas two and three? (ii) in the last two lines of the poem g) What do you think the last two lines of the poem mean? (Looking back, does the poet regret his choice or accept it?) iii) Thereafter, the teacher divides the class into pairs and asks them to use Google Story Speaker to write the story they had begun earlier iv) Have you ever had to make a difficult choice (or do you think you will have difficult choices to make)? How will you make the choice (for what reasons)? 2. After you have made a choice do you always think about what might have been, or do you accept the reality of the situation? 	

	v) Each pair group is then asked to share their story with another group.	
Learning Outcomes	(II) Students interpret how they will have difficult choices to make (ii) They learn to reason out before making the choice (iii) They analyze whether after a choice has been made, they think about what might have been, or whether they accept reality (iv) They develop skills of team work and coordination and improve their analytical and reasoning prowess.	
Self-Evaluation and Follow-Up	<ul style="list-style-type: none"> The teacher will assess the success of the activity through a poster which students will be asked to make on decisions that will affect their future 	
Follow-up Activity	<ul style="list-style-type: none"> The students will be asked to write an article as their future self from the position they are in life due to a decision they took in their youth that “made the difference”. 	

GLOSSARY

1. AI Related Terminologies

Rock, Paper Scissors: This rock-paper-scissors game illustrates the basic principles of an adaptive artificial intelligence technology. Here, the artificially intelligent system learns to identify patterns of a person’s behavior by analyzing their decision strategies in order to predict future behavior. This game is based on the domain **Data for AI** where the machine collects and analyzes data to predict future outcomes.

Link to the game: <https://www.afiniti.com/corporate/rock-paper-scissors>

The objective of playing this game is to illustrate how humans work in certain patterns and how an AI-enabled machine can detect those patterns for predicting future outcomes.

Story Speaker: It is an AI experiment which is available as an add-on to Google Docs. Story Speaker lets anyone create an interactive story with no coding required. It is an easy to install and easy to use tool and comes in handy when the user wants to create a story which changes according to the user’s input.

Link to install Story Speaker extension for Story Speaker:

<https://chrome.google.com/webstore/detail/story-speaker/ohfibfhfbhknfdkipjdopbnegkbpj>

Introduction to Story Speaker: <https://www.youtube.com/watch?v=wsrzvYYvhH8&feature=youtu.be>

Link to read more about Story Speaker:

<https://docs.google.com/document/d/1hFrBtsBbF2LoZ1FFpXEH7L6fWH1lj24W1-itXnKSXK8/edit>

Basic Template of Story Speaker: https://docs.google.com/document/d/1rXPSayQVVQ-T5cWlhxPbOCC2UJEZTbVWkxqOnC_RnDE/edit?usp=sharing

Steps to install Story Speaker:

- Login in to your Google account
- Go to google.com
- Search for story speaker addon download
- Go to the first link of experiments.google.com
- Click on Launch Experiment
- To install this addon, click on free.
- Give the required permissions to get the addon.
- Once it is installed, go to docs.google.com → Add-ons → Story Speaker → Open Story Speaker

Ask the students to first load in the basic template and play it. To play the story, go to Add-ons → Story Speaker → Open Story Speaker, as soon as the story speaker window opens at the right, click on Play your Story → scroll down to Play story in chat preview. The basic template will start playing where once the story pauses, the user needs to give input according to the question asked. According to the response fed either by typing or by speaking, the story will change.

Basic Template of Story Speaker:

Title: The Tale of The Pig Monster ← Title of the story (can be changed)

By: Your name ← Author's Name (can be changed)

START HERE ← Depicts the Start of the story to the machine (CANNOT be changed)

Intro ← Start of the story (CANNOT be changed)

You're standing in a forest. There are two roads in front of you. Do you go to the left or the right?

← Introduction to the story. Students can make it their own way

[1] **If you say "left"** ← Conditional Statement. Can only change the text in " " according to what input do they expect from the user to diverge their story.

You hear a fearsome growling. A pig monster approaches. It eats you. I'm sorry. [[END]] ←

The story diverges as the user gives appropriate input. The text here can be changed according to the story. [[END]] depicts that the story would end at this point.

If you say "right"

You walk down a darkened path. You come to a house. There's a light on inside. Do you go inside? ← The statement where you want the user to respond should end with a question like this.

[2] If you say "yes" or "go inside"

You knock on the door. It opens, revealing the pig monster. This is the pig monster's house. It eats you. I'm sorry. [[END]]

If you say "no" or "keep going" or "don't go inside"

You keep walking. The story would keep going. But you'll have to write it. [[END]]

Otherwise ← If user enters any input other than the expected ones, the story lands at this point. This is for the [2] if condition. (CANNOT be changed)

Do you want to go in the house? Say "yes" or "no." It's getting cold out here. ← (can be changed)

Otherwise ← The story would land at this point if the user gives an unexpected response to the Intro question. (CANNOT be changed)

You've got to go to the left or the right. The pig monster isn't going to wait all day. ← (Can be changed)

Anytime you say "where is the pig monster" ← Optional Statement. Text in " " can be changed
I don't know. It could be anywhere. ← (can be changed)

Fallback ← This statement gets executed for any erroneous response which does not get covered in any Otherwise statements. (CANNOT be changed)

Sorry, I didn't get that. Try asking again. ← (can be changed)

NOTE:

- The statements written in **BOLD** are interpreted by the machine for specific purposes. Thus, in most cases, they cannot be changed as they describe a specific function to the machine.
- Wherever one wants the story to diverge, the statement should end with a question which the user can answer so that according to his/her response, choices can be made. There can be more than one choice for the user to make but it is advisable that whichever choice the user has should be mentioned in the question itself to bring more clarity.
- Indentation is very important in writing an interactive story using story speaker. It lets the machine understand the flow of the story. Indentations are given with the help of TAB key. As you can see, the If statement [1] in the template has been tabbed after the intro part as it shows that this If statement comes under intro. While the other If statement [2], has been tabbed again to show that it comes inside the **If you say "right"** statement.

2. AI Activity Description

Rock-Paper-Scissors: Ask the students to go on the link: <https://www.afiniti.com/corporate/rock-paper-scissors> and click on play the game.

As soon as they land up in the game arena, they will observe 3 buttons each for Rock, Paper and Scissors. They need to choose one on the basis of the move which they want to make against AI.

Remember that the hand at the left is the human's hand while the one on the right side is the AI. As soon as the student makes a move, the AI will also randomly select one out of the three and according to the conventional rules, one will win against the another. The score gets updated at the top while in the middle of the screen, one can see which round was won by whom as the red colour depicts victory. Ask students to play the 20 rounds of the game and keep checking the scores.

Students will be able to identify how the AI-enabled machine is taking the choices of its opponent as data to train itself in such a way that it can predict future moves and can win against its opponent. Ask the students to try the following:

1. Try changing moves randomly and observe how the machines copes with it.
2. Try making the same move at least 7 times and then changing it abruptly. How does the machine react to it?

Story Speaker: Ask the students to explore the basic template and try playing it before they start working on their story. After they understand how to use the tool, ask them to make an interactive story to depict a scenario where they had to make a choice and the paths changed.

4.4 Class 10

ENGLISH

CLASS 10

Chapter Covered	Unit 3 How to tell Wild Animals	AI Concepts Integrated
Name of the book	First Flight, Class 10, NCERT	
Subject and Artificial Intelligence Integrated	Artificial Intelligence & English (Poetry)	
Objectives	<ul style="list-style-type: none"> i) To help students practice pronunciation and understand rhyme. ii) To develop an understanding of why poetic liberties are permitted in language usage. iii) To make the students understand and appreciate the benefits of the present educational system. iv) To help students identify different animals using the AI Game Mystery Animal as a precursor to reading the Poem to appreciate it. v) To draw out how Artificial Intelligence can be used to curb poaching. 	<p>Mystery Animal - AI Game to introduce the chapter using Natural language Processing</p> <p>Reflective video demonstrating how wild life can be protected using Artificial Intelligence</p>
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible – preferred round table seating	
Material Required	Pen, paper, sticky notes blackboard, chalk, smartboard/screen and projector and laptops	
Pre- Preparation Activity	<p>The students are divided into pairs to play the AI game Mystery Animal</p> <p>https://experiments.withgoogle.com/mystery-animal</p>	Mystery Animal - AI Game using Natural language Processing

Previous Knowledge	<p>Students are asked to recount their experience of playing against Artificial Intelligence and identifying the animal.</p> <p>Each pair will be asked to speak about the unique features of the animal they identified.</p>	
Introduction	<p>The teacher asks students to read aloud the Poem How to tell Wild Animals in pairs.</p>	
Methodology	<p>The students will be divided in pairs to play the introductory game and then read the Poem aloud.</p>	
Discussion on the Text	<p>a) After the activity the class retains its groups and students are asked to answer the questions as a pair group exercise:</p> <ol style="list-style-type: none"> i. Does 'dyin' really rhyme with 'lying'? Can you say it in such a way that it does? ii. Do you think the words "lept "and"lep" in the third stanza are spelled correctly? Why does the Poet spell them like this? iii. Can you find other examples of Poets taking liberties with language either in English or in your own language? iv. Can you find examples of humorous Poems in your own Language? <p>b) Poaching is a major cause of extinction of species. Watch the video and discuss https://www.youtube.com/watch?v=yYY0Jg0qGHO</p>	<p>Reflective video demonstrating how wild life can be protected using Artificial Intelligence</p>
Learning Outcomes	<ol style="list-style-type: none"> (i) Students will practice pronunciation and understand rhyme. (ii) Students develop an understanding of why poetic liberties are permitted in language usage. (iii) Students understand and appreciate the benefits of present educational system. (iv) Students identify different animals using the AI Game Mystery Animal as a precursor to reading the Poem to appreciate it. (v) Students draw out how Artificial Intelligence can be used to curb poaching. 	

Self-Evaluation and Follow-Up	The Teacher will encourage students to look for more examples of Artificial Intelligence to help in writing a poem based on Wild Animals	
Follow-up Activity	The students will be asked to present these Poems to the class.	

GLOSSARY

1. AI Related Terminologies

Mystery Animal: Mystery Animal is an AI experiment developed by Google on an open-sourced platform which is based on Natural Language Processing domain. In this game, the computer pretends to be an animal and the player needs to guess the animal by asking 20 Yes/No questions. The player asks the machine questions with the help of earphones/headphones/microphone to which the machine will respond either in Yes or No and according to the answers the player needs to modify his/her questions to guess the animal.

Natural Language Processing: It is the ability of a program to understand human language. Human language data can be fed to the machine in the form of text or speech. Natural Language Processing is one of the sub-fields of Artificial Intelligence wherein the machine interprets human language and produces intelligent output.

2. AI Activity Description

- a. **Mystery Animal:** Students need to go to the following link: <https://mysteryanimal.withgoogle.com/> . After reaching the website, students need to click on *Preview it Now!* Which will then start the experiment. In this experiment, the machine randomly selects any animal which the player needs to identify with the help of 20 Yes/No questions to be asked to the machine. Whatever question asked, the machine either responds in Yes or No or lets the user know when it is not able to comprehend the statement.

NOTE: Mystery Animal works ONLY on Google Chrome browser.

- b. **Reflective video demonstrating how wild life can be protected using Artificial Intelligence:** <https://www.youtube.com/watch?v=yYY0Jg0qGH0>

Students can find the video on the link mentioned above. This video is about reducing illegal poaching activities in an area where illegal poaching is a critical problem. The device named 'Train Guard' has been powered with computer vision-based AI which can identify if any suspicious activity takes place. It ensures only authorized people get near to the animals. The device is small enough to be easily hidden in natural surroundings.

HINDI

4.5 Class 6

HINDI

Class 6

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	पद्य (वह चिड़िया जो)	
Name of the book	वसंत भाग 1 (NCERT)	
Subject and Artificial Intelligence Integrated	चित्रकला, अनुमान व कल्पनाशीलता का विकास	
Objectives	1(क)—कविता के सस्वर गायन के माध्यम से छात्रों में सही उच्चारण, ध्वनि व लयबद्धता का विकास। 1(ख)—विशेषण व क्रिया विशेषण का ज्ञान 2— छात्रों में कल्पना के आधार पर एक चित्र बनाकर उसके सदगुणों की व्याख्या कर सकने के गुण का विकास।	
Time Required	35 मिनट के 2 कालांश	
Classroom Arrangement	लचीला	
Material Required	श्यामपट्ट, चॉक, स्मार्ट बोर्ड, लैपटॉप, कागज, पैनसिल इत्यादि।	
Pre- Preparation Activity	शिक्षक कक्षा को चार या पाँच समूहों में बाँट कर प्रत्येक समूह से कहेगा कि वे अपने समूह के लिये प्रतीकात्मक रूप से किसी भी पक्षी का चयन करें जो उसके सदस्यों के गुणों के अनुरूप हों व कक्षा में बारी-बारी से यह समझाया जायें कि वह पक्षी उनके समूह के लिये क्यों उपयुक्त है।	AI Classification through an activity and Understanding AI training.
Introduction	शिक्षक स्मार्ट बोर्ड या लैपटॉप पर बच्चों द्वारा चयनित पक्षियों के चित्र व गुण प्रदर्शित करेगा। तत्पश्चात वह स्वयं को नीले पंखों वाली चिड़िया मान कविता का वाचन शुरू करेगा।	
Methodology	बच्चे पद्य को क्रमवार पढ़ेंगे। (सस्वर वाचन) शिक्षक द्वारा वाचन	
Discussion on the Text	बच्चों से प्रश्न पूछकर विभिन्न पंक्तियों का आशय स्पष्ट करने को कहा जायेगा। पुनः बच्चों से कहा जायेगा कि वे चिड़िया के गुणों के आधार पर कक्षा को तीन वर्गों में विभाजित करें एवं विभाजन को औचित्य साबित करें।	

Learning Outcomes	1) छात्रों में कल्पनाशक्ति के विकास के फलस्वरूप सृजनात्मकता का विकास। 2) छात्रों में कविता के माध्यम से विशेषण व क्रिया विशेषण का ज्ञान। 3) वर्गीकरण की क्षमता का विकास। 4) वातावरण के प्रति सजगता का विकास।	
Self-Evaluation and Follow-Up	वर्णित नीली चिड़िया के गुणों के आधार पर अपनी कल्पना से प्रत्येक छात्र कविता में एक या दो नये बंध जोड़े।	

GLOSSARY:

1. AI Related Terminologies

AI Model Training: An algorithm is said to be artificially intelligent if it gets trained and can make decisions/predictions by itself. The intelligence which a machine gains comes by training the machine with the appropriate dataset. For example, let's say, a machine is to be created which needs to classify an image as either an apple or a banana. To achieve this task, the machine is trained with hundreds of images of apples and bananas. While training, the machine extracts features out of the image dataset of apples which would help the machine to classify any image of an apple, as an apple. Same is done for the banana dataset. Finally, after training, the machine is tested by providing an image of either an apple or a banana. If the machine is able to classify it correctly, the efficiency is said to be good else it gets re-trained on a better dataset.

Training an AI model requires two datasets: Training Data and Testing Data. The Machine is first fed with training data from which it makes its own rules which helps it to predict the output. Then the testing data is used to check the efficiency of the model. Once training and testing is done, the model is deployed for use.

Classification: Machine Learning algorithms can be broadly classified into three families: Supervised learning, Unsupervised learning and Reinforcement learning. Classification is a part of Supervised learning model. Classification models work on labelled datasets and are used to predict the label of testing dataset. For example, 100 images of apples and 100 images of bananas have been taken as a training dataset for the AI model. These 200 images have been labelled as apples or bananas respectively. This labelled data is then fed to the machine which trains itself by extracting common features from the dataset and understanding which features come under the apple label and which ones come under the banana label. At the time of testing, the machine takes an input image and extracts features from it which are then compared with the features marked under both the labels. On the basis of the degree of similarity, the machine would label the testing image as either apple or banana. This process is known as Classification.

2. AI Activity Description

Bird Identification Activity (Pre-preparation Activity):

Ask the students to split in to four groups where each group chooses a bird and starts acting like that bird. For example, the students select 4 birds: Parrot, Peacock, Pigeon and Owl. Now these groups have to act like the bird by imitating their unique sounds and characteristics. While one group is acting, the rest of the groups need to use their knowledge and guess which bird is being depicted. If a group guesses it right, they get plus points while the group that guesses incorrectly gets a negative. In the end, the scores are calculated and the group having the highest score is said to be the most efficient of all. With the help of this activity, the concept of classification of an AI model training can be explained as the students are using their own knowledge to guess the bird and then predicting a name for it (classification). Also, the winning group is said to be properly trained as their efficiency is highest while the ones who were not able to guess it right are considered at a lower efficiency level and they require more training data.

HINDI

Class 7

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	पद्य (हम पक्षी उन्मुक्त गगन के)	
Name of the book	वसंत भाग 2 (NCERT)	
Subject and Artificial Intelligence Integrated	कृत्रिम बुद्धिमत्ता के माध्यम से पिंजरबद्ध पक्षी की मनोव्यथा का वर्णन व आजादी के महत्व का चित्रांकन।	
Objectives	<ul style="list-style-type: none"> ● कविता वाचन के माध्यम से सुर, लय व सही उच्चारण के कौशल का विकास। ● कविता में निहित स्वाधीनता के महत्व को बच्चों के सम्मुख उजागर करना। ● बच्चों में पर्यावरण व उसमें रहने वाले सभी पशु-पक्षियों के प्रति लगाव का भाव व उनके संरक्षण की भावना विकसित करना। ● कविता में निहित व्याकरण का ज्ञान बच्चों को कराना। ● बच्चों में शब्दों का शुद्ध उच्चारण, वाक्यों का उचित आरोह-अवरोह, तान अनुतान एवं बलाघात के साथ पढ़ने का कौशल विकास करना। ● बच्चों में कहावतों व मुहावरों के प्रयोग को बढ़ावा देना। ● छात्रों में पाठ में आये परस्पर सम्बन्धों को समझने के कौशल को विकास करना। 	
Time Required	35 मिनट के 2 से 3 कालांश	
Classroom Arrangement	लचीला	
Material Required	श्यामपट्ट, चॉक, स्मार्ट बोर्ड, लैपटॉप, डस्टर इत्यादि।	
Pre- Preparation Activity	<p>गतिविधि-1</p> <p>बच्चों से प्रथम स्वतंत्रता संग्राम व भारत की आजादी के विषय में जानकारी एकत्रित कराना (विभिन्न नेताओं द्वारा</p>	

	<p>दिये गये नारें, विभिन्न आंदोलनों का उद्देश्य इत्यादि)।</p> <p>दी गई जानकारी के माध्यम से बच्चों का समझाना है कि आजादी महत्वपूर्ण क्यों है।</p> <p>गतिविधि-2</p> <p>डेटा अधिग्रहण एवं डेटा अन्वेषण</p> <p>छात्रों को बन्दी व स्वतंत्र पक्षियों का आवाज का डेटा एकत्रित करना है और उसके उपरान्त दोनों आवाजों में अन्तर पहचानने की कोशिश करना है। छात्रों से पूछना है कि क्या पक्षियों की आवाज सुनकर ये अनुमान लगाया जा सकता है कि कौन सा पक्षी बन्दी है व कौन सा पक्षी स्वतंत्र है।</p>	Data Acquisition & Data Exploration
Introduction	<p>शिक्षक स्मार्ट बोर्ड या लैपटॉप पर उपरिलिखित जानकारी को दर्शायेगा एवं बच्चों को समझायेगा कि आजादी पशु-पक्षियों के लिये भी उतनी ही महत्वपूर्ण है।</p> <p>(शिक्षक 2 से 3 विभिन्न आवाजें (जंगल व पिजरें) में पक्षियों की सुनायेगा)</p>	
Methodology	<p>बच्चों द्वारा कविता का स्वर वाचन व शिक्षक द्वारा प्रत्येक अनुच्छेद की व्याख्या की जायेगी।</p>	
Discussion on the Text	<p>बच्चों से विभिन्न प्रश्न पूछकर पता लगा जायेगा कि कविता की पंक्तियों का आशय उन्हें स्पष्ट है या नहीं जैसे-</p> <ul style="list-style-type: none"> • कृत्रिम बुद्धिमत्ता द्वारा उत्पन्न प्रश्नोत्तरी । • चित्र वर्णन। • स्वर्ण-श्रंखला, लाल किरण-सी में रेखांकित शब्दों में गुणवाचक विशेषण की व्याख्या (स्मार्ट बोर्ड पर अन्य उदाहरणों द्वारा भी) • द्वन्द्व की व्याख्या (उदाहरणों द्वारा) 	
Learning Outcomes	<p>1) छात्र गुणवाचक विशेषण, द्वन्द्व समास को परिभाषित कर सकेंगे, पहचान एवं उपयोग कर सकेंगे।</p>	
Self-Evaluation and Follow-Up	<p>मानव की वर्तमान जीवन शैली व शहरीकरण से जुड़ी योजनायें पक्षियों के लिये घातक है, इस विषय पर कक्षा में समूह चर्चा व वाद विवाद कराया जायेगा।</p>	

Follow-up Activity	भारतीय फिल्म रोबोट 2.0 का स्मार्ट बोर्ड पर प्रदर्शन।	
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GLOSSARY:

1. AI Related Terminologies

Data Acquisition: Data acquisition refers to acquiring authentic data crucial for the AI model from reliable sources. The data acquired could be then divided into two categories: Training Data and Testing Data. The AI model gets trained on the basis of training data and is evaluated on the basis of testing data.

There can be various ways in which you can collect data. Some of them are:

- Surveys
- Web Scraping
- Sensors
- Cameras
- Observations
- Application Program Interface

Data Exploration: After acquiring data there comes the need to analyze the data. For this, they need to visualize the acquired data in some user-friendly format so that they can:

- Quickly get a sense of the trends, relationships and patterns contained within the data.
- Define strategy for which model to use at a later stage.
- Communicate the same to others effectively.

To visualize data, various types of visual representations can be used by the students like diagrams, charts, graphs, flows, etc.

2. AI Activity Description

Ask the students to go out and record the sounds of birds which chirp in a free environment. After this, ask them to collect the data of caged birds. Now, the students need to explore the clips by listening to them carefully. Ask the students to work on the following questions:

1. Do the sounds of free and caged birds sound similar?
2. Can you identify any difference in the sounds of free and caged birds?
3. Can you predict if a bird is caged or not just by listening to its chirping?

This activity explains how an Artificially Intelligent machine is able to predict answers according to the data on which it is trained.

HINDI

Class 8

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	गद्य "लाख की चूड़ियाँ" (कामतानाथ)	
Name of the book	वसंत भाग 3 (NCERT)	
Subject and Artificial Intelligence Integrated	कला एवं रंगमंच।	
Objectives	<ul style="list-style-type: none"> छात्रों में इतिहास में प्रचलित भारतीय हस्तकला व विभिन्न शिल्प कलाओं के प्रति जागरूकता उत्पन्न करना। छात्रों में कठिन परिश्रम, अनुशासन, उदारता व आपसी सहयोग की भावना का उदय करना (सहानुभूति एवं अनुभूति)। छात्रों में शहरी व औद्योगिक विकास के फलस्वरूप गाँव को होने वाले नुकसान के प्रति जागरूक बनाना। छात्रों के मस्तिष्क में संबंधों के बिखराव व सांस्कृतिक नुकसान के आर्थिक कारणों के विवेचन की तस्वीर स्पष्ट करना। 	
Time Required	35 मिनट के 3 कालांश	
Classroom Arrangement	लचीला	
Material Required	श्यामपट्ट, चॉक, स्मार्ट बोर्ड, लैपटॉप, विभिन्न प्रकार की चूड़ियाँ (आभूषण) इत्यादि।	
Pre- Preparation Activity	छात्र विभिन्न सामग्रियों का डाटा करेगे जिसके साथ चूड़िया बनायी जाती है। उसके उपरान्त हर प्रकार की चूड़ियाँ करेगे और अनुमान लगाने की कोशिश करेगे कि चूड़ियाँ किस प्रयुक्त सामग्री से बनायी गयी है।	

		AI Classification Model
Introduction	<p>शिक्षक छात्रों को प्राचीन समय में भारत के गाँव में प्रचलित शिल्प कलाओं व हस्त कलाओं के चित्र स्क्रीन पर दिखायेगा। छात्र-छात्राओं को प्रचलित चूड़ियों (काँच की) प्रगति यात्रा का विवरण पाठ के बाद सुनायेगा।</p>	
Methodology	छात्र-छात्रायें गद्य को क्रमवर पढ़ेंगे।	
Discussion on the Text	<p>यह बच्चों से प्रश्न पूछकर किया जायेगा। कुछ प्रश्न इस प्रकार के हैं—</p> <ul style="list-style-type: none"> ● लेखक नाना/मामा के गाँव में किस खास उद्देश्य से जाता था ? ● लेखक ने बदलू काका के घर का पाठ में क्या विवरण दिया है ? ● लेखक ने आठ-दस वर्षों पश्चात क्या बदलाव देखा ? <p>कक्षा को तीन भागों में बाँटकर छात्र-छात्राओं को निम्न कार्य दिया जायेगा:—</p> <ul style="list-style-type: none"> ● आजादी से पूर्व की चूड़ियों की जानकारी। ● आज से बीस-तीस वर्ष पूर्व या वर्तमान समय की चूड़ियाँ। ● भविष्य में चूड़ियों का स्वरूप क्या होगा। <p>इन तीन विषय पर छात्र-छात्रायें पी0पी0टी0 बनाकर क्रमवर कक्षा में दिखायेंगे।</p> <p>शिक्षक फिरोजाबाद एवं राजस्थान की चूड़ियों की केस स्टडी कक्षा में प्रस्तुत करेगा। प्रस्तुतीकरण के पश्चात कक्षा में विचार-विमर्श किया जायेगा की कौन सी व्यवस्था बेहतर है।</p>	

Learning Outcomes	अधिगम प्रतिफल:— <ul style="list-style-type: none"> ● छात्र भारत की बदलती सामाजिक व आर्थिक परिस्थितियों का विवेचन करने में सफल हो सकेंगे। ● छात्रों में सहानुभूति व जागरूकता का प्रचार। ● छात्र भविष्य की आर्थिक सम्भावनाओं को तरास पायेंगे। 	
Self-Evaluation and Follow-Up	छात्रों को अपने दादा-दादी के समय में खेलें जाने खेलों की संरचनात्मक व भावनात्मक पहलुओं का वर्णन करते हुये एक अनुच्छेद लिखवाना।	

GLOSSARY:

1. AI Related Terminologies

Classification: Machine Learning algorithms can be broadly classified into tree families: Supervised learning, Unsupervised learning and Reinforcement learning. Classification is a part of the Supervised learning model. Classification models work on labelled datasets and are used to predict the label of the test dataset. For example, 100 images of apples and 100 images of bananas have been taken as a training dataset for the AI model. These 200 images have been labelled as apples or bananas respectively. This labelled data is then fed to the machine which trains itself by extracting common features from the dataset and understands which features come under the apple label and which ones come under the banana label. At the time of testing, the machine takes an input image and extracts features from it which are then compared with the features marked under both the labels. On the basis of the degree of similarity, the machine will label the testing image as either an apple or a banana. This process is known as Classification.

2. AI Activity Description

Ask the students to collect the data for materials which are used to make bangles. They can collect this data through various sources (online/offline). After collecting the data, ask the students to bring different types of bangles and randomly ask all of them to predict the materials used to make that bangle.

This activity explains the concept of AI Classification model where the model classifies an object according to its training data. Here, the students are able to classify the material used in the making of the bangles according to the knowledge which they gained while collecting data regards bangle making materials.

HINDI

Class 9

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	वैज्ञानिक चेतना के वाहक डा० चन्द्रशेखर वेकेंट रमन	
Name of the book	स्पर्श भाग 1 (NCERT)	
Subject and Artificial Intelligence Integrated	कृत्रिम बुद्धिमत्ता के एकीकरण से बच्चों के अवलोकन कौशल का विकास।	
Objectives	1. विभिन्न प्राकृतिक घटनाओं को वैज्ञानिक दृष्टि से अवलोकन करना। 1. प्रतिवेश में स्थित समस्याओं का अवलोकन करना एवं प्रॉब्लम कैनवास के माध्यम से समाधान निकालना।	
Time Required	35 मिनट के 2 कालांश	
Classroom Arrangement	लचीला	
Material Required	4 कैनवास प्रॉब्लम प्रपत्र	-
Pre- Preparation Activity	छात्रों को पूरा पाठ पढ़ने के लिये कहे।	
Introduction	<ul style="list-style-type: none"> सीवी रमन की जीवनी की मदद से छात्रों को प्रेरित करें और अध्याय के अंतिम पैराग्राफ पर जोर देते हुये बतायें कि सी बी रमन की तरह हमें अपने परिवेश को देखना चाहिये और हर प्रक्रिया के पीछे के विज्ञान को समझना चाहिये। इसके अलावा अपने ज्ञान के मदद से हमें अपने 	

	आस-पास मौजूद समस्याओं के समाधान का पता लगाने की कोशिश करनी चाहियें।	
Methodology	<ul style="list-style-type: none"> छात्रों को प्रोजेक्ट साइकिल की समस्या की रूपरेखा बतायें। छात्रों को प्रॉब्लम कैनवास के बारे में बतायें। समझाने के बाद छात्रों को किसी भी मुद्दे पर गौर करने के लिये कहें जो उनके आस-पास मौजूद है या जिसे वे किसी दिन हल करना चाहते हैं। वे अपने विद्यालय परिवेश, समाज, घर आदि में देख सकते हैं। वे सस्टेनवेल डेवलपमेंट गोल्स पर नजर डाल सकते हैं और उसमें से एक का चयन कर सकते हैं। समस्या के चयन के बाद छात्रों से समस्या वर विचार करने और अपने डोमेन के भीतर एक विशिष्ट समस्या पर काम करने के लिये कहें। छात्रों से कहें कि वे कौन, क्या, कहा और क्यों कैनवास भरें। कैनवास भरने के बाद छात्र को हल करने के तरीकों की पहचान करने में सक्षम होंगे। इसके अलावा छात्रों को यह सोचने दें कि समस्या को हल करने में कैसे शामिल किया जा सकता है। 	AI Project Cycle - Problem Scoping: 4Ws Problem Canvas
Learning Outcomes	<ul style="list-style-type: none"> छात्रों को सीवी रमन के जीवन के बारे में पता चलेगा। छात्र अपने रोजमर्रा के जीवन में अपने आस-पास हो रही विभिन्न चीजों प्रक्रियाओं के पीछे विज्ञान को देख पाएंगे। छात्र अपने आस-पास मौजूद समस्याओं को देख पाएंगे और उसी को प्रभावित करने वाले विभिन्न मापदंडों को समझने की कोशिश करेंगे। छात्र विभिन्न संभवानाओं के बारे में सोच पाएंगे जो समस्याओं को हल करने में मौजूद हैं। 	
Follow-up Activity	छात्र अपने कैनवास भरने के बाद डेटा फीचर्स पर ध्यान देंगे जो समस्या को हल करने के लिये आवश्यक है और विभिन्न स्रोतों का पता लगायेंगे जहां से डेटा का अधिग्रहण किया जा सकता है।	

GLOSSARY:

1. AI Related Terminologies

AI Project Cycle: AI Project cycle is a framework which is used to design an AI project taking all the crucial factors into consideration. The project cycle consists of 5 steps namely: problem scoping, data acquisition, data exploration, modelling and evaluation. Each stage holds equal importance in the framework.

Problem Scoping: Problem Scoping refers to understanding a problem and finding various factors which cause and affect the problem. Under problem scoping, we use the framework of 4Ws problem canvas where we look into the Who, What, Where and Why of a problem. After observing these factors, students get clarity regarding the issue to be solved which leads them towards data acquisition.

4Ws Problem Canvas:

The 4Ws Problem canvas helps in identifying the key elements related to the problem.

Who?

The “Who” block helps in analyzing the people getting affected directly or indirectly due to the problem. Under this, they identify who the ‘Stakeholders’ of this problem are and what is known about them. Stakeholders are the people who face this problem and would be benefited with the solution.

Who canvas consists of:

- Who are the Stakeholders?
- What do you know about them?

What?

Under the “What” block, they need to look into what they have on hand. At this stage, they need to determine the nature of the problem. What is the problem and how do they know that it is a problem? Under this block, they also gather evidence to prove that the problem they have selected actually exists. Newspaper articles, Media, announcements, etc. are some examples.

What canvas consists of:

- What is the problem?
- How do you know that it is a problem? (Is there any evidence?)

Where?

Now that they know who is associated with the problem and what the problem actually is; they need to focus on the context/situation/location of the problem. This block will help them look into the situation in which the problem arises, the context of it, and the locations where it is prominent.

Where canvas consists of:

- What is the situation/context where the stakeholders experience the problem?
- Where is the problem located?

Why?

They have finally listed down all the major elements that affect the problem directly. Now it is convenient to understand who the people that would be benefitted by the solution are; what is to be solved; and where will the solution be deployed. These three canvases now become the base of why they want to solve this problem. Thus, in the “Why” canvas, they would think about the benefits

which the stakeholders would get from the solution and how would it benefit them as well as the society.

Why canvas consists of:

- Why will this situation be of value to the stakeholders?
- How will the solution improve their situation?

2. AI Activity Description

Ask the students to identify various issues/problems which they experience in their daily lives and ask them to select any one out of these which they wish to solve. Once the problem is selected, explain the 4Ws problem canvas framework to the students and ask them to look into all the crucial parameters which affect the problem. Students need to find out about who the stakeholders are, what is the problem that is being focused upon, in what context does the problem exist, how the problem can be solved and what benefits would it give to the stakeholders. Once they fill up their canvases, ask them to think and discuss how AI can be used to leverage the situation towards solving the problem which they have selected. After brainstorming, ask the students to present their idea to the whole class.

HINDI

Class 10

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	विज्ञापन रचना व जीवनी लेखन	
Name of the book	हिन्दी (NCERT)	
Subject and Artificial Intelligence Integrated	हिन्दी व कृत्रिम बुद्धिमत्ता	
Objectives	<ul style="list-style-type: none"> ● छात्रों में विज्ञापन लिखने की क्षमता का विकास करना। ● छात्रों में जीवनी लेखन की क्षमता का विकास। ● लेखन कौशल—वार्तनिक शुद्धि व सही शब्द चयन क्षमता का विकास। 	
Time Required	35 मिनट के 2 कालांश	
Classroom Arrangement	लचीला।	
Material Required	श्यामपट्ट, चॉक, स्मार्ट बोर्ड, लैपटॉप इत्यादि।	
Pre- Preparation Activity	<ul style="list-style-type: none"> ● छात्रों को 4–6 छात्रों के समूह में बाटें और प्रत्येक टीम को एक थीम दें। थीम हो सकती है – कृषि, स्वास्थ्य, परिवहन, सुरक्षा, सेवायें, मनोरंजन आदि। ● छात्रों को डोमेन में कृत्रिम बुद्धिमत्ता की संभावनाओं का पता लगाने और उन्हें दिये गये रिसर्च टेम्पलेट को भरने के लिये कहें। ● एक बार जब उनका शोध पूरा हो जाता है तो छात्रों से ऐसे परिदृश्य के बारे में सोचने के लिये कहें जो भविष्य में 10 साल यानी 2029 का हो। अब छात्रों को अपने डोमेन में संभावित हस्ताक्षेप की कल्पना करने की आवश्यकता है। 	Exploring AI Possibilities

	<ul style="list-style-type: none"> ● छात्रों को यह कल्पना करने के लिये कहें कि वे 2029 में एक कम्पनी कृत्रिम बुद्धिमत्ता के साथ अपने डोमेन में काम करती है। कम्पनी लोगों को काम पर रख रही है इसलिये उन्हें जॉब एडवरटाइजिंग पोस्टर के साथ आने की आवश्यकता है जिसमें उन्हें नौकरी की भूमिका कौशल की आवश्यकता कम्पनी की प्रोफाइल और अन्य ऐड ऑन का उल्लेख करना होगा। ● एक बार जब छात्र अपने पोस्टर के साथ तैयार हो जाते हैं तो वे इसे पूरी कक्षा के सामने प्रस्तुत करते हैं। 	
Introduction	विज्ञापन लेखन/जीवनी लेखन के महत्वपूर्ण बिन्दु	
Methodology	विज्ञापन लेखन/जीवनी लेखन के महत्वपूर्ण बिन्दुओं को श्यामपट पर समझाना व स्मार्ट बोर्ड पर उसके कुछ उदाहरण दिखाना।	
Learning Outcomes	<ul style="list-style-type: none"> ● छात्र विज्ञापन लेखन कर सकेंगे व उनके मस्तिष्क पर पड़ने वाले प्रभाव को भी समझ पाएँगे। ● छात्र किसी भी महापुरुष की जीवनी लिख पाने में सफल होंगे। 	
Self-Evaluation and Follow-Up	<ul style="list-style-type: none"> ● एकिनेटर उपकरण की सहायता से जीवनी लेखन के प्रमुख बिन्दुओं के स्मरण को आसान बनाकर जीवनी लेखन का कार्य बच्चों को देना। 	
Follow-up Activity	<ul style="list-style-type: none"> ● छात्रों को चार समूहों में बाँटकर कृत्रिम बुद्धिमत्ता का स्वास्थ्य, पर्यावरण, अंतरिक्ष, खाद्य पदार्थ में भविष्य में प्रयोग पर विज्ञापन बनवाना। 	

GLOSSARY:

1. AI Activity Description

Divide the class in teams of 4-6 students. Now each team will be assigned a theme. Themes can be: Agriculture, Education, Services, Security, Transport, Health, Entertainment, etc. Ask the students to research about various companies or individuals or groups who are working towards incorporating AI in their respective domain. According to their research, ask the students to fill up the research template as given below:

Industry Vertical/Theme:	
<p>What are the names of the organizations in our country working around this theme?</p> <ol style="list-style-type: none"> 1. 2. 3. 4. 5. 	<p>Write briefly what they do.</p>
<p>What kind of skill sets (Look at both soft skills and technical skills) are they interested in their new hires possessing?</p> <p>Consider: Would the skills sets required still be the same after 10 years?</p>	
<p>Soft Skills</p> <ol style="list-style-type: none"> 1. 2. 3. 4. 5. 	<p>Technical Skills</p> <ol style="list-style-type: none"> 1. 2. 3. 4. 5.
<p>Soft Skills (10 years later)</p> <ol style="list-style-type: none"> 1. 2. 3. 4. 	<p>Technical Skills (10 years)</p> <ol style="list-style-type: none"> 1. 2. 3. 4.

5.	5.
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What are the ethical concerns revolving around the theme? (Keywords: AI ethics, AI bias, AI Access, AI privacy)	
Topic	Examples
1.	1.
2.	2.
3.	3.
Sources: Provide Website Links	
Title of Article	Website Link
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Now, the students need to confine their research to India only. That is, the students need to find out about companies/organizations/groups/individuals which work around AI in their respective domain and are working in and for India. After completing the whole research template, ask the students to go through it once and discuss the opportunities and possibilities which exist around AI in the current world. After this discussion, lead the students towards imagining a scenario of 2029. The students now have to think about the possibilities which would exist in 2029 around AI in their domain. After brainstorming about this, they need to come up with a poster about the job opportunities around AI. Ask the students to imagine a situation where they own a company in 2029. Their company works in their assigned domain and is incorporating AI in it. Their company is now hiring for a Job Ad poster advertisement needs to be created in which the students will be talking about the profile of their company, job description, skills required, and other details. Ask them to think as futuristic as possible and let them show their creativity regards the same. Ask the students to present their poster before the whole class at the end of this activity.

5. SCIENCE

5.1 Class 6

SCIENCE

Class 6

Chapter Covered	The Living Organisms Characteristics & Habitats	AI Concept
Name of the book	Science NCERT Class 6, Chapter 9	
Subject and Artificial Intelligence Integrated	Habitats of Living Organisms and their adaptation	<ul style="list-style-type: none"> ● Unsupervised Learning ● Natural Language Processing
Objectives	i) To familiarize students with different habitats of living organisms. ii) To help students understand the dynamic nature of organisms' surroundings. iii) To make them understand the concept of adaptation and acclimatization iv) To awaken the students to the importance of co-existence.	
Time Required	2-3 periods of 35 minutes each	
Classroom Arrangement	<ul style="list-style-type: none"> - Regular classroom setup having Projector, computer/laptop and internet - computer lab on Day 2 	
Material Required	Computers Media player with speakers, Pen, Paper, Sketch pens	
Pre - preparation Activity	<ul style="list-style-type: none"> ● Give students images from different habitats of organisms (Around 10-15) ● Ask them to recognize the habitats in the images and try to name the organisms which live there. 	

	<ul style="list-style-type: none"> ● Ask them to classify the habitats based on similarities of landscape ● After collecting all the information above, the teacher introduces the topic “living organisms” – characteristics and habitats. 	Unsupervised learning concept
Methodology	<ul style="list-style-type: none"> ● Divide the class into 4 groups and assign them the task of noting down different characteristics and habits of different types of organisms. (4 habitats assigned) ● Ask the group to give their presentation one by one and ask others to note this down as information ● discuss ‘Adaptation’, ‘Acclimatization’ ● on the second day, take the children to the computer lab and make them play the Mystery Animal Game. The game may be played in pairs or small/large groups based on the resources. 	Experiencing Natural Language Processing through Mystery Animal Game
Learning Outcomes	<ul style="list-style-type: none"> ● Students will be able to understand and differentiate between different types of habitats on the basis of their characteristics. ● Students will be able to understand the adaptation of living organisms. ● They will be able to understand the importance of co-existence of different organisms and ecological balance. 	
Self-Evaluation and Follow-Up Activity	<ul style="list-style-type: none"> ● At the end of Day 1, ask students to collect the following information from the library or through Google search: Find out what are the habitats of polar bears and penguins. For each animal, explain two ways in which it is well adapted to its habitat. ● Conduct brief discussions in small groups in the activity period and ask students to assess how much each of them understood of the topic. 	

GLOSSARY:

1. AI Related Terminologies

Unsupervised Learning: While there are many machine learning models, they can be broadly classified into 3 families. They are supervised learning, unsupervised learning and reinforcement learning. Unsupervised learning focusses on finding patterns or trends out of the data fed to the machine. Every machine learning algorithm requires training data as a base to work upon. Talking about unsupervised learning, the training data fed into this machine is un-labelled i.e. the data fed into the machine is unknown or random. It has not been supervised and hence is given to the machine to get processed in such a way that some meaningful information can be extracted out of it. For example, if in a locality, there are 1000 stray dogs and they are all random bred, if the pictures of all these dogs is fed into an unsupervised learning algorithm, it would automatically cluster these images according to the features observed and would give clusters of images as output. These clusters could be based on any trend or pattern observed in the data fed. This helps in understanding the dataset better.

Natural Language Processing: Artificially Intelligent machines could be broadly classified on the basis of the type of data fed to them. One of the domains of Artificial Intelligence is Natural Language Processing. NLP refers to the algorithms which processes natural language data and makes some sense out of it. Natural language data consists of textual data, speech data, etc. and artificially intelligent machines are used to interpret this data and make several decisions/predictions. Some of the examples can be speech recognition, chatbots, auto-captioning, etc.

Mystery Animal: Mystery Animal is an AI experiment designed by Google based on Natural Language Processing. In this game, the machine acts as an animal which has been randomly picked up and the player gets 20 chances to guess that animal. The player can ask 20 yes/no questions to get hints about the animal from the machine and the machine answers either in Yes or No. In this game, the machine tries to interpret the meaning of the question which has been asked by the player with the help of Natural Language Processing and answers accordingly.

Link to the game: <https://mysteryanimal.withgoogle.com/>

2. AI Activity Description

Unsupervised Learning: In this activity, students would understand the concept of unsupervised learning in AI machines. Students would be given pictures of various organisms and habitats and they would be asked to label them according to their understanding. They need to name them or mention their features. With the help of this activity, students will understand how unsupervised learning works in AI. The unsupervised learning algorithm tries to make some sense out of the data provided to it with the help of common features and other parameters. Students are able to label the images according to their understanding of organisms and habitats while the unsupervised learning algorithm does the same.

Mystery Animal: Ask the students to go on this link using Google Chrome browser: <https://mysteryanimal.withgoogle.com/>. Once students reach this site, they need to click on 'preview it here'. The tutorial will start on the screen. Ask the students to go through the whole tutorial. Also, make sure that the microphone is enabled for this site. The machine will act as an animal and the students need to guess that animal by asking 20 questions to the machine. The questions need to be Yes/No questions as the machine will interpret their questions and answer only either Yes or No. Students may ask questions about its diet, surrounding, species, etc. Once students exhaust all 20 questions, the machine will reveal the animal and then the students can evaluate their questions and see how far they could reach. With the help of this game, students can understand how the machine interprets natural language and tries to converse in the same way. They will also explore various constraints which occur during the process.

5.2 Class 7

SCIENCE

Class 7

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter No.7 - Climate and Weather, Adaptations of Animals to Climate	
Name of the book	NCERT – Science Text Book class 7	
Subject and Artificial Intelligence Integrated	Science and AI importance of data acquisition and data exploration for Artificial Intelligence.	
Objectives	Students will be able to understand the concept of <ol style="list-style-type: none"> 1. What is Weather? 2. How is Climate defined? 3. Ways in which Animals adapt to climate in different regions. 	Data acquisition & data exploration to identify pattern recognition
Time Required	2-3 periods of 40 minutes each	
Classroom Arrangement	Flexible seating	
Material Required	Chart Paper pen, pencils, sketch pens, scale ; laptops/desktops; screen; projector; Internet connection	
Pre- Preparation Activity	The students are divided in groups of 4 and asked to visit the following and discuss about what they understand regards weather and how it can be predicted.	https://interestingengineering.com/ai-might-be-the-future-for-weather-forecasting
Introduction	Students given newspapers in their pre preparation groups and asked to find the weather report in each newspaper and tabulate it. Students then present their findings from the	

	video they have watched and the weather reports they have tabulated	
Methodology	<p>The Students are guided in the larger class discussion on the introduction and pre preparation activities.</p> <p>They are introduced to how Artificial Intelligence is playing a major role in collection, collation and analyses of data to predict weather in the form of weather forecasts.</p> <p>https://interestingengineering.com/ai-might-be-the-future-for-weather-forecasting</p>	
Discussion on the Text	<p>Students will be made to realize that the average weather pattern taken over a long time, say 25 years, is called the climate of the place.</p> <p>They will be guided to understand how climate of a place influences all living organisms and how animals adapt to the climate of a place.</p> <p>An AI Game Mystery Animal will be played to reiterate this in a fun manner</p>	https://experiments.withgoogle.com/mystery-animal
Learning Outcomes	<p>Students will be able to understand</p> <ol style="list-style-type: none"> a) What is Weather and how it is forecast? b) How Climate is determined and defined c) Ways in which Animals adapt to climate 	
Self-Evaluation and Follow-Up Activity	<p>Group task by students:</p> <ol style="list-style-type: none"> 1. Collect weather reports of seven successive days in the winter months (preferably December). Collect similar reports for the summer months (preferably June) and prepare a table for sunrise and sunset times <p>They will try to answer the following questions:</p> <ol style="list-style-type: none"> (i) Is there any difference in the time of sunrise during summer and winter? (ii) When do you find that the sun rises earlier? (iii) Do you also find any difference in the time of sunset during the month of June and December? 	

	<p>(iv) When are the days longer? (v) When are the nights longer? (vi) Why are the days sometimes longer and sometimes shorter? (vii) Plot the length of the day against the days chosen in June and December. (Instructions for plotting graphs are given in Chapter 13.)</p> <p>2. Collect information about the Indian Meteorological Department by visiting its website: http://www.imd.gov.in</p> <p>Write a brief report about the things this department does.</p> <p>Students will make a video of themselves reading out the weather report and present it in the class</p>	
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GLOSSARY:

1. AI Related Terminologies

Data Acquisition: Data acquisition refers to acquiring authentic data crucial for the AI model from reliable sources. The data acquired could be then divided into two categories: Training Data and Testing Data. The AI model gets trained on the basis of training data and is evaluated on the basis of testing data.

There can be various ways in which students can collect data. Some of them are:

- Surveys
- Web Scraping
- Sensors
- Cameras
- Observations
- Application Program Interface

Data Exploration: After acquiring data there comes the need to analyze the data. For this, they need to visualize the acquired data in some user-friendly format so that they can:

- Quickly get a sense of the trends, relationships and patterns contained within the data.
- Define strategy for which model to use at a later stage.
- Communicate the same to others effectively.

To visualize data, various types of visual representations could be used by the students like diagrams, charts, graphs, flows, etc.

2. AI Activity Description

In this activity, divide the students into groups and all the groups need to browse various reliable sources from where they can get authentic data for the weather conditions of a place. You can also divide the students into groups and assign them different States of India to gather data. Once the students have acquired the dataset ask them to explore the same with the help of any visual representation (pictorial/graphical) and explain various patterns and trends observed in the same. Also, ask the students to brainstorm on how can AI be used to help in such situations to predict the weather and climatic conditions of the place.

SCIENCE**Class 8**

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter 2 Microorganisms : Friend and Foe	
Name of the book	NCERT – Science Text Book class 8	
Subject and Artificial Intelligence Integrated	Science and AI	
Objectives	<p>Students will be made to understand that there are living organisms around us which we cannot see with our naked eyes. These are called microorganisms or microbes.</p> <p>They will learn how to</p> <ol style="list-style-type: none"> 1. Classify Microorganisms 2. Explore where they live 3. Differentiate between Good and Harmful Micro organisms 	
Time Required	3 periods (plus 3-4 weeks pre- preparation time to observe)	
Classroom Arrangement	Flexible	
Material Required	Chart Paper pen, pencils, sketch pens, earthen pots; plant waste; waste plastic; projector; screen; laptops/desktops; Video links; Internet connection	
Pre- Preparation Activity	Students are divided into groups of four and asked to set up observation of two pots per group filled half with soil marked A and B. They are instructed to put plant waste in pot A and things like polythene bags, empty glass bottles and broken plastic toys in pot B. The pots are set aside and observed after 3-4 weeks.	

Introduction	Students are asked to list their observations with regard to the 2 Pots that they have been monitoring. The Teacher then leads a discussion on water and soil being full of tiny organisms with a focus on microbes.	
Methodology	<p>Continuing in the same groups as earlier, students are asked to conduct an online search for various kinds of microbes and to classify them as per the table given in the book</p> <p>Students are guided to identify where these Microorganisms can be found and where they live.</p> <p>The Student groups are asked to prepare a presentation on Friendly Microorganisms and their uses and harmful Microorganisms and their effects</p> <p>A Microbe scanner will be introduced to the students through a video showing how Artificial Intelligence is helping in the detection of microorganisms and can advise the next course of action regards prevention of disease or infection.</p>	https://www.geek.com/tech/wash-dry-scan-device-detects-disease-causing-germs-on-hands-1750845
Learning Outcomes	<p>Students will be able to understand and relate to the existence of microorganisms or microbes.</p> <p>Students will be able to Classify Microorganisms; Explore where they are found and where they live.</p> <p>Students will also differentiate between Good and Harmful Microorganisms and recognize how Artificial Intelligence is capable of identifying harmful Microorganisms and advising the next course of action regards prevention of disease or infection.</p>	
Self-Evaluation and Follow-Up	<p>The students will work in groups and find answers to the following</p> <ol style="list-style-type: none"> 1. Can microorganisms be seen with the naked eye? If not, how can they be seen? 2. What are the major groups of microorganisms? 3. Name the microorganisms which can fix atmospheric nitrogen in the soil. 4. Write 10 lines on the usefulness of microorganisms in our lives. 	

	<p>5. Write a short paragraph on the harms caused by microorganisms.</p> <p>6. What are antibiotics? What precautions must be taken while taking antibiotics?</p>	
Follow-up Activity	<p>Students will visit the following www.microorganisms www.biology4kids.com/files/micro_main record their learning and make portfolios with pictures</p> <p>They will also search online for AI tools that help in detection of disease-causing Microbes and make a record of their functioning and usefulness</p>	<p>https://www.geek.com/tech/wash-dry-scan-device-detects-disease-causing-germs-on-hands-1750845</p> <p>https://lebergsolutions.com/blog/how-ai-can-help-monitor-hand-hygiene-compliance</p>

GLOSSARY:

AI Case Study:

“Maybe you were rushing to a meeting and just couldn’t scrub for the full 20 seconds, or maybe the commercial break in the big game wasn’t long enough and you had to rush back from the bathroom without washing your hands.”

It happens—at home and in professional kitchens. According to the CDC, 70 percent of all foodborne illness breakouts originate in foodservice.

But Schindler and Waanders don’t think we should settle for vomiting, fever, aches, and diarrhea just because someone forgot to rinse between handling raw and ready-to-eat food.

“PathSpot can fill the gap, offering a technology to ensure only clean hands are touching food, doors, tables, and utensils,” the project website said. “If handwashing is the DIY vaccine, PathSpot is the tool to administer it—protecting restaurants, employees, and customers.”

PathSpot is a wall-mounted device that screens for disease-causing germs in just two seconds. Co-founders Schindler and Dutch Waanders, former biomedical engineering students at Duke University, began testing PathSpot in restaurants early this year.

The technology relies on spectroscopy: Wavelengths beamed from a tablet bounce off the microbes on a person’s hand, reflecting back into the built-in camera. Light reflects differently based on the shape of whatever it bounces off of—including bacteria. Within seconds, the PathSpot algorithm compares those echoed wavelengths with common disease signatures (*E. coli*, *salmonella*, norovirus, hepatitis A, *listeria*) and indicates the presence of contaminants.

Know more about the device on: <https://www.geek.com/tech/wash-dry-scan-device-detects-disease-causing-germs-on-hands-1750845/>

SCIENCE

Class: 9

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter 12 – PHYSICS Sound (Frequency, Amplitude & Velocity)	
Name of the book	NCERT Science Text Book for Class 9	
Subject & Artificial Intelligence Integrated	Frequency, Amplitude & Velocity integrated with the infinite Drum Machine experiment	
Learning Objectives	<ul style="list-style-type: none"> ● to understand and apply the principles of sound <ul style="list-style-type: none"> - wavelength - oscillation - frequency of sound - pitch - amplitude - concept of velocity (speed) of sound - concept of 'intensity' of sound & be able to differentiate it from 'loudness' ● the role of medium of sound in the above phenomenon 	
Time Required	Two periods of 40 min each.	
Classroom Arrangement	Normal Classroom	
Material Required	laptop/desktop or smart mobile phone with internet connection, chalk, blackboard	
Pre- Preparation Activity	Read about parameters of sound like Amplitude and Frequency	
Previous Knowledge	Students know the concept of how sound is produced and propagated through a medium	

Methodology	<ul style="list-style-type: none"> ● Lead the students to an understanding and application of the following principles of sound by relating it with demonstration of different sounds and wave diagrams <ul style="list-style-type: none"> -wavelength (pg. 164) - oscillation (pg. 164) - frequency of sound (pg. 164) - pitch (pg165) - amplitude (pg. 165) ● Explain the concept of velocity (speed) of sound & the role of medium of sound by diagrams and through formulas ● Make them understand the concept of ‘intensity’ of sound & be able to differentiate it from ‘loudness’ (pg. 166) ● Help them to differentiate between amplitude and frequency which otherwise have very similar characteristics of sound ● Direct the students to The Infinite Drum Machine activity ● Link how different sound sensors work in one and multiple directions by giving examples of different sound operated devices eg. a door being opened and closed in movies and an instrument turning on and off when one claps. 	Infinite Drum machine
Learning Outcomes	<p style="text-align: center;"><u>Students will be able to</u></p> <ul style="list-style-type: none"> ● Differentiate between amplitude and frequencies of sound waves. ● Relate performances of different musical instruments with amplitude and frequencies. ● understand and relate how sound is applied in AI based solutions 	
Follow-up Activity	<p>Hold a brief class discussion on the following topic and observe what the students say and which concepts are still not clear to them.</p> <p>Ask them to award a score to themselves based on how much they could contribute to the discussion</p> <p>“Guess which sound has a higher pitch and why - a car horn or a flute.”</p>	

GLOSSARY:

1. AI Related Terminologies

Infinite Drum Machine: An infinite drum machine is an AI experiment developed by Google for people to understand how unsupervised-learning works. In this machine, thousands of sounds found in our surroundings have been randomly fed for the machine to make sense out of them. The sounds are not labelled in any way nor does the machine have any other information about that sound. All that it knows is the sound clip itself. Using one of the unsupervised learning algorithms, the machine analyses the data fed to it and tries to cluster similar sounds together. These clusters are then visible with the help of colors on the user's screen. All the dots appearing on the screen are sound clips and they have been clustered together on their basis of their sound properties like amplitude, frequency and pitch with the help of which the machine is able to understand the similarity amongst different clips.

Link to Infinite Drum Machine: <https://experiments.withgoogle.com/ai/drum-machine/view/>

Video to know more: <https://youtu.be/9x-My5yjQY>

2. AI Activity Description:

Ask the students to go to the link: <https://experiments.withgoogle.com/ai/drum-machine/view/> and click on start playing.

Ask the students to do the following:

Move the circles appearing on the map all over. When they move the circles, they will hear various sounds. Ask them to notice the difference in their frequencies, amplitude and pitch.

Now, move a circle in just one area, where the dots are of the same color. Ask them to observe if the sounds are similar. They will notice that the sounds from the same color dots have similar properties. With the help of this experiment, explain the unsupervised learning concept to the students where the machine is interpreting sounds on the basis of various parameters like amplitude, frequency and/or pitch.

On the basis of this analysis, demonstrate that the machine is able to group similar sounds and is able to cluster them together in the same color.

Mention to the students that random sounds were recorded from the surroundings and were fed to the unsupervised machine learning model. The machine itself, identified the pattern out of them and clustered them in different groups.

Ask students to create their own beats by selecting any 4 sounds and pressing the play button shown at the bottom left corner. They can also select a filter which will highlight all those sounds which come under it.

SCIENCE

Class 10

Chapter 3	Metal and Non metals	AI Concepts Integrated
Chapter Covered	Chapter 3; Metals and Non metals	
Name of the book	NCERT – Science Text Book Class 10	
Subject & Artificial Intelligence integrated	Occurrence & Extraction of Metals through Story Speaker	
Subject Integrated	Occurrence & Extraction of metals through Interactive Story speaker and Interactive Quiz (Kahoot) 3.4.3- 3.4.5 Extracting Metals Low, Middle High in the Activity Series	Introduction to AI Awareness through Google story Speaker
Objectives	<ul style="list-style-type: none"> ● to understand the occurrence of metals ● to learn about extraction of metals. 	
Time required	2 periods of 40 minutes each	
Classroom Arrangement	Laptops/ desk tops with internet connection for each group	
Introduction/ Previous Knowledge	<ul style="list-style-type: none"> ● Students have learnt about various elements, their classification as metals and non-metals on the basis of their properties ● Ask the students to recall: Names of some metals and non-metals used in their daily life? ● Name the properties that help them to categorize the above-mentioned metals and non-metals ● emphasize that metals are also classified on the basis of their reactivity 	

Materials Required	Chart Paper pen, pencils, sketch pens, scale Laptops/ desktops, Internet connection	
Methodology – Activity Based	<p>In groups of 4-5 ask students to study the flow chart to show steps involved in the extraction of metals from their ores (pg 50 Fig 3.10)</p> <ul style="list-style-type: none"> ● Ask them to make a note of <ul style="list-style-type: none"> - different metals on the basis of reactivity - different processes for different categories of metals to extract them from their ores ● Ask them to build a story about extraction of any one metal (of high, medium or low reactivity) on the Story Speaker. ● Ask groups to showcase their story to at least one other group. 	Story Speaker
Learning Outcomes	<ul style="list-style-type: none"> ● Learners will be able to develop an understanding of the occurrence, classification of metals on the basis of their reactivity ● Learners will be able to explain the different processes in the extraction of metal ores according to their reactivity series 	
Self-Evaluation & Follow up Activity	<ul style="list-style-type: none"> ● Make students answer Question 2 & 3 on page 53 ● The students work in groups and do peer assessment ● Observe to assess how much have they understood the concept of extraction of metals ● also assess if they learn better using AI based apps like Story Speaker or Kahoot 	

GLOSSARY:

1. AI Related Terminologies:

Story Speaker: It is an AI experiment which is available as an add-on to Google Docs. Story Speaker lets anyone create an interactive story with no coding required. It is an easy to install and easy to use tool and comes in handy when the user wants to create a story which changes according to the user's input.

Link to install Story Speaker extension for Story Speaker:

<https://chrome.google.com/webstore/detail/story-speaker/ohfibfhfbhknfdkipjdopbnegkbpji>

Introduction to Story Speaker:

<https://www.youtube.com/watch?v=wsrzvYYvhH8&feature=youtu.be>

Link to read more about Story Speaker:

<https://docs.google.com/document/d/1hFrBtsBbF2LoZ1FFpXEH7L6fWH1lj24W1-itXnKSXK8/edit>

Basic Template of Story Speaker: https://docs.google.com/document/d/1rXPSayQVVQ-T5cWlhxPbOCC2UJEZTbVWkxqOnC_RnDE/edit?usp=sharing

Steps to install Story Speaker:

- Login in to your Google account
- Go to google.com
- Search for story speaker addon download
- Go to the first link of experiments.google.com
- Click on Launch Experiment
- To install this addon, click on free.
- Give the required permissions to get the addon.
- Once it is installed, go to docs.google.com → Add-ons → Story Speaker → Open Story Speaker

Ask the students to first load the basic template and play it. To play the story, go to Add-ons → Story Speaker → Open Story Speaker, as soon as the story speaker window opens at the right, click on Play your Story → scroll down to Play story in chat preview. The basic template will start playing where once the story pauses, the user needs to give input according to the question asked. According to the response fed either by typing or by speaking, the story will change.

Basic Template of Story Speaker:

Title: The Tale of The Pig Monster ← Title of the story (can be changed)

By: Your name ← Author's Name (can be changed)

START HERE ← Depicts the Start of the story to the machine (CANNOT be changed)

Intro ← Start of the story (CANNOT be changed)

You're standing in a forest. There are two roads in front of you. Do you go to the left or the right?

← Introduction to the story. Students can make it their own way

[1]If you say "left" ← Conditional Statement. Can only change the text in "" according to what input do they expect from the user to diverge their story.

You hear a fearsome growling. A pig monster approaches. It eats you. I'm sorry. [[END]] ←

The story diverges as the user gives appropriate input. The text here can be changed according to the story. [[END]] depicts that the story would end at this point.

[2] **If you say “right”**

You walk down a darkened path. You come to a house. There’s a light on inside. Do you go inside? ← The statement where you want the user to respond should end with a question like this.

If you say “yes” or “go inside”

You knock on the door. It opens, revealing the pig monster. This is the pig monster’s house. It eats you. I’m sorry. [[END]]

If you say “no” or “keep going” or “don’t go inside”

You keep walking. The story would keep going. But you’ll have to write it. [[END]]

Otherwise ← If user enters any input other than the expected ones, the story lands at this point. This is for the [2] if condition. (CANNOT be changed)

Do you want to go in the house? Say “yes” or “no.” It’s getting cold out here. ← (can be changed)

Otherwise ← The story would land at this point if the user gives an unexpected response to the Intro question. (CANNOT be changed)

You’ve got to go to the left or the right. The pig monster isn’t going to wait all day. ← (Can be changed)

Anytime you say “where is the pig monster” ← Optional Statement. Text in “ ” can be changed I don’t know. It could be anywhere. ← (can be changed)

Fallback ← This statement gets executed for any erroneous response which does not get covered in any Otherwise statements. (CANNOT be changed)

Sorry, I didn’t get that. Try asking again. ← (can be changed)

NOTE:

- The statements written in **BOLD** are interpreted by the machine for specific purposes. Thus, in most cases, they cannot be changed as they describe a specific function to the machine.
- Wherever one wants the story to diverge, the statement should end with a question which the user can answer so that according to his/her response, choices can be made. There can be more than one choice for the user to make but it is advisable that whichever choice the user has should be mentioned in the question itself to bring more clarity.
- Indentation is very important in writing an interactive story using story speaker. It lets the machine understand the flow of the story. Indentations are given with the help of TAB key. As you can see, the If statement [1] in the template has been tabbed after the intro part as it shows that this If statement comes under intro. While the other If statement [2], has been tabbed again to show that it comes inside the **If you say “right”** statement.

2. AI Activity Description

Ask the students to explore the basic template and try playing it before they start working on their story. After they understand how to use the tool, ask them to build a story about extraction of any one metal (of high, medium or low reactivity) in which the story talks about each and every step of metal extraction with the help of the knowledge they acquired from the chapter.

6. MATHEMATICS

6.1 Class 6

MATHS

Class 6

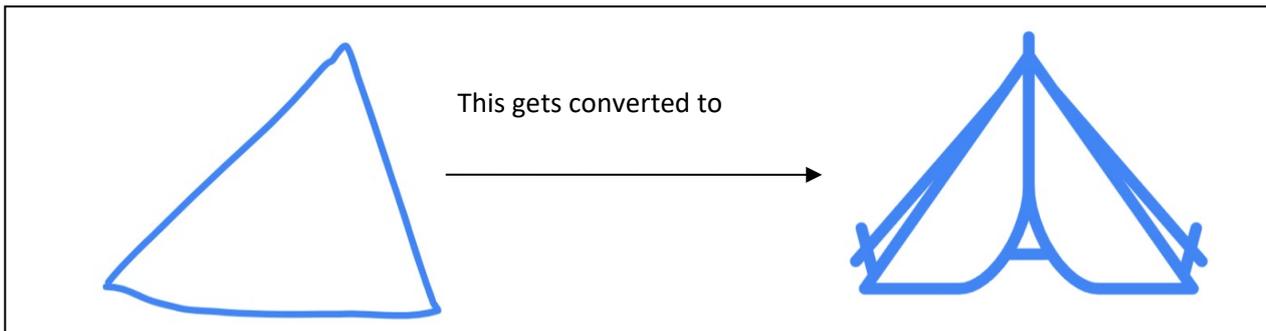
PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter No. 13: Symmetry	
Name of the book	Mathematics Text book for Class 6	
Subject and Artificial Intelligence Integrated	Understanding the concept of Symmetry using AI Experiential Applications	
Objectives	<ul style="list-style-type: none"> To understand concept of Symmetry. To understand difference between symmetrical and unsymmetrical articles/ Objects using AI game. To identify the number of lines of symmetry in any object. (one line, two lines and more than two lines) 	Autodraw.com
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, Black Board chalk, Laptops/ desktops and Internet connections.	
Pre- Preparation Activity	The Students will be asked to collect some objects and observe their pattern of symmetry.	
Previous Knowledge	The students are asked to collect any four or five objects whose halves can be mirror images and to draw the line of symmetry on the object.	

Introduction	The teacher will introduce the concept of symmetry with the help of objects brought by students.	
Methodology	<p>Divide the class into two teams. Activity I: Draw the line of symmetry. Ask students to draw one or more lines of symmetry depending upon the nature of the object. The students will be able to identify symmetrical and unsymmetrical articles.</p> <p>Activity II: Reflection and symmetry Ask students to look at a set of symmetrical objects in the mirror and observe that though the image shown in the mirror is inverse but the symmetry does not get affected.</p> <p>Activity III: Practice Activity ask students to apply their understanding of Symmetry to attempt questions of 13.1 and 13.2</p> <p>Activity IV: Autodraw! For this activity, ask the students to go to https://autodraw.com. Once they land on this website, ask the students to select the first icon from the left side toolbar. This icon activates the AI element of the tool. Now, ask the students to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions would appear in the top row. After looking at the predictions and analyzing how accurate the machine is, ask them to keep an image in mind (say of a monument or a vehicle or thing etc.) and then start drawing it roughly and see at what step the machine is able to predict the image. Once the original drawing comes into picture form, ask the students to observe the line of symmetry in it and describe it to the whole class.</p>	Computer Vision enabled AI application Autodraw.
Discussion on the Text	Open discussion and presentation on: <ul style="list-style-type: none"> a) Symmetry and its application in real life like Road signs, patterns on Board games like Ludo, Chess etc. b) More examples of Reflection and Symmetry. 	
Learning Outcomes	<ul style="list-style-type: none"> ● The students will understand the concept of Symmetry. ● The students will understand the lines of Symmetry. ● The students will understand relationship between Reflection and Symmetry. 	
Self-Evaluation and Follow-Up	Ask students to make a chart with different figures showing symmetrical patterns and lines on symmetry. Ask them to present to small groups. Let them assess how correct they are in their presentations	

GLOSSARY:

1. AI Related Terminologies

Autodraw.com: Autodraw.com is an AI enabled tool which is based on the domain of Computer Vision in which the machine identifies the pattern of your drawing and accordingly maps it with the most similar image. This tool shows various options trying to predict what the user is trying to draw. For example, if a user is trying to draw a tent and he starts with drawing a basic triangle, the machine will compare his/her drawing and show the possible outcomes for the same. The user can then select out of them which one is the most appropriate for him/her.



2. AI Activity Description

For this activity, ask the students to go to <https://autodraw.com>. Once they land on this website, ask the students to select the first icon from the left side toolbar. This icon activates the AI element of the tool. Now, ask the students to draw any shape and let the AI algorithm detect and predict the possible drawings similar to it. The predictions will appear in the top row. After looking at the predictions and analyzing how accurate the machine is, ask them to keep an image in mind (say of a monument or a vehicle or thing etc.) and then start drawing it roughly and see at what step the machine is able to predict the image. Once the original drawing comes into picture, ask the students to observe the line of symmetry in it and describe it to the whole class.

6.2 Class 7

MATHS

Class 7

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter No. 3: Data Handling	
Name of the book	Mathematics Text book for Class 7	
Subject and Artificial Intelligence Integrated	Understanding the concept of Data Handling using AI Tools of Data Acquisition and Data Exploration.	
Objectives	<ul style="list-style-type: none"> ● To understand concept of Data Handling. ● To understand process of Data Handling: <ol style="list-style-type: none"> a) Sources of Data b) Collection of Data – Data Acquisition c) Organization & Representation of Data – Data Exploration. ● To understand process of Data Handling in real-life situations using AI Tools of Data Acquisition and Data Exploration. 	<ul style="list-style-type: none"> ● Sources of Data ● Data Acquisition ● Data exploration
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Graph Paper, Colored Pen, paper, Black Board chalk, Laptops/ desktops and Internet connections.	
Pre-Preparation Activity	The Students will be asked to collect some Newspaper articles related to Air Pollution. A picture of a Graph showing the Air quality of India over the past 10 years will also be displayed	
Previous Knowledge	The students are asked to recall what they have already done with regard to collection of Data, Tabulations and Bar Graphs. Some questions would be given to them to solve.	

Introduction	The teacher will introduce the concept of Double Bar Graph in order to understand how to make comparative Analysis of two or more Data Sets.	
Methodology	<p>Divide the class into two teams. Activity I: Air Pollution in Delhi – A Case Study.</p> <p>Ask students to read articles on Air Pollution in Delhi from different Sources: Newspaper, Internet etc. Ask them to collect data on changing Air Pollution Levels in Delhi and represent it with the help of some graphical/pictorial representation. Ask the students to go on https://datavizcatalogue.com and explore various types of graphs and the way to use these. Ask them to select representation which will suit their data best. Students will be able to recognize various patterns/trends out of their representations which can be used to represent this problem. Ask the students to explore the possibilities of using AI in addressing this problem.</p> <p>Activity II: Practice Activity</p> <p>ask students to apply their understanding of Data Handling to attempt questions of 3.1 &3.2</p>	
Discussion on the Text	<p>Open discussion and presentation on:</p> <ul style="list-style-type: none"> c) Observation made by each group on the changing levels of air pollution in Delhi. d) What are the causes? e) How can the existing problem of deterioration of air quality be solved? 	
Learning Outcomes	<ul style="list-style-type: none"> ● The students will understand the concept of Data Handling. ● The students will understand the process of Data Handling: <ul style="list-style-type: none"> - Sources of Data - Collection of Data – Data Acquisition - Organization & Representation of Data – Data Exploration. ● The students will understand the process of Data Handling in real-life situations using AI Tools of Data Acquisition and Data Exploration. 	https://datavizcatalogue.com
Self-Evaluation and Follow-Up Activity	<p>Ask students to choose some issues in their surrounding and make a presentation with the help of AI.</p> <p>Ask them to present to small groups.</p> <p>Let them assess how accurate they are in their presentations.</p>	

GLOSSARY:

1. AI Related Terminologies

Data Acquisition: Data acquisition refers to acquiring authentic data crucial for the AI model from reliable sources. The data acquired can then be divided into two categories: Training Data and Testing Data. The AI model gets trained on the basis of training data and is evaluated on the basis of testing data.

There can be various ways in which students can collect data. Some of them are:

- Surveys
- Web Scraping
- Sensors
- Cameras
- Observations
- Application Program Interface

Data Exploration: After acquiring data comes the need to analyze the data. For this, they need to visualize the acquired data in some user-friendly format so that they can:

- Quickly get a sense of the trends, relationships and patterns contained within the data.
- Define strategy for which model to use at a later stage.
- Communicate the same to others effectively.

To visualize data, various types of visual representations can be used by the students like diagrams, charts, graphs, flows, etc. An online open-source website is available at <https://datavizcatalogue.com> where the students can observe various types of representations that can be used in data visualization. On this platform, the students will be able to get the description of any graph they select and the website will also guide them to various software/online tools which can be used to generate the same.

2. AI Activity Description

Data Acquisition: In this activity, ask the students to search for data regarding Air Pollution in Delhi through various sources. Ask them to identify authentic sources which can provide reliable information. They can go for either online or offline sources of acquiring data. After identifying reliable data sources, ask the students to get data and store it for the next activity.

Data Exploration: Now that the data has been acquired, ask the students to explore it through visual representations. Ask students about various visual representations that could be used to present their data in a meaningful manner. Guide the students to visit <https://datavizcatalogue.com> and observe various types of graphical/ pictorial representations. As soon as they land upon the website, they need to go to some of the graphs and read their descriptions and how to create them. After exploring the resource, ask the students to select the type of representation that according to them would be most appropriate for visualizing their data. Once they finalize their graph, ask them to draw the same on a chart paper using the data which they acquired. Now that the students have drawn the graph, they need to present it to the whole class in such a way that they are able to analyze some meaningful pattern out of it. The pattern or the trend recognized out of the representation should lead them towards solving the problem of Air pollution in Delhi. Finally, ask the students to discuss how AI can be leveraged in this situation.

MATHS
Class 8

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter No. 13: Direct and Indirect Proportion	
Name of the book	Mathematics Text book for Class 8	
Subject and Artificial Intelligence Integrated	Understanding the concept of Direct and Indirect Proportion using Google maps (AI App)	
Objectives	<ul style="list-style-type: none"> ● To understand the concept of Direct Proportion. ● To understand the concept of Inverse Proportion. ● To understand the concept of Direct and Inverse Proportion using an AI App. ● To understand the application of Direct and Inverse Proportion in real life. 	Google map in determining real time and speed relation: Rule Based AI App.
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, Black Board chalk, Laptops/ desktops and Internet connections.	
Pre-Preparation Activity	<p>Observe that change in one quantity leads to change in the other quantity.</p> <p>(i) If the number of articles purchased increases, the total cost also increases.</p>	

	<p>(ii) The more the money deposited in a bank, more is the interest earned.</p> <p>(iii) As the speed of a vehicle increases, the time taken to cover the same distance decreases.</p> <p>(iii) For a given job, the more the number of workers, the less will be the time taken to complete the work.</p> <p>Two quantities may change in such a manner that if one quantity increases, the other quantity decreases and vice versa.</p>	
Previous Knowledge	The students are made to recall about constant and variables in order to understand the concept of Direct and Inverse Proportion.	
Introduction	The teacher will introduce the concept of Direct and Inverse proportion with the help of real-life examples.	
Methodology	<p>Activity I: Google Maps. Inform how Google maps help us to know about the real time needed to travel from one place to another on the basis of the speed of the vehicle. Ask students to calculate the time for the same distance if travelling by</p> <ol style="list-style-type: none"> 1. car 2. bus 3. on foot (walking). <p>Activity II: Real-life Problem Solving Discuss to make students understand the concept and calculation of Direct and Inverse Proportion taking some real-life examples.</p> <p>(i) Number of workers required to complete a construction task. (Impact of change in number of workers on duration of completion of task)</p>	

	<p>(ii) Speed of vehicle and distance to be covered. (Impact of change in speed on distance covered)</p> <p>(iii) Distance to be travelled and time taken in covering that distance (Impact of change in distance travelled on time taken keeping speed as the constant factor)</p> <p>Activity III: Practice Activity ask students to apply their understanding of Symmetry to attempt questions of 13.1 and 13.2</p>	
Discussion on the Text	<p>Discussion and presentation on:</p> <p>a) Two quantities x and y are said to be in direct proportion if they increase (decrease) together in such a manner that the ratio of their corresponding values remains constant. That is if $x / y = K$. [k is a positive number], then x and y are said to vary directly.</p> <p>b) Two quantities x and y are said to be in inverse proportion if an increase in x causes a proportional decrease in y (and vice-versa) in such a manner that the product of their corresponding values remains constant. That is, if $xy = k$, then x and y are said to vary inversely.</p>	
Learning Outcomes	<ul style="list-style-type: none"> ● The students will understand the concept of Direct Proportion. ● The students will understand the concept of Inverse Proportion. ● The students will understand the concept of Direct and Inverse Proportion using the AI App. ● The students will understand the application of Direct and Inverse Proportion in real life. 	
Self-Evaluation and Follow-Up	<p>Ask the students to analyze the real-life problems in their daily life and apply the concept of direct and inverse proportion.</p> <p>Ask the students to explore what other available AI applications can be used as a Rule Based AI App.</p>	

GLOSSARY:

1. AI related terminologies

Google Maps: Google Maps is a web mapping service developed by Google. It offers satellite imagery, aerial photography, street maps, 360° panoramic views of streets (Street View), real-time traffic conditions, and route planning for traveling by foot, car, bicycle and air (in beta), or public transportation. Google maps effectively use AI in calculating the estimated time of arrival with the help of real-time traffic conditions.

2. AI Activity Description

For this activity ask the students to go to <https://maps.google.com> and enter a specific source and destination. Once they have fed the input, they will get an estimated time of arrival at the destination on the basis of real-time traffic conditions. Ask the students to note down the distance shown between these 2 points and the estimated time taken for the same. Now, ask the students to check the time taken for the same distance by another means of transport. Students can change the means of transport by clicking on various icons. Ask the students to note down time taken to reach the destination by car, bike and on foot (walking). Once they have got the information, ask them to calculate the speed of the vehicle for all the three datasets. Now, ask the students to identify the proportionality between time, speed and distance.

MATHS

Class 9

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter No. 15: Probability	
Name of the book	Mathematics Text book for Class 9	
Subject and Artificial Intelligence Integrated	Understanding the concept of Probability using AI Games.	
Objectives	<ul style="list-style-type: none"> To understand concept of probability. To determine the outcome of probability using an AI Game. To understand the terms Experiment, Event and Outcome with regard to probability. To know how to calculate the Experimental Probability of any event. To understand why probability ranges between 0 to 1. To apply the concept of probability in real life situations. 	https://www.afiniti.com/corporate/rock-paper-scissors
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, Black Board chalk, Laptops and Internet connections.	
Pre- Preparation Activity	The Students will be asked to bring a number of coins, dice and packs of playing cards from their home, one day in advance.	
Previous Knowledge	The students are given an idea regarding terms of Probability: Experiment, Event and Outcome. They will be made to do different activities like Tossing a coin, throwing a dice and drawing a card from a pack of playing cards.	

Introduction	Based on the above-mentioned activities students will get familiar with the basic terms of Probability- Experiment, Event and Outcome.	
Methodology	<p>Activity I: students are divided into groups of two (pairs) and asked to play the AI Game: Rock, Paper and scissors in order to predict the probability of the desired outcome.</p> <p>Activity II: students are asked to perform different activities in their respective groups and make a record of the outcome:</p> <ol style="list-style-type: none"> Tossing a coin and finding out the probability of getting Heads vs Tails. Throwing a Dice to find out the probability of getting an odd number. Getting a Queen from a pack of playing cards.... Etc. <p>Activity III: Practice Activity Ask students to apply their understanding of Probability to attempt questions of 15.1.</p>	https://www.afiniti.com/corporate/rock-paper-scissors
Discussion on the Text/ Activity	<p>There is an open discussion on the occurrence of the experiment and the desired outcome of it. The students would be able to apply the concept understood in determining the Experimental Probability:</p> <p>$P(E) = \frac{\text{Number of Favorable (Desired) Outcomes}}{\text{Total number of all possible outcomes of the experiment}}$</p>	
Learning Outcomes	<ul style="list-style-type: none"> The students understand the concept of probability. The students understand the terms Experiment, Event and Outcome with regard to probability. The students will be able to calculate the Experimental Probability of any event. The students understand why probability ranges between 0 to 1. The students will be able to apply the concept of probability in real life situations. 	
Self-Evaluation and Follow-Up Activity	<p>The students will be asked to observe and record the occurrence of different events at their home or surroundings with respect to probability.</p> <p>The teachers evaluate students' discussion and presentation on understanding concepts of Probability.</p>	

GLOSSARY

3. AI Related Terminologies

Rock, Paper Scissors: This rock-paper-scissors game illustrates the basic principles of an adaptive artificial intelligence technology. Here, the artificially intelligent system learns to identify patterns of a person's behavior by analyzing their decision strategies in order to predict future behavior. This game is based on the domain **Data for AI** where the machine collects and analyzes data to predict future outcomes.

Link to the game: <https://www.afiniti.com/corporate/rock-paper-scissors>

The objective of playing this game is to illustrate how humans work in certain patterns and how an AI-enabled machine can detect those patterns for predicting future outcomes.

4. AI Activity Description

Rock-Paper-Scissors: Ask the students to go on the link: <https://www.afiniti.com/corporate/rock-paper-scissors> and click on play the game.

As soon as they land up in the game arena, they would observe 3 buttons each for Rock, Paper and Scissors. They need to choose one on the basis of the move which they want to make against AI. Remember that the hand at the left the human's hand while the one on the right side is of AI. As soon as the student makes a move, the AI also randomly selects one out of the three and according to the conventional rules, one would win against the other. The score gets updated at the top while in the middle of the screen, one can see which round was won by whom as the red colour depicts victory. Ask students to play 20 rounds of the game and keep checking the scores.

Students will be able to identify how the AI-enabled machine is taking our choices as data to train itself in such a way that it can predict our future moves and can win against us. Ask the students to try the following:

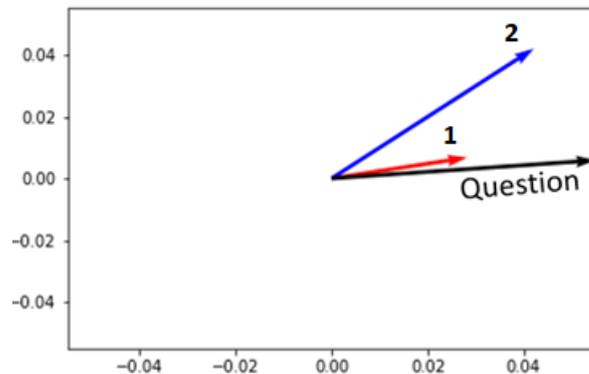
1. Try changing their moves randomly and observe how the machine copes with it.
2. Try making the same move at least 7 times and then changing it abruptly. How does the machine react to it?

MATHS**Class 10**

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter No. 8: Introduction to Trigonometry	
Name of the book	Mathematics Text book for Class 10	
Subject and Artificial Intelligence Integrated	Understanding the concept of Trigonometry and identities using Cosine Similarities.	
Objectives	<ul style="list-style-type: none"> • To understand the concept of Trigonometry. • To understand about the trigonometric ratios of an acute angle in a right-angle triangle. • To understand the trigonometric ratios of complementary angles • To understand the trigonometric ratios of specific angles such as 0, 30, 45, 60 and 90. • To study about different Trigonometric Identities. 	Cosine Similarity
Time Required	3 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, Black Board chalk, Laptops and Internet connections.	
Pre- Preparation Activity	The Students will be asked to recall the Pythagoras Theorem. Introduce the Angle of elevation and the angle of depression using some practical examples.	
Previous Knowledge	The students are given an idea how a right-angled triangle can be imagined to be formed and used to calculate heights and distances with the help of trigonometry in these situations.	

Introduction	The teacher will explain the concept of Trigonometry and talk briefly about its history and usage in order to make the students understand about its real-life applications in constructing buildings, optics and statistics.	
Methodology	<p>The class is divided into two teams.</p> <p>Activity I: Flash card Activity: Students are shown flash cards with an image of a right-angled triangle on every card and some questions regarding calculation of its trigonometric ratios. The team members will discuss among themselves and answer the questions.</p> <p>Activity II: Grid Activity Ask students to create a grid with angles and Trigonometry ratios. They will be able to write the values of different ratios of specific angles. The students will be able to solve the questions using Trigonometric Ratio and Trigonometric Ratio of Complementary Angles.</p> <p>Activity III: Trigonometric Identities Ask students to prepare a chart on Trigonometric ratios. They will be told that an equation involving different trigonometric ratios to an angle is called Trigonometric Identities.</p> <p>Activity IV: Practice Activity Ask students to apply their understanding of Trigonometry to attempt questions of 8.1, 8.2 and 8.3</p> <p>Activity V: Understanding Cosine Similarity With the help of the knowledge of trigonometric functions and terminologies, students will be able to understand the concept of Cosine Similarity. Give the students three statements: 1. Mira is my mother. 2. Jai is my father. 3. Who is my mother? Now the students have to observe these statements and figure out which statement out of the first two is closer to the third statement in terms of the words used? Now, as they select the first statement to be closer, the concept of cosine similarity will be explained to them in</p>	

which the sentences are taken as vectors having amplitude and direction. These sentences are then visually plotted in a 2D plane in such a way that all have the same origin. Now, to check which statement is closest to the question, we check the cosine angle between all the statements. The statement having minimum cosine angle with the question is considered to be the most similar statement to the question. This concept is known as cosine similarity.



As shown in the diagram, three vectors have been plotted on a 2D map where the red, blue and black arrows depict statement 1, 2 and 3 respectively. Since statement 1 is more similar to the question, the angle between these two statements is less while statement 2's angle is more with the question. This shows how different the two statements are.

Discussion on the Text/ Activity

There is an open discussion and presentation on:

- a) Trigonometry
- b) Trigonometric Ratios.
- c) Trigonometric Identities.

Learning Outcomes

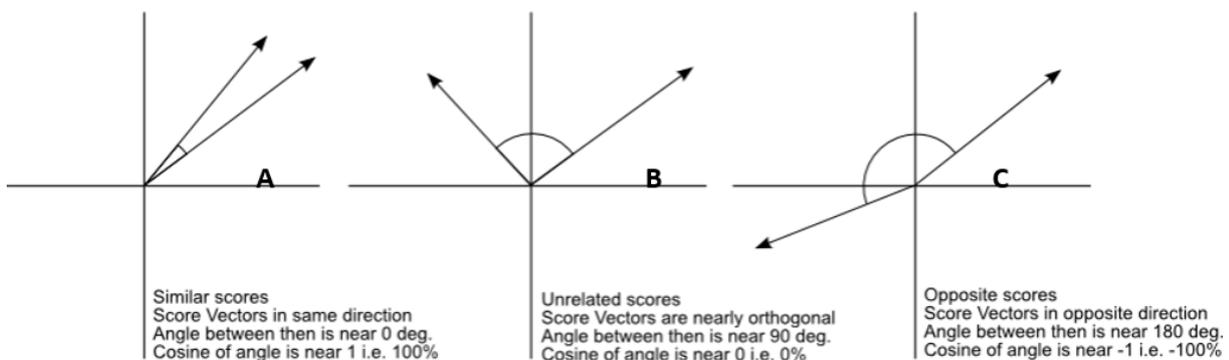
- The students will understand the concept of Trigonometry.
- The students will understand about the trigonometric ratios of an acute angle in a right-angle triangle.
- The students will understand about the trigonometric ratios of complementary angles
- The students will understand about the trigonometric ratios of specific angles such as 0, 30, 45, 60 and 90.

	<ul style="list-style-type: none"> Students learn about different Trigonometric Identities. 	
Self-Evaluation and Follow-Up	<p>The students will be asked questions to find out the understanding of the concept of Trigonometry its Ratios & Identities.</p> <p>The students will be asked to find out about the concept of parallax and how it is used.</p>	

GLOSSARY:

1. AI Related Terminologies

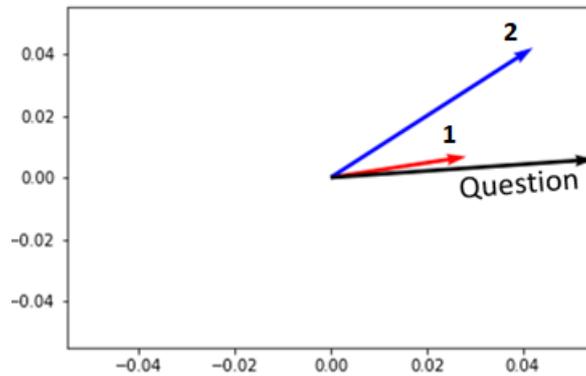
Cosine Similarity: Under the domain of Natural Language Processing in AI, the words are considered to be n-dimensional entities which can have much more information than what we can visualize. Also, all the statements which are to be processed under NLP for the AI algorithm, are considered as vectors which have an amplitude and direction. Now, to compare two statements to identify how similar they are, the cosine angle between these statements is calculated. According to the Cosine Similarity model, the statements whose cosine angle is the smallest are closest to each other in terms of the words used in them. Statements which have a 180degree angle in them are considered to be opposite to each other while those having almost perpendicular angles are said to be unrelated to each other. Here is a graphical representation for the same:



For example, the dataset is of two statements which are:

1. Mira is my mother.
2. Jai is my father.
3. Who is my mother?

Now, the third statement is the comparison statement for which the closest relatable sentence has to be identified. All the three statements after reducing the dimensions, are plotted on a 2D plane as follows:



As one can observe, statement 1 (Red) has a smaller cosine angle value with the question vector statement 3, (black) while statement 2 (blue) is farther from statement three. This shows how the similarity of two statements can be identified mathematically by calculating the cosine angles for the same. This concept is known as Cosine Similarity.

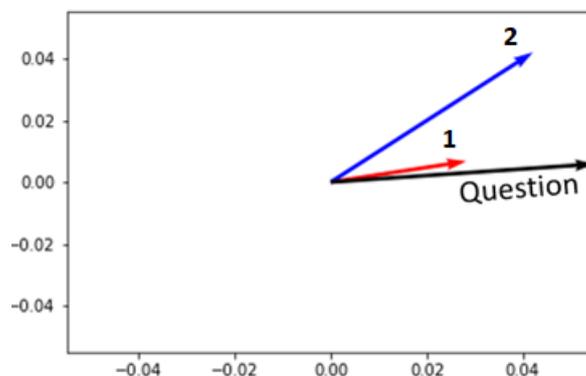
2. AI Activity Description

With the help of the knowledge of trigonometric functions and terminologies, students will be able to understand the concept of Cosine Similarity. Give the students three statements:

1. Mira is my mother.
2. Jai is my father.
3. Who is my mother?

Now the students have to observe these statements and figure out which statement out of the first two is closer to the third statement in terms of the words used?

As they select the first statement to be closer, the concept of cosine similarity is explained to them in which the sentences are taken as vectors having amplitude and direction. These sentences are then visually plotted in a 2D plane in such a way that all have the same origin. Now, to check which statement is closest to the question, we check the cosine angle between all the statements. The statement having minimum cosine angle with the question is considered to be the most similar statement to the question. This concept is known as cosine similarity.



As shown in the diagram, three vectors have been plotted on a 2D map where the red, blue and black arrows depict statement 1, 2 and 3 respectively. Since statement 1 is more similar to the question, the angle between these two statements is less while statement 2's angle is more with the question. This shows how different the two statements are.

SOCIAL SCIENCE

6.6 Class 6

SOCIAL SCIENCE

CLASS 6

Chapter Covered	Unit 3 Chapter 5 Panchayati Raj	Integration of Artificial Intelligence
Name of the book	Social and Political Life -I , Class 6, NCERT	
Subject and Artificial Intelligence Integrated	Understanding Panchayati Raj and its functioning using the concept of Neural Networks in Artificial Intelligence	
Objectives	<ul style="list-style-type: none"> ● To understand how a Neural network works ● To draw an analogy between Gram Sabha and Gram Panchayat functioning and the way in which Neural Network functions ● To understand different levels of Panchayat. ● To understand the link between Gram Sabha and Gram Panchayat ● To understand how Gram Sabha and Gram Panchayat are different. 	Introduction to Neural Network using three levels of Panchayat as an analogy
Time Required	3 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, blackboard, chalk, smartboard/screen and projector, internet websites for data acquisition & laptops	
Pre-Preparation Activity	The students are given a presentation on how Neural Networks function and are made to play the Neural Network Game	
Previous Knowledge	Students are asked what they know about how governance in rural areas function	

Introduction	There is a class discussion on common problems encountered in rural areas and how government policies have been formulated to resolve these	
Methodology	<ul style="list-style-type: none"> ● The teacher leads the students to role play with a situation involving a common problem in a rural area with a plaintiff and a Panchayat and how the Panchayat takes action to resolve the problem keeping in mind the policies of the government ● The students are asked to present the role play ● The students are now asked to play the Neural Network Game again with the Problem being given to the input layer while the solution is derived and presented by the output layer with help from the hidden layers that will take government policies into consideration while deriving a solution and passing it to the next layer. ● They are asked to present a final response to the Problem and the solution as provided by the Gram Panchayat. 	Using Neural network in AI to explain the concept of layers of Panchayati Raj
Discussion on the Text	<p>There is an open discussion on:</p> <ul style="list-style-type: none"> ● What problems did the villagers have? ● How was this problem solved? ● What is the importance of Gram Sabha? ● Is there any link between Gram Sabha and Gram Panchayat? ● What is the difference between Gram Sabha and Gram Panchayat 	
Learning Outcomes	<ol style="list-style-type: none"> 1. Students are able to understand how a Neural network works 2. Students are able to draw an analogy between Gram Sabha and Gram Panchayat functioning and the way in which Neural Network functions 3. They will be able to understand different levels of Panchayat and its functions. 4. Students will be able to understand the link between Gram Sabha and Gram Panchayat 	

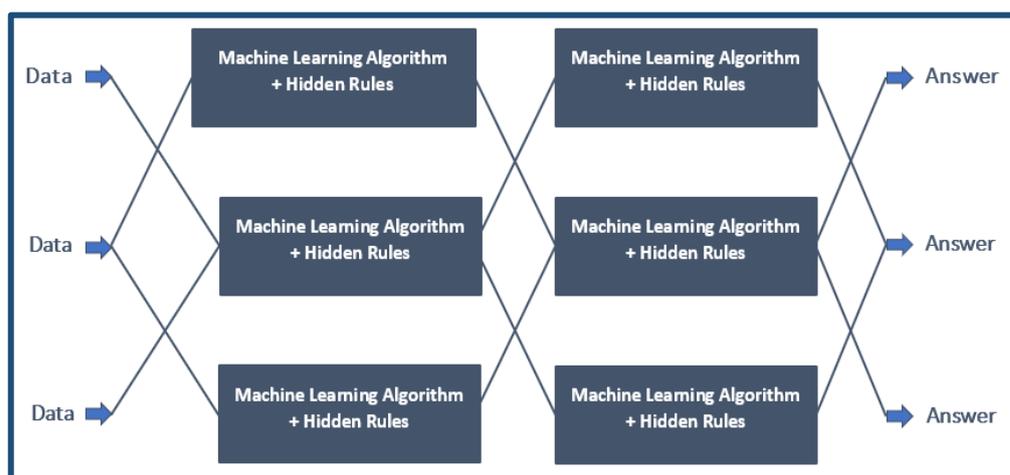
	5. Students will be able to understand how Gram Sabha and Gram Panchayat are different	
Self-Evaluation and Follow-Up	<ul style="list-style-type: none"> • The students are asked to take the example of any one task done by a Panchayat in their area or nearby rural area and find out the following <ul style="list-style-type: none"> ○ Why was it taken up? ○ Where did the money come from? ○ Whether or not the work has been completed 	
Follow-up Activity	<ul style="list-style-type: none"> • The students will be asked to identify more such issues and look for solutions to the same 	

GLOSSARY

1. AI Related Terminologies

Neural Networks

- a. Neural networks are loosely modelled after how neurons in the human brain behave. The key advantage of neural networks are that they are able to extract data features automatically without needing the input of the programmer. A neural network is essentially a system of organizing machine learning algorithms to perform certain tasks. It is a fast and efficient way to solve problems for which the dataset is very large, such as in images.



- b. This is a representation of how neural networks work. A Neural Network is divided into multiple layers and each layer is further divided into several blocks called nodes. Each node has its own task to accomplish which is then passed to the next layer. The first layer of a Neural Network is known as the input layer. The job of an input layer is to acquire data and feed it to the Neural Network. No processing occurs at the input

layer. Next to it, are the hidden layers. Hidden layers are the layers in which the whole processing occurs. Their name essentially means that these layers are hidden and are not visible to the user.

- c. Each node of these hidden layers has its own machine learning algorithm which it executes on the data received from the input layer. The processed output is then fed to the subsequent hidden layer of the network. There can be multiple hidden layers in a neural network system and their number depends upon the complexity of the function for which the network has been configured.

2. AI Activity Description

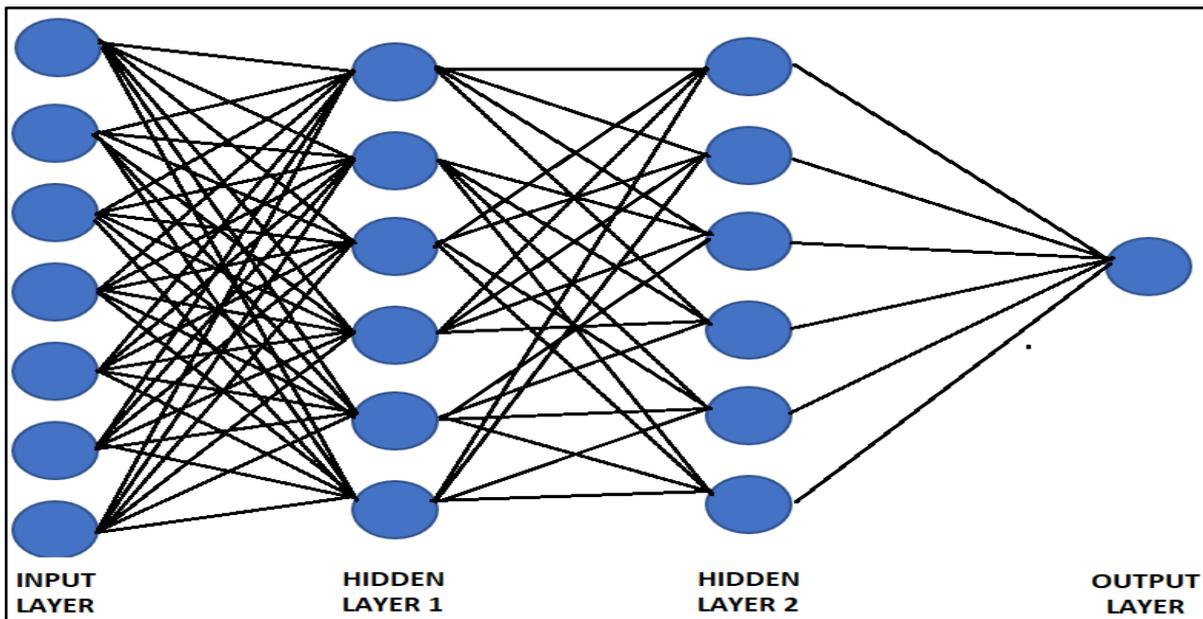
Human Neural Network

Materials Required:

ITEM	QUANTITY
Images (To be kept with the facilitator)	2
Post-It Notes	80
Sketch-pens	40

Game Structure:

Layers	Number of Students	Number of chits
Input Layer	7	6
Hidden Layer 1	6	4
Hidden Layer 2	6	2
Output Layer	1	-
TOTAL	20	-



Ground Rules:

- No one is allowed to talk or discuss till the game ends. Fun of the game lies in playing it honestly.
- Each layer should sit distant to each other.
- The image should only be shown to the Input layer and no one else.
- The game is supposed to be played silently. This means that one has to write a word on the chit and pass on the chit without speaking out aloud.
- One needs to process the data as fast as possible, hence not much time can be taken to write and pass on the chits.
- Input layer nodes cannot discuss the image shown with each other. Everyone has to use their own discretion.
- No sentences or multiple words are to be written on the chit. Only one word per chit is allowed.
- Once the task of a layer is finished, that layer needs to go and sit aside and not disturb others till the game ends.

Game Instructions:

- Input Layer:
 - 7 students will be standing as the nodes of an input layer.
 - All of them will be shown an image. After looking at it, they need to write 6 different words on 6 different chits. They have to choose the words which describe the image in the best way possible. They can also repeat the words if needed.
 - After making these chits, they need to pass on one chit to each of the nodes of hidden layer 1. That is, 1 chit will be given to one member.
 - Analogy with the chapter: The Input layer has an analogy with the common people of a village who take their problems/issues to the panchayat. This is where the data starts flowing to the Gram Panchayat which is the first tier of Panchayati Raj.

- Hidden Layer 1:
 - 6 students will be standing as the nodes of hidden layer 1.
 - Each of them will receive 7 chits from 7 different input nodes. Now they have to take a good look at the chits and then write down 4 different words on 4 different chits. For this, they can either use the same words as the input layer did, or they can make their own information (relevant to the context) and write it.
 - Now these 4 chits are to be given randomly to any 4 nodes of Hidden Layer 2. Out of the 6 nodes of 2nd hidden layer, one can choose any 4 and give one chit to each. (For best results, each node of hidden layer 2 should get almost the same number of chits thus the division should be done properly)
 - Analogy with the chapter: In this layer, the data fed by the people at the input layer has now reached the Gram Panchayat. Gram Panchayat looks into the matter and tries to cull out the important matters. The Gram Panchayat then holds a meeting for the same and carries forward the crucial matters to the Gram Sabha.

- Hidden Layer 2:
 - 6 students will be standing as the nodes of hidden layer 2.
 - Each one of them will get some number of chits from the previous layer. Now they have to perform the same task as hidden layer 1 and have to write down 2 different words on 2 different chits and pass it on to the output layer.
 - Analogy with the chapter: Now the information has reached the Gram Sabha from Gram Panchayat. The role of Gram Sabha is to make sure that Gram Panchayat is doing their work responsibly. Thus, Gram Sabha now looks into the matter and then after having meetings about its implementation, it then goes to Zila Parishad for further permissions.

- Output Layer:
 - Finally, the output layer node will get 12 chits. Now she/he has to understand all the words and has to guess which image was shown to the input layer initially.
 - Output layer will then write a summary out of all the words received to explain his/her deduction. The summary should not be more than 5 lines.
 - Analogy with the chapter: Zila Parishad is the highest authority for Panchayati Raj. The information flows from the people to Gram Panchayat which then reaches the Gram Sabha and finally comes to the Zila Parishad. Zila Parishad is responsible for getting the plans implemented in their respective districts. Finally, Zila Parishad is responsible for showcasing the output of the whole process and depending upon its efficient implementation, the whole system can be rated.
- Finally, the output layer presents this summary in-front of everyone and the real image is finally revealed to all.
 - If the summary is accurate enough, the whole network wins else they lose.

SOCIAL SCIENCE

Class 7

Chapter Covered	Chapter 2 Inside Our Earth	Integration of Artificial Intelligence
Name of the book	Our Environment, Class 7, NCERT	
Subject and Artificial Intelligence Integrated	Understanding the structure of the Earth and types of rocks using AI training and classification model	
Objectives	<ul style="list-style-type: none"> ● To identify the different types of rocks by creating a rock cycle ● To identify construction of various structures and list the types of rock used for it. 	
Time Required	3 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, blackboard, chalk, smartboard/screen and projector, internet, VR boxes & laptops	
Pre- Preparation Activity	The students are given the chance to watch a video/VR presentation on the interior of earth	
Previous Knowledge	Students are asked what they know about various types of rocks	
Introduction	There is an AV clip from “Journey to the Centre of the Earth” shown to students in preparation for the lesson	
Methodology	<ul style="list-style-type: none"> ● Students are asked to read about the layers of the earth and identify the various kinds of rocks ● They are asked to discuss about physical properties and chemical composition of rocks and minerals. ● Now, the students start collecting the images of various monuments and they try to identify which rock is used to make which monument. 	AI Model Training and Classification.

Discussion on the Text	<p>There is an open discussion on:</p> <ul style="list-style-type: none"> ● Three layers of the Earth? ● Rocks and types of rocks? ● Uses of rocks? 	
Learning Outcomes	<ul style="list-style-type: none"> ● The students would be able to understand about interior of earth and its three different layers. ● The students will be able to understand and identify different types of rock. ● The students will be able to understand and learn about the rock cycle. ● They would be able to understand the physical and chemical composition of rocks. 	
Self-Evaluation and Follow-Up	<ul style="list-style-type: none"> ● The students are asked to collect pictures of some monuments and find out which are the rocks used to build them. 	
Follow-up Activity	<p>Make a presentation on your findings regards the monuments identified and the type of rocks used to build this monument</p>	

GLOSSARY:

1. AI Related Terminologies:

AI Model Training: An algorithm is said to be artificially intelligent if it gets trained and can make decisions/predictions by its own. The intelligence which a machine gains comes by training the machine with the appropriate dataset. For example, a machine is to be created which needs to classify an image as either an apple or a banana. To achieve this task, the machine is trained with hundreds of images of apples and bananas each. While training, the machine extracts features from the image dataset of apples which would help the machine classify any image of an apple as an apple. The same is done for the banana dataset. Finally, after training, the machine is tested by providing an image of either an apple or banana. If the machine is able to classify it correctly, the efficiency is said to be good else it gets re-trained on a better dataset.

Training an AI model requires two datasets: Training Data and Testing Data. The machine is first fed the training data from which it makes its own rules which help it to predict the output. Then the testing data is used to check the efficiency of the model. Once training and testing is done, the model is deployed for use.

Classification: Machine Learning algorithms can be broadly classified into three families: Supervised learning, Unsupervised learning and Reinforcement learning. Classification is a part of Supervised learning model. Classification models work on labelled datasets and are used to predict the label of the testing dataset. For example, 100 images of apples and 100 images of bananas have been taken as a training dataset for the AI model. These 200 images have been labelled as apples or bananas respectively. This labelled data is then fed to the machine which trains itself by extracting common features from the dataset and understanding which features come under the apple label and which ones come under the banana label. At the time of testing, the machine takes an input image and extracts features from it which are then compared with the features marked under both the labels. On the basis of the degree of similarity, the machine will label the testing image as either apple or banana. This process is known as Classification.

2. AI Activity Description

Ask the students to understand the properties of all three types of rocks and ask them to collect the images of various monuments in which the rocks have been used for construction. Let the students explore these images and ask them to classify each of the images as igneous, metamorphic or sedimentary rock. Once they are able to classify them, ask students about their approach to classification and explain that this is how the AI machines do classification. The AI models get trained on the basis of knowledge (instructions) available and then give the desired classification output.

SOCIAL SCIENCE**Class 8**

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chap 1 HISTORY – How, When and Where	
Name of the book	OUR PASTS –III PART 1 Class 8	
Subject and Artificial Intelligence Integrated	History and AI	(Data Acquisition & Data Exploration)
Objectives	The objective of the lesson is to understand the importance of dates in collecting information of time periods in history highlighting the use of records for administrative purposes.	
Time Required	2-3 periods	
Classroom Arrangement	Regular classroom arrangement	
Material Required	Text book, Questionnaire, presentation – through PowerPoint / charts	
Pre- Preparation Activity	Teacher to discuss and explain about data and its importance. Examples in collecting, classifying and recording data to be shared.	
Introduction/Previous Knowledge	Learners dwell upon their understanding about data interpretation in Mathematics in the form of graphs. Ques 1; How do you think we know about different events that happened in the past? Do you think that there are different ways to collect information? Do you think that the official records of the past tell us something about the thoughts of the people, food, costumes, culture and hobbies of that time ?	

	<p>If you had to rewrite history what other information do you think you would need to collect to get a complete picture of those times?</p> <p>If we draw a time-line of history do you think there will be a change in the way we collect data? Will AI be of some benefit ?</p> 	<p>(Data Acquisition & Data Exploration)</p>
<p>Methodology</p>	<p>!. Children are divided into groups of 5 and asked what data would they like to collect about the past besides the ones collected by the British Administration?</p> <p>Some examples – data about the</p> <p>Types of Occupation Types of Transport Types of Houses Types of Entertainment</p> <p>After collecting the data for any one of the above the students will be asked to prepare a bar graph and a presentation</p> <p>What resources will you use to collect this data? Library resources, interviewing historians, old people and their experiences, Government data sets etc.</p>	
<p>Discussion on the Text</p>	<p>Discussion on</p> <ul style="list-style-type: none"> • How can they make this process simpler with the help of using AI? • How can AI help to collect data? • Why is it important to understand the importance of Data for understanding AI? 	<p>(Data Acquisition & Data Exploration) Use of Sketchy Graphs to represent data sets.</p>
<p>Learning Outcomes</p>	<p>Students will be able to understand the importance of data</p> <p>Students will be able to identify the sources for data</p> <p>Students will be able to interpret the data through graphs and presentation</p>	

Self-Evaluation and Follow-Up	Students will listen to each other and learn from their peers during the presentation.	
Follow-up Activity	They will collectively make a collage for the school to talk about the importance of data in History and how data can be collected and stored in the future through AI.	

GLOSSARY

1. AI Related Terminologies

Data: Data can be a piece of information or facts and statistics collected for reference or analysis.

Data Acquisition: AI Project cycle is a framework which is used to design an AI project keeping all the crucial factors into consideration. The project cycle consists of 5 steps namely: problem scoping, data acquisition, data exploration, modelling and evaluation. Data acquisition refers to acquiring authentic data crucial for the AI model from reliable sources. The data acquired could be then divided into two categories: Training Data and Testing Data. The AI model gets trained on the basis of training data and is evaluated on the basis of testing data.

There can be various ways in which you can collect data. Some of them are:

- Surveys
- Web Scraping
- Sensors
- Cameras
- Observations
- Application Program Interface

2. AI Activity Description

In this activity, students will be collecting data around various parameters which will help them in exploring history in a better way. They will think of areas which interest them the most and search online for various sources of data. They then need to select reliable sources of data and seek authentic information of out them. After acquiring data there comes the need to analyze the data. For this, they need to visualize the acquired data in some user-friendly format so that they can:

- Quickly get a sense of the trends, relationships and patterns contained within the data.
- Define strategy for which model to use at a later stage.
- Communicate the same to others effectively.

To visualize data, various types of visual representations can be used by the students like diagrams, charts, graphs, flows, etc. Using these representations, students need to understand the patterns of lifestyle in the past and deliver a presentation on the same.

SOCIAL SCIENCE

Class 9

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter No. 3: Poverty	
Name of the book	Economics Class9	
Subject and Artificial Intelligence Integrated	AI integrated with Poverty Trends in India: Causes of Poverty and Anti-Poverty Measures.	
Objectives	<ul style="list-style-type: none"> To understand the concept and Dimensions of Poverty with the help of problem Scoping concept of AI project cycle. To understand the poverty trends in India and Global Poverty Trends. To understand the Poverty Line and Poverty Estimation. To study two typical cases of Poverty: Urban case & Rural case. To understand Interstate disparities. To understand the various causes of Poverty To understand the Anti-Poverty Measures taken by the Government for poverty eradication. 	<p>4 W Canvas: Who, What, Where and Why</p> <p>} Data Acquisition and Data Exploration</p> <p>Decision Tree: Rule Based AI Model</p>
Time Required	2 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, Black Board chalk, Laptops and Internet connections.	

Pre- Preparation Activity	The students are divided into two different groups to deliberate about the Poverty Trends, Causes and Measures.	
Previous Knowledge	The students are asked to research about poverty and different issues related to poverty: Landlessness, Unemployment, Illiteracy, Malnutrition, Child Labour etc.	
Introduction	The teacher will initiate a discussion about two typical cases of Poverty in the Urban and Rural Context. She/he assigns a case study of different vulnerable groups.	Problem scoping: Who, What, Where and Why
Methodology	<ul style="list-style-type: none"> • The students are asked to collect data on different vulnerable groups. • The students are asked to discuss the concept of Poverty? How is poverty line estimated in India? • The students are asked to discuss Inter State Disparities and Global Poverty Scenario. • The students are asked to discuss the causes of Poverty. • The students are asked to collect the data and interpret the state wise trends of poverty in India. • The students are asked to discuss Anti-Poverty Measures taken by Government. 	Who? What? Where? Why? Data Acquisition and Data Exploration
Discussion on the Text	There is an open discussion and group wise presentation on: <ol style="list-style-type: none"> a. How poverty line is estimated in India b. Whether the present methodology of Poverty Estimation is appropriate c. Poverty Trends in India. d. Global trends of Poverty. e. Interstate Disparities of Poverty in India. f. Causes of Poverty g. Government strategy of Poverty alleviation. 	

Learning Outcomes	<ul style="list-style-type: none"> • The students will understand the concept and Dimensions of Poverty with the help of problem Scoping concept of the AI project cycle. • The students will understand the poverty trends in India and Global Poverty Trends. • The students will understand Poverty Line and Poverty Estimation. • The students will understand the various causes of Poverty and Anti-Poverty Measures taken by the Government for poverty eradication. • The students will be able to learn Data acquisition and exploration. 	
Self-Evaluation and Follow-Up	Students are asked to make presentations to compare the situation in different groups and states in India	
Follow-up Activity	Students will be asked to analyze the various challenges ahead in poverty reduction and alleviation.	

GLOSSARY

1. AI Related Terminologies

AI Project Cycle: AI Project cycle is a framework which is used to design an AI project taking all the crucial factors into consideration. The project cycle consists of 5 steps namely: problem scoping, data acquisition, data exploration, modelling and evaluation. Each of the stages holds importance in the framework.

Problem Scoping: Problem Scoping refers to understanding a problem and finding out various factors which affect the problem. Under problem scoping, we use the framework of 4Ws problem canvas where we look into the Who, What, Where and Why of a problem. After observing these factors, students get clarity towards the issue to be solved which leads them towards data acquisition.

4Ws Problem Canvas:

The 4Ws Problem canvas helps them in identifying the key elements related to the problem.

Who?

The “Who” block helps in analyzing the people getting affected directly or indirectly due to it. Under this, they find out who the ‘Stakeholders’ to this problem are and what they know about them. Stakeholders are the people who face this problem and would be benefitted with the solution.

Who canvas consists of:

- Who are the Stakeholders?
- What do you know about them?

What?

Under the “What” block, they need to look into what they have on hand. At this stage, they need to determine the nature of the problem. What is the problem and how do they know that it is a problem? Under this block, they also gather evidence to prove that the problem they have selected actually exists. Newspaper articles, Media, announcements, etc. are some examples.

What canvas consists of:

- What is the problem?
- How do you know that it is a problem? (Is there any evidence?)

Where?

Now that they know who is associated with the problem and what the problem actually is; they need to focus on the context/situation/location of the problem. This block will help them look into the situation in which the problem arises, the context of it, and the locations where it is prominent.

Where canvas consists of:

- What is the situation/context where the stakeholders experience the problem?
- Where is the problem located?

Why?

They have finally listed down all the major elements that affect the problem directly. Now it is convenient to understand who the people that would be benefitted by the solution are; what is to be solved; and where will the solution be deployed. These three canvases now become the base of why they want to solve this problem. Thus, in the “Why” canvas, they think about the benefits which the stakeholders will get from the solution and how it will benefit them as well as the society.

Why canvas consists of:

- Why will this situation be of value to the stakeholders?
- How will the solution improve their situation?

Data Acquisition: Data acquisition refers to acquiring authentic data crucial for the AI model from reliable sources. The data acquired can then be divided into two categories: Training Data and Testing Data. The AI model gets trained on the basis of training data and is evaluated on the basis of testing data.

There can be various ways in which you can collect data. Some of them are:

- Surveys
- Web Scraping
- Sensors
- Cameras
- Observations
- Application Program Interface

Data Exploration: After acquiring data there comes the need to analyze the data. For this, they need to visualize the acquired data in a user-friendly format so that they can:

- Quickly get a sense of the trends, relationships and patterns contained within the data.
- Define strategy for which model to use it at a later stage.
- Communicate the same to others effectively.

To visualize data, various types of visual representations can be used by the students like diagrams, charts, graphs, flows, etc.

2. AI Activity Description

In this activity, students will start scoping the problem of Poverty while going through the chapter and would simultaneously fill up the 4Ws Problem Canvas. After filling the canvases, the students would have acquired enough knowledge about poverty and factors related to it.

After this, students would start acquiring authentic data from various reliable sources to understand various trends and patterns observed around poverty and will explore the same in the form of visual representations. They will also be able to relate their searches to various government initiatives taken towards poverty.

Social Science

Class 10

PARAMETERS	DESCRIPTION	AI CONCEPTS INTEGRATED
Chapter Covered	Chapter No. 3: Water Resources	
Name of the book	Contemporary India- II Class 10	
Subject and Artificial Intelligence Integrated	AI integrated with Water Scarcity and Need for water conservation and management	
Objectives	<ul style="list-style-type: none"> To understand the concept of AI project cycle. To understand the concept of water cycle using AI application and how water is a renewable resource. To understand the concept of water scarcity and need for water conservation and management. Multi Purpose River Projects and Rain water Harvesting as tools of Water management. To understand the advantages and disadvantages of the Multipurpose River Projects. To understand how Rain water harvesting method is being carried out to conserve and store water. 	AI project cycle System mapping using Loopy App. (http://ncase.me/loopy/)
Time Required	3 periods of 40 minutes each	
Classroom Arrangement	Flexible	
Material Required	Pen, paper, Black Board chalk, Laptops and Internet connections.	
Pre- Preparation Activity	Students are asked to list down the area affected by water scarcity and the possible reasons behind the present situation of water scarcity.	

Previous Knowledge	The students are asked to discuss the various usage of water and to devise how water wastage can be controlled.	
Introduction	The teacher will initiate a discussion about latest facts and figures about water scarcity.	Problem scoping: Who, What, Where and Why
Methodology	<ul style="list-style-type: none"> • The students are asked to collect data on availability and Distribution of fresh water resources at different places. • The students are asked to interpret the data on the basis of: <ul style="list-style-type: none"> (i) Pre and Post Industrialization (II) Pre and Post Urbanization (iii) State wise Analysis • The Students are asked to develop different models in order to ensure Water Conservation and management. (Multi-Purpose River Projects and Rain Water Harvesting) • The students are asked to evaluate each and every model (Advantages and disadvantages) and choose the best model which gives the most efficient and reliable results. Also, they need to find specific AI enhancements which can be used to enhance their model. 	Data Acquisition Data Exploration Modelling Evaluation
Discussion on the Text	There is an open discussion on: <ol style="list-style-type: none"> a. Water as a renewable resource. b. Water Scarcity: Causes and Effects. c. Water conservation and management techniques. d. Multi-Purpose River Projects: Advantages & Disadvantages. e. Rain Water Harvesting: Support for Semi-Arid Areas. 	
Learning Outcomes	<ul style="list-style-type: none"> • The students will understand the concept of AI project cycle with regard to water scarcity and need for water conservation and management. 	

	<ul style="list-style-type: none"> • The students will understand the concept of water cycle using AI application • The students will understand Multi-Purpose River Projects and their advantages and disadvantages. • The students will understand Rain water harvesting as tools of Water management and how Rain water harvesting method is being carried out to conserve and store water. 	
Self-Evaluation and Follow-Up	The Teacher analyses the responses and flow of thoughts of students.	
Follow-up Activity	Students will be asked to analyze the situation in their surroundings Colony, Village or City, and submit the report on Water Management mechanism.	

GLOSSARY:

3. AI Related Terminologies

AI Project Cycle: AI Project cycle is a framework which is used to design an AI project taking all the crucial factors into consideration. The project cycle consists of 5 steps namely: problem scoping, data acquisition, data exploration, modelling and evaluation. Each of the stages holds importance in the framework.

Problem Scoping: Problem Scoping refers to understanding a problem and finding various factors which affect the problem. Under problem scoping, we use the framework of 4Ws problem canvas where we look into the Who, What, Where and Why of a problem. After observing these factors, students get clarity towards the issue to be solved which leads them towards data acquisition.

4Ws Problem Canvas:

The 4Ws Problem canvas helps them in identifying the key elements related to the problem.

Who?

The “Who” block helps in analyzing the people getting affected directly or indirectly due to it. Under this, they find out who the ‘Stakeholders’ to this problem are and what they know about them. Stakeholders are the people who face this problem and would benefit from the solution.

Who canvas consists of:

- Who are the Stakeholders?
- What do you know about them?

What?

Under the “What” block, they need to look into what they have on hand. At this stage, they need to determine the nature of the problem. What is the problem and how do they know that it is a problem? Under this block, they also gather evidence to prove that the problem they have selected actually exists. Newspaper articles, Media, announcements, etc. are some examples.

What canvas consists of:

- What is the problem?
- How do you know that it is a problem? (Is there any evidence?)

Where?

Now that they know who is associated with the problem and what the problem actually is; they need to focus on the context/situation/location of the problem. This block will help them look into the situation in which the problem arises, the context of it, and the locations where it is prominent.

Where canvas consists of:

- What is the situation/context where the stakeholders experience the problem?
- Where is the problem located?

Why?

They have finally listed down all the major elements that affect the problem directly. Now it is convenient to understand who the people that would benefit from the solution are; what is to be solved; and where will the solution be deployed. These three canvases now become the base of why they want to solve this problem. Thus, in the “Why” canvas, they would think about the benefits which the stakeholders would get from the solution and how would it benefit them as well as the society.

Why canvas consists of:

- Why will this situation be of value to the stakeholders?
- How will the solution improve their situation?

Data Acquisition:

Data acquisition refers to acquiring authentic data crucial for the AI model from reliable sources. The data acquired can then be divided into two categories: Training Data and Testing Data. The AI model gets trained on the basis of training data and is evaluated on the basis of testing data.

There can be various ways in which you can collect data. Some of them are:

- Surveys
- Web Scraping
- Sensors
- Cameras
- Observations
- Application Program Interface

Data Exploration:

After acquiring data, the students need to analyze it. For this, they need to visualize the acquired data in some user-friendly format so that they can:

- Quickly get a sense of the trends, relationships and patterns contained within the data.
- Define strategy for which model to use at a later stage.
- Communicate the same to others effectively.

To visualize data, various types of visual representations can be used by the students like diagrams, charts, graphs, flows, etc.

Modelling:

Once the data has been explored and various trends/patterns have been visualized, students can now think of various methods/techniques to solve the issue. According to the technique that they choose, they need to select the most appropriate way to depict it.

Evaluation:

After creating the model, the students will now evaluate it on the basis of the results expected versus the actual results obtained. On the basis of this comparison, they will be able to identify if the model which they have created is efficient or not. Also, at this stage, the students will identify the leverage points where AI can possibly be integrated in their model to enhance its efficiency. At this stage, the students will explore various possibilities around which AI can be used to leverage a condition to solve an issue.

4. AI Activity Description

Ask the students to collect data regarding availability and distribution of freshwater at different places. Students can gather data through various sources online or offline. Ask them to collect authentic data from reliable sources. After acquiring data, the students will explore it on the basis of the following parameters:

- Pre and Post Industrialization
- Pre and Post Urbanization
- State wise Analysis

Ask the students to visualize data and recognize certain patterns or trends out of the data explored. With the help of the patterns recognized, students will then work on various models which can help in water conservation.

Ask the students to select an idea to conserve water and make a model/presentation on it. Once they come up with their model, students will evaluate it on the basis of its efficiency. They can analyze the efficiency of their model on the basis of comparing the actual results with the results obtained from the model.

Ask the students to explore leverage points in their model where they can incorporate AI to make their model more efficient and to solve the problem.

Chapter 4

Appendix 1.

AI Curriculum

ARTIFICIAL INTELLIGENCE CURRICULUM CLASS 9

OBJECTIVE

The objective of this unit is to develop a readiness for understanding and appreciating Artificial Intelligence and its application in our lives. This unit focuses on:

1. Helping learners understand the world of Artificial Intelligence and its applications through games, activities and multisensorial learning to become AI-Ready.
2. Introducing the learners to three domains of AI in an age appropriate manner.
3. Allowing the learners to construct meaning of AI through interactive participation and engaging hands-on activities.
4. Introducing the learners to AI Project Cycle.
5. Introducing the learners to programming skills - Basic python coding language.

LEARNING OUTCOMES

Learners will be able to:

- Identify and appreciate Artificial Intelligence and describe its applications in daily life.
- Relate, apply and reflect on the Human-Machine Interactions to identify and interact with the three domains of AI: Data, Computer Vision and Natural Language Processing and Undergo assessment for analyzing their progress towards acquired AI-Readiness skills.
- Imagine, examine and reflect on the skills required for futuristic job opportunities.
- Unleash their imagination towards smart homes and build an interactive story around it.
- Understand the impact of Artificial Intelligence on Sustainable Development Goals to develop responsible citizenship.
- Gain awareness about AI bias and AI access and describe the potential ethical considerations of AI.
- Develop effective communication and collaborative work skills.
- Get familiar and motivated towards Artificial Intelligence and Identify the AI Project framework. Learn problem scoping and ways to set goals for an AI project and understand the iterative nature of problem scoping in the AI project cycle.

- Brainstorm on the ethical issues involved around the selected problem
- Foresee the kind of data required and the kind of analysis to be done, identify data requirements and find reliable sources to obtain relevant data.
- Use various types of graphs to visualise acquired data.
- Understand, create and implement the concept of Decision Trees.
- Understand and visualise computer’s ability to identify alphabets and handwritings.
- Understand and appreciate the concept of Neural Network through gamification and learn basic programming skills
- Acquire introductory Python programming skills in a very user-friendly format.

UNITWISE DISTRIBUTION

No.	UNIT	SUB-UNIT	DURATION	MARKS	
				THEOR Y	PRACTICA L
1	Introduction to AI	Excite	2.4 Hours (4 Periods)	10	10
		Relate	02 Hours (3 Periods)		
		Purpose	02 Hours (3 Periods)		
		Possibilities	02 Hours (3 Periods)		
		AI Ethics	3.6 Hours (6 Periods)		
2	AI Project Cycle	Problem Scoping	14 Hours (21 Periods)	10	10
		Data Acquisition	02 Hours (3 Periods)		
		Data Exploration	04 Hours (6 Periods)		
		Modelling	06 Hours (9 Periods)		
3	Neural Network		04 Hours (6 Periods)	10	10

4	Introduction to Python		70 Hours (105 Periods)	20	10
5	Co-curricular Skills				10
TOTAL			112 Hours (168 Periods)	50	50

Total: **100** Marks

COURSE OUTLINE

UNIT	SUB-UNIT	SESSION/ACTIVITY/PRACTICAL	LEARNING OUTCOMES
Introduction to AI	Excite	<p>Session: Introduction to AI and setting up the context of the curriculum</p>	To identify and appreciate Artificial Intelligence and describe its applications in daily life.
		<p>Ice Breaker Activity: Dream Smart Home idea</p> <p>Learners to design a rough layout of floor plan of their dream smart home.</p>	
		<p>Recommended Activity: The AI Game</p> <p>Learners to participate in three games based on different AI domains.</p> <ul style="list-style-type: none"> ● Game 1: Rock, Paper and Scissors (based on data) ● Game 2: Mystery Animal (based on Natural Language Processing - NLP) ● Game 3: Emoji Scavenger Hunt (based on Computer Vision - CV) 	To relate, apply and reflect on the Human-Machine Interactions.
		<p>Recommended Activity: AI Quiz (Paper Pen/Online Quiz)</p>	To undergo an assessment for analysing progress towards acquired AI-Readiness skills.
		<p>Recommended Activity: To write a letter</p> <p>Writing a Letter to one's future self</p> <ul style="list-style-type: none"> ● Learners to write a letter to self keeping the future in context. They will describe what they have learnt so far or what they would like to learn someday 	To imagine, examine and reflect on the skills required for futuristic job opportunities.

	Relate	<p>Video Session: To watch a video</p> <p>Introducing the concept of Smart Cities, Smart Schools and Smart Homes</p>	Learners to relate to application of Artificial Intelligence in their daily lives.
		<p>Recommended Activity: Write an Interactive Story</p> <p>Learners to draw a floor plan of a Home/School/City and write an interactive story around it using Story Speaker extension in Google docs.</p>	<p>To unleash their imagination towards smart homes and build an interactive story around it.</p> <p>To relate, apply and reflect on the Human-Machine Interactions.</p>
	Purpose	<p>Session: Introduction to sustainable development goals</p> <hr/> <p>Recommended Activity: Go Goals Board Game</p> <ul style="list-style-type: none"> Learners to answer questions on Sustainable Development Goals 	To understand the impact of Artificial Intelligence on Sustainable Development Goals to develop responsible citizenship.
	Possibilities	<p>Session: Theme-based research and Case Studies</p> <ul style="list-style-type: none"> Learners will listen to various case-studies of inspiring start-ups, companies or communities where AI has been involved in real-life. Learners will be allotted a theme around which they need to search for present AI trends and have to visualise the future of AI in and around their respective theme. <hr/> <p>Recommended Activity: Job Ad Creating activity</p> <ul style="list-style-type: none"> Learners to create a job advertisement for a firm describing the nature of job available and the skill-set required for it 10 years down the line. They need to figure out how AI is going to transform the nature of jobs and create the Ad accordingly. 	<p>To research and develop awareness of skills required for jobs of the future.</p> <p>To imagine, examine and reflect on the skills required for the futuristic opportunities.</p> <p>To develop effective communication and collaborative work skills.</p>
	AI Ethics	Video Session: Discussing about AI Ethics	

		<p>Recommended Activity: Ethics Awareness</p> <ul style="list-style-type: none"> ● Students play the role of major stakeholders and they have to decide what is ethical and what is not for a given scenario. 	<p>To understand and reflect on the ethical issues around AI.</p>
		<p>Session: AI Bias and AI Access</p> <ul style="list-style-type: none"> ● Discussing about the possible bias in data collection ● Discussing about the implications of AI technology 	<p>To gain awareness around AI bias and AI access.</p>
		<p>Recommended Activity: Balloon Debate</p> <ul style="list-style-type: none"> ● Students divide in teams of 3 and 2 teams are given same theme. One team goes in affirmation to AI for their section while the other one goes against it. ● They have to come up with their points as to why AI is beneficial/harmful for the society. 	<p>To let the students analyse the advantages and disadvantages of Artificial Intelligence.</p>

AI Project Cycle	Problem Scoping	<p>Session: Introduction to AI Project Cycle</p> <ul style="list-style-type: none"> ● Problem Scoping ● Data Acquisition ● Data Exploration ● Modelling ● Evaluation 	Identify the AI Project Cycle framework.
		<p>Activity: Brainstorm around the theme provided and set a goal for the AI project.</p> <ul style="list-style-type: none"> ● Discuss various topics within the given theme and select one. ● List down/ Draw a mind map of problems related to the selected topic and choose one problem to be the goal for the project. 	Learn problem scoping and ways to set goals for an AI project.
		<p>Activity: To set actions around the goal.</p> <ul style="list-style-type: none"> ● List down the stakeholders involved in the problem. ● Search on the current actions taken to solve this problem. ● Think around the ethics involved in the goal of your project. 	<p>Identify stakeholders involved in the problem scoped.</p> <p>Brainstorm on the ethical issues involved around the problem selected.</p>
		<p>Activity: Data and Analysis</p> <ul style="list-style-type: none"> ● What are the data features needed? ● Where can you get the data? ● How frequent do you have to collect the data? ● What happens if you don't have enough data? ● What kind of analysis needs to be done? ● How will it be validated? ● How does the analysis inform the action? 	<p>Understand the iterative nature of problem scoping for in the AI project cycle.</p> <p>Foresee the kind of data required and the kind of analysis to be done.</p>
		<p>Presentation: Presenting the goal, actions and data.</p>	Share what have the students discussed so far.

	Data Acquisition	<p>Activity: Introduction to data and its types.</p> <ul style="list-style-type: none"> Students work around the scenarios given to them and think of ways to acquire data. 	Identify data requirements and find reliable sources to obtain relevant data.
	Data Exploration	<p>Session: Data Visualization</p> <ul style="list-style-type: none"> Need of visualizing data Ways to visualize data using various types of graphical tools. 	To understand the purpose of Data Visualization
		<p>Recommended Activity: Let's use Graphical Tools</p> <ul style="list-style-type: none"> To decide what kind of data is required for a given scenario and acquire the same. To select an appropriate graphical format to represent the data acquired. Presenting the graph sketched. 	Use various types of graphs to visualize acquired data.
	Modelling	<p>Session: Decision Tree</p> <ul style="list-style-type: none"> To introduce basic structure of Decision Trees to students. 	Understand, create and implement the concept of Decision Trees.
		<p>Recommended Activity: Decision Tree</p> <ul style="list-style-type: none"> To design a Decision Tree based on the data given. 	
		<p>Recommended Activity: Pixel It</p> <ul style="list-style-type: none"> To create an "AI Model" to classify handwritten letters. Students develop a model to classify handwritten letters by dividing the alphabets into pixels. Pixels are then joined together to analyse a pattern amongst same alphabets and to differentiate the different ones. 	Understand and visualise computer's ability to identify alphabets and handwritings.

Neural Network	<p>Session: Introduction to neural network</p> <ul style="list-style-type: none"> ● Relation between the neural network and nervous system in human body ● Describing the function of neural network. 	Understand and appreciate the concept of Neural Network through gamification.
	<p>Recommended Activity: Creating a Human Neural Network</p> <ul style="list-style-type: none"> ● Students split in four teams each representing input layer (X students), hidden layer 1 (Y students), hidden layer 2 (Z students) and output layer (1 student) respectively. ● Input layer gets data which is passed on to hidden layers after some processing. The output layer finally gets all information and gives meaningful information as output. 	
Introduction to Python	<p>Recommended Activity: Introduction to programming using Online Gaming portals like Code Combat.</p>	Learn basic programming skills through gamified platforms.
	<p>Session: Introduction to Python language</p> <ul style="list-style-type: none"> ● Introducing python programming and its applications 	Acquire introductory Python programming skills in a very user-friendly format.
	<p>Practical: Python Basics</p> <ul style="list-style-type: none"> ● Students go through lessons on Python Basics (Variables, Arithmetic Operators, Expressions, Data Types - integer, float, strings, using print() and input() functions) ● Students will try some simple problem-solving exercises on Python Compiler. 	

		<p>Practical: Python Lists</p> <ul style="list-style-type: none"> • Students go through lessons on Python Lists (Simple operations using list) • Students will try some basic problem-solving exercises using lists on Python Compiler. 	
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ASSESSMENT

After completion of each unit, the students can be evaluated on the basis of the following skills:

Conceptual Skills	Technical Skills	Life Skills
Conceptual understanding of AI AI applications and three domains of AI Knowledge Enhancement in 3 AI Domains: Data, Computer Vision & Natural Language Processing Mind mapping Problem Identification Data Acquisition Data Exploration Graphical Representation Neural Network	Ability to use AI Powered Tools Troubleshooting Skill Basic programming skills Basic Python	Thinking Skills Problem Solving Creative thinking Critical Thinking Decision Making Skills Social Skills - Teamwork Team Building Skills Leadership Self-Awareness Empathy Effective Communication Skills Oral & Written Presentation

Appendix 2

AI Learning Indicators

Areas	Class 8	Class 9
Knowledge Understanding AI	What is AI? Why? Pedagogy- Brainstorming/Concept maps, Venn Diagrams	Why AI /Why not AI ? What other possibilities? Pedagogy- Discussion/Debate Questioning, NLR- Comparison Matrix
Skills Prerequisite skills Skills to be acquired/developed	Inquiry / Questioning Skills Generating Ideas – Critical & Computer skills	Inquiry / Questioning Skills Communicating Creative thinking Critical Thinking
Technical Competencies for Artificial Intelligence (AI) Data Computer Vision(CV) Natural Language Processing (NLP)	Through Creative games /Skills based problem solving challenges /Designing Introduction to all three domains Data CV NLP Using all three domains in different challenging games to identify AI in different context	Through Creative games /Skills based problem solving challenges /Designing Building conceptual understanding and skill development in one domain of AI - Data CV NLP- Gaining competency in NLP. Learning basics of Python
Attitude	Initiative Positive Thinking	Initiative Success Vs failure Positive Thinking
Life Skills to be developed	Thinking Skills Social Skills	Thinking Skills /Social Skills Emotional Skills
Program course to be covered	In one academic session	In one academic session
Mentoring & feedback Suggestive Activities	Face to face Online Online Newsletter for all levels on the work in AI all across participating schools	Face to face Online Online Newsletter for all levels on the work in AI all across participating schools

Appendix 3

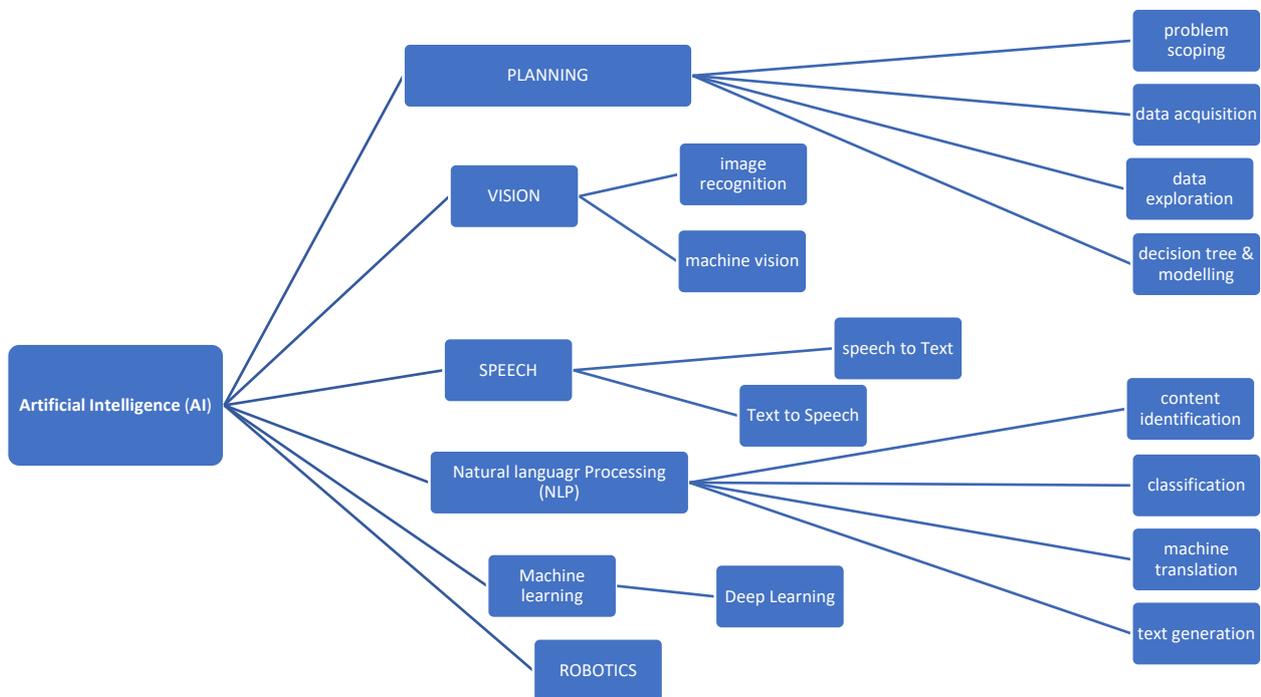
AI Learning Outcomes

Areas	Class 8	Class 9
Knowledge Understanding AI	What is AI? Why? Pedagogy- Brainstorming/Concept maps, Venn Diagrams	Why AI /Why not AI ? What other possibilities? Pedagogy- Discussion/Debate Questioning, NLR- Comparison Matrix
Skills Prerequisite skills Skills to be acquired/developed	Inquiry / Questioning Skills Generating Ideas – Critical & Computer skills	Inquiry / Questioning Skills Communicating Creative thinking Critical Thinking
Technical Competencies for Artificial Intelligence (AI) Data Computer Vision (CV) Natural Language Processing (NLP)	Through Creative games /Skills based problem solving challenges /Designing Introduction to all three domains Data CV NLP Using all three domains in different challenging games to identify AI in different context	Through Creative games /Skills based problem solving challenges /Designing Building conceptual understanding and skill development in one domain of AI - Data CV NLP- Gaining competency in NLP. Learning basics of Python
Attitude	Initiative Positive Thinking	Initiative Success Vs failure Positive Thinking
Life Skills to be developed	Thinking Skills Social Skills	Thinking Skills /Social Skills Emotional Skills
Program course to be covered	In one academic session	In one academic session
Mentoring & feedback Suggestive Activities	Face to face Online Online Newsletter for all levels on the work in AI all across participating schools	Face to face Online Online Newsletter for all levels on the work in AI all across participating schools

Appendix 4

AI CAPABILITIES

AI has been an academic area of study for many years with lots of dips on the way to its progress; in recent times it is increasingly becoming an enabler for a variety of technologies and appliances that impact our daily lives. Also, with the ever-increasing computing power, lesser cost of data storage and immense data available, there is a boom of technological innovations, which should make us believe that 'AI Spring' has arrived. So, AI is marching ahead to be the mainstream of the mainstream disciplines of study that it connects.



Appendix 5

AI versus Virtual Reality (VR); AI versus Internet of Things (IOT);

Artificial Intelligence VS Virtual Reality

Artificial intelligence is using an artificial obsolete intelligence to function the same way as we humans want it to work. We program it the way we want to, we specify the limits, we specify the loops; it's like giving a machine an artificial human brain so it can function on those areas where human interception is difficult. AI is directly related to machine learning, it's like the things we teach to them is what we will get in return as feedback. AI is responsible for singularity

Virtual Reality, on the other hand is to make virtual environment a form of reality for human needs - may be for an entertainment point of view. VR is a gadget technology which focuses on 3d visualization of graphics and generating a view which tops the graphic user interface. It's like creating an environment which we've always wanted in true reality.

Artificial Intelligence VS Internet of Things

Artificial Intelligence is a field of computer science in which a machine is equipped with the ability to mimic cognitive functions of a human (or any being that is capable of cognitive thinking) that can make decisions based on its past experiences or responding to an action that it was completely unaware of until that time. It is given a goal and it continuously tries to improve its performance from its past actions to the best reach of the goal. An AI machine will be equipped with a learning mechanism and a neural network -something similar to a brain- which enables a cognitive ability, where the machine will learn by understanding and adapting to the environment that it is surrounded with and making rational decisions. You can never know what an AI machine is capable of until it actually does that.

Internet of Things is the internetworking of physical devices like vehicles, buildings, electronic devices, sensors, actuators etc. that are capable of communicating among themselves (sensor1 to sensor2, sensor2 to sensor3 and so on) or with the external environment (sensor to vehicles, vehicles to humans) that are equipped with devices capable of communicating over a network. In IoT, the devices are given a fixed set of commands like:

Switch off the lights when a person leaves the room. (let's say communication between a light and a wearable device on the person based on GPS)

Open the garage door when a car approaches. (communication between a sensor 1 on garage door and a sensor 2 on the car)

In IoT, the capabilities of a machine already exist and you use it according to your feasibility.

Appendix 6

Translating AI on Ground

Creating the Mindset

The aim is to familiarize students into understanding the AI Program. The foundation on which AI is built upon is Patterning; Data Interpretation; Sorting; Comparing; Classifying; Identifying. The AI Applications that surround us are proof of innovation; we need to prepare ourselves to unlearn, learn and relearn!

Preparatory Groundwork

Reading and gathering all the information one can get about 'what is AI and what is not' - is imperative for a better understanding of the subject. We need to be prepared to connect to new learning on the basis of our previous knowledge. – Read, Research, Inquire, Ask Questions, Watch Videos, Discuss, Walk through Malls, Airports, Hospitals and try to figure out where do you find AI in operation.

To be a Good Facilitator

Learning to facilitate is learning to know the difference between when to guide/suggest and when to allow students to figure out and understand for themselves, question, hypothesize and take the challenge.

Being a Facilitator is mostly about how to motivate, encourage and simplify.

Learning to use appropriate vocabulary while giving feedback, is the skill set, most required by a Facilitator. Give feedback in a positive manner to inspire students to explore and persevere in their learning.

Mentoring & Monitoring

Ensure that continuity is maintained in mentorship and monitoring the students' learning. Online feedback, Interactive discussions on problems and challenges are some of the effective ways to assist this.