



Literature and Coping Skills
Professor Ajit K Mishra
Department of Humanistic Studies
Indian Institute of Technology (BHU) Varanasi
Lecture – 7
Simulation and Higher Order Thinking

Hello, everybody, I am Ajit K Mishra, your course instructor for Literature and Coping Skills. I hope you are doing well. We have already discussed a few very important concepts related to this course. And I am sure you might have found them to be interesting. Today, I am going to start with a new idea.

So, in this lecture, I am going to focus on simulation and higher order thinking. So, that may sound a little interesting, exciting, and a little scary as well. Because whenever we come across the idea of simulation in higher order thinking, we feel a little surprised.

(Refer Slide Time: 01:10)



**Simulation &
Higher Order Thinking**

- Simulation
- Literature as Simulation
- Abstraction, Simplification and Compression
- Literary Simulation and Mirror Neurons
- Higher Order Thinking



So, let us take a look at what we have in store for us today. So, I am going to talk about simulation and high order thinking by focusing on these important aspects of it. First simulation, what it is, and how we can connect the idea of simulation, with literature, especially poetry.

And then I am going to talk about literature as simulation, so that you get to know how it is going to, in fact, influence you and your understanding. Then, I will be talking about, there are certain simulation techniques that are popularly used. And they are also used in literary

works of abstraction, simplification and compression. And then I will be talking about literary simulation and mirror neurons.

And finally, I will be talking about higher order thinking, and how this type of thinking is going to help us understand our existence, and take care of our existential problems, so issues in a much informed manner, so that we can ensure our wellbeing. So, let us take a look at each of these components.

(Refer Slide Time: 02:37)



Simulation

- A **simulation** is an approximation of a real world process created in a controlled environment
- Through scientific **modelling** of natural systems or human systems, significant insights are gained into their functioning
- A simulation model, through its replication of objects or processes, helps us **understand phenomena** that we may not experience directly

Cont.

So, simulation, we live in the era of simulation, everything is simulated. And if I have to, quote the sayings, by the famous Elon Musk, I can tell you that we are probably living in a world that is a simulated world, it is not a real world. So, people are questioning whether the world that we live in is actually a real world or a simulated world. So, simulation is doing the rounds, It is everywhere. And simulation has in fact, contributed to our lives quite amazingly.

So, it becomes important that we understand the idea of simulation, in connection with literature so, that is exactly what I am going to do today. But before that, let us start with the idea of simulation, what it is and what it does. So, a simulation is an approximation of a real world process, created in a controlled environment. You all are probably familiar with this idea of simulation. So, it is an approximation. That means it is not the real thing.

It is in fact, the recreation of something that is real. It is an approximation of a real world process, which is created in a controlled environment. So, there are a few things that are

important in simulation starting with the idea of approximation. And then we need a real world process or an object or a mechanism that can be simulated. And all this has to happen in a controlled environment.

The second aspect of it is that through scientific modeling of natural systems, or human systems, significant insights are gained into their functioning, the functioning of the natural system, and human systems as well. So, it is important that we understand the role of scientific modeling or modeling as such, so that natural systems and human systems can be simulated. And with the help of those simulations, or simulated events or objects, we can gain important insights into their functioning.



So, this is the second important aspect related to simulation. A third important aspect that is related to the idea of simulation is that a simulation model through its replication of objects or processes, in this case, it can be an object, or it can be processes like the natural systems or human systems, a certain type of behavior or certain type of interaction, anything for that matter. It helps us understand phenomena that we may not experience directly.

And that is the purpose of simulation, of course, because there are so many things in this world that we cannot have access to, we cannot experience them directly. And that is the reason why we think of creating simulations of those objects or processes so that we get to interact with it, and then develop insights, especially critical insights into the functioning of that particular object or the process, since we cannot experience them directly.

So, that is how simulation becomes extremely important. Now, if we have to look at the world of literature, through the lens of simulation, we need to approach the process the thing through these stages that means, a simulation is an approximation of a real world process, which is created in a controlled environment.

And then we need a model through which we can simulate natural systems or human systems human practices, and then we can develop some insight into those practices. And then finally, once we develop that simulation model, and with the help of that model, we can understand certain phenomena that we may not experience directly. So, with that in mind, I will take you through the idea through the world of simulation and higher order thinking today.

(Refer Slide Time: 07:51)



Simulations serve two main purposes:

- First, they provide information by offering a model when access cannot be direct
- The second purpose of simulations is to understand, and to some extent predict, the behavior of systems made up of many processes in interaction

So, before we try to connect the idea of simulation with that, of literature, let us start with the main purposes of simulation. So, simulations serve two main purposes. The first is this; first, they provide information by offering a model. So, this thing model becomes extremely important in simulation because they provide information by offering a model when access cannot be direct.

I will explain how it is. For example, we have a clock to keep time to be informed about time the clock is a simulation of the sun's movement, because it tells us how the sun moves. And at the end of each of these movements, we know what time it is. So, the clock helps us understand the movement of the sun. Therefore, the clock is a simulation of the sun. Since we cannot experience the movement of the sun all the time, there are weather conditions as well.

So, it is better to have a simulated thing the clock that can help us with the time the movement of the sun. So, therefore, in this case, the axis cannot be direct. Therefore, we have a simulation that can help us with the information. So, simulations provide information by offering a model so in this case, the clock is a model.



Second, the second purpose of simulations is to understand and to some extent, predict the behavior of systems made up of many processes in interaction. So, the focus on many processes makes it a little complex. Because we humans are good at deciphering one process at a time, when it comes to a complex of processes, we find it extremely difficult to process.

So, the purpose of simulation is to help us understand and also help us predict the behavior of systems that is made up of many processes, and interaction. For example, the weather conditions or weather forecast, when we look at a weather forecast, we find that it is constituted of several processes simultaneously, for example, as humidity, temperature, wind movement, and a variety of other things.

So, it becomes a little difficult for us to focus on all these processes simultaneously. So, with the help of simulations, we can in fact, understand these processes that happen simultaneously. And we can also predict the behavior of these systems. So, predicting a weather behavior can be done, and is being done with the help of simulations.

So, that is why these two functions make simulation, very, very important. But we are not focused on the scientific processes. We are not focused on the scientific meanings of simulation. We are rather trying to extend it to our understanding of literary works on literature as models of simulation. So, let us take a look at those aspects as well.

(Refer Slide Time: 12:14)



Literature as Simulation

Literature offers models or simulations of life and the social world through

- Abstraction
- Simplification
- Compression

Cont.

Literature as simulation, when we come across a piece of literature, whether it is a piece of drama, poetry, fiction, or even cinema, we come to know that it constructs a wall for us right in front of us. And it gradually drives us to that world through certain simulations. If you remember, we started with the idea that simulation is in fact conducted in a controlled environment. Simulation is an approximation of life.

It simulates things that cannot be experienced directly. And how does it do that, with the help of a model, it does so. And that particular model helps us not only develop critical insights into the mechanisms, so the process of objects and human processes or natural systems, they help us understand this process as well.

So, when we come across literature, we find that it offers models or simulations of life and the social world through abstractions, simplification and compression. I will be talking about abstractions simplification, compression, in greater detail in a while. But before that, let us focus on the idea of literature as a model, or simulation, how is a piece of literature, a simulation or a model?

For example, it is created in controlled environments, that means everything that constitute a literary work, it can be poetry, drama, or fiction or even cinema is in fact, created in a controlled environment. All the elements are for literary work; are chosen or selected carefully, cautiously, so that they can combine to produce a coherent piece of work. So, it is created in a controlled environment and what does it do, any literary work for that matter?

It actually tries to approximate life. It is not the real world. It is a simulated world. It is a virtual world. It is a model in fact, that tries to simulate a real life events. So, how does it do that, through the technique of approximation, it does so. For example, we may come across a piece of fiction or novel, or even a short story, the story has a certain world, the story has a few elements, a few characters, there is a plot that moves through actions by the characters.



And in the process, the story tries to approximate the real world, because it has all the elements of the real world, for example, there is there is action, there are characters, and there is a storyline. In real world, we also have these storylines, and we also perform certain actions as characters. So, the story presents an approximation of a real world or a real life situation. And then it is done through controlled environments.

And once it is simulated, the story turns out to be a model; it becomes a model that offers critical insights into the workings of human system within it. And what is that human system, we have characters, they interact with each other, they come across each other, they contribute to each other's lives, they deal with their emotions, and they behave in certain

manners. So, that is how it offers is a critical insight into the world of simulation, or the world of the human system within that story.

So, irrespective of what type of literary work we are picking, we come across such simulations in there. Because this suddenly present a world of human systems in front of us, and that promptly draws our attention towards it. And then we begin to engage. So, first our simulation is created a model is created. And then we need to engage with that model, we need to immerse in that model, so that we become a part of it, and we become one way set, and then begin to experience the happenings within it.

(Refer Slide Time: 18:23)



- Fictional literature has been ignored by psychology for being far from empirical validity
- It has been, at best, treated as a source of entertainment
- Literature induces deep and immersive simulative personal and social experience in readers
- Readers of novels, filmgoers, and theatergoers all undergo simulations of events
- Understanding stories as simulations can help explain why they provide a special kind of experience

So, let us take a look at those things. But before that, I can tell you that fictional literature has been ignored by psychology and other disciplines in science for being far from empirical validity. And that is the reason why for long people prefer to ignore fictional literature as being an important model for our understanding of important life processes, our human systems, because they thought fiction literature lacks empirical validity.

Therefore, we cannot adopt an objective or scientific approach to the study of fiction literature. So, fiction literature was at best treated as a source of entertainment. So, people never try to look beyond this entertainment element associated with fictional literature. So, for long people believed that fiction literature has nothing to do with our life systems life

mechanisms, it cannot help us in developing any insight into our life processes. Therefore, it was ignored and it was treated as a piece of entertainment.

As a source of entertainment, then we all know that literature induces deep and immersive, simulated personal and social experience in readers. That is exactly where it took a turn. And people gradually began to approach fictional literature through a fresh perspective, which allowed them to understand that it induces deep and immersive simulative experiences, both personal and social in readers, and that is the reason why you suddenly feel immersed, you suddenly feel engaged in literature.



Even when you are watching a piece of cinema watching a movie, you gradually feel immersed in the world, which is projected in that movie. When you do if a certain type of emotion is being heightened, while you are watching that movie, you will gradually experience you will begin to experience that particular emotion, because you have immersed and that simulation of events in seen that movie has finally made you immerse and engage.

And that is one reason why we begin to experience similar emotions that we watch on television or film screens, or even while reading, fictional, literature, fiction, drama, or poetry because of this particular element so that, is the reason why readers of novels, filmgoers, and theatergoers all undergo simulation of events, we all do that. So, you can think about it, and try to understand that we all undergo such a simulation of events.

So, therefore, it is very, very important that we understand the simulated power of fictional literature, including cinema. And understanding stories as simulations can help us explain why they provide a special kind of experience, we all know that these stories provide us with a special kind of experience. Because they transport us to a different world, where we begin to interact with those characters, we begin to experience the emotions that the characters experience.

And that is how we can experience a connection with those characters. And then we begin to feel as if we are experiencing all those things as characters in that particular piece of literature. So, therefore, understanding stories as simulations, it is important that we begin to understand stories as simulations, because it is going to help us explain why we have a special kind of experience.

(Refer Slide Time: 23:50)



Abstraction, Simplification and Compression

- Literary works do not eschew memory and can help comprehend what has happened, but they provide a model of what could happen. Works of imaginative literature are the means by which we make sense of our history and our current life and by which we make predictions and decisions regarding our future world (Adapted from Aristotle, *Poetics*)
- Literary works are explanations of what goes on beneath the surface to generate observable behavior

Cont.

That brings us to the idea of abstractions, simplification and compression; we all know that abstraction is all about deriving general principles from specific ideas or objects so that we can universalize those principles, abstractions, simplification and compression are the three most important elements in literature that make it simulation or that convert it into a model of simulation.

So, always an adaptation from Aristotle's poetics, we can understand the idea of abstraction simplification compression, literary works do not eschew memory and can help comprehend what has happened. They can actually comprehend and they can help us comprehend what has happened, but they provide our model again, the mention of model simulation they provide a model of what could happen, that is prediction.


A works of imaginative literature are the means by which we make sense of our history and our current life and by which we make predictions and decisions regarding our future world. Now, if we try to equate this with the idea of simulation, we can see such a great similarity between these two propositions. Simulations also help us predict and make decisions regarding our future course of action, the future vote.

Similarly, works of imaginative literatures also act as a means by which when not only make sense of our history and current life, but also make predictions and decisions. So, therefore, literature or imaginative literature is in fact, a work of simulation or a model so that way

literary works are explanations of what goes on beneath the surface to generate observable behavior that takes us back to the claim that literary works lack empirical validity therefore, they cannot be treated as simulations or models of simulation.

They do have, because they provide- they furnish important explanations of what goes on beneath the surface, so that we can observe the behavioral patterns. So, this generates observable behavior.

(Refer Slide Time: 27:00)

The image shows a man in a maroon shirt speaking, with the NPTEL logo in the top left corner. The logo consists of a stylized sun or starburst icon above the text 'NPTEL'.

- Abstraction also means compression, greater portability, and ease of communication.
- fictional literature abstracts, summarizes, and compresses complex human relations by selecting only the most relevant elements.
- This abstracted level of comprehension also enables one to see how these principles apply elsewhere and how they may be generalized.

So, abstraction also means compression, for greater portability and ease of communication, unless we compress ideas, we cannot communicate them properly with greater portability. So, therefore, since literature can do this, it can compress it can select important aspects of life in a controlled environment, so that those important aspects can be enacted, can be converted into a model and be presented to the readers or the viewers.

So, that way, fictional literature abstracts, summarizes and compresses complex human relations, by selecting not only the most relevant only the most relevant elements so that means those elements that are the most relevant are selected by fictional literature. And it also abstracts, summarizes and compresses complex human relations by presenting a simulation or a model for us to get immersed in.


So, this abstracted level of comprehension also enables us to see how these principles apply elsewhere and how they may be generalized. Since these, principles have been abstracted, on

the basis of one model. Similarly, how it is done in scientific simulation or modeling, simulation has been abstracted. The principles have been abstracted. Now we can apply those principles elsewhere by generalizing them.

To give you an example of it, Shakespeare has written several plays with a variety of characters in their heroic, villainous and people with gray shades as well. So, we still come across people with similar dispositions and approaches. So, if we call somebody a Macbeth or a lady Macbeth that means they are so akin to those characters, that there is hardly any difference between those characters and the people we are referring to.

It is not that those works were produced long ago; therefore they have lost their currency. Therefore, the abstracted level of comprehension does not exist at all. And those principles are non-existent; we can still apply those principles that have been abstracted. And we can generalize on the basis of those principles.

(Refer Slide Time: 30:26)



Literary Simulation and Mirror Neurons

The premotor cortex containing MNS in humans is directly involved in the:

- Imitation of simple movements
- Imitation learning of complex skills
- Perception of communicative actions
- Detection of action intentions
- Processing of action-related words and sentences



So, that brings us to the idea of literary simulation and to mirror neurons. I have already hinted at mirror neurons, you are probably familiar with the idea of mirror neurons. You know, the, the premotor cortex has the mirror neuron system in humans. And the MNS or the mirror neuron system is directly involved in the imitation of simple movements, for example, somebody is doing something.

So, if our mirror neurons get activated, we will also begin to imitate those things, then imitation of learning of complex skills. So, we can also imitate the learning of complex skills, and that is how we imitate then perception of communicative actions. So, whenever we are engaged, we are immersed in the world of literary simulation. We can develop a perception of the communicative actions that goes on inside it and then we can also detect action intention that is the prediction element.

And then we can process action related words and sentences. So, these are some of the things that we can do with the mirror neuron. But the most important thing that makes it possible that can convert transform a literary work into a model, a simulated model is the activation the firing of mirror neurons in us.

The mirror neurons get fired, the moment we come across things with which we can quickly or promptly identify. So, therefore, whenever we come across human processes, in literary works, or imaginative literature, we suddenly experience the activation of the mirror neurons, and we get immersed in it. And that probably explains how we gradually get immersed while reading a piece of literature or while watching a piece of cinema.

(Refer Slide Time: 33:01)



Higher Order Thinking

Concepts
Concept formation: Concrete or Abstract, verbal or nonverbal, Process
Concept connection: classifying, categorizing, recognizing patterns, or chaining

- Metaphors, similes, and analogies
- Visualization
- Inference
- Problem solving
- Idea generation, insights

So, that brings us to the idea of higher order thinking we all know that it has an opposite the lower order thinking there is 'every day thinking'. But higher order thinking is all about concepts, concept formation and concept connection so, when it comes to concept formation,

it can be concrete or abstract. If it is concrete, we can easily form that concept, when it is abstract, we need to show certain skills on the basis of which we can form the concept, it can be verbal or nonverbal, it can be a process.

So, in order for us to develop concept formation, we need to develop higher order thinking. So, our engagement with literature as simulation leads to better concept formation by inducing higher order thinking in us and that also leads to concept connection. We can generalize, we can project, we can create a chain, we can classify, categorize, we can recognize patterns in that simulated piece of literature.



And how does that happen? Through metaphors, similes and analogies, we all know that we cannot understand everything, we cannot explain everything. So, we need certain higher order thinking skills, metaphorical skills, so that we can in fact, understand and explain complex ideas and concepts. We also need the power of visualization because literature or any simulated model, in fact, presents a visualized object or form right in front of us.

So, does literature. So, it helps us with visualization. It helps us with inference, we can infer certain ideas, and hence develop critical insights into those significant happenings. And then with all this, we can move towards problem solving activities so that is exactly what literature does for us. In the same way as any scientific model does for us.

The scientific model helps us understand the processes, look for the possible problem areas, so that we can address them before we finally manufacture or create that object or we finally create a process. Similarly, a literature with it is highly you know simulative capacity or power does the same thing.

And it also leads us to problem solving at the end of it through a connection established by mirroring of neurons that leads us to problem solving as well. And then, when it is done, we come to the insight level. Now we have developed a greater insight into those ideas.

(Refer Slide Time: 36:28)



References

- Gallese, V. (2009). Mirror neurons, embodied simulation, and the neural basis of social identification. *Psychoanalytic Dialogues*, 19.5.
- Maier, N.R.F. (1933). An aspect of human reasoning. *British Journal of Psychology*, 24.
- Mar, R.A., K. Oatley (2008). The function of fiction is the abstraction and simulation of social experience. *Perspectives on Psychological Science*, 3.3
- Thomas, A., and Thorne, G. (2009). How To Increase Higher Order Thinking. Metairie, LA: Center for Development and Learning. Retrieved Jan 21, from <https://www.cdl.org/how-to-increase-high-order-thinking>

So, that brings us to the end of today's lecture. I hope you have liked today's lecture, you like the idea of literature as simulation, and literature, inducing higher order thinking in us so that we can develop critical insights and lead ourselves to solve life's several problems. So, thank you for joining me. I will meet you again in the next lecture. Thank you.