Ergonomics for Beginners Industrial Design Perspective

Prof. D. Chakrabarti

Department of Design

Indian Institute of Technology, Guwahati

Module No. # 08

Ergonomic design process

Lecture No. # 33

Design process involving ergonomics check

Welcome to this thirty-third session of ergonomics for beginners industrial design perspective. The current module is module number 8, Ergonomic Design Process; out of 4 classes, today's session is class number 33 - Design process involving ergonomics check.

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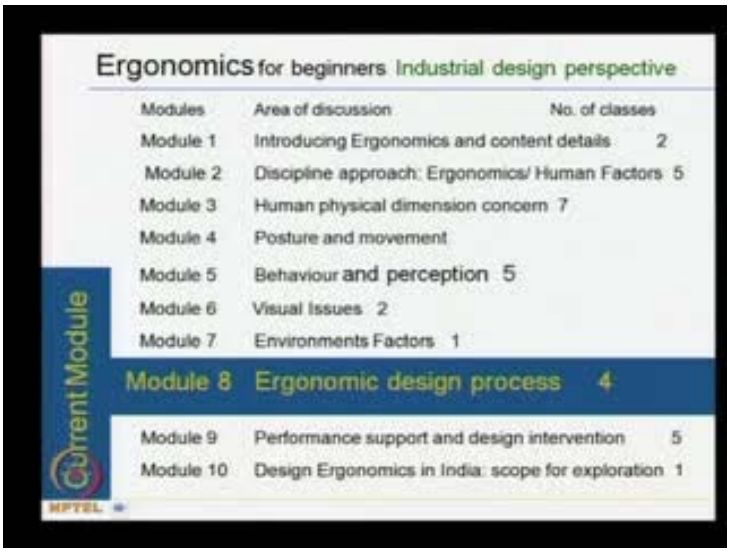

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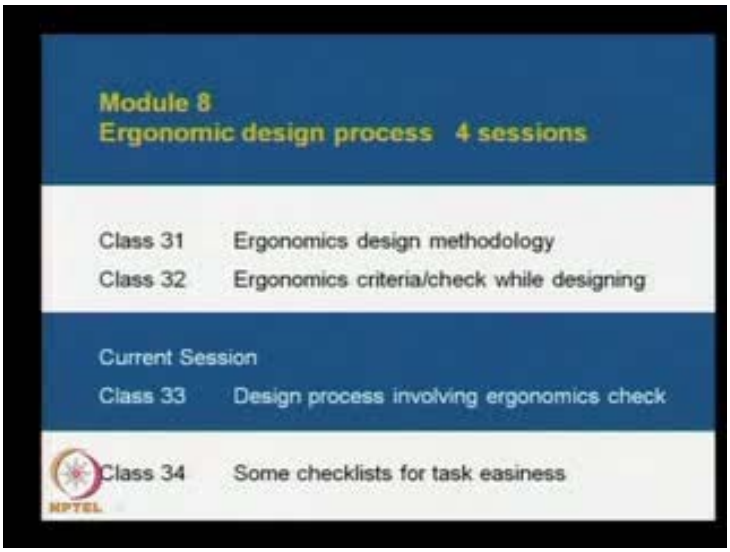

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The gist of last class, where we have specifically discussed that a product or design space should establish compatibility between human factors, principles and product or system features, comfort of use and functional reliability through product reliability and safety.

Second issue was the design process involving several relevant ergonomics check issues, third point we discussed few aspects of ergonomic criteria for designing or redesigning a product or a system, and towards reliability and trust worthiness, requirement for satisfying various legal bases, we have discussed.

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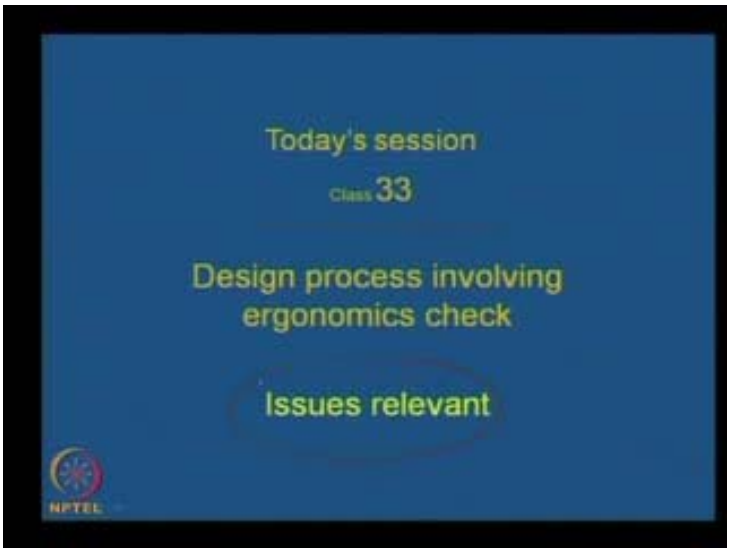

Now, with this background, today's session is class number 33, the Design process involving ergonomics check where we are going to discuss some issues relevant to this.

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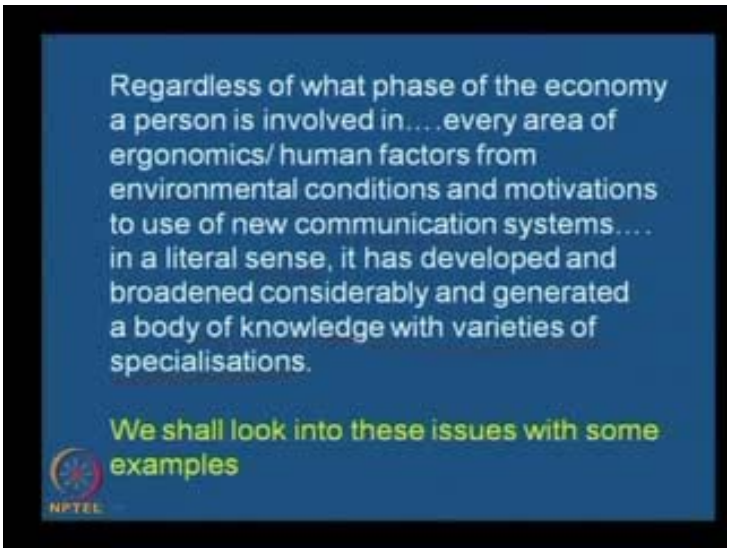

Regardless of what phase of the economy a person is involved in…. every area of ergonomics and human factors from environmental conditions and motivations to use of new communication systems…. in a literal sense, it has developed and broadened considerably and generated a body of knowledge with varieties of specializations. We shall look into these issues with some examples, in the following time.

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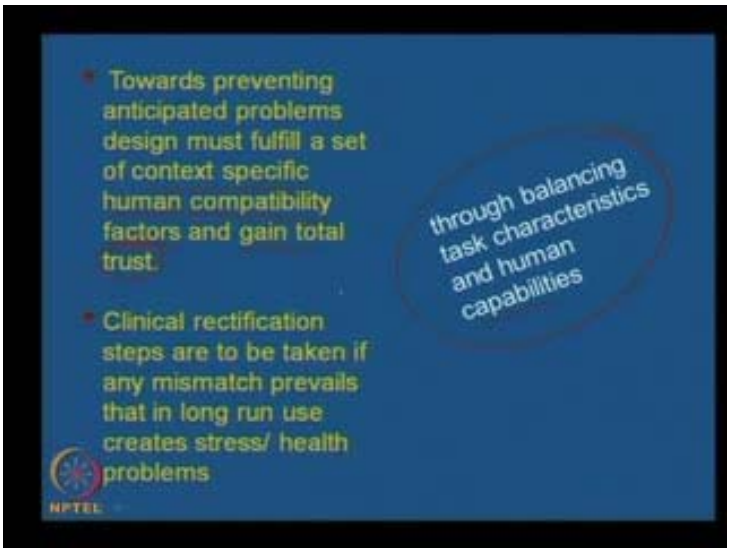

Now the two issues are there - one is that, towards preventing anticipated problems, design must fulfill a set of context specific human compatibility factors and gain total trust. Second issue - the clinical rectification steps are to be taken, if any mismatch prevails, that in long run use creates stress and health problems, and so, this can be done through balancing task characteristics and human capabilities. Now, how are we relevant and how can you apply it? Let us see with this.

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So, today's design or the design today is - Usability and Pleasure. So, in this figure, it says that the boy is playing a multi audio-visual player in a car where the main thing appears from this figure, the inquisitiveness to learn and feel trust so that, without fear, he can try to use this.

Design a practice: it has aesthetics, functional reliability and human aspects affordability, and that, is the reality. If the design I cannot afford to have it, then that design does not give me any benefit. So, for the functionality and reliability of this issue, we can say that frequency of use, it should satisfy mode of use, maintenance facilities, repair and reuse, and proud possession these feelings would be there. So, a product should have two issues we should consider - the usable and the pleasurable. Usable is functional and reliable - isn't it? And pleasurable is that aesthetic perception, attractiveness, feel-good to possess and joy in use, thus, a total trust can be achieved.

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Now, some issues for discussion, one point is that - Honor the user and their practice rather giving a complete new thing, Technology to satisfy urban and rural sector, Urban and rural requirements, that is, variation verses similarities we must need to consider. In these figures, we can say that, in here, is a sow-type of device the person is using to level the grass heads.

So, the movement and etcetera, how they are using, it can be used. So, in certain places where the lawn mosses are not able to perform its task, in those cases, this type of some specific development, we may require it.

Now here, the sequence of operation is being shown here. After with this analysis, the movement pattern and etcetera, the device can be designed. So, this is the device - it is like this - this is the cutting area and this is the holding.

Now, if a completely new design - suppose, in our paddy field, one paddy is ripping, normally, we harvest this paddy with a sickle but there lot of problems there, and many designs have already been developed, and as still that, development process is going on by various agencies to achieve maximum benefit of reaping, where the users comfort and health problem will be solved or will be tackled/ handled.

Now, one suggestion was there, one person has suggested that, why not to use this type of device here, so that it can be cut. Now the question comes - In any different development, should be context specific? It means, normally in our country, the paddy - it falls after paddy is ripened, and so haphazardly it falls.

So then, if we use this type of equipment, then what happens? There will be heavy loss and proper paddy harvesting is not possible with this type of equipment so there, the sickle type of device is required. So, the development it requires is its context-specific use.

Now another thing is that so Urban and rural development: one can say that rural and urban, as per their behavior differences, and then their ambiance differences, the product also should be like that means, for city users, product should be slick, look good - like that - , thin - something like that - , whereas in rural area, depending on that nature of the rural locations, it may be rugged.

Now in that case, we cannot say that, a product of this type of thing - the mobile, it should not be different for urban population group and rural population group, so something it requires to be different and somewhere, we require same approach. Now, it is our responsibility to just the context and the requirement so, the variations and similarities of a product development, we need to consider.

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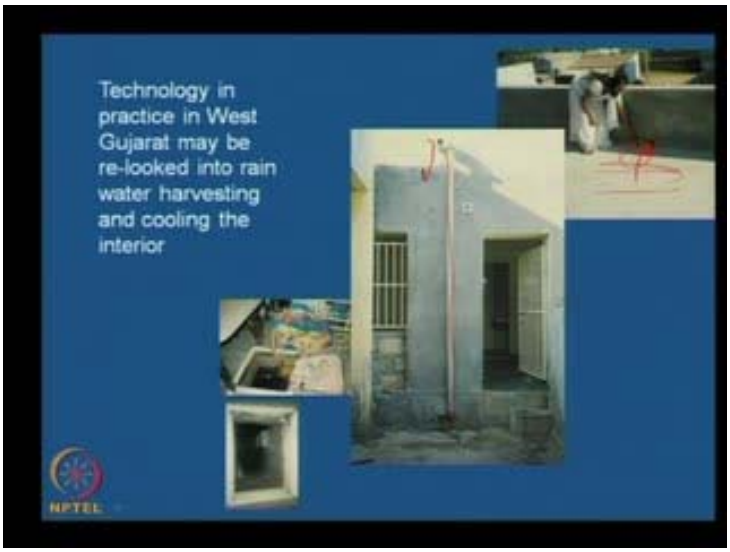

Why not take our own technology, traditional technology or betterment with some new addition of thoughts? In this case, it is seen that the technology in practice in west Gujarat may be relooked into rain water harvesting and cooling the interior of the home.

Like in the terrace of those places, the terrace has two pipe holes and these two pipe holes, if we see, this is from the inside of the terrace, and this is the outside of the wall. So these two outlets are there - one outlet, what happens? When the first rain comes, this one water outlet will be blocked - it is little higher than the floor level so it is blocked. So what happens? Normally, the first rain water, it flows down this way and goes out, and after a certain period, then this will be blocked, then what happens? The water level will fill this and then after sedimentation, some top layer water will flow into this hole and then, it will, through this pipe, it will come to a storage chamber, inside the home so this water, it also gives that cool effect as well as the water supply, when water scarcity is there. This system one also can relook into for a newer application.

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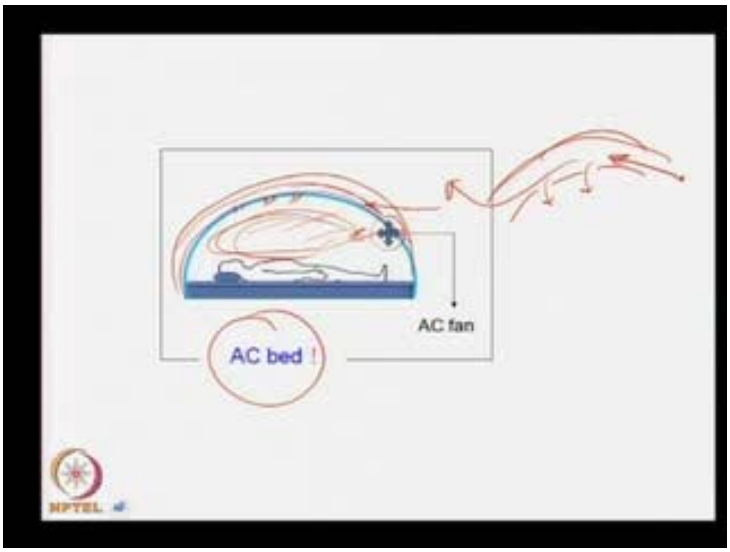

One talk is there that one type of development, whether we can consider it, like, instead of making the whole room, air conditioned, specifically in hotels or somewhere else, if we have a small cover like this, this small cover is a small enclosed space and then one Ac inlet, so what is we can say that this much area will be filled in (air cooled) air conditioned air, and so the whole room, we do not need to spend energy, it will be energy saving also, but there are some concerns - if a single way, air inlet is there, then there will be a circular movement of air so, some people may not like it, so if we found that, then the thirst and etcetera will come? So people may like/ may not like so, some study is necessary.

But before that, some prediction can be done, or some anticipation/anticipated design thought may be that we may have this is one layer and another layer may be there, so, if the air inlet, we can make it in between these two layers, and then let it flow with this, and then there will be some small holes, with that some back-airflow will be here, so it will have without any turbulence, a constant air flow kind of thing, so, that type of development means if there are two layers like this way, so what happens? The air flow will be through this, then main airflow will go like this way, and then, this airflow will come inside. Like that, an air conditioned bed can be developed, but this is a concept only, but now, we can make it a good design. Another thing is that, to honor the old.

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The Firewood: firewood, etcetra, for making our day-to-day life, people use this but earlier, what happened? Still in villages, we have a special mud-made stove, where we have that one or three openings.

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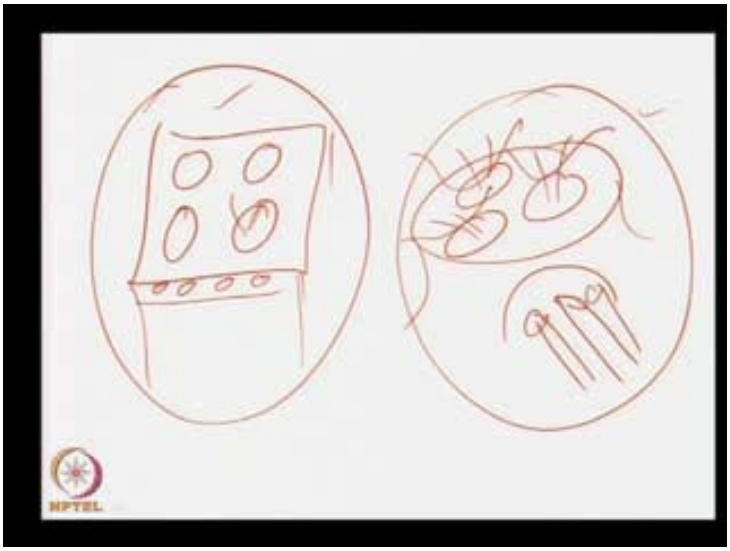

If we see today's cabinets and etcetera, we have 4 burners and some switches so, we can control all the things and when we require, we make it open or we may close it. Similarly, the earlier system it was that maybe two or three openings of a same hole and then, with one pyre and one opening here, we may put the firewood. So, when the

firewood burns, the flames here will come out. So, at that time, the three vessels can be used. If we do not need anything, then it may be covered so, what happens? Only one side, in a controlled way we can have the fire.

So this type of solution, when these things we are making with modern technology, and this system we have already and so, for a rural requirement, how we can have a common interaction between this development and this traditional practice, that scope is there for development.

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With this development, when we consider ergonomics and x-ergonomics, it will be a good design. But sometimes what happens, some product - in this figure, we can say that it is mentioned new as x-ergonomics. What does x be? Its extra-ergonomics there is nothing called extra ergonomics, ergonomics if we consider all this, then it'll be a good design so now, still it is imported.

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Now, a need based design development, easy to use and pleasure possession, is necessary. When you are putting it here, it is ergonomic, but this product is imported for Indian use, what Indians will require in our context, it may be considered. In this figure, it says that the lady is using a stove where it requires to keep this stove, a specific space is always engaged. When seeing this, the necessity of design on development, one product development trial was made where this product is like this way so, it may be folded up. So, when you require, you can fold it down like this, and after cooking and etcetera, when it is in use and after use, you can open it and stand so, it requires minimum kitchen platform space. So, a design/new designs are energy efficient methods, and the ways to use them are to be compatible to the complicated human characteristics of different social strata, and the context where these are to use human - comes with assorted body size, and many psycho-physiological constraints. After considering this, and the context, this type of development, we can approach.

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Now, another issue is that ease/easy of handling and understanding about the proper use. In this product the person is using, what type of product it is, and what function it can do? With the product shape, size and home appearance, itself, it does not need to tell how to use this product like this. So the handling at different position, etcetera, the handling easeness, is already considered.

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Now in this figure, we are showing the different movement pattern and the design how it can take.

Task and design match: now, when the person is holding a cup like this way, the holding is like this, then it is coming to the mouth, and then it goes this way. So in this case, some uneven pressure effect falls here, this is a paper-cup - it may squeeze and etcetera. So, how the hand movement and the cup movement is there? So, while designing a specific cup, for this, these issues are to be considered.

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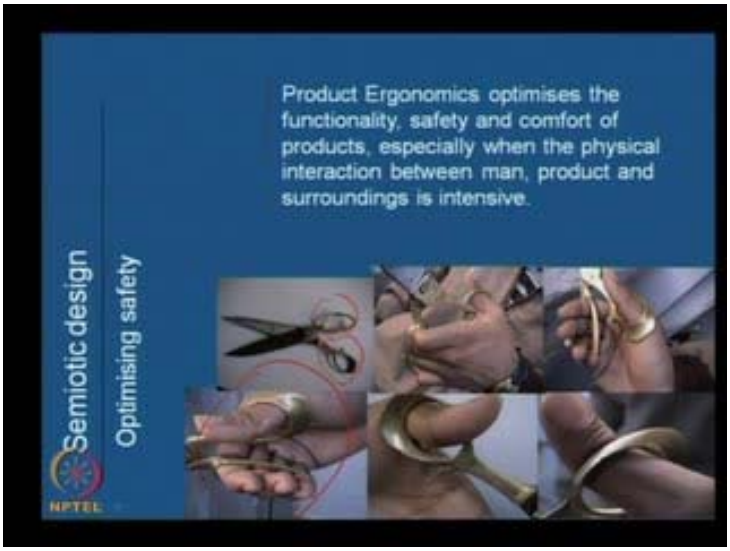

Like in this case, we can say that the semiotic design - how to use it? Like here, the product ergonomics optimizes the functionality, safety and comfort of products, especially, when the physical interaction between man, product and surroundings is intensive - like this scissors we are using. The scissor has these rings that put in a certain way, it fits in the fingers, and then how to operate? We do not need to tell anybody how to operate it, because when it fits to our palm, then we know it is the correct way of using it.

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Now, another thing we can say that, in this case, so this is the very common product we use every day, but now the thing is that, in this, though it is a smaller section, small size and a big size but still, we know what it is for. And now, after seeing this product, this product - how to hold it? This product is kept upside down so, we do not require to show that whether it is really upside down, because, if it does not fit, but it fits to your fingers - holding and pressing like this so, we know which one is the right way of using it. Also with this, another matter comes, normally, what happens when there is a staple? Our behavior is that, we use the papers not in a straight, vertical or horizontal, not like this, not directly - like this, but we normally open it with a little bend - like this, so it becomes a bend - like this. Now, the question comes, how should we staple it? If we staple normally, if we staple somewhere - in this position, then when we try to turn - like this way, then there is a chance of tearing from this top point. So, from this top point, tearing chances are there and so, it may tear. Now, if we do the stapling from the top - this side from the front - like this way, in this position - then what happens:? When I try to leave the page - like this way, then it also starts tearing from this point because, our movement is a little circular movement - like this, so, for that, it would be better if we can have a stapler in this position - in this corner position, so what happens? It matches with this, with the dimension of this product, so it matches in this position means, if we hold - like this way, and then if this corner matches, then we can have it here, so what happens? We may do - like this, we may do - like this, or with a circular movement - like this way. The life of the stapler will be little longer than earlier ones.

So, now once we learn it, we normally tend to follow this so, this proper design says that how to operate it once it is told to somebody, it remains. People will try to use like that, so, the design, its proper usage, sometimes requires to tell at the beginning - how to use it, then it will continue like that. In this figure, it is shown - like this way (())

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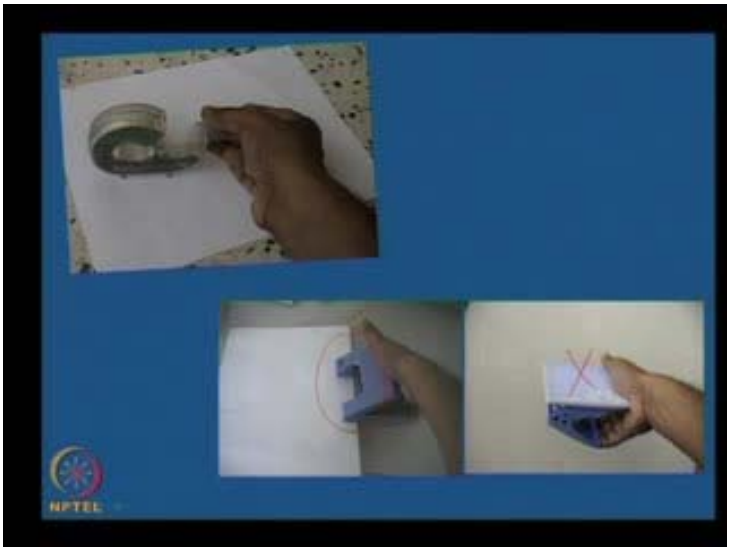

In another item, product is supposed to work in a single hand, but in need, it cannot perform that, means - if it is placed like this way, then, if we tear it, it requires a force/pressure, and with that pressure, if I do not hold it, it is not stable on the floor. It is not stable. If it is not stable, then what happens? I have to hold it; what type of design can it have so that, without holding, I can make it - means what happens if I need to use it? Suppose, this product, I am making folds; I am making a fold, and then, I want to put a staple here, so, I have to hold it and then I have to tear this tip front, but with a single hand it is not possible.

Then, either I have to leave this - if I leave this, then it will open. So, how can I keep this here and I can use it, so a special design is necessary here? There are many attempts already been done in products, but still, to make a gift-type of item with the same utility value, the product's development scope is also there. Another thing is that, to see the semiotic application of this type of product for puncture - how to use it/operate it, tells with its own figure. So, people will use like this, they will not use like this, because it

does not fit, it does not match. You do not feel comfortable while operating it so, where the product feature gives a comfort, that would be the right way of using that.

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Another item we can say that, some techniques one can develop to use, like, if a single paper placed on a surface, there is a chance of displacement but, if the same paper, if we have a small fold like this way, if a small fold like this, then what happens? With this, it gives structural strength to it. It will not flow, but still, you can have a hold - like this way, you can have a hold. But in this case, it is not possible to hold so, it may fall; it gives a special strength so, these types of things, we also may consider for our development in design surface treatment and etcetera.

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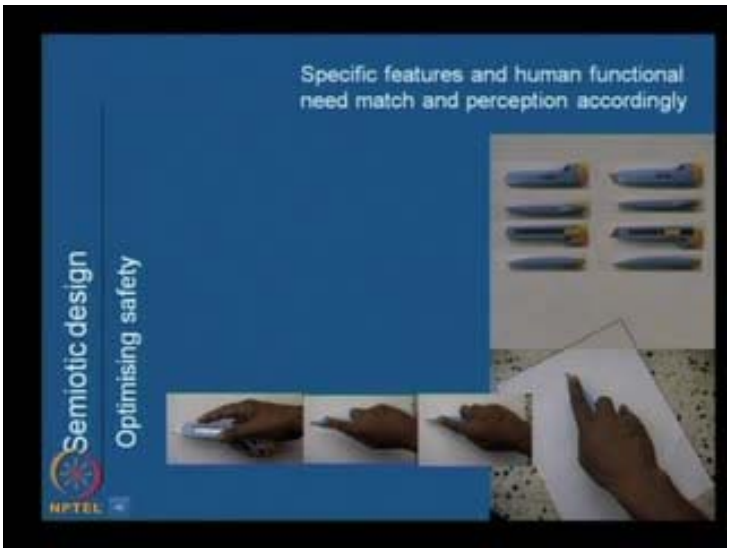

Then it is Optimization of safety: optimization of safety, people say that remove all the unsafe matter, but it cannot be possible. It is not possible to remove all the unsafe thing, because some unsafe things are necessary, so, just one incident, we can see that one project was done for child safety, and this type of product, children are not supposed to use - like this way; it is very dangerous product, but the thing is that, in school, they are required to use it. So then the question comes - how can we make it a safe product with the function still on? Then some people say that, this blade is very dangerous, so cover it as much as possible, so just keep only the tip open, so that there is less exposure of the unsafe component.

Some people say, that, to motivate use by the children, let it have a toy type of figure, so that they will like it. Like that, many suggestions came but finally, after analyzing all the different components - its plus and minus points, it is found that the safety of this product lies with this lock - with this lock only - with this lock, because, when it is opened, I know that this is unsafe, so accordingly, I can use it and accordingly, I can apply pressure and move. But with that, what if this lock slips - then accident takes place. So, with this, in design point of view, one can say that the ergonomic risk of using this - this lock is a very important point, so, the product should be develop like that. It is not that - avoid everything. Some people say that, children are prone to accident. If there is a flame - lamp is glowing in a single flame, we feel that child will go and put his finger inside that flame; we have this fear and myth, but actually, it is not possible for any child

knowingly, just for inquisitiveness, they put that finger in a flame to see what happens. Because, when he reaches near, that heat senses and etcetera, it will repel him from going near that so, that inbuilt safety features are already inside so, the accidental issues that should be considered - like lock - in this case.

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Another issue is that, frequency of use, use mode, maintenance, repair and reuse. Now, in this bucket case - why does it break in this position? Why does it break? Because, the frequent use, the load - it cannot take. So, while designing, we can say that - this portion - should be a little thicker? It should be a little thicker then - like that. Another thing is the use mode, and in the use mode here, the transparent glass, the transparent material is used so, inside - what is the content one can see? Texture cap is given for ease of use. In this case - in this harpic, for the safety purpose, child lock, there is a system, if you press these 2 points, then it opens up - here - it opens up, then we can open it. Otherwise, normally, without pressing - these 2 points, to release - these 2 buttons - this 2 area, it will not open. So these types of safety things are there.

Another thing is that, many times, in this type of tubes, we see that the head breaks. Among many reasons, one may be that here, if the spiral area is like this - here, so, if this is more - so this is the cap - so if this area, is more than - this, it is larger - this one is larger than this – then what happens? When we tighten this thing, it gives a pressure here and so, there is a chance of breaking it. So, in that case, one can consider that - this

height is always higher than these places - means - in these cases - this here, this one - it would be lower and - this area - would be higher. In design - have the specific context and anticipated use mode and behavioral influences and movement considered. While manufacturing context - material quality and finish, appropriate material and process used, care and carelessness means - while using it, whether we anticipate what type of behavior, while using that, careless or careful.

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Knowingly, some features are provided that, with the first instance, people may feel wrong, but knowingly, it is given. Like in this case, in this figure, we can say that - we see the figure - now, if we open it, it comes out; here it is not fully covered - the circle. Now, in this case, if it is placed here, then you can use it, so what happens? A provision is given so when you use it, it should not fall when you are using, it should not fall - like that - when you are pouring something, and for maintenance and etcetera, it may be cleaned - like that way, so - this is a live hinge is given here. This type of development can also possible, but at the beginning, first instance, we may feel that, there is some problem - it is unfinished. So, what are the features for a specific function? It should not give that feeling - at the first instance, one should know, but, once you know this factor, then there will be no problem, you can follow it. So, how to give this first instance, the first information - that is the design challenge!

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Another issue - some student exercises, we are showing here. As a class assignment, we have done these earlier, the students designed accessories for liquid containers. Now many containers are there, as shown here. Glasses generally have a cylindrical profile; it is difficult to hold them, in case it is hot. So, there are many systems being used, like the attachment design for a glass. It serves as - here what happens - in here, we have made some kind of attachment - specific thing, so, this is flexible attachment can be used for any kind of glasses.

If you put it inside, then you can hold it, it will give you its resistance, and when it is not necessary, you can remove it also. So, here what happens is, a lifestyle accessory - as an insulating ring to avoid contact with hot surface, material is rubber type of things - nylon, rubber and whatever. Similarly, the heat resistance materials can be used, flexible, and dimensions depends upon the diameter of the glass - with a specific range of glasses, we can make these specific rings.

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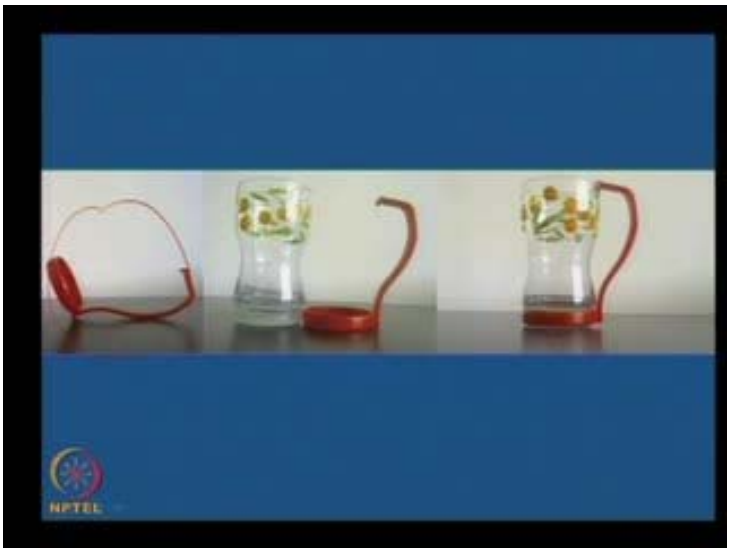

Now one example we can show here again, like in this case, the glass handle, it may be a specific handle - like this, that may be fitted here. Now as per experience, we can say that, this is the glass, we can hold it - we can hold this glass - but now, with a pressure, you can lift it. So when you do not require - this one, then this may be a single glass/ simple glass but when we are using it - let it have, and then with extension - let us fix it here, so, it will be a cup - like this. So this type of development is possible, and this is already available in market, this sample, I am showing it for the experiment of this matter.

Now another question comes, when we use - this type of product, we normally do not - if its handle is here - we do not pour anything - like this way, or directly 90 degree angle. Normally, we pour in - this way, in the corner - like this, so then, if this notch is in the front, then we had to do - like this way only, if its kept here, then only - like this way, but depending on various activities, if I want to pour - here, here, in different directions, then - this has to be movable, so, a specific design was developed in this, I am just showing it in a dummy figure here, suppose we require to open it - in this. So, a specific tap can be developed, and that may be placed here, and this cap may be moved as and whenever, wherever required - like this. So, this cap is mentioned here - the cap is fixed at this ring, so, the ring, we can move wherever we require.

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Like that, here is another program, in a conventional flask, the water comes from here. Now, while travelling in a train or somewhere else, normally, these water pots are placed on floor so, when we need to have water from here, then we have to lift it and then take water. So dirt and dirtiness gives a problem. So with that, a thought has come, and some people have tried to operate - why not to have a special system, the push cup valve-lifting kind of thing, so that, what will be your, so push the cup either from here, or from here, then water will come up from this thing. So this mechanism is available, but its applications in such type of requirement, one can have a new design development. Considering this human requirement of putting this nozzle, a little above the floor height so that, no dirtiness will come here. Such a case for a bucket is shown.

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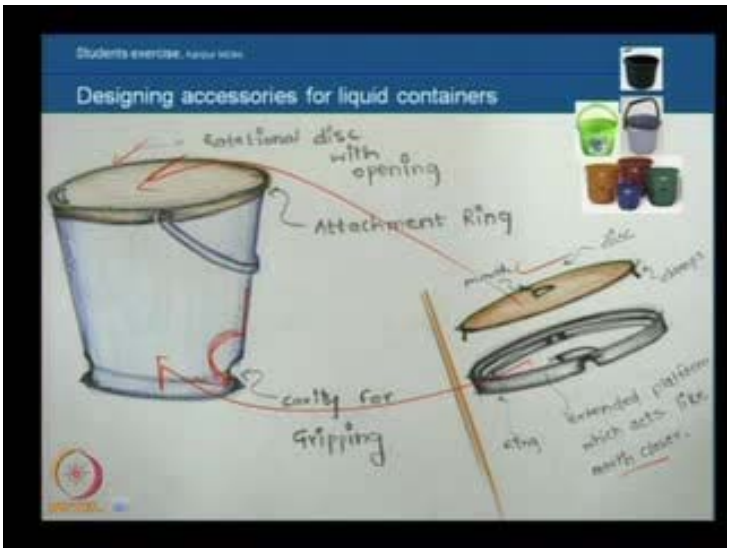

Designing accessories for liquid containers like buckets: in buckets, what happens is when we lift it with the handle, and then we tilt it, many times, we are required to hold the bottom, but there is no space. For that now, this some bucket is available in market, and that has a special card area - like this way, so that here, you can hold it, but, this is the only one part, so, it gives a constrain of holding it, so for that, a special development was made in the bottom area, with a special ring, with a holder here so that, if it is fitted here, then whenever you are required to move it and you can fix it according to your requirement. So the clarity of gripping is equal, so here, we say that - this rotational disk opening for the top, wherever you want to pour the water - this is a rotational cap, rotational cap - put it here, and these types of things may be placed here - like this so, it has a mouth, disc and clamps, and here also, it has a ring, opening and then clamps, on closing.

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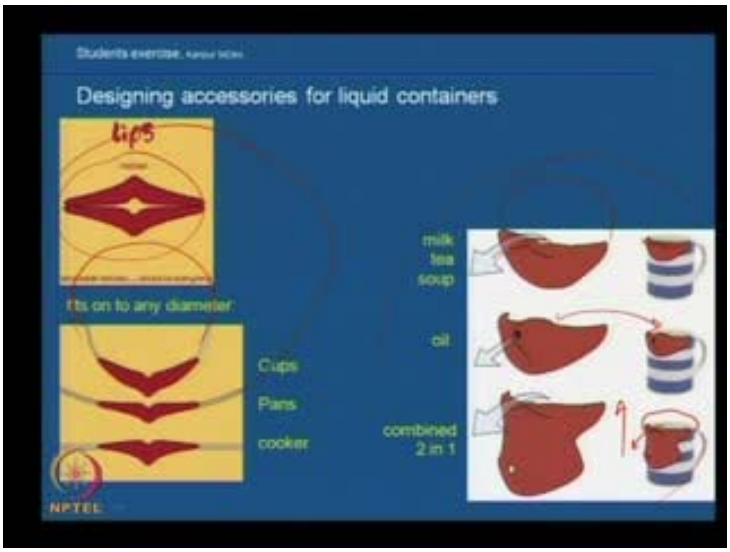

Another issue, we can say that, using designing accessories for liquid containers: using a lip as an element for design; the same lip form here, fits on to any diameter, this lip - it can squeeze and extend, and give biggest meaning, so, that was taken as a theme for design development, and it was seen that, if we use the ring - like this way, this one - if its put on a container, we can be use on a car, or a specific pouring - this one, if we have - like this way, then - this one, or a pan, we can use it for pouring, we can rotate it as of wherever we would like to fix this nozzle, and then we can operate it. And this one, for a cooker type of thing, where the larger base is required, this is one type of development, one can consider. Another development is that, from this one, the specific development was made - like this way, with that ring, if it is put on the cup, with this small hole here - in this top, you can pour over - this, so this can be used on a milk, tea, or a soup-type cup.

Another was a little larger with a hole here; here there is no hole; here - it is there, and here - this is a curvature - like this way, so water will flow over - this, so, over this, water or liquid will flow. In this case, what happens, it is a little larger, which is oil, so, oil, we have to pour in a line, so, it will be easier to make the flow of oil in this.

Another is that, combining both - a hole and a top here, if we keep on the cup, then if we push it down, then there will be a ring - like this, if we push it down, then from here, it will pour down - you can use as a cup-type of thing, if we lift it up, then this will come

here, then what happens? We can pour it through - this. So this type of the new thought and new development is also possible. Let us try using the same approach in some other areas of development.

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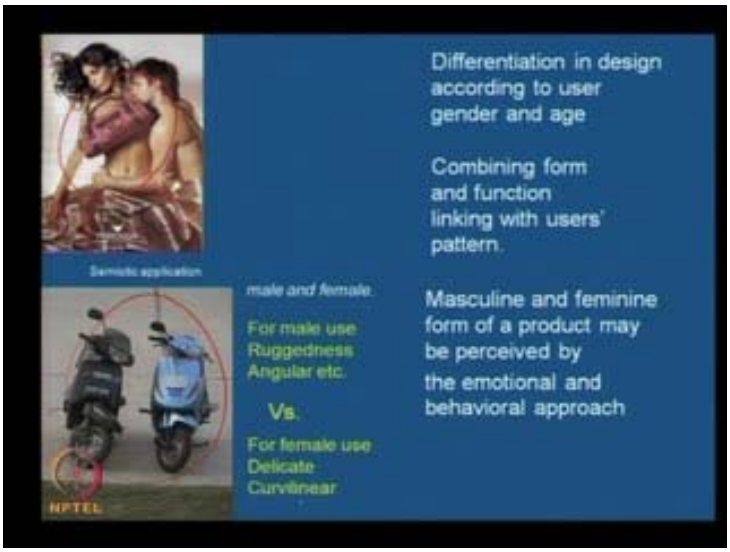

Another issue I would like to say here is that - some feeling, male and female feeling etcetera, that is very well known and now, in this, the product - leather product, has a sexual affinity, and then that relevance, those products also like that.

So, differentiation in design according to user, gender and age, combination/combining form and function linking with user patterns, masculine and feminine form of a product may be perceived by the emotional and behavioral approaches - male, female. For male use regards ruggedness and angular etcetera…, features should be there, and for female use delicate, curvilinear, etcetera…, approach, and at that type of applications, should be there.

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Now with this, we can say that male requirement and female requirement may be different but, nowadays, today's concern is that, for common use - like, even in this petrol pump also, ladies are employed, so the design, whatever, developed for a specific male domain area to work, now the ladies are also working. So, without altering the male functional requirement, how this male and female combined requirement can be fulfilled - those things need to be considered.

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Well, another thing is that, using this sexual appeal - still in advertisement, product development things are going on. Now we would like to see here, whether, some meets or something applicable in some other context, whether it can be similarly applicable in different context like - means, todays in, if we can see that girls like to kiss boys with some small beards - like that way - in advertisement, and at the cinemas, and etcetera.., it is coming.

So, if someone takes clues from this - like earlier heroes, they are having clean shave but, now, recently, these types of changes have come like men with beard, with small beard, they are also preferred by girls, so, let us take this thing. For a well-developing lipstick, the semiotic application - lipstick, if we have, if we want to give that feeling, that, while opening this lipstick, this type of some bristles, will also come up - while you are opening this thing, that some, while this lipstick is coming up from this cap, on this container, that bristles also will come. So, while applying it, the bristles will give you that type of feeling - so this was one person. It was asked by some girls students, and the result was that, they did not like it, because for one type of senses, and the same senses for a specific product development, are not always same. It's the same for the male also.

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For male also, the same thing, this type of figure is preferable - people feel, but while shaving - this type of product, we asked the male students, they did not like to have a safety razor with handle of a female body style.

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These types of human compatibility that - holding handles, handle sizes like. While operating these types of things, the people hold another position. For that, development was done - like this way - how can people hold it, and operate it. The tongs are - like this, but, while holding these thongs - like this way, basically here, so the arm remains over the fire. So, to modify that, a specific development was done - like this way, so, that arm remains away from the main fire point.

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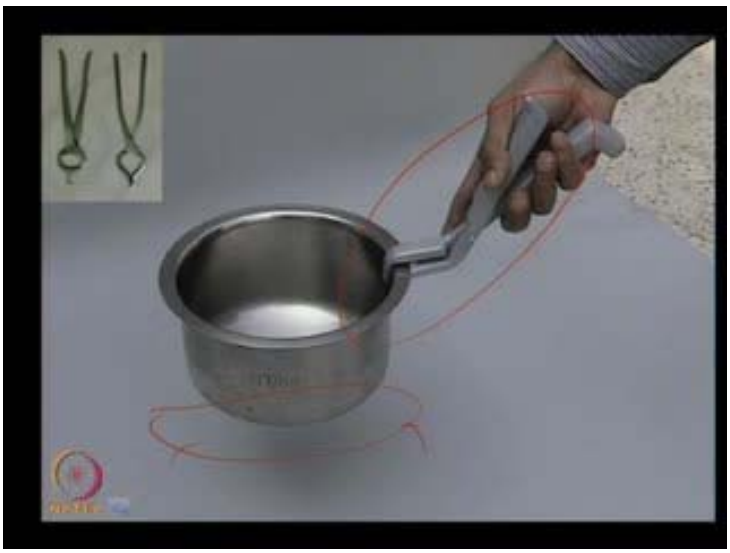

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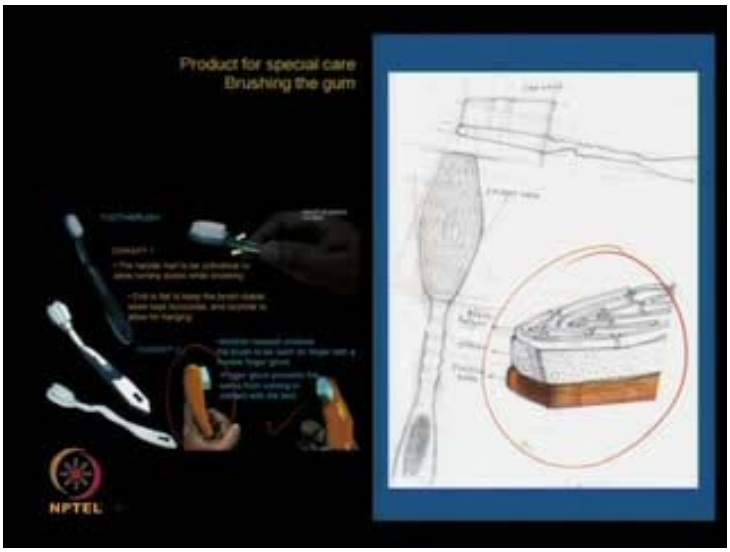

This is a special toothbrush, which was developed, for assisting the old and bed-ridden patients, that means - having a finger, and with this type of small brush, instead of brush, nylon or rubber made (some features) that resembles with the lines of the thing, so, it will be easier to clean without any brush.

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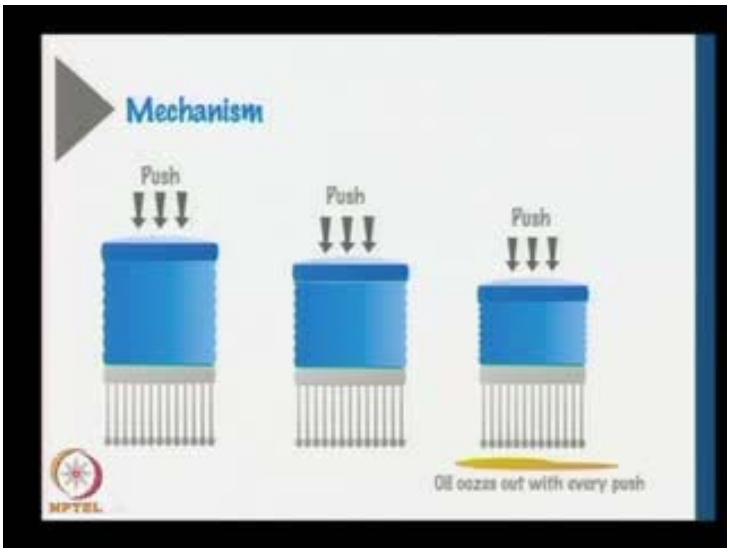

Then, one development is that, while developing/giving hair oil application - a thought - as a student exercise, we have done. So, how do we use the oil? How we use the oil - a development was that, a container where the oil will be filled, and with these strings, the openings will be here, so that, with this finger pressure, that oil will come up from here, and it will give you. Oil oozes out with every push, so, evenly application will be possible in that way. And then, it may be refilled again with the oil.

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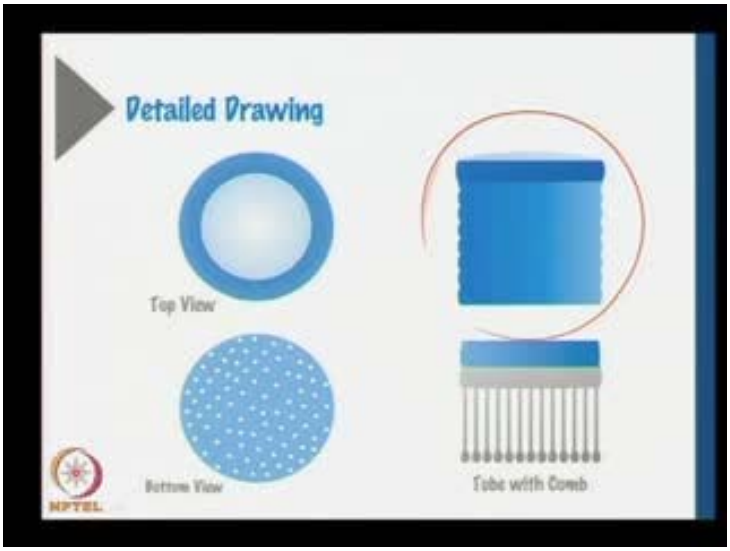

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When a usable item and space is conceived with interface matching between users' compatible physical features and how our body behaves, the design would be well accepted. Evaluate the match.

With this, we are concluding today's session. The design process involving ergonomic checks and some relevant issues, and we have seen today, some examples of that, and some students' thoughts are also in this.

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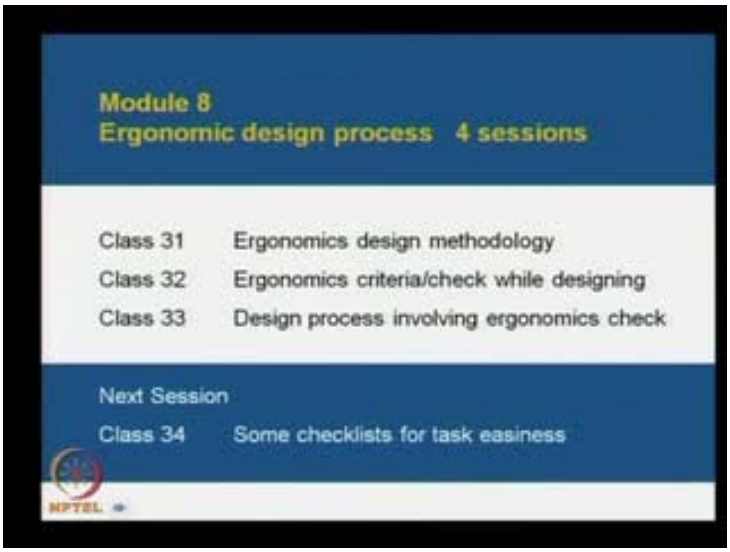

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So, with this, we can say, for a good design, the design ergonomic principle needs to be considered, context-specific application is necessary, and creative idea is generation, those ideas are necessary, so observe and do it. So till today, this much, and next day - we will see you again, Thank you.