

Only the Curious Shall Thrive

Strategies for Lifelong Learners to
Formulate Insightful Questions



Atul Pant

Only the Curious Shall Thrive

Strategies for Lifelong Learners to
Formulate Insightful Questions

Atul Pant

Author: Atul Pant

Also by the author:

Fire Up the Learner Within – The Art of Self-Directed Learning

Published by:



**Timeless
Lifeskills**

for flourishing in the 21st century and beyond...

Timeless Lifeskills Limited, London

www.TimelessLifeskills.co.uk

Copyright © Timeless Lifeskills Limited 2012

All rights reserved

ISBN 978-1-908102-05-8

For further enquiries please send email to:

Info@TimelessLifeskills.co.uk

For my father, who at 75 is still immensely curious.

CONTENTS

1. The Importance of Questions	7
Guided DIY Workshop	28
2. Goals of Learning and the Role Questions Play	32
Guided DIY Workshop	66
3. Typology of Questions.....	70
Guided DIY Workshop	94
4. Questioning Techniques for Studying	97
Guided DIY Workshop	118
5. Questioning Strategies.....	119
6. Taking Ownership of Learning (Applying the Questioning Strategies).....	147
Case-Study-1	148
Case-Study-2	153
Case-Study-3	162
Case-Study-4	169
7. Amplify Your Curiosity.....	177
Bibliography	185

1. THE IMPORTANCE OF QUESTIONS

In the beginning there must have been questions.

Ancient man probably wondered about everything around him – the bright thing that moved across the vastness up above, the twinkling spots that glowed when the bright thing disappeared, the wetness that sometimes fell down from the vastness, the loud sounds that came with the wetness.

That which was essential for survival or that which was frightening must have been worshipped to be placated.

The Importance of Questions



*In ancient times, that which was
essential for survival or that which
was frightening must have been
worshipped to be placated*



Nevertheless, judging by all that we know today, curiosity must have got the better of some people and they would have observed, experimented, tinkered, hypothesised, and learnt by trial and error. The driving force of these pioneer investigators must have been much like the incessant interrogation of a toddler – why, why, why?



Curiosity must have got the better of some people and they would have observed, tinkered, experimented, hypothesized and learnt by trial and error

Emergence of Disciplines

The intense desire to find answers to fundamental questions and the process adopted for finding answers has led to all the knowledge we have today. What we understood of the world around us we gradually metamorphosed that

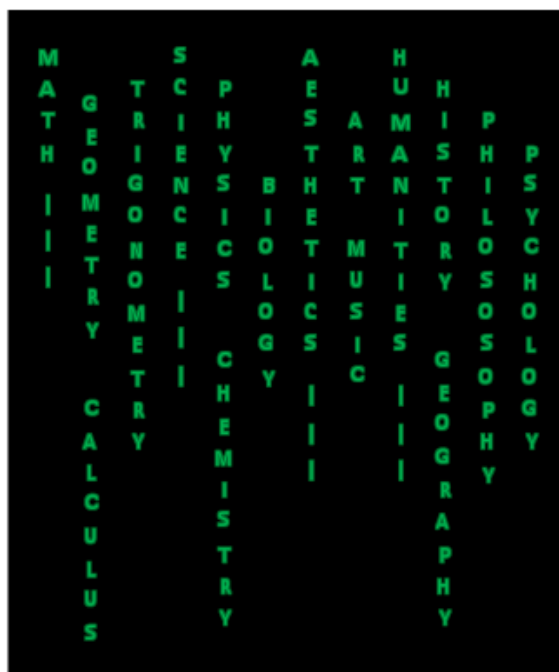
The Importance of Questions

knowledge into different disciplines like, science, math, literature, humanities and so forth.

Over centuries each discipline has developed unique ways of thinking and looking at the world. Each discipline has developed its unique vocabulary, rules, frameworks and methodologies. Yet, underneath each discipline lies our curiosity and urge to answer our fundamental questions:

- **Discipline of science** is our curiosity to understand nature
- **Discipline of math** is our desire to express measurements and understand patterns and relationships
- **Discipline of philosophy** is our urge to understand ourselves
- **Discipline of art** is our yearning to understand beauty and create aesthetic artefacts
- **Discipline of psychology** is our urge to dwell deeper into our own mind and understand how it functions
- **Discipline of geography** is our endeavour to understand the natural environment and our relationship with it
- **Discipline of history** is our need to understand past events in human affairs.

Our intense desire to find answers to fundamental questions led to accumulation of knowledge. What we understood of the world around us gradually metamorphosed into different disciplines

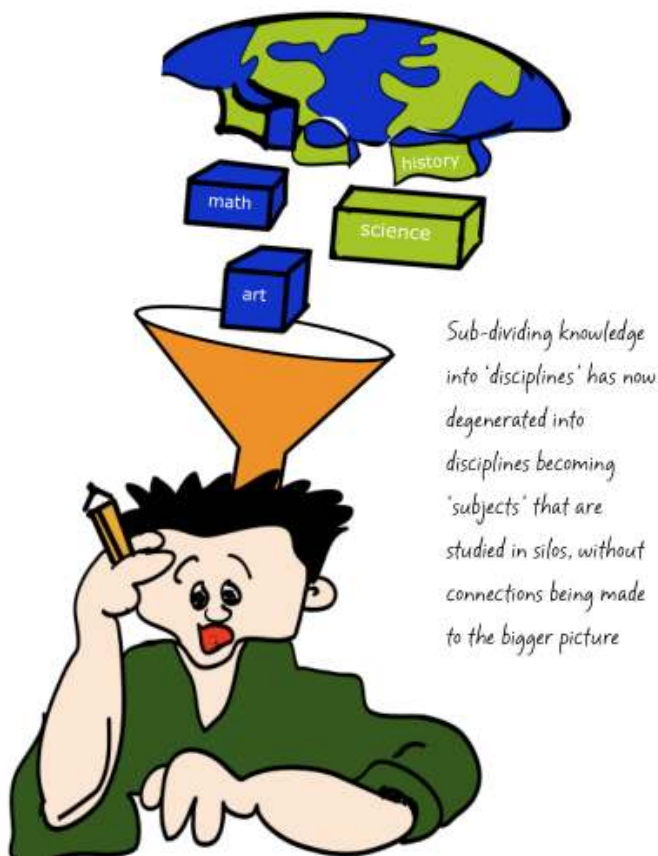


As knowledge in these disciplines, or knowledge domains grew, the need arose to branch out the disciplines into further sub-domains and sub-sub domains. For example, in science, which depicts our curiosity to understand nature, as our knowledge accumulated in this discipline, we sub-divided the discipline into sub-domains of physics, chemistry and

The Importance of Questions

biology. As our knowledge and understanding increased further we segregated physics into classical physics, Einstein's relativity and quantum mechanics.

Degeneration into Silos



While carving up the disciplines helped better manage the amassed knowledge in the discipline, the downside we face today is that for most students these ‘disciplines’ have become ‘subjects’, that are studied in silos, without connections being made to the bigger picture.

A school level student may be introduced to genetics without the appreciation that genetics is part of biology, which belongs to the discipline of science, which in turn is our dialogue with nature.

Linking discrete topics to the bigger picture of a discipline is useful for gaining a deeper understanding of the fundamental questions raised by that discipline and how we have gone about finding answers to these questions – what is the evolving history of that discipline, who were the people who made great discoveries or inventions in that domain, what was the context when they lived and thought of these things, what is the vocabulary and framework and modes of thinking of that discipline.

For example, in the discipline of science, the mode of thinking involves hypothesising, making empirical observations, experimenting and proving or disproving the hypothesis by deduction or induction. Whereas, in the discipline of history, the mode of thinking is looking for evidence through primary and secondary sources and

The Importance of Questions

looking at events through multiple perspectives like the victor's and the vanquisher's point of view.

Over centuries some of our fundamental questions have been answered, for some questions we have better understanding that may lead to answers in the near future, but a plethora of new questions has also emerged. For example, human population has never been as large as it is now and we do not fully understand the consequences this will have on our natural environment and human affairs, what ethics should guide our growing knowledge of the genome, what impact will ICTs have on the fabric of life, what are the implications of taming the atom and harnessing nuclear energy and in this fast changing world how are age-old questions of justice and liberty best answered?

Understanding and being able to apply varied modes of thinking that different disciplines have to offer is especially important today in the 21st century, when the context is changing dramatically.

21st Century Context

The Geologic Timescale is used to describe the timing and relationships between events that have occurred throughout earth's history. The scale comprises of Supereon, Eon, Era, Period, Epoch and Age. For example, the

Pleistocene epoch refers to the period of repeated glaciations and the Holocene epoch refers to the rise of human civilization, beginning at the end of Pleistocene epoch around 11,000 years ago and is the epoch we are currently in.

A new term ‘Anthropocene’ has been proposed by Nobel laureate Paul Crutzen for describing the latest part of the Holocene epoch that characterises the human impact on earth and its ecosystem. A new term has been proposed because the impact of human activities on the planet are considered so significant that they have implications for future evolution of living species.

The Anthropocene epoch is considered to have accelerated with the Industrial Revolution, since when human systems have significantly eroded the natural systems that support life.

What is pertinent is that our neural systems are more attuned to the Holocene epoch and we are still adjusting our cognition to the Anthropocene period. Our brain is not fully able to grasp macro threats like climate change and micro threats like new viruses and what impact these will have on the planet or on our species.

According to psychologist Daniel Golemanⁱⁱ, “We approach the Anthropocene threat with brains shaped by evolution to survive the previous geological epoch, the Holocene, when dangers were signalled by growls and rustles

The Importance of Questions

in the bushes, and it served one well to reflexively abhor spiders and snakes. Our neural systems still attune to this largely antiquated range of danger. Add to that mis-attunement the threats to our built-in perpetual blind spot: we have no direct neural register for the dangers of the Anthropocene epoch, which are too macro or micro for our sensory apparatus...”

The concept of ‘*umwelt*’ helps us further understand how we take time to sensitise ourselves to a changing environment. According to biologist Jakob von Uexküll, *umwelt*ⁱⁱⁱ is what an organism is able to detect of its world. It is the limiting sensory world of each animal. For the bat its *umwelt* is the air-compression waves it generates, for the tick it is the temperature and the odour of butyric acid. Each animal presumes that its *umwelt* – what it can sense – is the entire reality out there and its behaviour is shaped by its *umwelt*. However, there is a bigger reality, the ‘*umgebung*’.

In the Anthropocene epoch we are living in at present, we need to make sure that while dealing with issues we face we ask questions not only about our *umwelt* but also about the *umgebung*.

This is so because issues we face today are no longer complicated – difficult to solve but having a unique solution, like a 1,000-piece jigsaw puzzle; instead, our issues have become complex – difficult to solve, interlinked and

requiring dynamic solutions that need to be constantly recalibrated as circumstances change, much like the game of chess.

To make our world a better place our quest should be to constantly find better solutions to the exigencies we face. Solutions that have least harmful impact on the environment at large, on collective human affairs and on individual psyche. For this we need to be sure that we are yet again asking the right, consequential questions, and not, as John Gardner has put it asking questions of, “Increasing irrelevance with increasing precision.”

The 21st Century Conundrum

In the 19th and early 20th century stockpiling knowledge in a domain, for example, getting a degree in medicine or engineering, more often than not, ensured lifelong employment because addition to that body of knowledge was incremental and it was easy to remain up-to-date with developments.

In the 21st century, knowledge in almost every domain is growing exponentially. According to the American Society of Training and Documentation (ASTD), the amount of knowledge in the world has doubled in the past 10 years and is doubling every 18 months^{iv}.

The Importance of Questions

Furthermore, cheap and ubiquitous computing is taking over the task of memorisation and basic analysis. Jobs that can be done by writing an algorithm, like computation or basic data analysis, are being done by computers.

Knowledge explosion coupled with cheap, ubiquitous and hyper-connected computing is bringing about a phase change in our socio-economic milieu^v. A phase change happens when there is a change in state of matter. For example, when water (liquid) turns into ice (solid) or steam (gas). Temperature changes between 1°C to 99°C give no indication of the dramatic change that is to occur in the state of water on either side of the temperature spectrum.

Likewise, in the unfolding Anthropocene epoch, we don't know what lies ahead. As Richard Riley, Secretary of Education under President Clinton observed, "We are currently preparing students for jobs that don't yet exist, using technologies that haven't yet been invented, in order to solve problems that we don't even know are problems yet."^{vi}

Only the Curious Shall Thrive

While in the midst of a Phase Change it is very difficult to predict what the future will hold...



From 99°C to 1°C we cannot anticipate what will happen at 0°C



From 1°C to 99°C we cannot anticipate what will happen at 100°C

While on the one hand, ubiquitous computing and the vast amount of knowledge that is becoming available easily and cheaply on electronic repositories like the World Wide Web is bringing about a phase change, knowledge, computing and ease of collaboration across the globe that the Internet enables, is also equipping us to derive insights

The Importance of Questions

and find innovative solutions to better deal with the outcomes of the phase change.

*We are NOW in the midst of a Phase Change
and do not know what the future will hold...*



Language



ABCDE
FGHIJK
LMNOP
QRSTU
VWXYZ

Writing



Printing Press



Current Phase
Change



Internet

“ We are currently preparing students for jobs that don't yet exist... using technologies that haven't yet been invented... in order to solve problems we don't even know are problems yet. ”

- Richard Riley, Secretary of Education
under President Clinton

The amount of knowledge in
the world has doubled in the
past 10 years and is
doubling every 18 months
- ASTD

But the digital, networked knowledge is highly fragmented. To effectively use this colossal but fragmented knowledge repository we adopt strategies like skimming and

Only the Curious Shall Thrive

scanning because skimming and scanning help us deal efficiently with the abundant and constantly growing knowledge base. However, skimming and scanning cognitive strategies are detrimental to deep understanding and insight.



As Nobel laureate, Herbert Simon, put it (in 1971)^{vii}, "...in an information-rich world, the wealth of information means a dearth of something else: a scarcity of whatever it is that

The Importance of Questions

information consumes. What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it."

The wealth of knowledge we have today is indeed creating a poverty of attention. To make sense of all the knowledge now available to us, we need to know the art of formulating questions that lead to clarity, comprehension and insight.

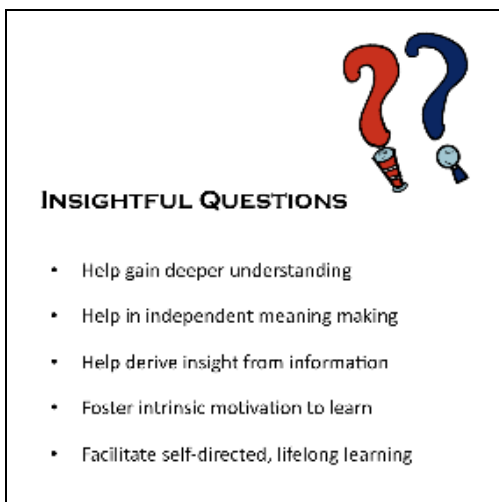
Questions not only amplify our curiosity they also help us focus our attention on the relevant. They help us filter meaning from the clutter. Questions are tools of contemplation that sculpt thought.

Story goes, Isidor Isaac Rabi, winner of the Nobel Prize for Physics in 1944, when asked how he became a scientist, replied, "My mother made me a scientist without ever intending it. Every other Jewish mother in Brooklyn would ask her child after school: 'So? Did you learn anything today?' But not my mother. She always asked me a different question. 'Izzy,' she would say, 'did you ask a good question today?' That difference - asking good questions - made me become a scientist!"^{viii}

Only the Curious Shall Thrive

In stark contrast, most schools and higher education institutions focus on questions that test recall of knowledge and surface level comprehension. They don't guide students on how to conceive more profound questions that lead to discerning comprehension, imaginative synthesis, unique insight and creative solutions.

Given the pace of knowledge accumulation in most fields, self-directed lifelong learning offers a possible panacea to keep abreast of new ideas and findings. The vast learning repositories now available, especially in digital form, facilitate lifelong, self-directed learning. Those who can add the art of formulating good questions to their cognitive repertoire of skimming and scanning will make the most of humongous knowledge now available. Using a question-based learning approach will ensure that we acquire deep understanding of a discipline, synthesise our knowledge across domains and apply our fresh insights in innovative ways.



Overview of this Book

In this book we will explore how formulating good questions catalyses curiosity, fosters an intrinsic yearning to learn by contextualising knowledge and securing a cognitive commitment to embark on a learning adventure, leads to deeper comprehension and independence in meaning making, helps derive insights from information and facilitates self-directed, lifelong learning.

We will start by understanding what are the goals of learning and the role questions play in achieving these goals, delve into different types of questions and questioning methodologies, look at how goals of learning and education have evolved over centuries and what should be the goals in

Only the Curious Shall Thrive

the 21st century, develop questioning strategies that juxtaposes the 21st century learning goals of knowledge acquisition, comprehension, mastery, creativity and wisdom with most optimal questions that can be asked to achieve these goals effectively and efficiently, then with the help of case studies we will learn how our questioning strategies can be applied in different disciplines and situations to take ownership of our learning, and finally, conclude with some thoughts about importance of questions in the evolving 21st century context.

Let's dive into goals of learning and education.

Chapter Summary

- Human curiosity led to incessant questioning, accumulation of knowledge and its gradual metamorphosis into disciplines
- Today disciplines have degenerated into subjects that students study in silos, seldom making connections to the bigger picture
- While we have found answers to many fundamental questions, new challenges like ethics of genetic engineering, harnessing of the atom and burgeoning human population are emerging
- Never before has the impact of human affairs on the larger environment been so significant
- Our neural system is not yet geared for the macro and micro challenges we face in the Anthropocene epoch we are currently in
- Knowledge explosion along with cheap and ubiquitous computing is bringing about a phase change in our socio-economic milieu
- To find innovative solutions to the challenges we face we need to derive meaning and insight from the knowledge we have accumulated
- But to deal with the vast knowledge now available, especially in electronic form, we adopt cognitive

Only the Curious Shall Thrive

strategies of skimming and scanning which are detrimental to deep understanding

- Formal education mostly focuses on questions of recall and surface level comprehension and hence students usually do not learn how to formulate questions that help in meaning making
- Questions not only amplify our curiosity, they focus our attention on the relevant and serve as filters to glean meaning and insight from the abundant knowledge now available
- Questions pique our curiosity, foster an intrinsic yearning to learn by adding a meaningful context and secure a cognitive commitment to embark on a learning adventure
- Along with skimming and scanning strategies we need to add the art of formulating insightful questions to our cognitive repertoire so that we can become lifelong, self-directed and intrinsically motivated learners interested in deeper comprehension, independent sense-making, able to glean insight from information, synthesise knowledge across domains and find more elegant and innovative solutions to the challenges we face

GUIDED DIY WORKSHOP

Activity-1

To which disciplines do the following questions belong?

1. Who am I?
2. Examination of cause and effect relationships between people, places, ideas and events?
3. What is small and how can you tell?
4. What are the great ideas humans have come up with in the last hundred years?
5. What makes a good life?
6. Why do you enjoy music?
7. Compare and contrast active and passive voice?
8. What is the relationship between humans and their environment?
9. How can we reliably understand the past events in human affairs?
10. What incentives guide human behaviour?

Takeaway: the same topic can be looked at from the lens of different disciplines and can reveal very different perspectives. Some topics sit at the cusp of two different disciplines like behavioural economics, which looks at economics and psychology – how and what incentives influence human behaviour.

Only the Curious Shall Thrive

What is essential is to mentally rewind the human story (or perhaps the story of the universe back to the point of the Big Bang) to understand the big picture of human curiosity, fundamental questions we have asked and how this has led to formation of disciplines.

Activity-2

How can you reconstruct the following learning activities such that instead of simply requiring skimming the web and cutting and pasting information, these activities lead to more thinking and deeper understanding?

1. Write about the topic 'Men on Moon'?
2. Write about any three metropolitan cities in your country?

Suggested Answers

Activity-1

To which disciplines do the following questions belong?

Following are suggested answers to the questions, which should be taken as prompts for thinking. You can come up with other answers.

The Importance of Questions

1. Who am I? (Philosophy, Psychology, Biology)
2. Examination of cause and effect relationships between people, places, ideas and events? (Social Sciences)
3. What is small and how can you tell? (Math)
4. What are the great ideas humans have come up with in the last hundred years? (All Disciplines)
5. What makes a good life? (Philosophy, Psychology)
6. Why do you enjoy music? (Aesthetics, Physics)
7. Compare and contrast active and passive voice? (Literature)
8. What is the relationship between humans and their environment? (Geography)
9. How can we reliably understand the past events in human affairs? (History)
10. What incentives guide human behaviour? (Economics, Psychology)

Activity-2

1. Write about the topic 'Men on Moon'?

A student can find loads of information on this topic on sites like Wikipedia and simply cut-paste the information. In its present form the question is good enough if the learning goal is 'seeking

Only the Curious Shall Thrive

information'. For higher order learning goals like independent thinking and deeper understanding the question could be rephrased thus:

- You have won a lucky draw of InterGalactic Airlines – one-week stay on the Moon. What all essentials will you need to pack for the journey on board the spaceship and for your stay on the moon? Provide evidence why you think each item you have selected will be needed. You can base your evidence on the Apollo missions to the moon and other scientific knowledge.

2. Write about any three metropolitan cities in your country?

The question can be rephrased thus:

- You have got a new job and you can choose from one of the three metropolitan cities in your country to base yourself. Which city will you choose and why?

2. GOALS OF LEARNING AND THE ROLE QUESTIONS PLAY

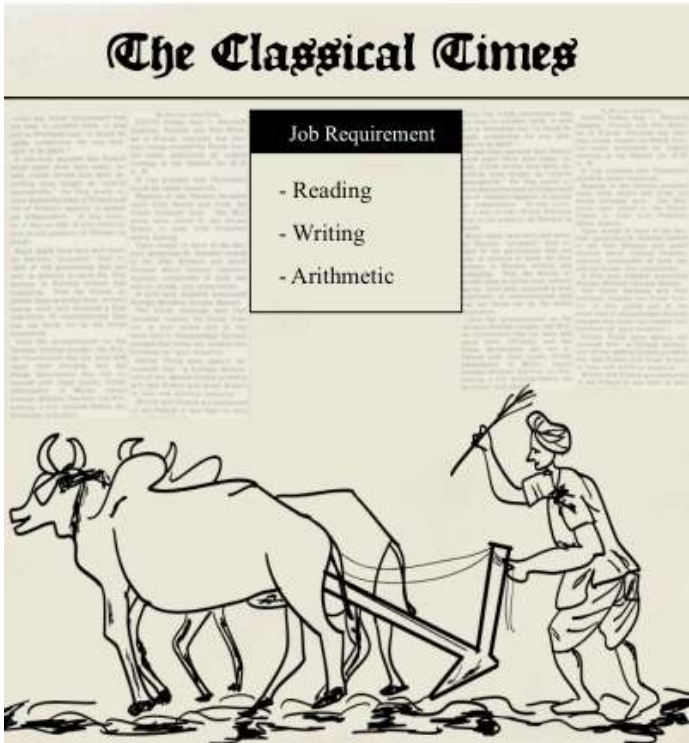
What should be the outcomes of a learning experience? What should be the destination of a learning journey? What milestones and guideposts can tell us where we are in a learning adventure? Clarity about goals of learning help us formulate questions that enable us achieve these goals more efficiently and effectively.

Evolution of Goals of Learning and Education

Put a little simplistically, the goals of learning and education over the centuries have been the following:

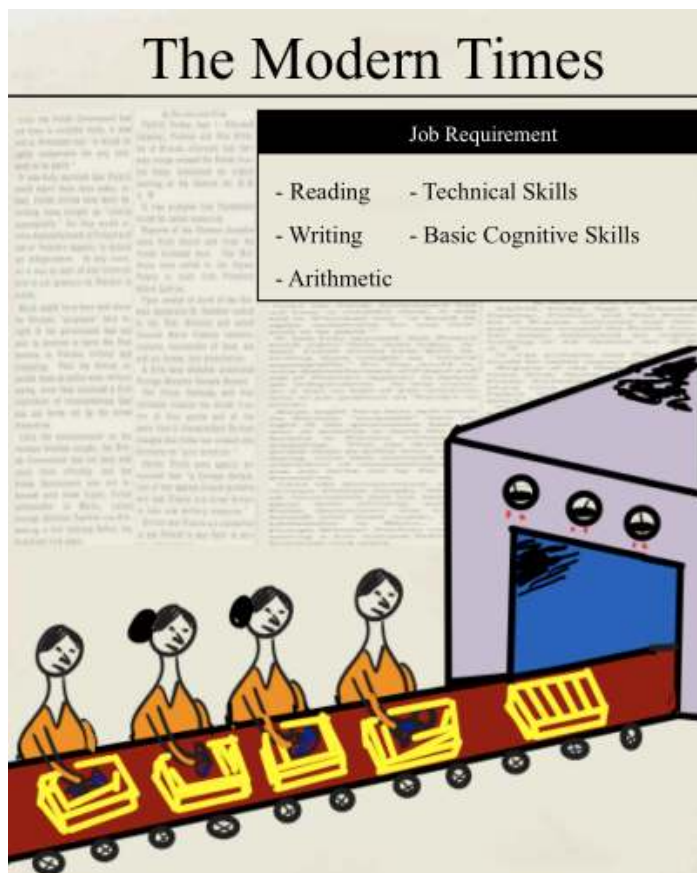
In the classical age learning the 3Rs (Reading, wRiting and aRithmetic) was the primary goal of education, which was usually adequate to be gainfully employed.

Evolving Goals of Education



Goals of Learning and the Role Questions Play

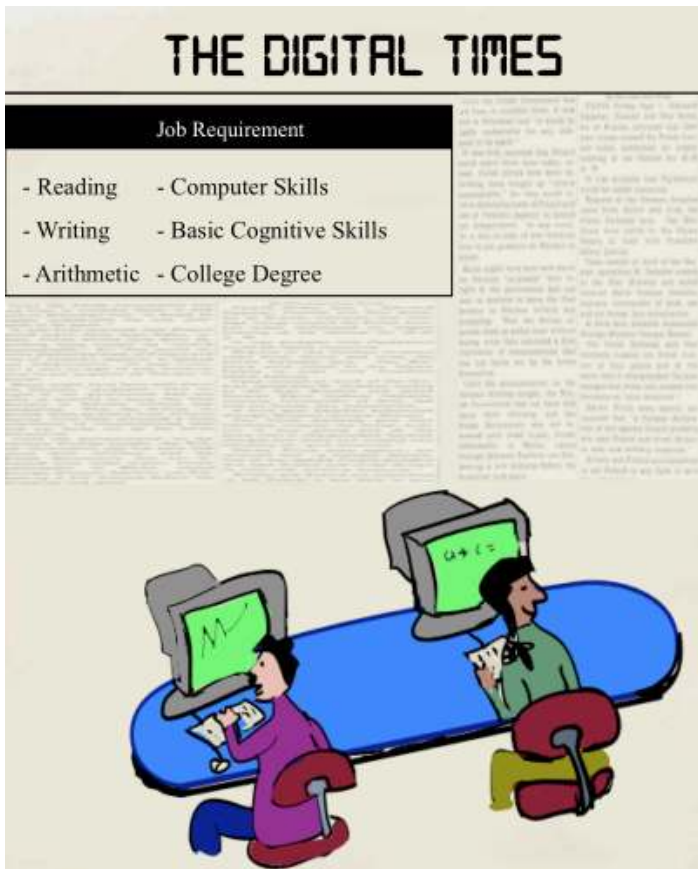
In the industrial age the main goal of education was to master the 3Rs, learn some technical skills and some basic cognitive skills so as to get a job in a factory.



In the information age, in addition to mastering 3Rs and acquiring basic cognitive skills, knowledge had to be amassed

Only the Curious Shall Thrive

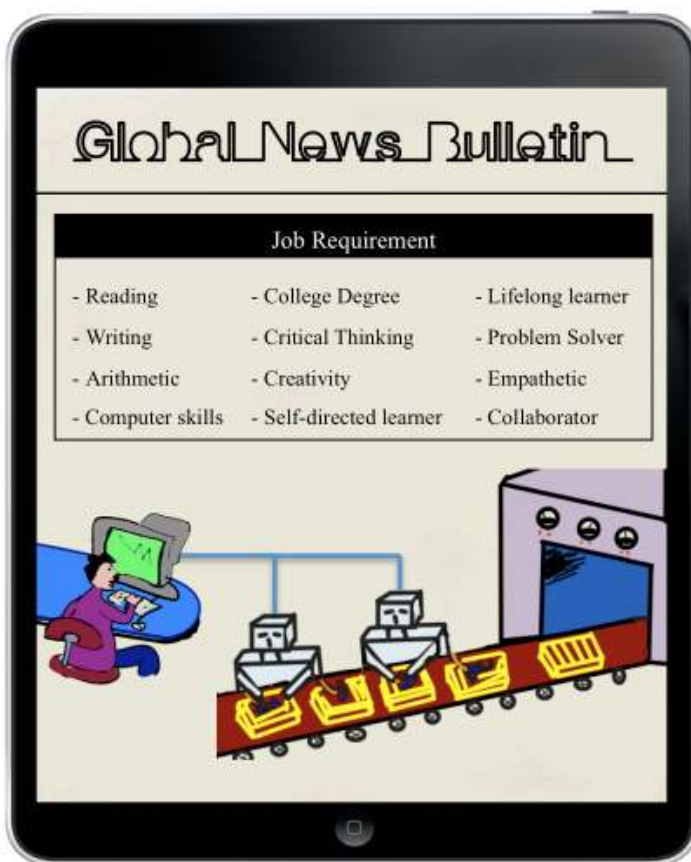
in a specific discipline (for example, get a university degree)
to become employable.



In today's knowledge age we need to learn the 3Rs, acquire basic cognitive skills, stockpile knowledge in a specific discipline but because of advent of computers,

Goals of Learning and the Role Questions Play

networks and automation, which have taken over the job of memorisation and basic analysis like crunching numbers and data, we also need to learn higher order cognitive skills, emotional intelligence, empathy, creative problem solving, self-directed learning skills, decision making and collaboration skills to be able to create economic and social value.



The complexity and scale of some of the issues we are facing today pose a threat to our very existence – climate change, environmental degradation, burgeoning human population, the rate at which we are consuming natural resources that do not regenerate at the same pace, nuclear threat, terrorism and more. We need to go beyond knowledge, comprehension and higher-order cognition, and embrace wisdom to meaningfully address these issues.

Hence, beyond learning the 3Rs, domain knowledge, analytical skills and creativity, the goals of learning today have to also include wisdom, that is, wise use of knowledge, thinking and creativity to solve problems and take decisions that enable us to live in harmony with other beings and with mother nature.

To take an in-depth look at the goals of learning and education that are relevant today, we pick up the thread of the ever-unfolding story of learning goals with the work done by Benjamin Bloom.

Benjamin Bloom - Taxonomy of Educational Objectives^{ix}

Benjamin Bloom, an American educational psychologist, worked on the question of desired goals of education, i.e. what should the students be expected to learn as a result of

Goals of Learning and the Role Questions Play

the instruction they are provided, such that performance can be measured against these generally accepted goals. In 1956, along with a group of educationists, Bloom published taxonomy of educational objectives in order to provide a common language about learning goals and outcomes.

Bloom identified three domains of educational objectives:

- i. **Psychomotor** (doing/hands): manual skills like ability to physically manipulate a tool or an instrument
- ii. **Affective** (feeling/heart): emotional reactions like sympathy, empathy, values, motivations and attitude
- iii. **Cognitive** (knowing/head): intellectual or mental skills like knowledge, comprehension and critical thinking

Within the cognitive domain, Bloom proposed a six-level taxonomy, moving from simple cognitive tasks to more challenging ones, from concrete to abstract. Mastery of each simpler category becoming a pre-requisite for the mastery of the next complex one. The six levels are:

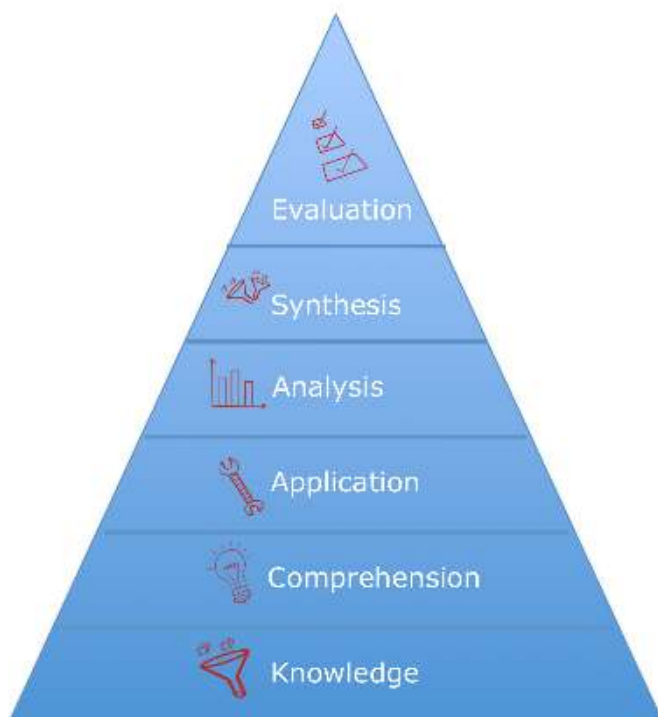
- i. **Knowledge:** recall or recognise facts, basic concepts, definitions, classifications, principles, theories, terminology, conventions and theories

Only the Curious Shall Thrive

- ii. **Comprehension:** demonstrate understanding by stating main ideas, organising, comparing, translating, interpreting and extrapolating
- iii. **Application:** apply knowledge and understanding
- iv. **Analysis:** analyse elements, relationships and organisational principles – distinguish between fact and inference, draw inferences, support generalisations, break information into parts to understand the underlying organisation structure
- v. **Synthesis:** compile information in new ways by combining diverse elements, propose alternate solutions, derive abstract relations, produce unique communication, plans and proposed set of operations
- vi. **Evaluation:** validate or judge ideas or quality of work in terms of internal evidence or external criteria, defend opinions and ideas

Goals of Learning and the Role Questions Play

Bloom's Taxonomy of Educational Objectives



Most traditional school-level education focuses on lower order cognitive outcomes like knowledge and comprehension. Higher education also ventures into application and analysis.

Impact of Computing on Learning Goals

The challenge today is that with mechanisation, knowledge explosion and pervasive computing, mere memorisation of knowledge and basic analytical skills are no longer of great economic value and do not assure lifelong employability.

The challenge today is that tasks that can get automated get done by machines, tasks that can be reduced to an algorithm get done by computers; knowledge and basic analytical skills no longer assure lifelong employability



Goals of Learning and the Role Questions Play

Tasks that can be automated get done by machines. Think of all types of vending machines from soft-drinks to ATMs, assembly lines in factories run by robots and unmanned drones undertaking dangerous reconnaissance missions.

Routine tasks that can be reduced to an algorithm are increasingly being done by computers because computers can do these tasks more efficiently and accurately. For example, large amount of information is now stored electronically and is available on multitude of devices on a tap of a button. This information can also be searched and analysed better by computers than humans. Banks, that earlier calculated interest on a monthly basis can now calculate it on a daily or even hourly basis. They do not need to employ an army of clerks to do this job.

A more profound example is IBM's computer 'Watson', which is an advance artificial intelligence machine. Watson won the famous American quiz show, Jeopardy, in 2011, beating two human contestants who were the show champions in previous years. You can search on YouTube and watch Watson play Jeopardy.

'Digital Aristotle' is another AI-based reasoning system capable of answering novel questions and solving advanced problems in a broad range of scientific disciplines and related human affairs. It has two primary functions – a tutor capable

of instructing and assessing students in those subjects, and a research assistant with broad, interdisciplinary skills to help scientists and others in their work. If your knowledge and skills are below that of Digital Aristotle, there is a fair chance that you will be replaced!

Knowledge accumulation in almost every domain is happening at such a fast pace that stockpiling knowledge one time (i.e. getting a degree) is no longer sufficient for lifelong employability. For example, developments in the field of genetics imply that a degree in medicine alone does not guarantee lifelong employability. A doctor has to keep abreast of new knowledge in the domain of medicine just to remain employable, and to really shine, the doctor has to find new insights, create and innovate.

Employers are willing to pay a premium only if a person is able of doing complex, non-routine creative work.

Revised Taxonomy of Educational Objectives^x

With the change in the complexion of the global economy, a need was felt to redefine Bloom's taxonomy to make it more contextually relevant to the 21st century. The six-level taxonomy proposed by Bloom in 1956, was revised in 2001 by his student Lorin Anderson, along with David

Krathwohl, who was one of the partners in Bloom's original work.

While Bloom's taxonomy has only one dimension, Anderson follows a two-dimensional approach. One dimension identifies the different kinds of knowledge and the other dimension identifies cognitive process used to learn that knowledge.

Two dimensions approach is more appropriate for describing what we expect or intend students to learn as a result of instruction because the learning outcomes of instructions are usually two-fold – first, subject matter content (i.e. knowledge dimension) and second, a description of what is to be done with or to that content (i.e. a cognitive process dimension). For example, a learning outcome like 'explain demand' has these two aspects 'explain' – a cognitive process and 'demand' – subject matter.

According to Anderson, knowledge dimension has four categories:

- a. **Factual Knowledge:** familiarity with basic elements of a discipline, like terminology
- b. **Conceptual Knowledge:** inter-relationships between basic elements of a discipline, like principles, theories and models

- c. **Procedural Knowledge:** how to do something, like methods of inquiry, algorithms, techniques, criteria
- d. **Meta-cognitive Knowledge:** knowledge of general cognition and own cognition i.e. knowing yourself how you think and learn best

Each knowledge category has the following cognitive dimensions:

- i. **Remember:** retrieve relevant information from long-term memory – recognise or recall
- ii. **Understand:** determine the meaning of instructional messages – interpret, exemplify, classify, summarise, infer, compare, explain
- iii. **Apply:** carry out or use a procedure in a given situation – execute or implement
- iv. **Analyse:** break material into its constituent parts and detect how the parts relate to one another or to an overall structure or purpose – differentiate, organise, attribute
- v. **Evaluate:** make judgements based on criteria and standards – checking, critiquing
- vi. **Create:** put elements together to form a novel, coherent whole, or make an original product – generate, plan, produce

Goals of Learning and the Role Questions Play

	Remember	Understand	Apply	Analyse	Evaluate	Create
Factual Knowledge						
Conceptual Knowledge						
Procedural Knowledge						
Metacognitive Knowledge						

A Revision of Bloom's Taxonomy of Learning Goals

PURSUIT OF WISDOM

– An Essential 21st Century Learning Goal

Bloom's taxonomy and the revised taxonomy both do not explicitly talk about wisdom being a goal of learning and education, whereas what is imperative today is that we use all our knowledge of the past centuries, our profound thinking skills and creativity, in wise ways. Education needs to focus explicitly on nurturing wisdom so that do not compromise our very survival, instead we live in harmony with nature, other species and with fellow human beings.

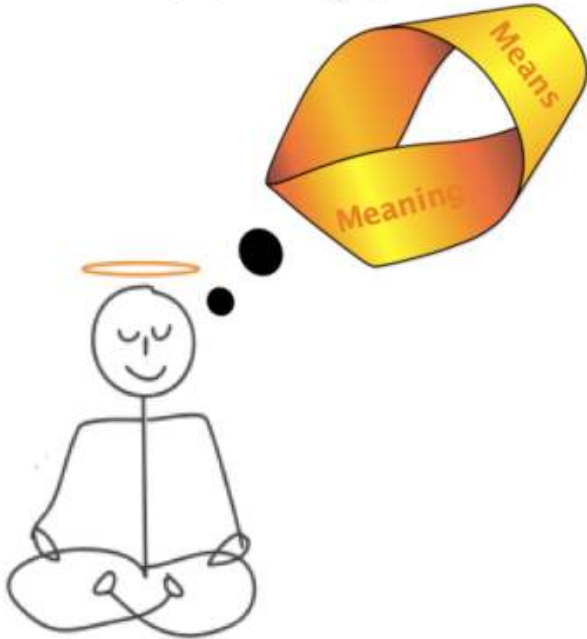
Viktor Frankl, in his book 'Unheard Cry for Meaning'^{xi} writes, "For too long we have been dreaming a dream from which we are now waking up: the dream that if we just improve the socioeconomic situation of people, everything will be okay, people will become happy. The truth is that as the *struggle for survival* has subsided, the question has emerged:

Only the Curious Shall Thrive

survival for what? Ever more people today have the means to live, but no meaning to live for.”

The ‘wisdom’ learning goal is application of our knowledge, understanding and creativity to pursue meaning, purpose and larger good.

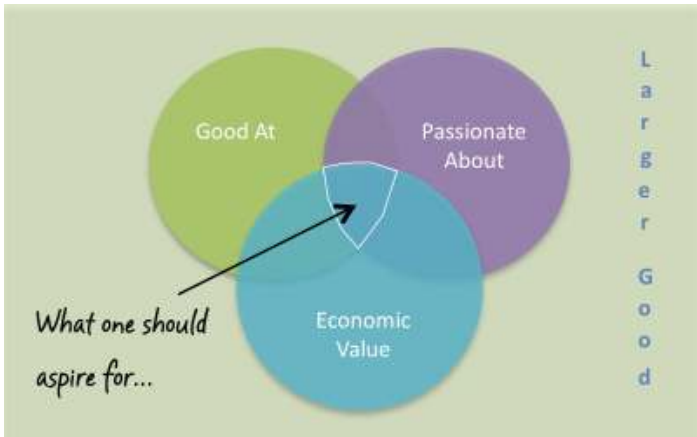
*The ‘wisdom’ learning goal is application of our knowledge,
understanding and creativity in pursuit of meaning,
purpose and larger good*



Martin Seligman, founder of Positive Psychology, in his book ‘Flourish^{xii}’ defines the five constituent elements of well-being as PERMA: Positive Emotions, Engagement, Positive Relationships, Meaning and Accomplishment. For Seligman, meaning is belonging to or serving something that you believe is bigger than yourself.

The Hedgehog Concept

Jim Collins, in his bestseller ‘Good to Great^{xiii}’ describes the ‘Hedgehog Concept’ – think of three intersecting circles, in the first circle put what you are good at, in the second circle put what you are passionate about (you may not be good at everything that you are passionate about) and in the third circle put things you can do that are of value (i.e. they can lead to economic gains). Then pursue those ambitions that lie where all the three circles intersect. That is, chase aspirations around things you are good at, passionate about and those that lead to financial returns by creating value.



The Hedgehog Concept

To add to this, you will be wise to choose only those activities that do not harm fellow beings and do not degrade the environment. It will be even better if some of the activities you choose are those that go beyond your self-interest and you do them for the larger good.

The 20-10 Question^{xiv}

Collins also poses a very interesting ‘20-10 Question’ – imagine you wake up one morning and discover that you have inherited \$20 million, but you also discover that you have a terminal disease and have only 10 years to live. What will you do, and more importantly, what will you stop doing?

Most people have some form of a ‘To Do’ list but Collins points out that it is perhaps more important to have a ‘Stop Doing’ list so that you don’t waste time and energy doing

activities that are inconsequential, especially from the point of view of the three-intersecting circles Hedgehog concept you have developed.

FRAMEWORK OF LEARNING GOALS

The objective of this book is to create Questioning Strategies that map the major learning goals with appropriate questions such that accomplishing these goals can be facilitated.

Bloom's taxonomy defines learning goals as six cognitive processes and Anderson's revised taxonomy takes a two-dimensional view of learning goals, with knowledge types on one axis and cognitive processes on the other.

We have also noted that neither of these taxonomies explicitly lists 'wisdom' as a goal of learning but in today's context this becomes a very important objective of learning and education given the nature of issues we face.

Based on the taxonomies of learning goals we looked at and the changing context that makes it imperative to add pursuit of wisdom as an important goal of learning and modern education, we can club the learning goals into the following five broad categories:

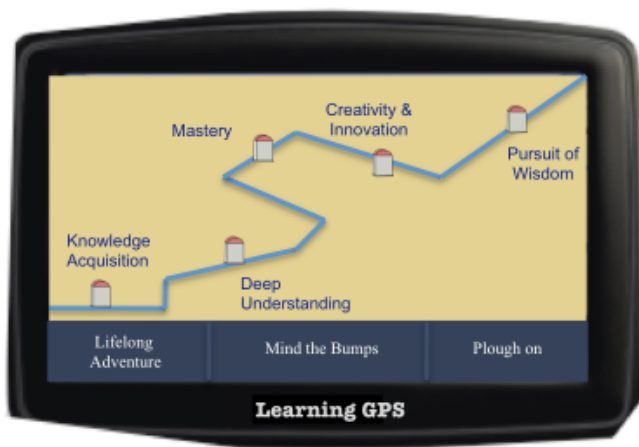
- 1. Knowledge Acquisition**
- 2. Deep Understanding**

3. **Mastery**
4. **Creativity and Innovation**
5. **Pursuit of Wisdom**

Meta-cognition or thinking about our thinking and learning needs to happen for each learning goal because only thinking about where we are and where we want to go next is what enables us reach there.

Learning Goals relevant in the 21st century.

Goals serve as guideposts in our learning journey. Ability to formulate questions appropriate for each learning goal makes us more efficient and effective in reaching that goal



Goals of Learning and the Role Questions Play

‘Knowledge Acquisition’ maps to the ‘knowledge’ goal in Bloom’s taxonomy and to the ‘remember’ aspect of Anderson’s revised taxonomy of learning objectives.

‘Clarity and Understanding’ aligns with ‘comprehension’ goal in Bloom’s taxonomy and to ‘understand’ aspect in the revised taxonomy.

‘Mastery’ maps to ‘application’, ‘analysis’, ‘synthesis’ and ‘evaluation’ goals in Bloom’s taxonomy and to ‘apply’, ‘analyse’ and ‘evaluate’ aspects in the revised taxonomy.

‘Creativity and Innovation’ does not have an equivalent in Bloom’s taxonomy but maps to ‘create’ aspect in the revised taxonomy.

‘Pursuit of Wisdom’ does not explicitly appear in either taxonomies but it is a learning goal we need to add given the context of challenges we face today.

Knowledge Acquisition and Deep Understanding have been the established goals of learning and education and we have an intuitive understanding of why these goals are important. But let’s dwell a little deeper into the goals of Mastery, Creativity and Wisdom.

More on the Learning Goal – Mastery

Competence

The ‘self-determination theory of human motivation’

postulates that besides extrinsic motivators like grades in an examination or salary and perks in a job, there are intrinsic motivators like pursuing an activity because it is interesting and satisfying in itself. For example, learning for the sheer joy of learning. The theory identifies three intrinsic motivators viz. autonomy, competence and relatedness. Pursuit of mastery is driven by the intrinsic motivator – competence, which is the desire to acquire expertise and proficiency in a chosen field.

In 1959, psychologist Robert White, in a paper titled “Motivation Reconsidered: The Concept of Competence” proposed the concept of ‘Effectance Motivation’. He postulated that the ‘master reinforcer’ (i.e. motivator) for humans is personal competence. Effectance helps an organism improve itself.

The ‘Mastery’ goal of learning is driven by our intrinsic desire to become competent.

‘Calling’ and Inner Conflict

In his book “The Fifth Discipline^{xv}” author Peter Senge defines ‘personal mastery’ as, “Discipline of continually clarifying and deepening our personal vision, of focusing our energies, of developing patience, and of seeing reality objectively.” Mastery, according to Senge, is about finding and pursuing own ‘calling’ in life.

Senge describes ‘creative tension’ as the pull of the goals (or calling) from where we currently are to where we want to be. To release this tension we can either move towards the goal or lower the goal. What action we take depends on the mental conflicts we face – our own thoughts of unworthiness and incapability. A sub-goal of achieving mastery thus becomes introspecting on inner conflicts and figuring out ways of resolving them.

Flow

Psychologist Mihaly Csikszentmihalyi describes ‘Flow’^{xvi} as a state of total immersion in a task that is challenging yet closely matched to one’s abilities. One experiences flow when – there is a clear challenge that fully engages one’s attention, one has the skills to meet the challenge, and one get immediate feedback on each step.

According to Nakamura and Csikszentmihalyi, people enjoy longer period of flow as their interest in the flow activity intensifies and their relationship to people, practices and values in that domain deepens. This they call ‘Vital Engagement’ – a relationship to the world characterized both by experiences of flow (enjoyed absorption) and by meaning (subjective significance).

Mastery and flow are inter-dependent. More flow moments you have more you will master that activity and

more you master an activity more flow moments you will have.

Engagement

According to Seligman, in his PERMA factors that lead to a life of happiness and well-being, the ‘E’ of Engagement, becomes possible only when our life is filled more and more with moments of ‘flow’.

Drive

In his book ‘Drive^{xvii}’ author Daniel Pink suggests that the new operating system for the 21st century, or Motivation 3.0, has three components – Autonomy: the urge to direct our own lives, Mastery: the desire to get better and better on something that matters, and Purpose: a yearning to do something larger than our self-interest.

Mastery Defined

Based on these different perspectives we can define the learning goal ‘Mastery’ as a desire to continuously self-improve by recognising and resolving our inner conflicts. Finding and pursuing goals that matter to us and are our calling in life. Goals that engage us so much that we lose sense of time when we are pursuing them.

Striving for mastery is innately satisfying and contributes

to our well-being and happiness, which makes it a highly desirable goal of learning.

More on the Learning Goal – Creativity and Innovation

Creative Creators

In their book, ‘That Used to be Us^{xviii}’, authors Thomas Friedman and Michael Mandelbaum quote Harvard University’s Lawrence Katz and MIT’s David Autor, who have argued that the big change wrought by merger of globalisation and the IT revolution is ‘employment polarisation’ or ‘skill-biased technological change’ – “A computer makes an educated person more productive and opens up more markets around the world, but often makes a less educated person less employable.”

Friedman and Mandelbaum suggest that today we have four types of jobs – ‘creative creators’ are people who do non-routine work in non-routine ways like best lawyers, doctors, writers or professors, ‘routine creators’ are those who do non-routine work in routine ways like average lawyer, scientist or teacher, ‘creative servers’ are those who do non-routine low-skilled work in inspired ways like a baker who comes up with a special cake recipe, or a nurse with extraordinary interpersonal skills, or a sales person who has

exceptional expertise on wines, and ‘routine servers’ are those who do routine serving work in routine ways.

The authors argue that the most lucrative opportunities are increasingly available only to ‘creative creators’ and ‘creative servers’ who can add a little extra to what they are doing. ‘Routine creators’ are vulnerable to outsourcing, automation or digitisation and ‘routine servers’, even though they may be doing face-to-face jobs, which cannot be outsourced, like barber, plumber, nurse or electrician, are also vulnerable because they will be the first to be fired in an economic squeeze or get replaced by immigrants. As the authors put it, “Average is Over”. An element of creativity, however routine the job may be, is what is of value now.

‘Why Not?’ Thinking

Yale professors, Barry Nalebuff and Ian Ayres, in their book ‘Why Not?’^{2xix} argue that innovation is not just about high-tech breakthroughs, its about everyday ingenuity. They suggest posing questions like how would a very rich person solve a particular problem (i.e. thinking of a solution without constraints), or rethink the incentives that drive behaviour like buying a bottle of shampoo vs. buying a sachet (also called single-serve pricing), or flip concepts around like flip of a microwave could be a macrowave – which instantly cools beverages.

Goals of Learning and the Role Questions Play

Creative thinking and ability to innovate has become a key goal for learning and education in the 21st century. Creativity and innovation, among other things, involves suspending our disbelief, challenging our age-old inherent assumptions, being aware of our cognitive biases, ability to look at issues from multiple perspectives and synthesising knowledge from varied domains (which happens through the collaboration of experts or masters in different disciplines)

More on the Learning Goal – Wisdom

Stages of Moral Development and Ethics

Psychologist Lawrence Kohlberg, in his 1958 dissertation proposed what are now known as ‘Kohlberg’s Stages of Moral Development^{xx}’. According to Kohlberg, moral reasoning forms the basis of ethical behaviour and there are six stages of responding to moral dilemmas, grouped into three categories:

Group-1: Pre-Conventional

1. **Obedience and Punishment Orientation:**
morality of an action is judged by its direct consequences. For example, last time I did that, I got punished so I won’t do that again.

2. **Self-Interest Orientation:** what's in it for me or, if you scratch my back I will scratch yours.

Group-2: Conventional

3. **Interpersonal Accord and Conformity:** approval or disapproval from others guides moral behaviour. For example, not being naughty makes people like me, so I will not be naughty.
4. **Authority and Social Order Maintaining Orientation:** it is important to observe rules and laws because they help maintain a functioning society. Morality is still dictated by an outside force.

Group-3: Post-Conventional

5. **Social Contract Orientation:** laws are social contracts and not rigid edicts and if the laws do not promote general welfare then they should be changed.
6. **Universal Ethical Principles:** laws are valid only if they are grounded in the larger, abstract concept of justice and hence if a law is unjust it should be disobeyed.

Goals of Learning and the Role Questions Play

Rafe Esquith, elementary school teacher in Los Angeles, the only teacher to have been awarded the president's National Medal of the Arts in America so far, in his book 'Teach Like Your Hair's on Fire^{xxi}', explains how one of his goals with his grade-5 students is to help them understand and move up the ladder on Kohlberg's six stages of moral development.

Level-1 Behaviour – I Don't Want Trouble

Student behaviour is based on, 'I don't want to get in trouble' and teachers and parents reinforce this by promising students trouble if they don't follow what is told to them. Such an approach creates a classroom or home environment that is based on fear, instead of a place where students learn and behave because they believe it is the right thing to do.

Level-2 Behaviour – I Want a Reward

Student behaviour is based on 'I want a reward' and teachers and parents promise students rewards for performance. This creates 'Pavlovian students'. If at all rewards are to be used they should be used for encouraging effort and not be given based on outcome. The need is to demonstrate to the students that proper behaviour is expected, not rewarded.

Level-3 Behaviour – I Want to Please Somebody

Student behaviour is based on ‘I want to please somebody’ and to please their teachers or parents they behave well. Esquith challenges his fifth graders, “Do you brush your teeth for me? Do you tie your shoes for me? Do you see how silly that sounds?”

Level-4 Behaviour – Follow Rules

Students behaviour is based on rules that have been laid down. Good teachers and parents explain the rules and creative ones involve the students in formulating the rules because students need to appreciate the reasons why rules are there, and at times question them to make sure they are the right rules.

Level-5 Behaviour - Empathy

Students behaviour is based being considerate of other people and parents and teachers need to help students understand importance of empathy – ability to see the world from the other person’s perspective.

Level-6 Behaviour – Personal Moral Code

Student behaviour is based on ‘I have a personal code of behaviour and I follow it’. Teachers and parents

Goals of Learning and the Role Questions Play

need to help students understand what it means to operate at this level of moral and ethical reasoning. One way is by identifying characters who live by such a code in books and movies like the character Atticus Finch, in the book ‘To Kill a Mocking Bird’.

Wisdom Defined

The learning goal, ‘pursuit of wisdom’, thus has two dimensions – living a life of meaning and purpose that enhances happiness and well-being, pursuing life goals that go beyond self-interest and are for the larger good; and, living an ethical life where own morals are a personal code, based on empathy for fellow beings and maintain harmony with nature.

Role of Questioning in Learning Goals

Learning objectives act as guideposts in our learning journey – telling us that we are now at the first milestone of knowledge acquisition, now we are at the second milestone of comprehension, now we are speeding towards analysis and application, next stop – creation and innovation.

Ability to formulate questions appropriate for each learning goal makes us more efficient and effective in reaching that goal. Questions can also help us ascertain that

we have indeed achieved our goal and prepare us to go towards the next goal.

For example, question-based activities to assess knowledge and comprehension could include – fill in the blanks questions, true or false questions, multiple choice questions, fill in a faded flowchart questions (some components missing which have to be filled in), complete a Venn diagram (compare and contrast) questions, summarise, classify, sort, critique and essay-type questions. Answering questions about feasibility of a hypothetical new application of knowledge could be used for testing creativity and innovation learning goal.

What is important is that as a learner we understand what purpose a question serves. For example, a fill-in the blank question, requiring recall, can be more cognitively challenging than a multiple choice question, which tests recognition. A summarise in own words question leads to deeper comprehension. Coming up with examples of how knowledge can be applied in solving real-world problems is a test of creativity.

To develop strategies for questioning that progress us from one learning goal to the next, let us now understand what are the different types of questions and questioning techniques.

Chapter Summary:

- Learning goals bring clarity to the expected or desired outcomes of a learning experience
- In the agrarian age learning the 3Rs was the primary goal of education
- In the industrial age the main goal of education was to master the 3Rs, learn some technical skills and some basic cognitive
- In the information age in addition to earlier learning goals, amassing knowledge in a specific discipline (e.g. a university degree) became an additional learning goal
- In today's knowledge age because of advent of computers, networks and automation, which have taken over the job of memorisation and basic analysis, in addition to earlier goals of learning now we also need to learn higher order cognitive skills, emotional intelligence, empathy, creative problem solving, self-directed learning skills, decision making and collaboration skills to be able to create economic and social value
- Bloom's Taxonomy of Educational Objectives: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation

Only the Curious Shall Thrive

- Anderson's Revised Taxonomy of Educational Objectives (two-dimensional) – Knowledge Dimension: Factual, Conceptual, Procedural and Meta-cognitive; Cognitive Process Dimension: Remember, Understand, Apply, Analyse, Evaluate, Create
- Neither taxonomies explicitly includes 'wisdom' as a goal of learning and education but we need to embrace wisdom to meaningfully address the potentially grave challenges we face today like climate change, poverty, terrorism and pandemics
- 21st Century Framework of Learning Goals: Knowledge Acquisition, Deep Understanding, Mastery, Creativity and Innovation and Pursuit of Wisdom
- Learning objectives act as guideposts in our learning journey and ability to formulate insightful questions appropriate for each learning goal makes us more efficient and effective in reaching that goal

GUIDED DIY WORKSHOP

Activity-1

Imagine how a traditional profession like being a doctor will get further impacted by the exponential growth of knowledge and increasing use of advanced computing and information technologies...

Following are some thought prompts that will help you better appreciate what automation, computing and knowledge explosion will mean for a doctor:

- Did you think how self-diagnostic tools would create more empowered patients and how this would impact a doctor?
- Did you think how X-rays could be analysed by computers by comparing digital information of one X-ray with millions of other records in a fraction of a second? (End of the profession of radiologists, as it exists today, is imminent?)
- How would medical devices embedded in the human body, like a pace-maker, that is linked to the internet and can send critical information to doctors impact the profession?
- How exploding knowledge in genetics will imply that doctors have to be lifelong learners?

Only the Curious Shall Thrive

- How doctors will have to constantly question what new knowledge and skills they have to keep acquiring to survive and thrive? Perhaps, empathy will become even more important trait of a doctor, given how much else may get done by computers and machines.

Takeaway: All professions will get impacted by mechanisation, automation or computing. Knowledge may grow at exponential rate in most fields and this will mean all of us will have to become excellent self-directed, lifelong learners.

Activity-2

Populate the table of learning goals with the listed questions and tasks based on which question/task you think maps most appropriately with a particular learning goal.

The answers could be interpreted differently (i.e. one question/task could belong to different learning goals) but the exercise should give you an overall sense of what types of questions are appropriate for different learning goals.

List of Questions/Tasks:

Is it Just, When, Justify, Define, Summarise, Explain, List, Differentiate, Sort, Critique, Why Not, Classify,

Goals of Learning and the Role Questions Play

Interpret, Tabulate, Is it Meaningful, Match, Is it Moral,
Where, Which One, Who, Is it Ethical, Summarise,
Predict, Estimate, How else, Why, Infer, Evaluate, Judge,
Apply, Relate, What if, Synthesise, Is it Purposeful, How

Knowledge Acquisition	Deep Understanding	Mastery	Creativity	Pursuit of Wisdom

Suggested Answer:

Knowledge Acquisition	Deep Understanding	Mastery	Creativity	Pursuit of Wisdom
Define	Summarise	Critique	What if	Is it moral
List	Predict	Infer	How else	Is it ethical
Sort	Interpret	Evaluate	Why not	Is it purposeful
Classify	Explain	Judge	Synthesise	Is it meaningful
Tabulate	Estimate	Apply		Is it just
Match	How	Relate		
When	Why	Which one		
Where	Differentiate	Justify		
Who				

3. TYPOLOGY OF QUESTIONS

What do you think is the world's best question?

Perhaps that is the world's best question!

What makes a Good Question?

Good questions are excellent thinking tools. In a given context they help us understand what do we know, what do we not know, what wrong assumptions and biases do we have, what do we need to know, how can we find out, how do we zoom into and zoom out of the issue, how can we look at the issue from different perspectives, is there a

Only the Curious Shall Thrive

similar issue that we have faced earlier, how did we go about solving that issue – what worked, what did not work then, and so on.

A good question has the following characteristics:

- It is simple, clear and penetrating
- It brings focus and sustains attention
- It is invigorating – generates energy and enthusiasm
- It is relevant but broad
- It is thought provoking and stimulates thinking
- It shifts the focus from problem to possibility
- It diagnoses difficulties
- It challenges cognitive biases and inherent assumptions
- It leads to deeper understanding and insight
- It makes one wonder
- It evokes more good questions
- “A prudent question is one-half of wisdom”
(*Francis Bacon*)

TYPES OF QUESTIONS

Close-ended and Open-ended Questions

A close-ended question is a yes/no question that seeks a very specific response and does not lead to deep reflection. Recall of facts – ‘what is the capital of Chile?’ or objective-type questions like choose from one of the four given options, are examples of close-ended questions.

An open-ended question, on the other hand, requires deep reflection. For example, ‘how to resolve an inner conflict like fear of failure or ridicule in attempting to learn something new?’ or ‘what is your opinion about the proposed tax reforms, based on your study of economics?’

Questions based on End Objectives

Based on the desired outcome of questioning process, questions can be based on such objectives:

- i. **Eliciting Information:** questions that look at sources and quality of information and test recall
- ii. **Interpretation:** questions that help organise information – classify, sort, distinguish, relate
- iii. **Deeper Understanding:** questions that lead to comprehension and help make sense

- iv. **Analysis and Persuasion:** questions that analyse information – help make patterns and connections, analyse causal relationships, identify logical fallacies, identify own cognitive biases and wrong assumptions
- v. **Integration and Synthesis:** questions that help rearrange or reconstruct knowledge, make connections across knowledge domains, draw inferences, solve problems
- vi. **Evaluation, Judgement and Decision Making:** questions that compare, contrast, appraise, critique, assess, help in decision making, and take us from satisficing (the first correct solution found) to optimising (further search for a more elegant solution)
- vii. **Creativity and Innovation:** questions that lead to new solutions and designs – questions that prod curiosity, wonder, inquisitiveness and imagination
- viii. **Pursuit of Wisdom:** questions on meaning and purpose of life, ethical behaviour and morality

Analytic vs. Evaluative Questions

In their book, “The Art of Asking Essential Questions^{xxii}” authors Richard Paul and Linda Elder suggest that one way

of classifying questions can be analytic vs. evaluative questions.

Analytic Questions

According to the authors, analytic questions require breaking the whole into parts and then probing each part.

Analytic questions can be further classified into:

- **One-System questions** that require evidence and reasoning and have a correct answer like questions around facts – what is two plus two?
- **No-System questions** state a subjective preference and hence do not have any correct or incorrect answers since they are just a subjective opinion like a preference for a colour scheme
- **Multi-System questions** that require evidence and reasoning across multiple systems. These questions have better or worse answers (multiple viewpoints but no one correct answer) and hence require judgement. Like, what is the best way to eradicate poverty?

Evaluative Questions

Evaluative questions are useful for determining the value or quality of something or someone. However, these are not

questions of preference or subjective choice (no-system questions). Evaluative questions can be:

- **One-System:** that can be definitely answered.
Like, what is the quality of air in London?
- **Conflicting System:** that call for reasoned judgement between conflicting views. Like, which mobile phone should I buy?

The authors further suggest that while formulating questions the following guideline should be kept in mind:

- Questioning Goals and Purposes
- Questioning Questions
- Questioning Information, Data and Experience
- Questioning Inferences and Conclusions
- Questioning Concepts and Ideas
- Questioning Assumptions
- Questioning Implications
- Questioning Viewpoints and Perspectives

Guszak's Classification of Questions^{xxiii}

Frank Guszak conducted a study on the type of questions teachers typically ask their students. Based on this study, Guszak classified the questions as:

Typology of Questions

- i. **Recognition questions:** that test literal comprehension skills to locate information in given text
- ii. **Recall questions:** that test if factual information can be recalled
- iii. **Translate questions:** that test if information can be paraphrased in own words
- iv. **Conjecture questions:** that test if students can predict what is to come
- v. **Explanation questions:** that test if students can draw inference and explain the rationale
- vi. **Evaluation questions:** that test if the students can judge the worthy, acceptable or probable

Pearson and Johnson Taxonomy of Questions^{xxiv}

Pearson and Johnson (1978) gave the following taxonomy of questions:

- i. **Textually Explicit Questions:** information needed to answer the question is explicitly stated in the text and both question and answer are derived from the text. Such questions are useful to test recall, or very simple inferences.
- ii. **Textually Implicit Questions:** information needed to answer the question is implied in the

text and requires inference but both question and answer are derived from the text. Such questions are useful to see if reader is able to integrate different ideas, but within the text.

- iii. **Scripturally Implicit Questions:** the question is derived from the text but to answer it the reader has to rely on own store of prior knowledge. Such questions are useful for activating reader's prior knowledge.

QUESTIONING TECHNIQUES

5W1H Questioning Technique

Rudyard Kipling wrote the famous lines,

*I keep six honest serving-men,
(They taught me all I knew);
Their names are What and Why and When,
And How and Where and Who.*

The 5W1H is a simple but powerful questioning technique. 'When' questions are about time or duration; 'where' questions are about location; 'who' questions are about identification; 'what' questions seek specificity or description.

Typology of Questions

‘Why’ questions help explain things and can be very profound. They help establish cause and effect relationships between variables. ‘How’ questions seek instruction and can be very helpful in problem solving – how can this be done in a better way.

As we go from when, who, where to how, what and why we need to invest more time reflecting on the answers.

A sixth ‘w’ is ‘which’ and it can become the basis of decision-making – which of these options is most optimal.

A ‘what if’ question can catalyse wonder and imagination, as can a ‘why not’ or a ‘how else’ question. ‘What if this step was eliminated, what would happen?’ or ‘What if our underlying assumption is wrong?’ or ‘How else can we do this more efficiently?’ In his book ‘Back to Methuselah’ George Bernard Shaw writes, “I hear you say “Why?” Always “Why?” You see things and you say “Why?” But I dream things that never were and I say “Why not?””

The 5-Whys Questioning Technique

Sakichi Toyoda, son of a poor Japanese carpenter, founded the Toyota Corporation (most well known today for its cars) and he is often referred to as the father of Japanese industrial revolution.

Toyoda invented various weaving devices, most famous of which was a power loom in which he integrated the principle of Jidoka, which means that the machine stops automatically when a problem occurs.

Toyoda also developed a useful questioning technique for finding root-causes of a problem, called the ‘5 Whys’ technique. In this technique, when faced with a problem, one needs to ask why the problem occurred, and then ask why again to probe the reasons for the first cause and so on.

Usually asking why at five levels reveals the root cause, although depending on the situation more or less than five whys may be required.

Although 5 Whys technique may not work where the causes of a problem are not apparent enough, or cannot be diagnosed easily. In which case more powerful techniques like Root-Cause analysis or Cause and Effect analysis may be required. However, to analyse basic cause and effect relationships underlying problems 5 Whys is a simple and useful technique.

For example, say a student does not like math. Applying the 5 Whys technique the self-analysis could be as follows:

- Why do I not like math? Because I don’t score well in math.
- Why do I not score well in math? Because I find it difficult to understand.

Typology of Questions

- Why do I find it difficult to understand math?
Because my fundamentals are not clear.
- Why are my fundamentals in math not clear?
Because when we were taught these fundamentals in school I could not follow them and my teachers had to move on to make sure that they cover the syllabus.

In this case we have a deeper understanding of the problem by asking why four times. The solution may lie in self-studying math fundamentals that the student did not understand when they were taught in school. The student could make use of free online resources like Khan Academy to self-learn these fundamentals and come up to speed on what is being currently taught.

Socratic Questioning Technique

Famous Greek philosopher, Socrates, used dialectics – dialogue between two people who look at an issue with opposing perspectives. Socrates would ask probing questions, with a point of view that was contrary to the point of view of the other person and this would stimulate a debate that would lead to critical thinking and deeper insight into the topic of discussion.

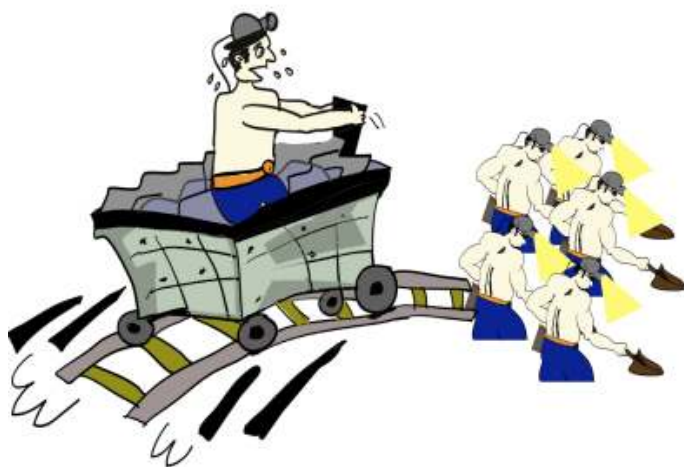
As the adversary came up with better arguments, to defend one's own point of view one would have to eliminate current hypothesis and think hard for better arguments in one's own favour.

For example, a declarative statement is made – 'this apple is red.' To challenge this a question could be asked, "Is this apple also red to a blind person?" or, "Under a different light would the apple still be red?" The initial declarative statement would then have to be revised – 'In normal light this apple is red for people who can see.'

Or, take another example – 'A trolley car in a coalmine is hurtling on the track and the breaks have failed. You are the driver and you can either go straight and for sure kill five people, or you can swerve to a sidetrack on the right and kill one person. What will you do?'

Most people say they will swerve to the right and the reason they give is based on the broad principle of larger good.

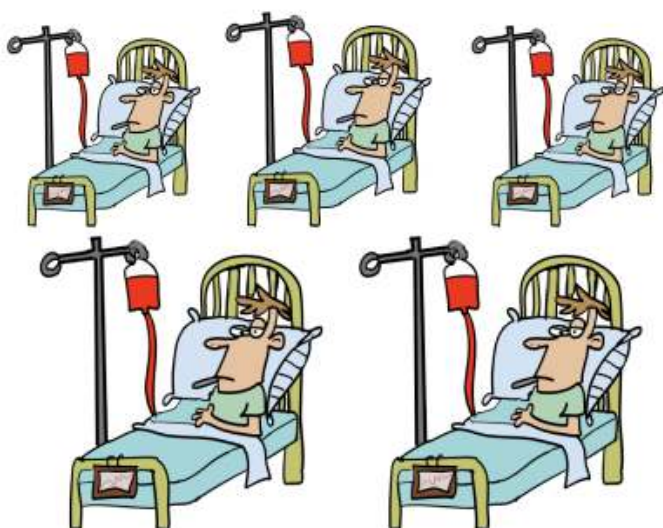
A trolley car in a coal mine is hurtling down the track and the brakes have failed. You are the driver and you can either go straight and for sure kill five workers, or you can swerve to a side track and kill one worker. What will you do?



An alternate scenario can then be painted – ‘Five people in a hospital urgently require a heart transplant, a kidney transplant, a liver transplant, a lung transplant and an intestine transplant respectively, else they will die. A healthy person comes to the hospital for a regular check-up. If you were to kill the healthy person you could take his organs and save the life of the other five people. What would you do?’

Only the Curious Shall Thrive

Five people in a hospital urgently require a heart transplant, a kidney transplant, a liver transplant, a lung transplant and an intestine transplant respectively, else they will die. A healthy person comes to the hospital for a regular check-up. If you were to kill the healthy person you could take his organs and save the life of the other five people. What will you do?



Most people, who earlier agreed to kill one person on the sidetrack, on the principle of larger good, now don't agree to killing the healthy person. The principle of larger good can then be questioned because it is getting trumped by the principle of individual liberty.

Typology of Questions

The objective of Socratic questioning is to look at an issue from opposing perspectives, or find exceptions to stated position. The method is most useful for challenging beliefs and highlighting biases in thinking.

In a history class Socratic method could be used for role-playing. Students could be asked to play the role of opposite camps in historic events – like freedom fighters vs. colonial rulers, or two parties in apartheid, or two religious groups who have different points of view on moral issues – and each uses the Socratic method to defend their perspective.

This is not easy because in today's context it will be difficult to come up with arguments that are pro-slavery, or pro-imperialism but helping students to go back in time and look at issues as they were looked upon then and question those views using Socratic method can prove to be a very effective learning experience.

Though the Socratic method ideally requires two people or more for defending different point of views, the method can be used by individuals by mentally putting on two hats and seeing the issue from two opposite points of view.

SCAMPER Questioning Technique

In 1942, Alex Osborn, an advertising executive, wrote a book 'How To Think Up', in which he presented the

technique of brainstorming. Osborn did extensive work on creative thinking, including developing a Creative Problem Solving Process (CPS) in association with Sidney Parnes.

Based on Osborn's work on creative thinking, Bob Eberle developed a checklist based thinking process, to help young children learn creative thinking. Eberle came up with a mnemonic for this creative thinking process – SCAMPER.

Eberle explains SCAMPER technique in his book, 'Scamper – Let your Imagination Run Wild'. Although he developed this technique mainly for children, and in his books suggests games for children that have the checklist built-in, SCAMPER technique provides a ready-reckoner for questions that can be asked for creative problem solving at any level.

The SCAMPER checklist contains questions that prompt and stimulate individuals to form creative ideas:

- **S – Substitute:** to have a person or thing act or serve in the place of another. Questions – Who else? What else? Other place? Time?
- **C – Combine:** to bring together or unite. Questions – Combine what? Bring whom together? Combine purposes? Ideas? Materials?
- **A – Adjust:** to adapt for the purpose of suiting a condition. Questions – Reshape? Tune-up? Tune-down? Accommodate? Agree?

Typology of Questions

- **M – Modify:** to alter or change the form or quality. Questions – Other colour? Sound? Motion? Form? Size? Shape? Taste? Odour?

Magnify: To enlarge, to make greater in form of quality. Questions – Add what to make higher? Stronger? Thicker? Longer.

Minify: To make less, minimise. Questions – Make what smaller? Lighter? Slower? Less frequent? Shrink? Reduce?

- **P – Put to Other Uses:** Use of purposes other than originally intended. Questions – Use when? How?
- **E – Eliminate:** To remove, omit, or get rid of a quality. Questions – What to cut out? Remove? Simplify? Weed out?
- **R – Reverse:** To make opposite or contrary. Questions – To turn what around? Upside down? Inside out? 180-degree flip?

Rearrange: Change order or sequence. Questions – Other pattern? Layout? Plan? Scheme? Regroup? Redistribute?

SCAMPER checklist-based questioning technique could be applied in active reading, i.e. better engaging with a book you are reading. Questions you could ask yourself could be:

Only the Curious Shall Thrive

- **Substitute:** who else could have written the book and how would that be different. E.g. Yoda vs. Darth Vader as the author.
- **Combine:** Who could have co-authored the book and how would it be different then.
- **Add:** How would the book be written in different context – in 18th century vs. 21st century.
- **Modify:** How could themes in the book be modified to make it more serious/funny/dramatic.
- **Put to other Uses:** how could the book be useful for people other than the target audience.
- **Eliminate:** Would the world be different if this book were never written (especially relevant for classics).
- **Reverse:** What could be the opposite argument than proposed in the book. For example, for this book you could take an opposite point of view – formulating questions is a waste of time!

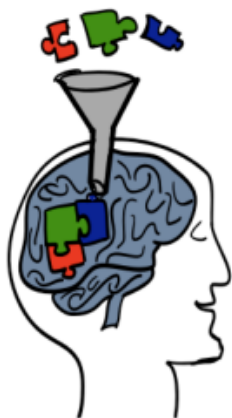
Six Hats Questioning Technique^{xxv}

Edward de Bono, who coined the term ‘lateral thinking’, distinguishes between ‘what is’ or judgment thinking and ‘what can be’ or design thinking.

Typology of Questions

According to de Bono, it is perception and not logic that is at the root of faulty solutions. How we interpret a problem is based on our inherent assumptions and mostly this starting point of interpretation itself is wrong. The logic that follows may be absolutely sound but since the initial understanding or interpretation of the situation or the problem is wrong, the final solution is often flawed.

These inherent assumptions are formed because our mind is super efficient at self-organising information. It boils down incoming information into patterns and every time new information is received our mind immediately tries to map it to existing patterns of information.



Our mind is super efficient at self-organising information. It boils down incoming information into patterns and every time new information is received our mind immediately tries to map it to existing patterns of information

For example, if we meet a person for the first time we immediately try to associate this person with someone we already know. Or, when faced with a situation say while visiting a new country, our first reaction is to draw a parallel

with a similar situation we have faced in the country we live, even though culturally the situations may be very different and hence viewing the new situation with the same cognitive lens could lead to fallacious interpretations.

This habit of our mind to immediately draw conclusions by mapping new information with similar existing information patterns is called heuristics. Heuristics are mental thumb-rules and heuristics-based thinking is very efficient when the context and information is indeed similar to what we have faced before, but it may lead to highly erroneous conclusions if the context is different.

According to de Bono, logical or critical thinking is limited because it is reductive in nature and useful only for eliminating ideas. This type of thinking does not help in generating new ideas, and hence the need for lateral thinking approach.

de Bono suggests a questioning technique for parallel thinking, which he opines is much more efficient than traditional arguing techniques. Argumentation suffers from the same limitation as logical thinking – it only helps in eliminating ideas and not in producing new ideas. Moreover, if the initial assumption of such logical thinking is flawed, because it is based on an incorrect heuristic or a cognitive bias, then the follow on thinking can lead to erroneous conclusions.

Typology of Questions

In his book, 'Six Thinking Hats', de Bono explains the parallel thinking process that enables groups or an individual to look at an issue from distinct perspectives, deliberately. The Six Thinking Hats technique helps formulate questions to look at an issue from multiple lenses. One hypothetically wears different coloured hats and questions the issue based on the lens the hat advocates:

- **The White Hat:** is the neutral perspective hat, to look at facts, figures and data to gauge if adequate information is available or more is needed and how can it be procured. Questions include – what do we know, what do we not know, how can we find out.
- **The Red Hat:** is the emotional perspective hat, to look at the issue based on our feelings, intuition and hunches, without trying to justify them. Questions include – what is our gut sense about the issue, what kind of predictions can we make, what is our first impression.
- **The Black Hat:** is the serious perspective hat, to look at the issue cautiously, carefully, logically and make judgements on feasibility. Questions include – why would it not work, what is the worst-case scenario.

- **The Yellow Hat:** is the positive perspective hat, to look at the benefits and values of the issue, even if these are speculative in nature. Questions include – what is the best-case scenario, what other benefits could be derived, what other opportunities could be explored.
- **The Green Hat:** is the creative perspective hat, to consider blue-sky possibilities, creative thinking while withholding judgement. Questions include – what other alternatives, what new approaches.
- **The Blue Hat:** is the reflection or meta-cognition perspective hat, to think about all the issues thought of wearing other hats. Questions include – what did we achieve, what are the main outcomes, what is a possible solution, what are the next steps.

These questioning techniques we have looked at help us in formulating questions that are penetrating, thought provoking, make one wonder, challenge assumptions and lead to even better questioning.

In the next chapter we will survey some questioning techniques that are especially useful for studying.

Chapter Summary:

- Good questions are excellent thinking tools
- Good questions are simple, clear, penetrating, invigorating, focus attention, diagnose difficulties and evoke more questions
- Types of Questions
 - Open-ended and Close-ended questions
 - Questions based on End Objectives – Eliciting Information, Interpretation, Deeper Understanding, Analysis, Persuasion, Integration, Synthesis, Evaluation, Judgement, Decision Making, Creativity, Innovation and Wisdom
 - Analytic and Evaluative questions
 - Guszak's classification of questions typically asked by teachers – Recognition, Recall, Translate, Conjecture, Explanation and Evaluation questions
 - Pearson and Johnson's taxonomy of questions: Textually Explicit, Textually Implicit and Scripturally Implicit questions

Only the Curious Shall Thrive

- Questioning Techniques
 - 5W1H
 - 5-Whys
 - Socratic Questioning
 - SCAMPER
 - 6-Hats

GUIDED DIY WORKSHOP

Activity-1

You are the judge of a blog writing competition. Formulate the questions or parameters by which you will judge the competition entries. Once you have done this categorise the questions you have created. Finally, formulate further questions about your questions.

Thought Prompts:

Did you consider the following parameters –

- To the point
- Language used - vocabulary, expression, metaphor
- Was it an interesting read, or tedious and boring?
- Did the author present a cogent argument or key point? Could Socratic Method be used to poke holes into the author's argument to see how robust it is?
- Did the author give credible evidence in support of the key point or main argument?

Did you consider the following categories –

- Effectiveness: cogent argument, credible evidence, to the point, straying from the argument

Only the Curious Shall Thrive

- Engagement: interesting read or boring, language, expression, humour

Did you consider the following questions about your questions –

- Which of your questions or parameters is more important than others? Since it is a blog you are judging, being to the point is a very important aspect
- Which of the questions are easy to evaluate and which ones are difficult? Finding the key point or main argument of a blog may be easier than rating the engagement aspect
- Which of your questions are objective and which ones are subjective?
- What kind of rating scale will be most appropriate 1-5, 1-10, 1-100? What factors will determine the rating scale – number of entries, granularity of differences in various parameters (the more granular the difference the higher the scale)?
- You could use the 5-Whys technique to evaluate your own questions: Why do I think this is a relevant question? – then subject your answer to few more whys.

Typology of Questions

Takeaway: the objective of this exercise is to familiarise you with the art of formulating questions. Doing the above exercise will help you in your own writing because the act of creating a rubric for judging blogs will give you a better understanding of ingredients that go into making of a good blog, which you can then apply in your own writing. Such is the utility of good questions.

4. QUESTIONING TECHNIQUES FOR STUDYING

Nobel laureate Sydney Brenner was of the view that nobody in science, especially students, read anymore. They only Xerox things (photocopying on machines made by Xerox company is sometimes referred to as 'Xeroxing'). He once quipped to a student, "Have you tried neuroxing papers? It's a very easy and cheap process. You hold the page in front of your eyes and you let it go through there into the brain. It's much better than Xeroxing."^{xxvi} Questions help in neuroxing learning content.

Questioning Techniques for Studying

Questions are thinking tools that lead to deeper understanding. Usually in schools, it is the teachers who do all the questioning that makes the students pause and ponder. However, to become self-directed learners, students need to learn the art of formulating questions themselves.

Good questions pique interest and curiosity and lead to more active engagement with the process of learning, which in turn leads to more clarity. Questions slow down the process of information input and contemplating the possible answers to questions leads to better comprehension.

Students need to internalise the art of formulating good questions because only then can they become independent, self-directed learners who can, on their own, gain deep understanding even in domains they are not familiar with.

Only the Curious Shall Thrive

You need to internalise the art of formulating good questions because only then do you become independent, self-directed learners who can, on their own, gain deep understanding, even in domains you are not initially familiar with



Information and knowledge explosion by itself is not a new phenomenon. After the printing presses took off and plentiful books became available at lower and lower cost any single library held more knowledge than what a single mind could acquire in a lifetime. However, what has changed with the advent of Internet and World Wide Web is the process of information retrieval.

Questioning Techniques for Studying

In the analog world the process of information retrieval involved referring to books and research papers for which you had to usually go to a library. When knowledge repositories like a library were not easily accessible it made more sense to memorise important information.

In the digital world not only has the knowledge increased because digital tools have made publishing so easy that any individual can now be an author, a fact revealed by the number of new blogs or YouTube videos that come up every minute, access to this knowledge is cheap and easy for people who have devices like computers, tablets and mobile phones.

Thus, today the quantum of knowledge, its rate of growth and ease of access together make memorisation difficult and redundant. Electronic knowledge repositories like the World Wide Web are far more efficient in storing and retrieving information through meta-data and search functions.

The rate at which new knowledge is getting created also implies that lifelong learning is no longer an esoteric concept. It has become a reality and a necessity for thriving in the 21st century. Ability to conceive penetrating questions that lead to clarity and insights is a pre-requisite for becoming an effective lifelong learner.

Students need to be able to self-articulate meaningful questions for all levels of learning goals – knowledge, comprehension, mastery, creativity and wisdom.

Following are some of the questioning techniques that enhance learning and lead to deeper understanding.

Self-Questioning Techniques for Deep Understanding

Question Method of Studying

In the McMaster University's Academic Skills Workshop series^{xxvii} (available for free on iTunes University), the video on 'Question Method of Studying' gives ideas on how questions can be used while studying to improve comprehension.

The video explains that texts and books are nothing but questions the authors tried to answer, now being presented with the original questions stripped away. So a good elaboration strategy is to formulate your own questions that you think the text is an answer to.

Questioning Techniques for Studying

Texts and books are nothing but questions the authors tried to answer, now being presented with the original questions stripped away. A good elaboration strategy is to formulate your own questions that you think the text is an answer to



The process of reading the text and formulating your own questions leads to active engagement with the text and better comprehension.

While thinking up questions ensure that you are not focusing only on recall or basic definition questions. For example, if you are reading text on history don't restrict yourself to recall type questions – when did the event

happen, who were the main actors – instead go beyond to questions that trigger comprehension and analysis – what was the larger context when the event happened, is there enough primary and secondary evidence to prove that the event did happen, are there other perspectives on the event and its outcome, what would have happened if the event had not taken place, and so forth.

The McMaster University video expounds four levels of questions:

- **Level-1 Questions:** summary or definition questions, or questions that have a specific answer. For example, what is the definition of demand?
- **Level-2 Questions:** on relationships, differences and similarities between concepts, analysis or interpretation. For example, what is the relationship between demand and supply?
- **Level-3 Questions:** hypothetical, predictive or application oriented. For example, if demand increases and supply remains the same what happens to price and quantity?
- **Level-4 Questions:** evaluative, critique, requiring judgement. For example, what are the limitations of demand and supply analysis in predicting major economic indicators.

How to Ask a Smart Question^{xxviii}

In an online article titled, ‘How to Ask a Smart Question’ (Snyder, 2003), the author proposes a three-level hierarchy of questions. Level one questions help form a general understanding of a subject, level two build upon the general understanding and find connections with what is already known (prior knowledge) and level three questions extend the newly acquired understanding to the world and in new directions.

- **Level One** questions include **definitions**, **clarifications and examples**; help **establish the context** – how was the idea or concept shaped by its time, who was the originator and what was he or she like; **facilitate analysis** – what are the parts, how do they work together, how is it organised, what are its important features.
- **Level Two** questions include **comparatives** – how is it same/different than, what is its opposite; **causals** – what caused it, which factors are sufficient, how can we eliminate what are the non-contributing factors; **evaluatives** – why do you agree/disagree, what are the criteria to judge, what is the argument against.

- **Level Three** questions include **counterfactuals** – how would this change if X happened, how would this be different if X had not happened; **extenders or synthesisers** – what can we predict because of this, what ideas can be added to this.

Reciprocal Teaching^{xxix}

Studies conducted by Palinscar and Brown (1985) revealed that students could be very good at decoding (surface level understanding of content they are reading) but very poor at comprehension (deeper understanding of what they are reading).

Reciprocal Teaching is a self-questioning and study strategy developed by Palinscar (1984) that helps improve students' comprehension through active reading, thinking and monitoring.

Reciprocal Teaching strategy consists of four activities:

- i. **Prediction:** activate already existing relevant background knowledge about the topic to be studied. Questions include – based on what I already know about the topic, what plausible predictions can I make about the new text? Based on the title, what do I think the article will be

Questioning Techniques for Studying

about? Why do I think so? The purpose of reading then becomes confirming or disproving own hypothesis.

- ii. **Summarisation:** What is the main idea of the – paragraph, chapter, topic and what are three or four supporting details?
- iii. **Questioning:** Having read about the topic, was the prediction correct? What could be the resolution (next prediction)? Other questions could be around analysis and application of the text read.
- iv. **Clarification:** understand new vocabulary, difficult concepts, ambiguities – otherwise these impede comprehension

Directed Reading – Thinking Activity (DR-TA)^{xxx}

Similar to Reciprocal Teaching is the ‘Directed Reading – Thinking Activity’ (Stauffer, 1975). This strategy also involves making predictions prior to reading, confirming correctness of predictions by using the text for verification and making more predictions and validating them as the text is read.

This Predict – Read – Prove/Disprove cycle continues throughout the reading of the text.

DR-TA is an active reading strategy and a constructive process where the ongoing interaction between reader, text and context leads to clarity and comprehension.

KWL-Plus Strategy^{xxxi}

KWL-Plus is a self-questioning strategy developed by Carr and Ogle (1987). It involves making predictions about the text by invoking prior knowledge, generating interest in the topic by posing questions about expectations from the text, monitoring understanding while reading the text, and reflecting upon the text through techniques like listing, mapping and summarising.

In their paper titled, “K-W-L Plus: A Strategy for Comprehension and Summarization” Carr and Ogle note that many secondary readers fail to realise that good reading means asking questions and thinking about ideas while reading. They asked one student what the student did while reading? The student responded, “I try to take in the words and hope the teacher won’t call on me.”

Questioning Techniques for Studying

- **K – What do I already Know:** is similar to prediction and involves recalling what is known. This information can also be categorised under appropriate broad categories.
- **W – What do I Want to Know:** this also involves prediction and students enunciate what do they want to learn as a result of studying this topic.
- **L – What did I learn:** while reading the text students confirm ‘K’ (prove/disprove), answer ‘W’ and note any new points that they learn, which they had not predicted.
- **Plus** – to the KWL strategy, Carr and Ogle later added the dimension of mapping and summarisation because these are powerful tools that help students better process information. ‘Plus’ involves categorising the information under ‘L’ column and if needed, add to the categories predicted earlier in the ‘K’ column; create a semantic map (like a mindmap), where the lesson topic is in the middle of the map, each category (can be in order of priority) in the ‘L’ column is an off-shoot from the main topic, and each off-shoot lists summary information (key points) about the topic.

KWL-Plus is a self-questioning strategy that involves making predictions about the text by invoking prior knowledge, generating interest in the topic by posing questions about expectations from the text and reflecting upon the text through techniques like listing mapping and summarising

 What do I Know?

 Want to Know?

 Learn?

 Summarise?

KWL-Plus learning strategy engages the readers in constructing meaning from text and fosters independence in understanding.

SQ3R Strategy

- S – Survey or skim through the text
- Q – Prediction questions like what is the text about, how can I relate with the information, how can it be useful for me.
- R1 – Read actively
- R2 – Recite or recall key points and answers to ‘Q’ questions
- R3 – Review and write key points in own words

PQRST Strategy

- P – Preview or skim the text
- Q – Questions about the text (prediction)
- R – Read the text
- S – Summarise text in own words, self-recite
- T – Test or answer the questions (in ‘Q’ or past papers)

What is important in the questioning strategies is that one should not get stuck with asking just recall questions. Questioning should go from lower-order cognition (recall, define) to higher-order cognition (analyse, draw inference, apply, evaluate).

Howard Gardner's Approach to Understanding^{xxxii}

According to psychologist and educator Howard Gardner, except in areas where we gain expertise, most of us continue to think the way we did when we were five years old. Research done in a project titled, 'A Private Universe' lends credence to Gardner's conjecture.

A group of Harvard graduates was asked why do we have seasons? Majority of them replied that this is because of the elliptical orbit of the earth around the sun. So when the earth is closer to the sun we have summers and when earth is farther away we have winters.

If this were true then it would be summer or winter all over the earth and we know this is not the case because when it is summer in the northern hemisphere, it is winter in the southern hemisphere.

The reason we have seasons is because earth is tilted on its axis. Thus, while orbiting the sun there are times when the southern hemisphere gets direct sunlight and it is summer there and winter in the northern hemisphere where the rays of the sun are at an angle.

That it is mostly warm near the equator (at sea level and not at higher altitudes) throughout the year further bears out that seasons happen because of the tilted axis of the earth.

Questioning Techniques for Studying

According to Gardner the reason why adults continue to think like pre-schoolers in areas where they don't have expertise is because they never really deeply understood what they learnt during formal education, except in select areas where they gained specialisation.

During our formal education, more often than not, we simply memorise and regurgitate knowledge, without really appreciating what it means and how it can be applied in novel contexts.

Deep understanding happens when one is able to apply what one learnt in new contexts. For example, learning about Venn diagrams in math but applying Venn diagrams in English, to compare and contrast two authors, is a simple example of application of knowledge in a new context.

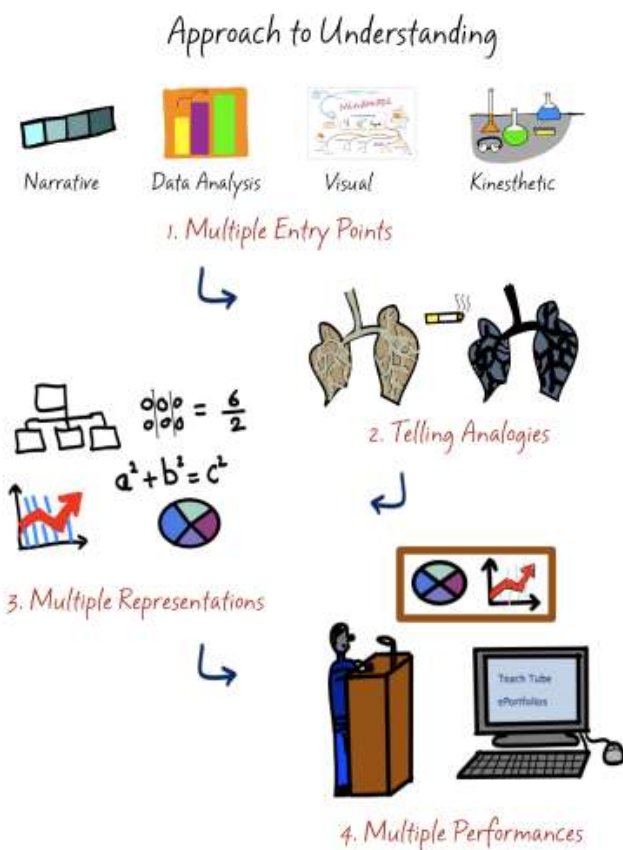
Gardner suggests a framework of studying that leads to deep understanding:

- i. **Multiple Entry Points:** looking at a topic of study from different perspectives (which are more or less based on Gardner's multiple intelligences theory and help in arousing interest of different types of learners and secure their cognitive commitment)
 - a. **Narrational:** story mode
 - b. **Quantitative, Logical or Rational**

Only the Curious Shall Thrive

- c. **Foundational:** basic questions like why is this important, how is it related to what came before it, how is it relevant today
 - d. **Aesthetic:** what does it look like, sound like, what patterns it makes, why do I find it impressive
 - e. **Hands on:** what is it actually like to do this thing? For example, Christopherian Encounters technique that exposes theories to consistent disconfirmation till better theories are constructed. Young children wrongly believe that the warmth is inside the woollen pullover they wear. Christopherian Encounter involves putting the pullover outside on a cold day and measuring its temperature to prove that there is no intrinsic warmth inside.
 - f. **Social:** debate, role play, projects and group interactions
- ii. **Telling Analogies:** students come up with analogies, examples and metaphors based on prior knowledge of the topic. Creating instructive analogies based on what is already understood conveys important aspects of a less familiar topic.

- iii. **Approaching the Core:** a concept can be well understood only when a student is capable of representing the core ideas in several ways, drawing on a number of symbol systems, intelligences, schemas and frames.



In addition to the above three-step framework, Gardner also recommends ‘multiple performances of understanding’ that reveal the extent to which materials have been mastered. Such performances of understanding can include projects, e-portfolios, debates, discussions, creation of artefacts and more.

‘Minute Paper’, where at the end of a topic the students are asked to write one thing they understood from the topic and one question they still have, is one simple performance of understanding.

Gardner’s framework heavily relies on the art of formulating good questions. Multiple entry points imply posing questions like why the topic is important, why is it relevant today, what is the logic or rationale, do I agree or disagree, what does it look like or sound like?

To create telling analogies one has to probe one’s own prior knowledge and that requires asking questions about connections that can be made between the new topic and existing own knowledge.

Multiple representations can be made by asking questions about the core ideas – what are the key ideas are similar to, what different forms of representation – diagrams, flowcharts, schemas – are they amenable to?

Performances of understanding too depend on question formulation – what are the pros and cons of the topic, is it

Questioning Techniques for Studying

relevant, how, do I still agree or disagree, what are its examples and non-examples, where else can it be applied and how, what new derivatives are possible?

Chapter Summary:

- To become self-directed learners, students need to learn the art of formulating questions themselves
- Good questions pique interest and curiosity and lead to more active engagement with the process of learning, which in turn leads to more clarity
- Students need to be able to self-articulate meaningful questions for all levels of learning goals
 - knowledge, comprehension, mastery, creativity and wisdom
- Self-Questioning Techniques for Deep Understanding:
 - o Question Method of Studying
 - o How to Ask a Smart Question
 - o Reciprocal Teaching
 - o Directed Reading – Thinking Activity
 - o KWL-Plus Strategy
 - o SQ3R Strategy
 - o PQRSST Strategy
- Howard Gardner's Approach to Understanding:
 - o Multiple Entry Points
 - o Telling Analogies
 - o Approaching the Core
 - o Multiple Performances of Understanding

GUIDED DIY WORKSHOP

Activity-1

Create a Learning Journal template for a learning strategy you think will be useful, based on the questioning techniques you have learnt in this chapter.

Following is one possible template for a learning journal that helps you pose the right questions, which lead to deeper understanding.

LEARNING JOURNAL				
Topic:		Date:		
What does it Say?	What does it Mean?	How does it Relate to something I know?	What I do Not Understand?	What I understood (Pose Questions)
<in own words>	<in own words>			<2nd order ques>
	<contextmap>			< 3rd order ques >
	<goalless>			
	<flowchart>			
	<graphs>			
EXAM FOCUS				
Types of Questions in last 10 year papers:				
Marking Scheme / Assessment Rubrics:				
<teacher feedback on tests>				
INFORMAL LEARNING				
Curated Resources:				
<cut paste>	<card earth>	<web links>		
<screen shot>	<math acid>	<you tube>		
META LEARNING				
Inner Conflicts		What hinders?	Rate Learning Experience	
Learning Exp.		New Ideas	What helps?	
Review / Progress				

5. QUESTIONING STRATEGIES

So far we have discussed,

1. Why is the ability to formulate insightful questions important:
 - a. For gaining clarity and deeper understanding
 - b. For independent meaning-making
 - c. For deriving insights from information
 - d. For intrinsically motivated, self-directed lifelong learning

Questioning Strategies

2. To deal with the vast knowledge now available, especially in electronic form, we adopt cognitive strategies of skimming and scanning which are detrimental to deep understanding
3. Questions amplify our curiosity, focus our attention on the relevant and serve as filters to glean meaning and insight from the abundant knowledge now available
4. Along with skimming and scanning strategies we need to add the art of formulating insightful questions to our cognitive repertoire
5. Learning goals act as guideposts in our learning journey and ability to formulate insightful questions appropriate for each learning goal makes us more efficient and effective in reaching that goal
6. In today's knowledge age because of advent of computers, networks and automation, which have taken over the job of memorisation and basic analysis, in addition to earlier educational goals of learning the 3Rs, basic cognitive skills, technical skills and knowledge of a discipline, we also need to learn higher order cognitive skills, emotional intelligence, empathy, creative problem solving, self-

Only the Curious Shall Thrive

directed learning skills, decision making and collaboration skills

7. There is also an imperative need to add pursuit of wisdom as a learning goal so that we are better equipped to make choices that add meaning and purpose to our life
8. For different forms of knowledge viz. factual, conceptual, procedural and meta-cognitive, the traditionally accepted goals of learning are: Remember, Understand, Apply, Analyse, Evaluate and Create
9. Learning Goals relevant in the 21st century are:
 - a. Knowledge Acquisition
 - b. Deep Understanding
 - c. Mastery
 - d. Creativity and Innovation
 - e. Pursuit of Wisdom
10. Meta-cognition, or thinking about our learning and how we can improve it, needs to happen at all stages of the learning journey
11. Typology of Questions:
 - a. Close or Open-ended questions

Questioning Strategies

- b. Questions based on end objectives: to elicit, interpret, understand, analyse and evaluate information, for decision making and for persuasion
- c. Analytic vs. Evaluative questions
- d. Questioning Techniques: 5W1H, 5-Whys, Socratic Questioning, SCAMPER, 6 Hats

12. Questioning Techniques for Studying

- a. Self-questioning Method of Studying
- b. How to Ask a Smart Question
- c. Reciprocal Teaching
- d. DR-TA
- e. KWL-Plus
- f. Howard Gardner's Framework of Understanding
 - i. Multiple Entry Points
 - ii. Telling Analogies
 - iii. Approaching the Core
 - iv. Multiple Performance Opportunities

In order to create Questioning Strategies that will help us achieve the learning goals in a most optimal manner, let us consider what is the essence of various questioning

techniques for studying that we explored in the previous chapter.

Essence of Questioning Techniques for Studying

Predict to Activate Prior Knowledge

Most questioning techniques for studying suggest that when we embark on a learning adventure we should first of all formulate questions that help us recall what we already know about the topic of study (the ‘Know’ in KWL, or the ‘predict’ step in other self-questioning strategies), thus activating our prior knowledge about the topic of study.

Then we should formulate questions that pique our curiosity in the topic and make the topic more contextually relevant for ourselves (how is the topic useful for me). Contextual relevance fires up our intrinsic desire to know more about the topic rather than learning it because of fear of exams, or parental pressure, or any other external factor. This maps to the ‘Want to Know’ step in the KWL strategy and is useful for triggering curiosity and securing a cognitive commitment to undertake the learning journey that is bound to have its ups and downs.

Active Reading

Next, we figure out what is the ideal way to engage with the learning material so that we can pursue our preferred style of learning and match the way we will engage with the content with the type of intelligence we possess. For example, we could consider creating a story in our mind about the topic, or do hands-on experiments, or prepare for a debate, or look for data based analysis suiting our preferred learning style.

We then peruse through the learning material in a way that we can enjoy the task and continue the process of predicting and proving or disproving our predictions and find answers to our 'want to know' questions. We should also formulate questions like what is the author's main argument, what is the evidence the author is presenting in support of the argument and do we agree or disagree with the author's point of view.

We should continue conceiving questions that help us connect new information with what we know, see underlying patterns and relationship to the bigger picture so that we can update our mental model on the topic i.e. achieve a more sophisticated and deeper understanding of the topic than what we started with.

Multiple Representations

We should then think of questions that help us represent our new understanding in multiple ways, like what are key points of the text and represent the key points as concept maps. Imagine appropriate analogies and metaphors for what we have learnt. We can also reverse question what we have learnt, i.e. look at predictions we made, answers to our curiosity questions, the new information that we have acquired and create meta-questions around the bigger picture. The answers to these meta-questions can also be visually represented in the form of mindmaps, diagrams, schematics, flowcharts and mnemonics.

Multiple Performances of Understanding

We should consider questions like how do we connect this knowledge with something that we already understand? What patterns and connections can we make with other topics? Where can we apply this knowledge? Then consider questions on what performances of understanding are possible like creation of an e-portfolio – a blog or a multimedia presentation.

Insight and Creativity

We should also pose questions to ourselves that help us derive new insights from what we have learnt. Such questions can be about challenging our fundamental beliefs and assumptions about the way we look at a particular topic. Questioning techniques like 6-Hat Thinking are helpful here.

Meta-Cognition

We should also ask questions around meta-cognition that help improve our learning ability. Introspective questions like was this a good learning experience, what worked and what did not work, how can I improve my learning, how can I become more efficient in every step of learning, and so forth.

Now that we understand the essence of formulating questions from the perspective of desired goals of learning, we can derive Questioning Strategies that most optimally helps us achieve these learning goals.

QUESTIONING STRATEGIES

Juxtaposing the essence of different questioning techniques for studying with our learning goals of knowledge acquisition, deep understanding, mastery, creativity and

innovation and pursuit of wisdom, we can create Questioning Strategies that can be applied across different learning endeavours, be it an academic pursuit or learning more about a hobby.

1. KNOWLEDGE ACQUISITION

Acquire information or knowledge about a topic.

- i. **Activate Prior Knowledge:** by making predictions about the learning material based on what one already knows and by linking the material with the bigger picture. For example, what discipline does this learning material relate to?
- ii. **Build Curiosity:** about the learning material by posing questions around what more would one like to know about the topic thus making the topic contextual and securing a cognitive commitment to persevere in the learning adventure that is to follow and prepare better to relish all its moments of frustrations and accomplishments.

Questioning Strategies



Knowledge Acquisition



1. Make Predictions to Activate Prior Knowledge



2. Build Curiosity and Fire Up Intrinsic Motivation to Learn



3. Make Learning Contextually Relevant



4. Secure Cognitive Commitment

2. DEEP UNDERSTANDING

Better comprehend the topic of study and independently gain a deeper understanding.

- i. **Read with Engagement:** by proving or disproving predictions made, making more predictions about what is to come, proving / disproving these new predictions (the cycle continues) and seeking responses to questions one was curious to learn more about. Engaging with the text also involves reading it from multiple perspectives, especially those that suit one's own learning style.
- ii. **Detect Patterns and Make Connections:** while perusing through the learning materials, one should also make note of what more the text has to say, how to relate the new learning with what one already knows and update own mental model on the topic. Create categories that help classify what is already known and what new was learnt while reading.
- iii. **Multiple Representations:** represent the updated mental model in varied forms like mindmaps, flowcharts, diagrams, key ideas summary in own words, tables, mnemonics and other multimedia representations.

Questioning Strategies

Aha! Deep Understanding

1. Active Engagement with Learning Material



Narrative



Data Analysis



Kinesthetic

a. Multiple
Entry Points



b. Prove/Disprove
Earlier Predictions



c. Find Answers to
Curiosity Questions



d. Make New
Predictions



e. Find Author's Key
Argument, Evidence,
Agree/Disagree



2. Multiple Perspectives



3. Make Connections (prior knowledge or bigger picture)



4. Update Mental Model



5. Multiple Representations (of new mental model)

3. MASTERY

Apply the understanding in novel contexts, solve problems and evaluate information to make better decisions.

i. Multiple Performances of Understanding:

utilise deep understanding of a topic to create e-portfolios like writing a blog on the topic, creating a short YouTube video around key ideas of the topic, simple animation, multimedia presentation or digital storytelling, do projects like making charts, posters, abstractions and evaluations. In a formal education setting performance of understanding would also include solving past year question papers to gauge understanding. Applying deep understanding of a topic to solve real-world problems and make better decisions is perhaps the most authentic performance of understanding.

ii. Flow: discover and spend time on activities that lead to a state of flow – so engrossed in an activity that time seems to stop.

iii. Yearning to Learn: Explore and find what fires up your intrinsic motivation to learn, instead of relying only on extrinsic rewards. Find out what makes you yearn to learn, all life long?

Questioning Strategies



Mastery



1. Multiple Performances of Understanding



2. Flow (when time seems to stop)



3. Lifelong Yearning to Learn, Self-driven

4. CREATIVITY AND INNOVATION

Synthesise knowledge across topics, gain new insights and innovate better solutions.

- i. **Synthesis:** find patterns and underlying connections between two different domains.

ii. Derive New Insights: derive new ways of looking at the world and apply that knowledge to find new or more elegant solutions to problems.

iii. Overcoming Cognitive Bias: become aware of your internal bias and wrong assumptions and challenge these to gain a fresh perspective on the topic, which can further lead to innovation and novel creations.



Creativity & Innovation



1. Synthesis: patterns and connections between two different domains



2. Derive New Insights: more elegant solutions



3. Overcome own cognitive bias and wrong assumptions

5. PURSUIT OF WISDOM

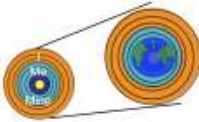
Conceive and pursue life goals that go beyond self-interest and are for the larger good of society, engage in activities that enhance own happiness and well-being, formulate own meaningful life philosophy and ethical code of conduct and develop the ability to follow it with conviction and compassion.

- a. Happiness and well-being questions
- b. Own life philosophy questions
- c. Ethics questions
- d. Meaning and purpose questions
- e. Harmony (with nature) questions

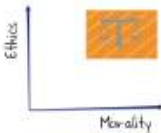
Only the Curious Shall Thrive



Wisdom



1. Life goals that go beyond self-interest
(meaning and purpose, larger good)



2. Moral and Ethical Life Pursuits (own
code of conduct that is moral and ethical)



3. Develop Life Philosophy that Enhances
Happiness and Well-being



4. Balance and Harmony with Nature

Meta Cognition

Self-interrogate meta-cognitive aspects like how can further knowledge be gained, how can performance be improved and how can the learning experience be enhanced while pursuing different learning goals? Such questions need to be asked at every stage of the learning journey.



Meta-Cognition

Self-interrogate how
learning and performance
can be improved

QUESTIONING STRATEGIES

1. Knowledge Acquisition Questioning Strategies

Prediction Questions

Predict questions for activating prior knowledge, recall questions, recognize questions (drag and drop and multiple choice questions are examples of recognize questions). What, Where, When, Who type questions. 5W1H technique of questioning.

- What do I think this topic will be about?
- What do I already know about this topic?
- How can I categorise what I know?

Only the Curious Shall Thrive

- d. What larger discipline does this topic belong to?
- e. What are the big picture questions in that discipline and how does this topic relate to those big picture questions?
- f. What modes of thinking are usually applied in the discipline?

Curiosity Questions

Curiosity questions that pique your interest and help contextualise learning so that it becomes meaningful to you and in the process secure your cognitive commitment to undertake the learning adventure:

- a. What do I want to know about this topic?
- b. What I am personally curious to learn more about?
- c. How will studying this topic be useful for me?
Perhaps I won't be applying this in my daily life (e.g. calculus) but studying it will help me understand how to learn complex topics.

2. Deep Understanding Questioning Strategies

5-Whys and Socratic Questioning techniques are useful here.

Questioning Strategies

- a. What new things did I learn?
- b. How do these connect with what I know?
- c. Do I need to update my mental model about this concept?

Questions for Reading with Engagement

- a. Do the predictions I made about this topic hold true? Why / Why not?
- b. What new predictions can I make about what is to come based on what I have read so far?
- c. What entry point can I take with this topic such that reading about it becomes more interesting – can I create a story, can I look at fundamental questions, can I do some data analysis, can I do some experiments to validate the argument?
- d. Do I agree with the author's argument and claims?
- e. What arguments does the author make to substantiate his or her claim?
- f. What other arguments in favour or against the topic are possible?

Only the Curious Shall Thrive

- g. What is the conflict the protagonist faces? How will the conflict be resolved? Does the author tie-up all the loose ends?

Questions for Detecting Patterns and Making Connections

- a. Is the learning material similar to something I already know?
- b. What similarities and differences does it have with that?
- c. How is it related with that?
- d. Can I recreate the questions that the author must have posed while writing the text?
- e. What will change if this changes? What is this caused by? What does it further impact?
- f. What are possible examples of the applications of this topic in real-life?
- g. What can we predict because of this?
- h. What is the opposite of this?
- i. What can be added to this?

Still don't Understand Question

- a. I still don't get it – make a list of what you don't understand.

Questions for Multiple Representations

- a. What is the ideal way of representing what I have understood (my updated mental model for the topic) – a concept map, a flowchart, a tree chart, a fishbone diagram, a table, a mnemonic?
- b. How best can I summarise the main ideas in my own words?
- c. Is there an analogy or a metaphor I can come up with for this?
- d. What examples and non-examples can I think of?

3. Mastery Questioning Strategies

When we can apply our knowledge in different and novel contexts. Problem Solving questions like 'how' to better do this and Decision Making questions like 'which' option to choose.

Questions for Multiple Performances of Understanding

- a. What projects can I think of for applying my knowledge and understanding? For example, create a poster showing how the topic connects with the big picture of the discipline the topic is a part of.
- b. What web-based projects can I do? For example, write a blog, make an animation using free online animation tools, make a short YouTube video, and tell a digital story using PowerPoint.
- c. Can I solve past year question papers and self-mark my answers based on the assessment rubrics?
- d. What specific aspects of the topic do I need to improve on (the concept of deliberate practice)?
- e. How can my knowledge and understanding help me take better decisions? For example, is the discipline something I am so deeply interested in that I can imagine making a career out of this in future?

Questions of Flow

Introspect and find out which activities, or how an activity can help you achieve and remain in a state of flow, when you are so engrossed that time seems to have stopped.

Questions of Intrinsic Motivation

Ask yourself how can I become intrinsically motivated to learn more instead of learning only for external rewards. Reflect on how you can become an excellent, lifelong, self-directed learner.

4. Creativity and Innovation Questioning Strategies

Figure out new patterns and connections, derive new insights. Questions like ‘what if?’, ‘why not?’ and ‘how else?’.

Questions for Synthesis

- a. What new insights can I derive based on what I have understood?
- b. Can I combine this topic with a completely different topic and derive more insights?

Questions for Deriving Insights, Overcoming Own Cognitive Bias and Challenging Assumptions

- a. Can I think of more elegant solutions to the problem – fewer steps, more cogent argument, a better framework?

Only the Curious Shall Thrive

- b. Do I have some internal cognitive bias, or am I making some wrong assumption while looking at this topic?
- c. Can I look at the topic with a totally different perspective, derive insights to find a new solution?
- d. Can I put my knowledge and understanding to innovate? For example, create better assessment tools or figure out different applications.

5. Pursuit of Wisdom Questioning Strategies

The ‘profound why’ question – why should I do this, what is the meaning and purpose, is it in sync with my long-term life aspiration. Or ‘should I?’ question that deals with ethics.

Own Life Philosophy Questions

- a. How can I use my knowledge and understanding in ways that make this world a better place? For example, at the technology company HP, they changed the question from, “What does being the best industrial research lab **in** the world mean?” to “How can we be the best industrial lab **for** the world?”^{xxxiii}

Questioning Strategies

Ethics Questions

- a. Is it a fair thing to do?
- b. Is it justified?
- c. Will it serve short-term needs but compromise long-term interests?

Harmony Questions

- a. Is the pursuit in harmony with nature?
- b. Will it have an adverse impact on the environment?

Chapter Summary:

- Questioning Strategies for Learning Goals

1. Knowledge Acquisition
 - a. Activate prior knowledge through prediction
 - b. Build curiosity, contextualise and secure cognitive commitment
2. Deep Understanding
 - a. Read with engagement (active reading)
 - b. Detect patterns and make connections
 - c. Multiple representations
3. Mastery
 - a. Multiple performances of understanding
 - b. Achieve flow
 - c. Yearn to learn
4. Creativity and Innovation
 - a. Synthesis
 - b. Derive new insights
 - c. Overcome Cognitive Bias

Questioning Strategies

5. Wisdom

- a. Happiness and well-being
- b. Own life philosophy
- c. Ethics and morals
- d. Meaning and purpose questions
- e. Harmony (with nature)

6. Meta-cognition

6. TAKING OWNERSHIP OF LEARNING

(APPLYING THE QUESTIONING STRATEGIES)

We will look at a few cases to see how the questioning strategies can be practically applied. In the first case we will consider how can the questioning strategies be applied for studying works of fiction. In the second case we will look at how the questioning strategies can be applied while studying mathematics. The third case is about studying a historic event and the in the fourth case we will see how questioning helps in learning to self-learn.

CASE-STUDY-1

Deeper Understanding of Works of Fiction

Example: Book/Movie – ‘To Kill a Mockingbird’^{xxxiv}

Goal-1: Knowledge Acquisition

Recall Question

What do I know about this movie or book? Let’s say I know nothing except that it is a famous book.

If so, skim through the book. The back cover (of a particular edition) reads:

“Shoot all the blue jays you want, if you can hit ‘em, but remember it is a sin to kill a mockingbird – A lawyer’s advice to his children as he defends the real mockingbird of Harper Lee’s classic novel – a black man charged with the rape of a white girl. Through the young eyes of Scout and Jem Finch, Harper Lee explores with exuberant humour the irrationality of adult attitudes towards race and class in the Deep South of the 1930s. The conscience of a town steeped in prejudice, violence and hypocrisy is pricked by the stamina of one man’s struggle for justice. But the weight of history will only tolerate so much.”

Only the Curious Shall Thrive

Based on just this much information try to make predictions - what do I think the book will be about? Answer the curiosity question – what do I want to know when I read this book (or watch this movie)? Contextualise the book so that you are cognitively committed to reading it – how will reading (or watching) this be useful for me?

Goal-2: Deep Understanding

To read the book with active engagement, keep posing more questions – what is the author's main point or argument? For example, is it promote empathy, tolerance, courage and compassion, decry prejudice? What else?. What evidence does the author provide to substantiate her arguments?

Find out more about the author Harper Lee – when was she born, is the story autobiographical in nature? Find out more about the context in which the book is set – 1930s depression, racial discrimination.

Think about the style and tone of writing. Think about similes and metaphors used. For example, title of the book (To Kill a Mockingbird) and the second name of the protagonist (Finch, which is also a bird and has connection to Darwin's research on evolution).

Taking Ownership of Learning

For some works of fiction you can use Gustav Freytag's dramatic structure to gain a deeper understanding. According to Freytag a drama is divided into five parts:

- i. **Exposition:** characters and plot is introduced
- ii. **Rising Action:** internal conflict faced by the protagonist and the conflict between the protagonist and the antagonist is revealed
- iii. **Climax:** is the key turning point, which could be for better or worse
- iv. **Falling Action:** the conflict between protagonist and antagonist unravels
- v. **Denouement:** final resolution of the protagonist's inner conflict. In a tragedy, the protagonist ends up worse off than at the start

Based on this structure, some of the questions for better understanding of works of fiction can be - who are the main characters, what is the conflict they face, how do they resolve their conflicts?

To analyse fiction you can also use Joseph Campbell's theory about typical stages in a mythological hero's journey (while going through these stages think of the movie Star Wars and its hero Luke Skywalker's journey. The director of

Only the Curious Shall Thrive

the Star Wars movie series, George Lucas, made deliberate use of Campbell's theory):

- **Call to Action** (in the movie, the robot R2D2 shows a message from Princess Leia to Luke)
- **Refusal of the Call** (Luke initially refuses to go with Obi Wan Kenobi to join the rebel forces)
- **Divine Intervention** (Luke's foster parents are killed by the Emperor's troops and he agrees to go with Obi Wan Kenobi)
- **Journey of Trials and Tribulations** (all the travails Luke has to face)
- **Master of Two Worlds** (inner resolution with Darth Vader being his father and defeating the Emperor)
- **Freedom to Live**

Goal-3: Mastery

What do the critics say about the book? Do you agree/disagree? Is the main message of the book still relevant today?

You can have fun creating projects around the book – map out the inner journey of different characters, like Scout

Taking Ownership of Learning

Finch and change in her attitude towards Boo Radley. Do a book review. Draw linkages with prejudices we face today and what has the book got to offer to address our current prejudices. Compare the book with the movie. Have a discussion or a debate with friends who have seen the movie or read the book. Go online and find out more information, reviews and critiques of the book.

Goal-4: Creativity and Innovation

What other books/movies carry similar messages and how is this similar/different from those (think of movies like Remember the Titans or The Great Debaters)?

Write a short story, based on the book, but from the perspective of another character, say Tom Robinson or Bob Ewell. Play with different endings to the book.

Goal-5: Pursuit of Wisdom

Atticus Finch, who operates at level-6 of Kohlberg's six stages of moral reasoning and lives a life based on his own code of conduct and ethics – how does this character influence your life? Introspect.

CASE-STUDY-2

Deeper Understanding of Mathematical Concepts

Example: Solving Quadratic Equations

Goal-1: Knowledge Acquisition

Recall Question

What do I know about quadratic equations? Nothing! Ok, so what do I know about equations? It is a mathematical way of saying that two or more quantities are the same as one another.

You may also recall terms like linear equations, slope of a linear equation, intercepts and how do you graph linear equation.

You could also refresh your memory about what is a system of equations – a relationship between two or more linear functions, where the variables represent the same elements. For example, compare two mobile phone plans, in the first one the handset (variable-1) is more expensive but monthly charge (variable-2) is lower and in the second one the handset (variable-1) is cheaper but the monthly charge (variable-2) is higher. You could write equations for each

Taking Ownership of Learning

plan and then solve the system of equations to decide which plan suits you better.

If you don't know any of this but are still interested in learning then perhaps a good place to start is the website of Khan Academy and watch the videos on Algebra (or find similar other free online resources). Or, if you do know these terms but simply want to refresh exactly what these terms mean then you can start with a specialised search engine for math like Wolfram Alpha (<http://www.wolframalpha.com>).

Big Picture and Recall of Fundamentals

Make the connection that all this is in the domain of algebra, which in turn is in the discipline of math, and math is our curiosity to understand patterns and relationships.

Linear functions are patterns that arise when there is a constant rate of change, for example a car that accelerates at a constant rate, or savings that increase at a constant rate.

Curiosity Question

A natural question could be – if linear functions depict things that change at a constant rate, what depicts things that don't change at a constant rate. For example, if you drop a ball rate of change as it bounces and finally comes to rest, will be constantly changing.

Contextualisation Question

Be curious to find out what is the real-world application of quadratic equations. Finding this out may secure your cognitive commitment to persist.

Predict Question

You may either make a prediction that quadratic equation could be a way of finding solutions for things that do not change at a constant rate, or let it remain a curiosity – to be proved or disproved.

Goal-2: Deep Understanding

Reading with Engagement

As you read or learn about quadratic equations in school or yourself by referring to online learning resources, actively mentally engage with what you are studying.

Remember that the opposite of active learning is passive learning or mindless learning, where you are not making any connections between the new stuff you are learning and what you already know and simply going through the material in an autopilot mode. Deep understanding leads to an updated mental model.

Taking Ownership of Learning

For active engagement constantly mentally engage with the text by finding answers to the questions you postulated earlier. For example, do quadratic equations indeed depict functions where the rate of change is not constant, what are the real-world applications of quadratic equations, and so on.

Keep formulating new questions and finding answers – Are the quadratic equations related with the quadratic function? How? What is a quadratic function (either recall, or make a prediction and find out if your prediction is true)?

Find a Right Entry Point

Depending on your learning preference (remember Gardner's multiple entry points which are loosely based on his multiple intelligences theory) look at the learning material through a lens that appeals to you. This could be creation of a story in your head about quadratic equations – this story could start with linear equations and how they represent constant rate of change and move to quadratic function. Or, your entry point could be contextualisation – why is it important to study quadratic equations and for this you look for real-world applications like flight of a ball, a forecasting tool, or application of quadratic equation in the engine of a game like Angry Birds.

Still don't Understand

If you still don't 'get' quadratic equations then you have to retrace your steps, perhaps all the way back to what is algebra. This is not such a daunting task, at least not in terms of good learning resources not being easily available. If you have the time, inclination and the resolve to learn there are tons of learning resources available online for free, in multiple formats – videos, text, exercises – that you can learn from.

Multiple Representations

You could write a summary in your own words explaining what is a quadratic equation. Or, you could solve questions on quadratic equations, including questions from past year question papers, using different methods – factoring, squaring, graphing or using the formula for finding roots of a quadratic equation.

Goal-3: Mastery

Multiple Performances of Understanding

You could make a YouTube video – 'The Essence of Quadratic Equations in 5 minutes' where you could explain to an imaginary student, who is struggling the way you did

Taking Ownership of Learning

earlier, what you have learnt and walk this imaginary student through your learning journey (what resources did you refer to, what connections did you make, what questions you asked and so on).

Or, you could teach a friend all that you know about quadratic equations. After all teaching leads to mastery. Or, you could think of real-life situations where quadratic equations could be applied to find optimal solutions.

Goal-4: Creativity and Innovation

In the context of quadratic equations, creativity and innovation could be extrapolating your knowledge to imagine what could come next. For example, you now know that a quadratic equation is second-degree equation (i.e. two is the highest power of the independent variable). Can you imagine what would the graph be if the highest power is 3 (i.e. cubic equation), or, how about 6 (i.e. sextic equation).

You could also download the free Wolfram player and see for yourself how quadratic and cubic equations graph - <http://demonstrations.wolfram.com/CubicEquation/>

Goal-5: Pursuit of Wisdom

In the context of quadratic equations, pursuit of wisdom may lie in meta-cognitive introspection.

If you are a student who has to learn about quadratic equations because it is in the syllabus and will impact your exam result, although otherwise you are least interested in the topic (or for that matter least interested in math!), pursuit of wisdom in this context could mean finding reasons that motivate you to study quadratic equations (or math) even though you do not see yourself using this knowledge in real-life, ever, by changing your mindset and looking at it as an opportunity to learn, difficult and complex concepts. Learning how to learn complex concepts is a life skill that will surely be useful, whatever you may do later in life.

Deep, Deep Dive

In the context of the goal of pursuit of wisdom, you could dwell really deep into the discipline of math. Story of Math has almost always gone from the felt-need to measure an idea and finding a language to describe the idea, which includes coming up with appropriate units of measurement and tools for measuring the idea.^{xxxv}

In ancient times we needed to measure simple concepts like near, far, big, small, description of a shape, pattern and

Taking Ownership of Learning

so forth. As our ideas became more complex and abstract and as our need for accuracy and precision grew, we needed to come up with better ways to depict these ideas and concepts and the discipline of math progressed.

Formulation of the problem, be it finding the area of an irregular shaped Egyptian field to calculate tax, or recreating contours of nature using fractals, or exploring 11 dimensions, is the basis of math. However, most math education at school level emphasises computation and that is why trigonometry and calculus come later in the syllabus because they involve more complex computation. School-level math education does not explain the deeper need for math, nor does it do anything to spark curiosity. It is mostly rote memorisation of formulas derived by famous dead people and their blind application in pre-formulated exam problems (which, by the way, is also the case with most school-level science education).

With computing becoming cheap and pervasive there is an even urgent need to shift the focus of school-level math education from computation to conceptualisation. In conceptualisation, one has to begin with being able to formulate the problem.

School-level math could be looked at from three perspectives – Conceptual Math (problem formulation and figuring out the appropriate algorithm), Real-world Math (i.e.

applied math like statistics and probability that are useful in real life, like figuring out which mobile phone plan is better and, Computational Math (which can be done faster and more precisely by machines – calculators, mobile devices and computers).

In his TED talk, ‘Teaching Kids Real-Math with Computers^{xxxvi}’, British technologist, Conrad Wolfram, says the part of math we teach – calculation by hand – is not just tedious, it is mostly irrelevant to real mathematics and the real world. According to Wolfram, computation is required in real life mostly for estimation and the important part is formulating the problem, not the computation.

In his talk Wolfram blasts myths about importance of computational math like automation dumbs you down, learning basics is essential and calculating leads to deeper understanding. He advocates that with the help of computers we need to change teaching of math from ‘difficult to calculate’ to ‘difficult to understand’. He illustrates how using a simulation, Calculus can be taught even to young children because you don’t bog them down with the calculation, instead excite them with the amazing concept. According to Wolfram, computer-based math can help a student ‘feel’ the math (i.e. gain conceptual understanding).

Taking Ownership of Learning

So the profoundly wise question for any discipline is to ask if what we are studying is still relevant or do we need to change the curriculum? Are there better ways of studying the discipline today, for example by use of computers, Internet or social media? For this we need to go back to the fundamental questions and curiosities that form the basis of a discipline and see how they are applicable today.

CASE-STUDY-3

Deeper Understanding of a Historic Event

Example: Learn more about India's freedom struggle of 1857

Goal-1: Knowledge Acquisition

Recall Question

What do I know about this event? Even if I don't know anything about this event, the title seems self-explanatory – it is an event in India's history, specifically related to India's freedom struggle.

Recall whatever you know about India's history, especially in the early nineteenth century because this period would have had the most impact on the event and late

Only the Curious Shall Thrive

nineteenth century because this period would have been most impacted by the event.

Big Picture question

It is obvious that the event relates to the discipline of history. What is interesting about history is that it is often about perspectives and interpretations. Unlike science, where a hypothesis can be tested, empirically or theoretically, historic events are based on primary and secondary sources (pre-historic events are based on archaeological findings like fossils and studying them to make extrapolations like if the fossil of the tooth is very sharp, the animal could be a meat eater).

Hence, a good student of the discipline of history must always be wary of possible biases in how the primary and secondary sources of information are being interpreted.

Curiosity Questions

Why did the event happen? Why in 1857? Who were the key people involved? What did it lead to?

Are there any other perspectives or interpretation of this event? If so, how do we find out who has made the right interpretation?

Taking Ownership of Learning

What else was happening in the world in 1857? Did these other global events have a bearing on this event?

Contextual Questions

How is studying this topic useful for me? Does it help me better understand contemporary events? How does studying this event help me derive insights for better studying the discipline of history?

Goal-2: Deep Understanding

Reading with Engagement

While reading about the event actively try to find answers to the questions you have raised. Try to find if there are different perspectives or interpretations of this event. Looking at historic events from different perspectives is key to learning history correctly.

For example, go to Wikipedia and search for the phrase, “India’s freedom struggle of 1857”. At the time of writing this book (March 2012) Wikipedia says, “The page ‘India’s freedom struggle of 1857’ does not exist.” Persist and you will find that the event is instead listed under the heading, ‘Indian Rebellion of 1857’.

Why is this so? Click on the ‘Talk’ button on top left of the Wikipedia page and see the archived history of the page. You will find that a debate has raged for years on the title of the page. Some would like to call the page ‘Sepoy Mutiny’, or ‘Revolt of 1857’, some suggest that these are titles being suggested by imperialists and compare calling this event a rebellion similar to calling ‘American War of Independence’ as the ‘American Rebellion’.

Arguments against calling this event India’s first freedom struggle include – debate over the national character of the rebellion which took place primarily in North-Central India and many of the then princesses and maharajas did not take part.

Those arguing in favour of calling it India’s war of independence cite that the rebelling soldiers aimed at reviving the old Mughul empire and were not protesting against their own grievances and if not national, the uprising was certainly pan-regional.

Apparently the naming issue was put to vote in 2004 amongst editors of the particular Wikipedia page and the title, ‘Indian Rebellion of 1857’ was accepted as mutual compromise.

As a student of history, what is fascinating about the discussion on Wikipedia is how much more one can learn about the event and the different perspectives. So much so

that on Wikipedia a page exists just on the term (not the event) – “India's First War of Independence (term)” - [http://en.wikipedia.org/wiki/First_War_of_Indian_Independence_\(term\)](http://en.wikipedia.org/wiki/First_War_of_Indian_Independence_(term))

Multiple Entry Points

You could start your learning journey by watching a movie based on the event, like director Ketan Mehta's movie, 'Mangal Pandey'. The movie is about a soldier who played a prominent role in the event.

Or, you may start by finding out more about Major General Havelock, whose statue stands at the 'Trafalgar Square in London. The plaque at his statue at 'Trafalgar Square reads, “To Major General Sir Henry Havelock K.C.B. and his brave companions in arms, during the campaign in India 1857”, “Soldiers' your labours your privations your sufferings and your valour will not be forgotten by a grateful country – H Havelock.”

You may also be interested in finding more about the controversy that erupted in 2003 when the then Mayor of London, Ken Livingstone, suggested that Havelock's statue and that of Charles James Napier (who was British Army's Commander-in-Chief in India), be replaced with more relevant figures.

History is a matter of perspective!

Goal-3: Mastery

Multiple Performances of Understanding

You could do a critique of the movie ‘Mangal Pandey’ and see if there are any significant inconsistencies from accepted accounts of what actually happened (it being a movie there would be some creative liberties taken but you could look for significant oversights).

You could narrate the event from two different perspectives – the then Indian perspective and the then British perspective. Who were the major players on either side, what could their views be, what was the fallout of the event on both sides and so forth.

You could write a blog post on the controversy on Wikipedia on the nomenclature of the event, giving your views on what the title should be and why, giving evidence.

Goal-4: Creativity and Innovation

Based on your learning experience, you could come up with a rubric for assessing history assignments.

You could compare and contrast freedom struggles in different countries and point out lessons for contemporary freedom movements like the Arab Spring.

Taking Ownership of Learning

You could do an essay on how historians make sure that their personal biases have least impact on their work.

Goal-5: Pursuit of Wisdom

You could introspect if history is best viewed as ‘human history’ with the aim of looking at past events as a collective story of the affairs of Homo sapiens.

Prof David Christian has created a course on history, which he calls ‘Big History’^{xxxvii} (he has also written a book on this theme titled, ‘Maps of Time’^{xxxviii}) that narrates the story from the big bang to contemporary times, a story stretching 13.7 billion years. Christian divides Big History into eight major thresholds based on massive jumps in complexity in the universe. For example, big bang, formation of the stars, emergence of life on earth and advent of agriculture are some of the major threshold events when the complexity increased manifold.

Viewed from this perspective, last 300 years in human affairs, which is usually the basis of most major conflicts we face today, is nothing more than a blink of an eye. Viewed from the same perspective, while we cannot predict what will happen in the next fifty years, we do know what will happen in a billion years (what will happen to planet earth, what will happen to our sun and so forth).

Only the Curious Shall Thrive

A 'Big History' lens of looking at human affairs could give us a different sense of what should our life priorities be while we are alive.

CASE-STUDY-4

Deeper Understanding of Learning Itself

Example: Learning to self-learn

Goal-1: Knowledge Acquisition

Recall Questions

Here, you could first simply reflect on your own learning process. Do you just read the prescribed textbook, do you refer to other books, do you go online and look for free content that has been made available by prestigious educational institutions on sites like Academic Earth?

You could also reflect on what works and what doesn't. Think of a great learning experience and do a post-mortem analysis on what made it so? Recall various learning strategies that you know of.

Big Picture Questions

Under what discipline would self-directed learning fall? Think about psychology and relevant branches of the discipline like educational psychology and cognitive psychology. This will help you think of what different perspectives you could look at when you dig deeper into self-directed learning.

Prediction Questions

Predict the specific vocabulary you will encounter while learning more about self-directed learning – words like metacognition, pedagogy and learner motivation. Predict the famous educationists whose work you will encounter. Draw a list of websites you think will be useful. Recall what you know about good study habits.

Curiosity Questions

You may ponder... Is there research on how web-based or social-media based learning happens? Is there any new thinking on how Internet has impacted learning? Are there any new learning theories being proposed? Can I find case studies of how online learning is being used by students to enhance their learning? Can I create a list of great learning resources that can help me keep abreast of new thinking in

the field of self-directed learning? What new tools have come up that facilitate self-directed learning?

Contextual Questions

Pose questions on what specific information or ideas will help you improve your self-learning ability in your specific context. This need not be an academic pursuit. It could be a hobby – I want to learn how to play the guitar, how can self-directed learning techniques help me?

Think of what you are finding difficult to understand, what is it you are struggling with and then form questions on what sort of self-directed learning will help you understand these specific topics better. This way you make your learning contextual and personal and will in turn secure a cognitive commitment from yourself to persevere.

If you do not add the linkage to own context and make your learning personally significant to yourself, the temptation to give-up early will be very high.

Goal-2: Deep Understanding

Reading with Engagement

When you read, or watch online videos on TED or YouTube, or look for information on self-directed learning

Taking Ownership of Learning

on iTunes University, or listen to podcasts – engage actively, don't just consume passively. Look for answers to the questions you have raised. Look for the main argument and key ideas in the learning material you are consuming. Keep making and validating predictions of what the presenter may say later.

Make Connections

When you learn about a self-directed learning theory think of your own learning experience and ask yourself if what the theory proposes would indeed be helpful or not. Think of examples of when the theory worked for you and when it did not. Or, think of ideas on how you can apply what the theory is suggesting.

Still Don't Understand

Make a note of what you don't understand, or more importantly what you don't agree with, or on what you have different ideas. For example, you may not agree with American psychologist, B F Skinner's work on behaviourism and build your argument.

Multiple Representations

You can draw concept maps around learning theories proposed by different educational psychologist. You could make a context-based timeline, juxtaposing the work of leading educational psychologists like Skinner, Vygotsky, Piaget, Dewey and Gardner with what was happening in the world when they said what they said.

Create learning templates for self-directed learning. Create possible learning journey maps – I will start with Wiki, then check YouTube, visit Academic Earth, search on TED.com and so forth.

Goal-3: Mastery

Multiple Performances of Understanding

The topic of self-directed learning is ideally suited for project-based work. Apply your knowledge and understanding of self-directed learning into your real-life studies. This could be for your academic work, job-related work or for a hobby you want to pursue.

Create checklists for yourself based on the self-directed learning map you created so that each time you start studying something new you can use the learning map as a ready-reckoner for steps you can take.

Flow Questions

Which studying strategies can I follow such that I can enjoy a state of flow for longer and longer duration while studying?

Goal-4 Creativity and Innovation

Synthesis Questions

How can I synthesise what different learning theories have to say about learning and see what web-based learning resources I can use to achieve what the learning theories suggest (like an online mind-mapping tool for deeper understanding and comprehension learning objective, or YouTube videos to create an e-portfolio to demonstrate my creativity).

Innovation

Internet is having a massive impact on our understanding of how learning can happen (ask any digital native how they learn). Hence, there are ample opportunities to think of innovations in self-directed learning. You just need to ask the right questions – does teaching someone improves my understanding and creating knowledge instead of simply consuming information leads to deeper comprehension, can

Only the Curious Shall Thrive

I create while I am myself learning, for example, by creating digital artefacts like blogs about what I am learning? Or, what other dramatic changes are afoot in the context of learning and education?

Goal-5: Pursuit of Wisdom

These are questions to gain clarity on the desired outcome of any educational endeavour.

Own Life Philosophy Questions

What is it that I wish to accomplish by becoming a lifelong, self-directed learner, which goes beyond my own interest? How can I make a contribution back to society? How can I pursue goals with passion and compassion?

Ethics Questions

How can self-directed learning take me to level-6 of moral reasoning and help me formulate my own code of conduct that is highly ethical? How can I build self-conviction to pursue my own life philosophy when most other people seem to be pursuing only selfish motives?

Pervasive Goal: Meta-Cognition

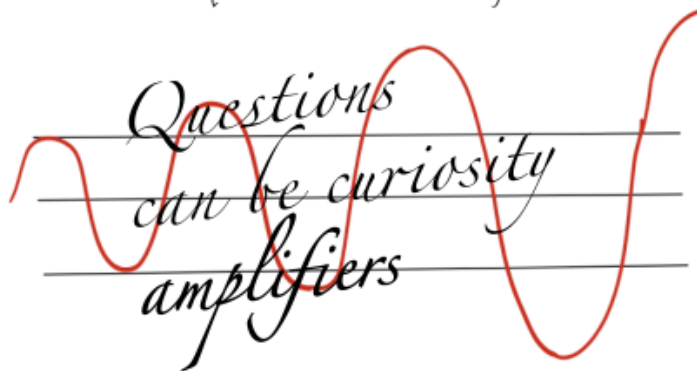
At every stage in our learning journey we should ask ourselves how can we improve our learning ability. What new study strategies should we experiment with? Introspect if a learning experience was a good one or a lousy one and why? Such self-reflection will help us become a better learner.

7. AMPLIFY YOUR CURIOSITY

Questions serve as curiosity amplifiers – questions like why, why not, what if, how else? Questions help us filter the right information – is this information correct, verified, updated, precise? Questions are tools that focus our attention – is this pursuit worth my time?

Curiosity, focus and ability to filter the right knowledge from abundant information are life skills essential for thriving in the Anthropene epoch (as discussed in chapter 1) we are living in.

Good questions are excellent thinking tools



Think of the Questioning Strategies we have discussed as something similar to the ‘alethiometer’ in Philip Pullman’s fictional trilogy, ‘His Dark Materials^{xxxix}’. The word alethiometer comes from the Greek word ‘alethia’ which means ‘unconcealing’, or ‘disclosing’, or ‘state of not remaining hidden’ and good questioning strategies do just that – they helps us dig deeper, for more profound understanding.

In Pullman’s book series, alethiometer is a golden colour, compass like device, with hands pointing to 36 small pictures painted around the dial and each of the pictures has a meaning. For example, sun stands for authority and truth, serpent stands for evil, anchor stands for steadfastness, helmet for war and candle for learning.

The user creates a question by pointing the three hands to different symbols. When the question is loosely framed in

the user's mind, the fourth needle moves around pointing to different symbols and the user has to figure out the answer.



Questioning Strategies Alethiometer

In our Questioning Strategies Alethiometer, the symbols on the dial get replaced by fundamental questions like – why (causal and profound), why not, what if, which one, how else, what next, should I and what for?

At the start of a learning journey you can think of the Questioning Strategies Alethiometer and reflect on some of the fundamental questions as they may apply to what you want to study. The alethiometer is a nice analogy because it not only serves as a handy checklist of questions to ask, it reminds us that the objective of learning is to unravel

mysteries and arrive at deeper understanding, mastery, creativity and wisdom.

The Changing Complexion of Knowledge

According to David Weinberger, author of the book, ‘Too Big to Know - Rethinking Knowledge Now That the Facts Aren't the Facts, Experts are Everywhere, and the Smartest Person in the Room is the Room^{xl}’, medium confers its properties to knowledge, i.e. knowledge gets transformed by the medium in which it is developed, communicated and preserved.

Weinberger argues that knowledge presented in the medium of paper is bounded, scarce, settled, orderly, step-by-step and driven by reason. In the Internet age networked knowledge is unbounded, overwhelming, unsettled, messy and linked. He quips, “For every fact on the internet, there is an equal and opposite fact”, “truth is judged by the number of thumbs up, wisdom by the number of views, and knowledge by whatever is the most fun to believe.”

Networked knowledge has only intensified what T.S. Eliot wrote in 1934:

Where is the life we have lost in living?

Where is the wisdom we have lost in knowledge?

Where is the knowledge we have lost in information?

Kevin Kelly, editor-at-large of Wired magazine, in response to the question ‘how is internet changing the way you think’, in an article titled ‘The Waking Dream^{xli}’ writes, “Every fact has its antifact... For every expert there is an equal and countervailing antiexpert... My certainty about *anything* has decreased... the embrace of uncertainty is one way my thinking has changed. Uncertainty is a kind of liquidity. I think my thinking has become more liquid. It is less fixed like text in a book, and more fluid, like, say, text in Wikipedia. My opinions shift more. My interests rise and fall more quickly. I am less interested in Truth with a capital *T* and more interested in truths, plural.”

In the 21st century, when knowledge has become a commodity, we not only need to make sense of all the information and knowledge out there to whatever degree we can, we also have to master the art and science of independent understanding so that we can ourselves synthesise knowledge, derive meaning and insight from information, achieve excellence, whatever our pursuit, by creating and innovating new ideas and solutions.

The skill of being able to formulate good questions helps in proactively engaging in studying and independently gaining deep understanding of the text. From the perspective of traits essential for success in the 21st century, ability to

think up insightful questions on one's own leads to active, self-directed learning and independence in understanding.

Self-probing questions can also help in diagnosing own inner conflicts that impede learning. For example, lack of self-efficacy, fear of failure or ridicule, ambiguity and inertia are some inner conflicts we face when we embark on a learning adventure. Posing searching questions and introspecting on why we hesitate to embark on a learning journey reveals our inner conflicts. Once we understand what inner conflicts we have, we can then take gradual steps towards resolving these conflicts. Facing, resolving, then facing higher level or more intense inner conflicts, this cycle is one of the ways we grow in life.

New Questions – New Disciplines

With the way knowledge is exploding and becoming networked, what will be the disciplines of the future?

Information literacy is a potent candidate. According to communications expert, Howard Rheingold^{xlii}, fundamental literacy essential for the digital information age include:

Attention: where to spend my attention, what I allow into my head when I am online, should I open a link on a new tab and should I bookmark it?

Collaboration: taking advantage of knowledge curated by others and also sharing content I create and my tags and bookmarks.

Credibility Assessment: skills necessary to determine whether the information is accurate or not.

Network Awareness: understand the ecology and characteristics of networks like strength of weak ties and Pareto principle. Understand how to use and not to use the Internet. For example, importance of setting difficult passwords and knowing the privacy settings on social networking sites.

New questions on the horizon range from the micro – better understanding of how our neurons function, to the macro – exploring the mysteries of the universe – dark matter, dark energy, Higgs boson and life on other planets.

Who am I? How can I be happy? How can I lead a meaningful life? How can this world become a better place? These are some age-old questions and we continuously strive to find better answers.

Will questions like ‘why’, ‘why not’, ‘what if’, ‘what more’ still remain valid? Are these questions timeless? Or, will we discover universal truths that lay such questions to rest, forever? What fundamental curiosities will generate questions that will lead to the genesis of new disciplines?

What are the questions you will ask yourself... to learn more, understand better, take wise decisions, enhance your well-being and live in harmony with nature?

BIBLIOGRAPHY

- i. IGBP Newsletter 41 (2000), P. Crutzen and E.F. Stoermer
- ii ‘Anthropocene Thinking’ article by Daniel Goleman in the book ‘This Will Make You Smarter – New Scientific Concepts to Improve Your Thinking’ (2012)
- iii ‘The Umwelt’ article by David Eagleman in the book ‘This Will Make You Smarter’ (2012) and Wikipedia article - http://en.wikipedia.org/wiki/Jakob_von_Uexküll (*accessed on April 19, 2012*)

Bibliography

iv 'Time's a Wastin' Training and Development Magazine, ASTD (2000), D. Wetmore

v Based on the broad idea of phase change suggested in the book 'Phase Change: The Computer Revolution in Science and Mathematics' (2003), Douglas S. Robertson

vi As quoted in the book '21st Century Skills – Learning for Life in our Times' (2009), Bernie Trelling and Charles Fadel

vii 'Designing Organizations for an Information-Rich World' (1971), H.A. Simon

viii 'Izzy, Did You Ask a Good Question Today?' (New York Times, Opinion, January 19, 1988) - <http://www.nytimes.com/1988/01/19/opinion/l-izzy-did-you-ask-a-good-question-today-712388.html> (*accessed on April 19, 2012*)

ix 'Taxonomy of Educational Objectives: The Classification of Educational Goals, by a committee of college and university examiners. Handbook I: Cognitive Domain' (1956), B.S. Bloom, D.R. Krathwohl; Wikipedia Article – 'Bloom's Taxonomy' - http://en.wikipedia.org/wiki/Bloom's_Taxonomy (*accessed on April 19, 2012*)

x 'A Revision of Bloom's Taxonomy: A Overview' (2002), David R Krathwohl – Theory Into Practice, Volume 41, Number 4, Autumn 2002; 'A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's

Taxonomy of Educational Objectives' (2001), L.W. Anderson and David R. Krathwohl

xi 'Unheard Cry for Meaning' (1979), Viktor E Frankl

xii 'Flourish: A New Understanding of Happiness and Well-Being - and How To Achieve Them' (2011), Martin E.P. Seligman

xiii 'Good To Great: Why Some Companies Make the Leap... and Others Don't' (2001), Jim Collins

xiv 'Best New Year's Resolution? A 'Stop Doing' List' (2003), Jim Collins - http://www.jimcollins.com/article_topics/articles/best-new-years.html (*accessed on April 19, 2012*)

xv 'The Fifth Discipline: The Art and Practice of the Learning Organization' (1993), Peter M Senge

xvi 'Flow: The Psychology of Happiness: The Classic Work on How to Achieve Happiness' (2002), Mihaly Csikszentmihalyi

xvii 'Drive: The Surprising Truth About What Motivates Us' (2011), Daniel H. Pink

xviii 'That Used To Be Us: What Went Wrong with America - and How It Can Come Back' (2011), Thomas Friedman and Michael Mandelbaum

xix 'Why Not?: How to Use Everyday Ingenuity to Solve Problems Big And Small' (2006), Barry J Nalebuff and Ian Ayres

xx 'Lawrence Kohlberg's Stages of Moral Development' –

Bibliography

Wikipedia article -

http://en.wikipedia.org/wiki/Lawrence_Kohlberg's_stages_of_moral_development (*accessed on April 19, 2012*)

^{xxi} 'Teach Like Your Hair's on Fire: The Methods and Madness Inside Room 56' (2007), Rafe Esquith

^{xxii} 'The Miniature Guide to 'The Art of Asking Essential Questions' (2005), Richard Paul and Linda Elder

^{xxiii} 'Teacher Questioning and Reading', *The Reading Teacher* (1967), T. Guszak

^{xxiv} 'Teaching Reading Comprehension' (1978), P. Pearson and D. Johnson

^{xxv} 'Six Thinking Hats' (2009) and 'Why So Stupid? How the Human Race Has Never Really Learned to Think' (2006), Edward de Bono

^{xxvi} 'Under the microscope: Heard the one about...? A Witty Scientist, Surely Not' (1997), *The Independent*, Lewis Wolport - <http://www.independent.co.uk/arts-entertainment/under-the-microscope-heard-the-one-about-1293155.html> (*accessed on April 19, 2012*)

^{xxvii} 'Question Method of Studying' - McMaster University Online Resources (*accessed on April 19, 2012*)
http://maclife.mcmaster.ca/academicskills/online_resources.cfm

- xxviii 'How to Ask a Smart Question' (2003) S. Snyder, online article - <http://faculty.gvc.edu/ssnyder/121/Goodquestions.html> (*accessed on April 19, 2012*)
- xxix 'The Quest for Meaning from Expository Text: A Teacher Guided Journey' (1984), A. Palinscar
- xxx 'Directing the Reading-Thinking Process' (1975), R. Stauffer
- xxxi 'K-W-L Plus: A Strategy for Comprehension and Summarization', Journal of Reading (1987), E. Carr and D. Ogle
- xxxii 'The Development and Education of the Mind: The Selected Works of Howard Gardner' (2005)
- xxxiii 'The Jugular Question' (2007), Faye Mallett - <http://www.galtglobalreview.com/article.php?id=120> (*accessed on April 19, 2012*)
- xxxiv 'To Kill a Mocking Bird' (1960), Harper Lee
- xxxv Based on the ideas of Indian educationist, Prof M.M. Pant – more about him is at www.mmpant.net
- xxxvi You can watch Conrad Wolfram's TED talk here: http://www.ted.com/talks/conrad_wolfram_teaching_kids_real_math_with_computers.html (*accessed on April 19, 2012*)
- xxxvii 'Big History: An Introduction to Everything' - <http://www.bighistoryproject.com/> (*accessed on April 19, 2012*)
- xxxviii 'Maps of Time: An Introduction to Big History' (2005), David

Bibliography

Christian and William H Mcneill

^{xxxix} 'His Dark Materials Trilogy: Northern Lights, Subtle Knife, Amber Spyglass' (2001), Philip Pullman

^{xi} 'Too Big to Know: Rethinking Knowledge Now That the Facts Aren't the Facts, Experts Are Everywhere, and the Smartest Person in the Room is the Room' (2012), David Weinberger

^{xli} 'The Waking Dream' - article by Kevin Kelly in the book 'How is the Internet Changing the Way You Think – The Net's Impact on our Mind and Future' (2011)

^{xlii} 'Attention, Crap Detection and Network Awareness' - article by Howard Rheingold in the book 'How is the Internet Changing the Way You Think – The Net's Impact on our Mind and Future' (2011)



About the Author

Atul Pant is the founder of Timeless Lifeskills Limited, a UK based company providing e-learning products on skills essential for thriving in the 21st century. He is also the author of the book, 'Fire Up the Learner Within – The Art of Self-Directed Learning'. Atul lives with his family in London.

What Next?

More learning modules on skills essential for thriving in the 21st century are available at: www.TimelessLifeskills.co.uk/

You can join the learning conversation on timeless lifeskills at: www.facebook.com/LifeSkills/

Ability to formulate insightful questions is a timeless life skill essential for thriving in life.

Only the Curious Shall Thrive is a book about...



With Guided DIY exercises, four case studies of the questioning strategies and over thirty illustrations



**Timeless
Lifeskills**

for flourishing in the 21st century and beyond...

www.TimelessLifeskills.co.uk