Introduction to Biomimicry
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Lecture – 32
Using Biomimicry to Design a Solution Week 6 Part 4

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We now are moving towards the student project as usual. This is your 6th session and we have had how many about 5 students' projects already. So, it is nice to know that there is someone who you can actually imitate have used the right word imitate because, you know, doing the student projects serves several purposes. One of them of course is knowing how they did it so you become better at the process.

The second is to take inspiration from that person and say oh this person has done I can do similar way. The third is if you are an entrepreneur try and find out if the idea appeals to you then you can find out if you can collaborate with the person who brought out that idea and do something to make that idea happen and the fourth thing of course it gives you tremendous confidence in creative thinking because you know that when you go from problem to solution and you actually come out with some tangible solution which can be implemented.

The confidence in their own ability to think through a problem, come to a solution is tremendous nothing can meet that.

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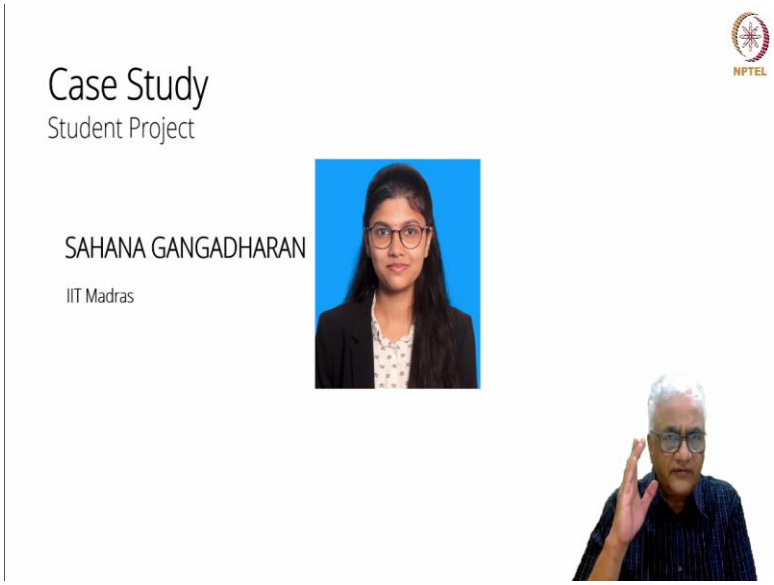

So, now I am going to go to students projects. The name of the student is Sahana Gangadharan from IIT Madras and for her what do you think she would have done first?

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She would have first chosen a United Nation Sustainable Development Goal. So, now the goal that she has chosen is goal number 6 clean water and sanitation. The clean water and sanitation there is apparently an emotional connect for her to clean water and sanitation which is why she choose it.

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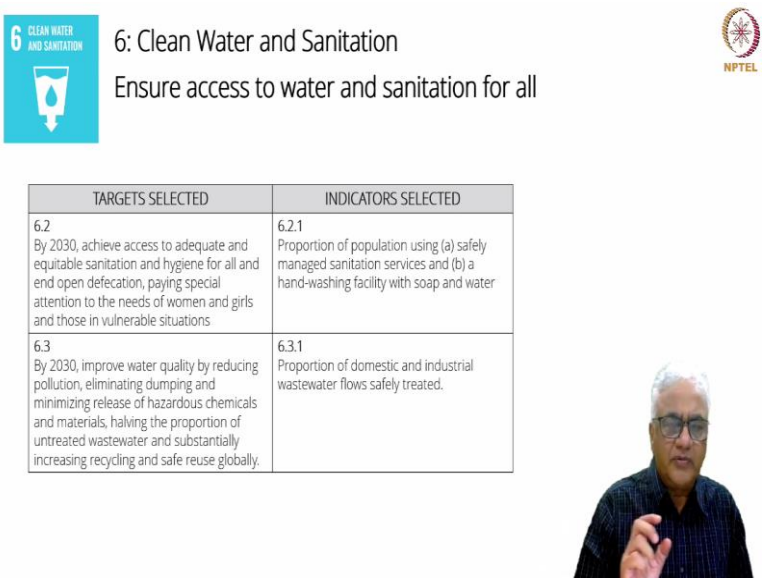

So, this is the target selected. Now all this is very familiar to you. I think if I wake you up in your sleep and ask you what is the next step each one of you will say it and that is how familiar you must be. So, the targets and indicators that she selected all of them. Her goal is clean water and sanitation. Ensure access to water and sanitation for all.

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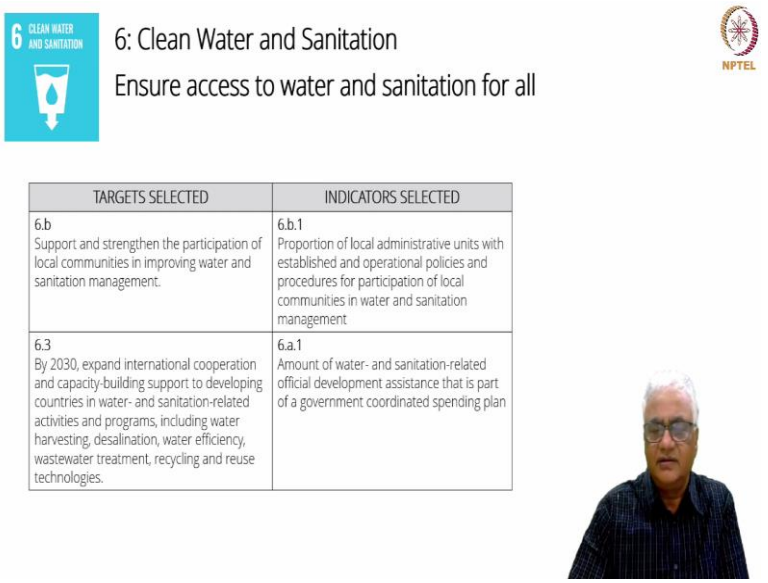

So, therefore target selected 6.2, 6.3 indicators and 6.b and 6.3 these are the targets she selected apparently she has done lot of work reading up on the goal which is what everyone must do. Remember the connection between information and new ideas do not forget that please.

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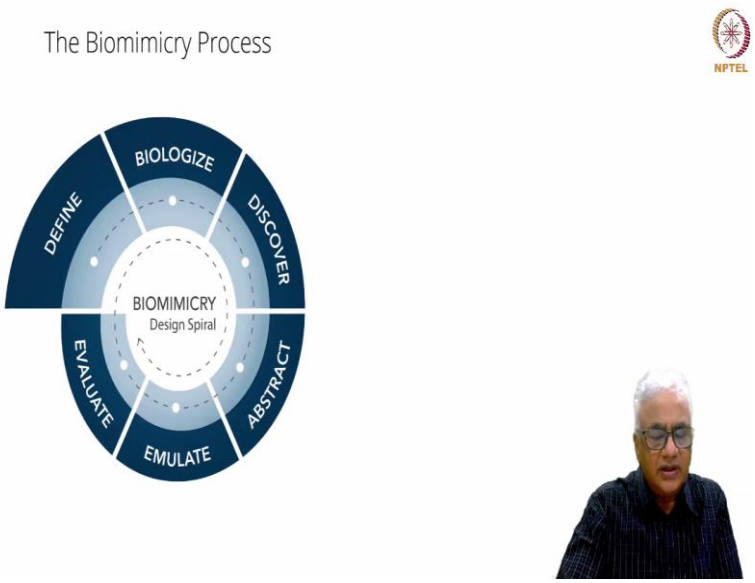

Then what does she do? She looks at the process. The spiral.

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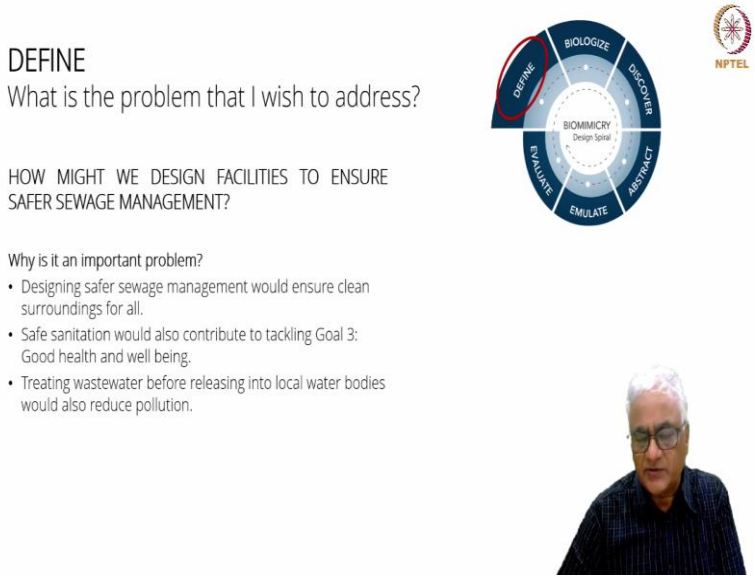

And what does the spiral say first is to define the problem. I am not going to get into detail because I want you to read Sahana's notes, Sahana's PPT, but just to guide you through the PPT what we are doing is how much she is asking the question how much we design facilities to ensure safer sewage management. So, therefore she is saying how much we design facilities to ensure say first of all objective is safer sewage management.

Why is it important problem I do not think anyone needs to argue saying it is not an important problem and she has got enough reasons to say that it is an important problem.

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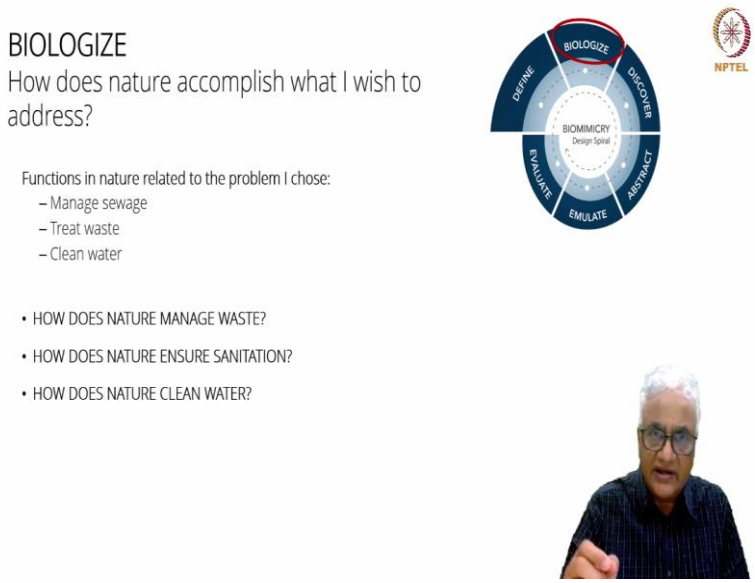

Next is biologize; biologize like we have said remember, ad nauseam to repeat does not matter, ad nauseam to think to understand that biologize means asking the question how does nature accomplish, what I want to accomplish. In this case what are the three functions that emerge out of the problem statement. The three functions in the problem statement are manage sewage, treat waste and clean water.

Clean water as in clean here is the verb clean water not some noun clean water. So, manage sewage, treat waste, and clean water and you will find that all three functions have a verb in them which is an important aspect of a function. So, therefore the question that she asks how does nature manage waste, it is so simple falls in so logically now. So, imagine the more important thing is your skill in finding out what is the function that you want to accomplish, how does nature ensure sanitation, how does nature clean water.

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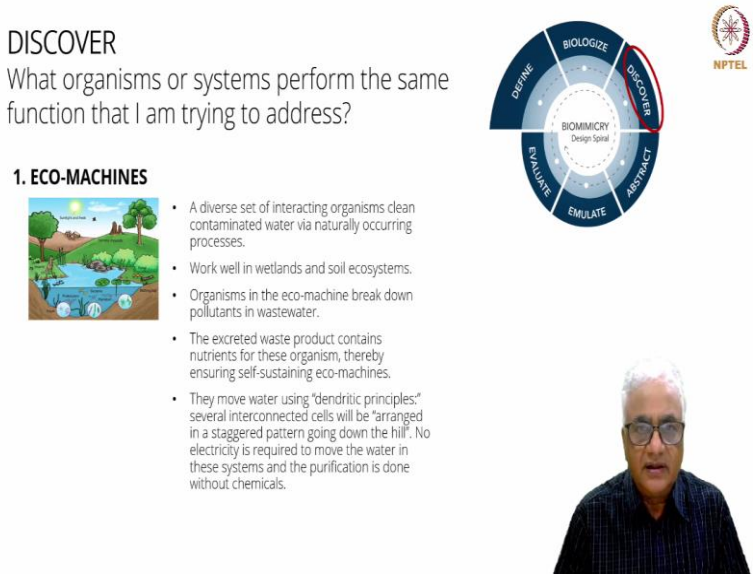

What has she done? She has discovered she has gone to discover naturally and then she has spoken about something called eco machines. She has described eco machines and she spoke about eco machines. Look at the last paragraph they move water using dendritic principles, several interconnected cells. So, when I read Sahana's project for the first time I knew there was something about lot of interconnections.

Water having to go through several filters that is what I understood the minute I saw that and that is what I think she is trying to convey.

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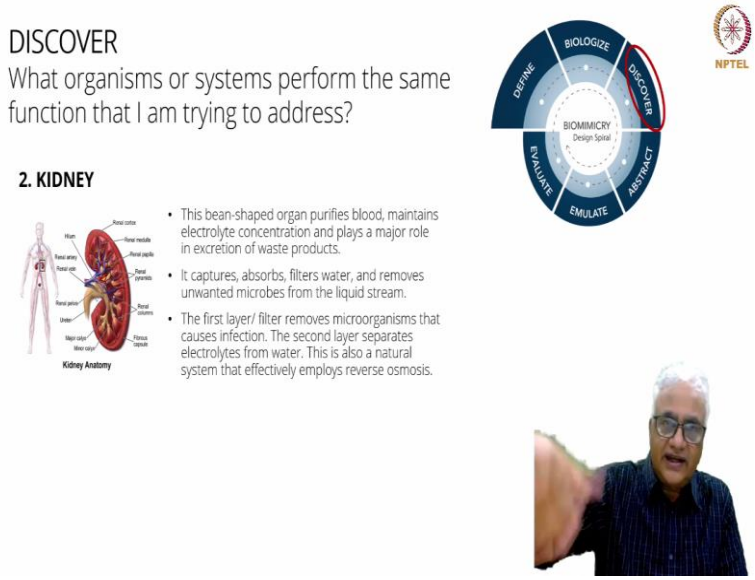

And then what does she say she looks at the kidney I think normally one would look at outside the body to look at organism here she is saying let me look at my own kidney and what does she find that kidney purifies blood, maintains electrolyte concentrations, captures

look at the same day it is coming back the idea is coming back to capture absorb filters water and she goes on to looking at her kidney and all that.

You can read all these descriptions on your own otherwise you will get bored if I keep on reading line by line.

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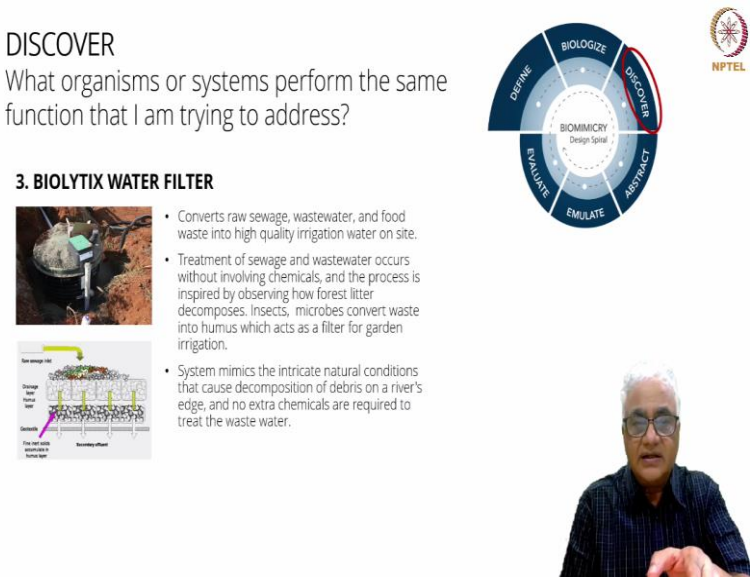

So, here she actually talked about something called biolytix water filter. If you look at the second paragraph you will understand why she is talking about it. She is saying treatment of sewage, how forest litter decomposes insects microbes convert waste which in the humans which acts as the filter. So, here she is talking about several organisms that filter waste and she describes what is called the biolytix water filter.

So, how I interpret it is because what I learnt from Sahana is that if I read about the water filter I understand what nature does. So, this is her discover.

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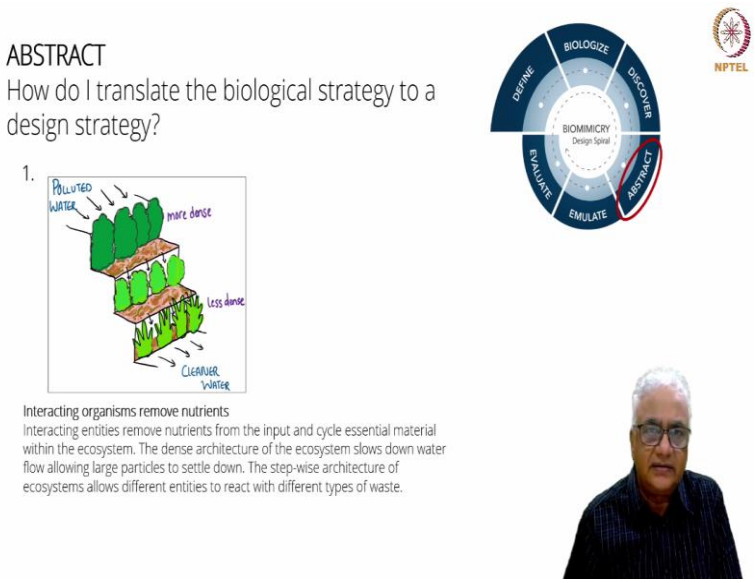

The next one is abstract. So, how do I translate the biological strategy to a design strategy. So, she has abstracted design strategy, she has made some drawing, she is very, very clear, you look at this paragraph you will start to understand how easy she has made the process of filtration.

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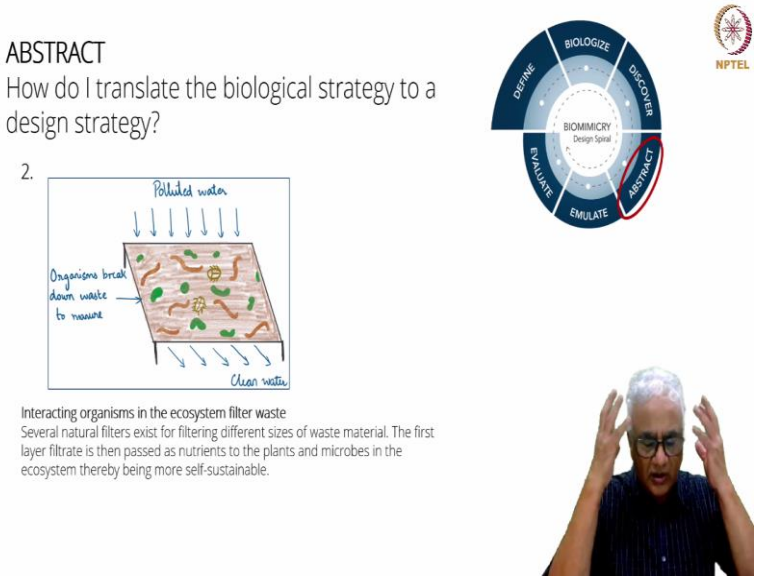

And she has done one more abstract to explain it even more deeply, how interacting organisms in the ecosystem filter waste. So, her whole thing is about filtering, interacting organisms etcetera.

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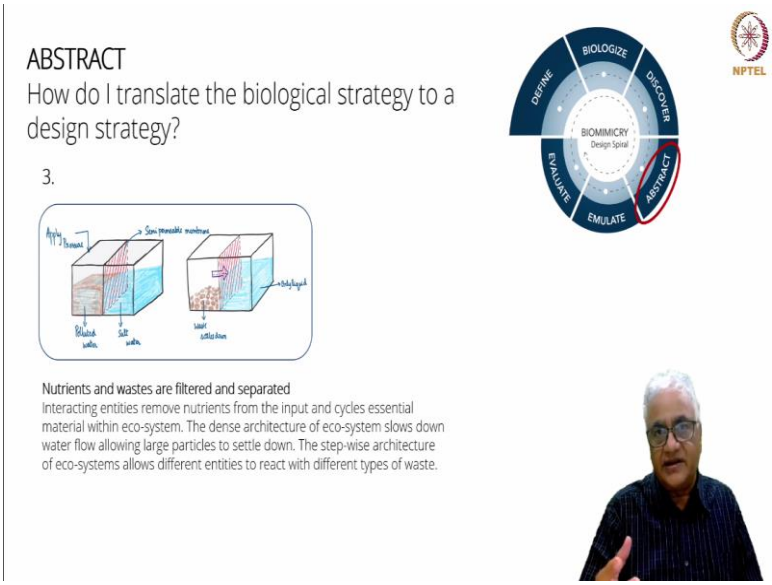

Again she has done one more abstract made it even more simple. She has actually drawn pictures to help us understand what she has in mind, how nature accomplishes the functions she wants to accomplish, how does nature clean water etcetera. So, it has one nice word here called step-wise architecture of ecosystem maybe you can Google that.

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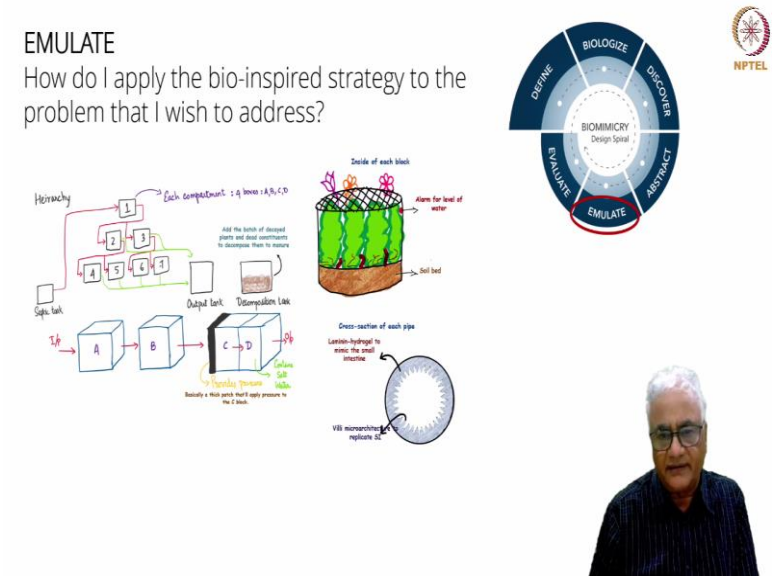

Then she does emulate, you know, emulate is ‘idea’ so here she has got an emulate idea, how do I apply the bio-inspired strategy to the problem that I wish to address. So, please read it I am going to give you, you can pause the video now and read how she does the emulate, and if you have some questions on these you can use the live sessions or the questions you can write to us and ask some questions about what is idea if you are interested in this idea.

Again she has made it her idea is going towards I think having beds I think as we will see she is having some beds to make the water filter from one bed to the other bed and all that.

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And finally of course she is talking about evaluate. She is talking about evaluate.

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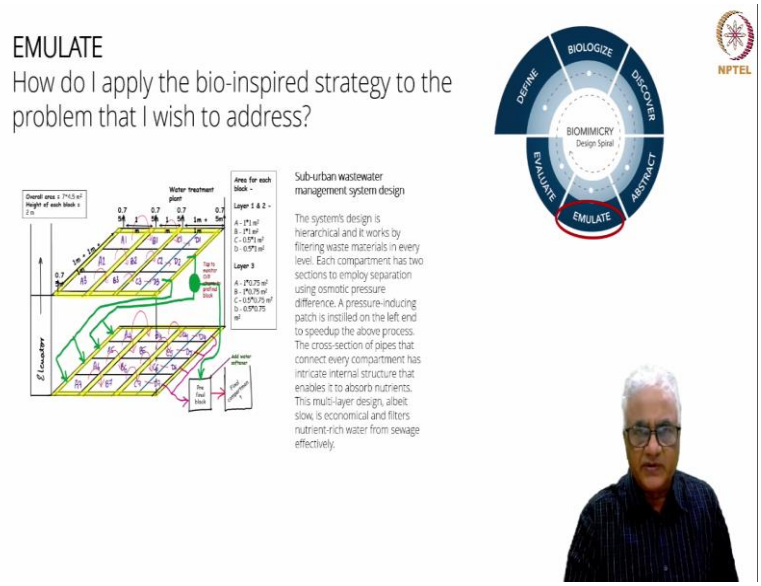

So, from emulate so, therefore, her emulate idea is sub urban wastewater management system design. She has written down the design. The system design is a hierarchy and it works by filtering waste materials in every level. Every level it is being filtered. Each compartment has two sections to employ a separate separation since she is employing separation using osmotic pressure difference.

The pressure-inducing patch is instilled on the left and on the left hand to speed up the above process. Pressure-inducing patch a cross-section of pipes that connects every compartment has intricate internal success that enables to absorb nutrients. This multilayered design albeit slow is economical and filters nutrients rich water from sewage effectively. So, this is her system that she is creating.

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And from the emulate from her idea of system she has gone on to evaluate, how can my solution be applied in the real world. How will I follow nature's design principles. So, she is saying nature recycles all materials so she has followed that principles. Nature uses chemistry and materials that are safe for human beings. In her design she is not using anything toxic unsafe. So, what are the next steps that she wants to do.

Identify materials required, ensure the working of a single compartment before deploying it. As a system it is a very clever way of doing it and treat the final output stream with water softener to make it fit for drinking. So water softener I am sure is going to be non-toxic and finally, she has created a water filtration system simply because she intended to do it. So, the cornerstone of creative thinking is intention or willingness to be creative.

By showing us these student projects, we are hoping that we are making more and more of you willing to be creative.