Ergonomics for beginners Industrial design Perspective

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Module No. # 09

Performance support and design intervention

Lecture No. # 37

Furniture support

Welcome to this 37th session of Ergonomics for beginners Industrial design Perspective.

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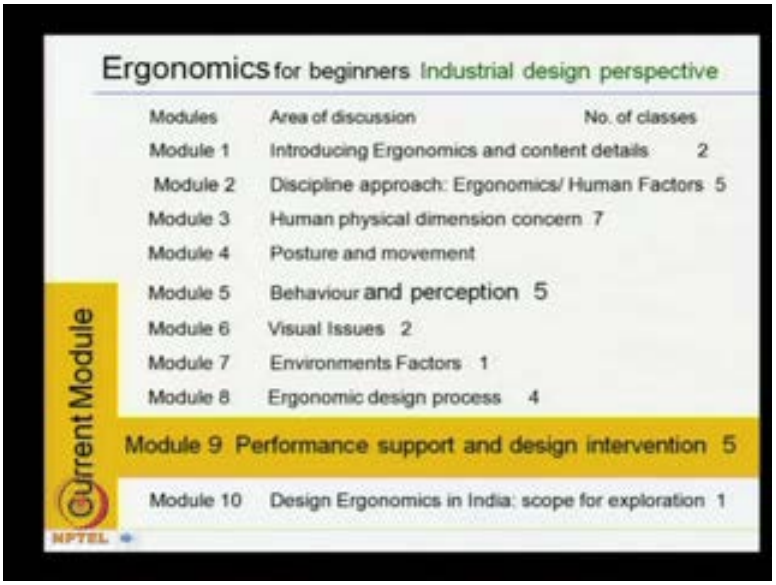

Now, the current module is module number 9, performance support and design intervention.

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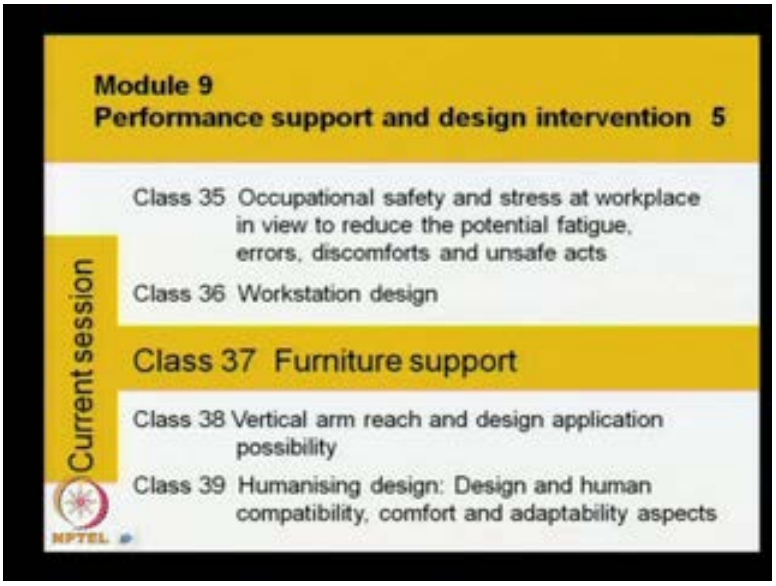

Out of five classes here, today's the current session is a class number 37, the furniture support related.

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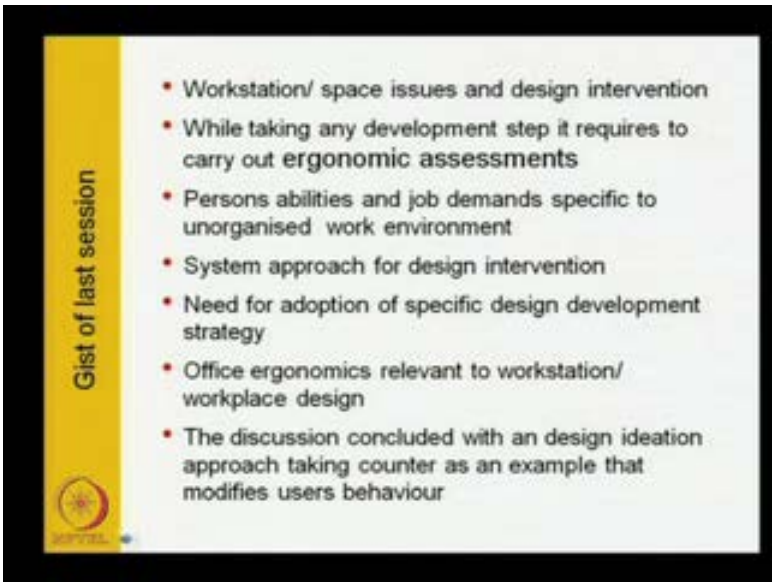

The gist of last session, what we have discussed just to recall, workstation or workspace issues and design intervention, while taking any development step, it requires to carry out ergonomic assessments. Persons abilities and job demands specific to unorganized work environment, it was it is necessary and it was trusted, system approach to be taken for design intervention, even to develop a single product. Need for adoption of specific

design development strategy, whether it is, employees requirement based or employers supply based. Office ergonomics relevant to workstation and workplace design and office ergonomics issues, this point I have discussed. That discussion concluded with a design ideation approach taking counter as an example that modifies user's behavior. So, we have concluded last session with the mention that, design can modify users behavior.

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So, with this background, today's session is class 37, Furniture support and relevant design ideation issues and some exercises, we are going to discuss now.

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Now, the ideation or innovation, the issues and some issues along with the ergonomic principles in design development, that we are it constitutes today's session.

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Innovation meets the need with value addition. Now, in this figure, the person, the peer group of the friends, they are using some furniture, but it is not the regular way of using it. Now, the question comes, if this behavior or this meeting arrangement is necessary then, what could be the design support? And that design support, should fulfill some basic criteria that is, space con constraints and the users compatibility features. So, it would be better to see, if those design can be stackable like here in this figure, it is shown that, how it can be made in a stackable design development.

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Now, the some design concepts addressing context specific issues. What we need to consider? The design is an innovative, practical, reproducible solution to conceive various aids to human needs. It is a continuous problem solving process with conversion of ideas into reality, keeping in minds the users characteristics and limitations, art and aesthetics, material and process, and new technology applications in consideration.

So now, good design thus follow human, inbuilt as well as acquired, abilities and limitations in terms of physical, physiological and behavioral aspects. New attempts are being made by designers exploring local eco-friendly material, application of ergonomics principles would yield better result like a here, some of the furniture being the cane and bamboo items that already been developed at the department of design I I T Guwahati through faculty initiatives. These are very good looking but, when the ergonomic principles are considered, the design would be better and people will accept it with trust and reliability of using that, it would also be there.

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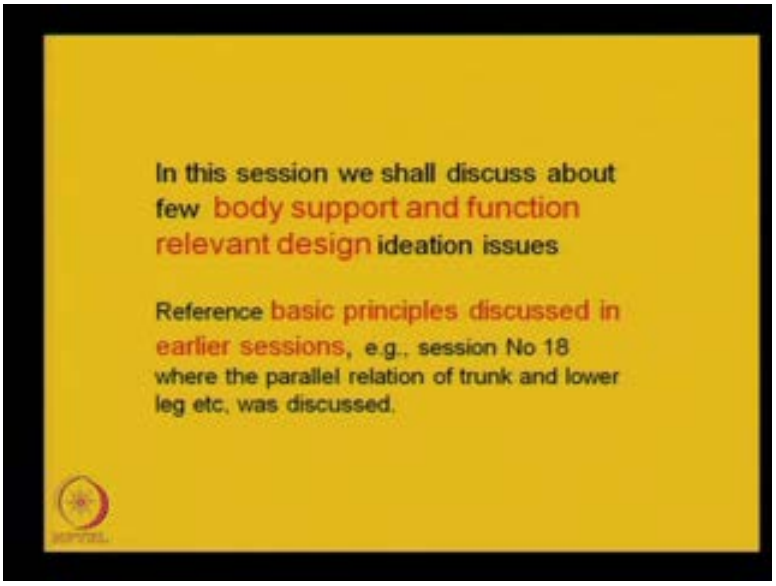

So, in this session we shall discuss about the few body support and function relevant design, that is ideation issues. Now, when here, we will be discussing some of the design relevant matter, so the ergonomic principles, that is a reference basic principles the reference to be taken, as discussed in earlier sessions. Just for as for example, we can say that like, session number 18, where the parallel relation between trunk and lower leg etcetera, was discussed. So, like that some other principles related to the human compatibility, that issues to be taken or referred the material we have already discussed in earlier classes, now we are present showing some of the design ideation ex examples.

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Now, here the four design ideation exercises, we are going to discuss now, that satisfy specific requirements. Now, these exercises are: number one, a multipurpose hostel table, number two, mobile lecture delivery assistive trolley, number three, a student's classroom drawing table with sit-stand facility and four, a school classroom seat-desk furniture, these four exercises we will be discussing now.

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An exercise to make a simple multipurpose hostel table, it was developed for hostel rooms purpose, where much space is not available.

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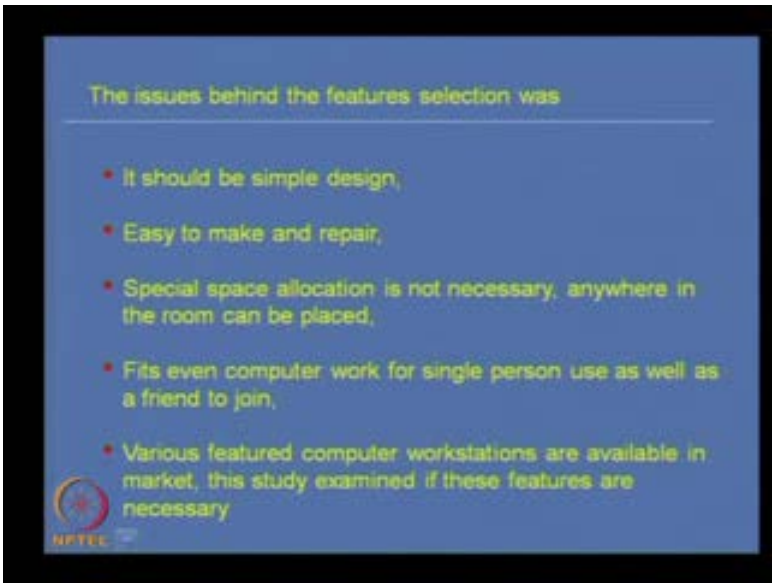

So, the issues behind the feature selection was, it should be simple design, easy to make and repair, special space allocation is not necessary, anywhere in the room it can be placed, fits even computer work for single person use, as well as a friend also may join in that same table, to share their ideas and views and work in that same computer also, the various featured computer workstations are available in market, this study examined, if these features are really necessary or not.

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Here, this was developed or we can say that, this was conceived this design, the simplicity in design, a table that can also be used as personal computer worktable. Here, all the anthropometric dimensions like, different work zones, primary work zones, secondary work zone and others, and the height of the as per human body, anthropometric this design was conceived. And the lakes and etcetera were put inside, so that while crossing the persons leg, should not hit the furniture leg etcetera.

And in the lower plate is presented in such a way that, it can be used as foot rest as well as material keeping like that, so the optimum use of human resources to maximum output that was considered here fitting task and design to man in work and rest. These were the basic thought behind conceiving this idea or this design. The simple concept of a table with two layer platform two layer platform; the top one to be used as main work surface, and bottom one for other storage, as well as can also be used as foot rest. The product dimensions follow the ease of user's body parts movement, while work with computer.

Now, it can be said that, whatever computer workstations are available in market it has many compartments. Mostly it is seen that, one table top where the computer monitor etcetera can be placed, and below that, a small drawer is there, that it can be pull out and push in that our drawer is there, where the keyboards may be placed and then, C P U and etcetera it may be placed, either on the side on any side below the table top. So, these are the normally this is the basic structure. Now, when we work it seems that, when we use the mouse, the mouse moment space is required, but normally that under drawer, that drawer under that table platform it is does not give that must scope to move freely the mouse.

So, what is happen, mouse the hand remains almost in a static po position to operate that mouse and also the layer, the one layer where the mouse and typing is going on, and then another layer, where the computer monitor and other reference materials are there, that also you are touching, so the multilayer is there. So, instead of all the things and also when you have a drawer type of keyboard keeping space, there the arm remains in a hanging position, so some other piece of body problems it appears. So, to avoid all the things a small study was done and it is somehow found that, a single table top would be good for all type of things. Even, now a days, the the at the development of laptop computers and etcetera, that a that a computer workstation whatever is available in market, there is a time has to come to relook into the requirements of all those things.

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Just with this it is seen that, now here you seen that, how it can be used, the below the U P S or may be that C P U and then, the computer monitor here it can be operated. So, a single person on this any chair can be placed. One person can operate, even both persons also can operate with the same thing, so like that, and these are the concepts. So, with this concept it can be said that, a single table top would be good for hostel purpose, where the first top level will be for a used as a table top and the bottom one, will be as a material keeping platform, as well as for to be used as a foot rest.

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Now, the second exercise, a design exercise that is mobile lecture delivery assistive trolley. The need is that it is observed, how many person delivers lecture in a classroom in a large classroom he prefers to move from one end to other end of the dais and while moving, now if it is a corner of a dais, if that computer or some other, mike and etcetera are placed, then it restrict its movement. But, while delivering some lecture, the body gesture posture it also adds to the topic, he is delivering through forward message.

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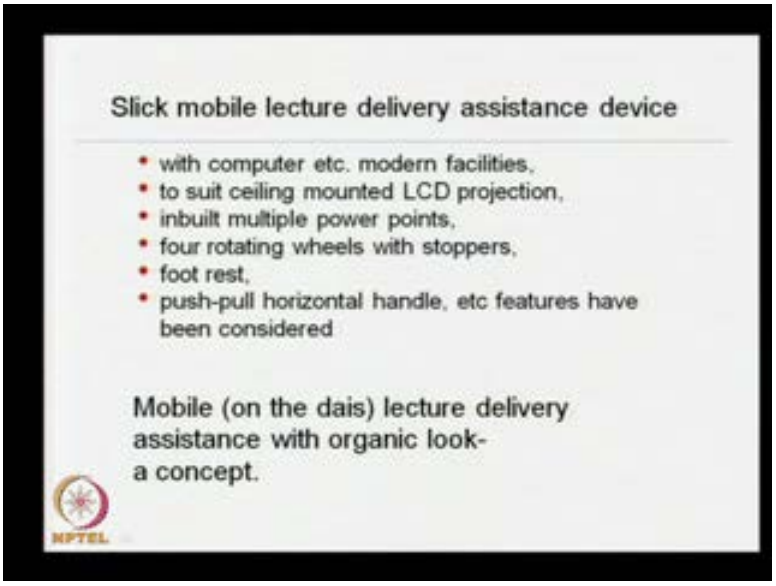

So, to fulfill this need what was done, a slick mobile lecture delivery assistance device, which felt to develop? Now, what was the basic facility to be there? With computer etcetera, modern facilities will be there, to suit ceiling mounted L C D projection means, L C D projection will be somewhere ceiling mounted, but the lecture as the, who is delivery the lecture he can move on the at the floor on the dais, inbuilt multiple power points to be there, four rotating wheels with supports with stoppers will be there.

So that, he can move around with that and four wheels rotating will see, so that it can have free movement, the foot rest, because while delivering some lecture some working some work, people prefer to use the foot rest even in a standing position, push-pull horizontal handle, etcetera features have been considered. Now, mobile on the dais lecture delivery assistance with organic look was given or the straight lines and sharp corners, it gives a very hard look. So, if we have free proof some form like, organic form it invites, it gives a pleasant look.

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So, with that a concept was developed in (( )) like this, here what is happen? The table top, this portion is a computer area, may be monitor, small monitor or laptop monitor laptop. Now, here the four wheels are there, four legs. It is a card, this is the C P U, if it is necessary to use or may be some other things can be placed. Here, with this type of leg here one can keep their leg, while standing. Now, on this people can lean and can move over the dais. Now, this is for the front, this side is that lecturer side and opposite is the classroom side.

Here, this platform this platform can be pulled out like this, if it is necessary to use as the writing platform, it can be pulled out to and then, if it is then this is a drawer, where some other material like remote controls and etcetera, paper, pen, pencil like, if it can be stored and this place is free. Now, if you pull out and after like delivery lecture, all the material keep it here and then, just pull this call cover then, make a lock here. So, everything will be locked on and then, on this the sides where some plug points and etcetera, so that with only one plug point, that gives here is multi plug connection, so that it can be used. If on this head here, mike also can be fitted.

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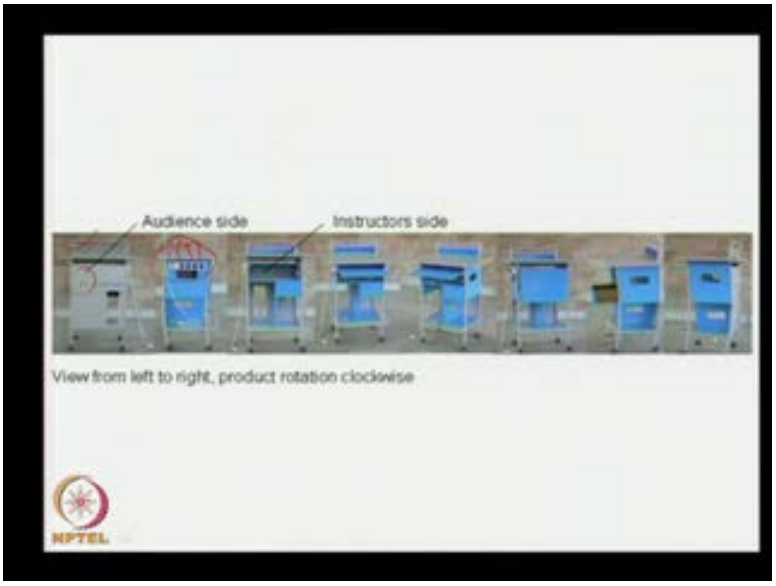

So, these are the some concepts that developed for, now the actual product it looks like this, this is the audience side and this is the lectures, instructors' side, now here the symbol of the, whatever the classes going on an etcetera, that may be placed in this area. This can this handle can be used for rolling and this with only one wire, there is a connection to multi connection here, so that from here whatever required, it can be plugged in, so these are the issues. Now, here what has happen, this platform the lower, the below the main table top, it can be pulled out slow little bit to use it is again extended table and if you pull it more, then it can fold and it can be used as a locking device. So, view from left to right, the product rotation takes place in a clockwise movement. So, this is the product was developed.

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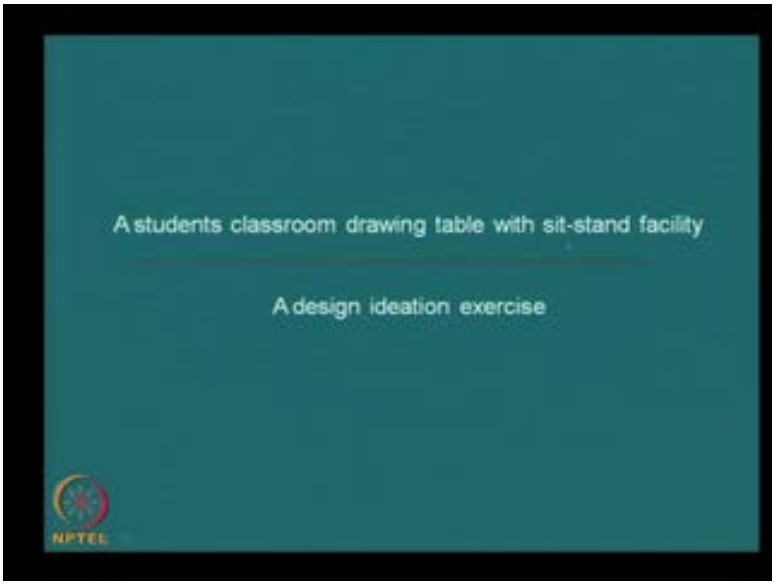

Now another area, a student's class room, student classroom drawing table with sit-stand facility, a design ideation exercise.

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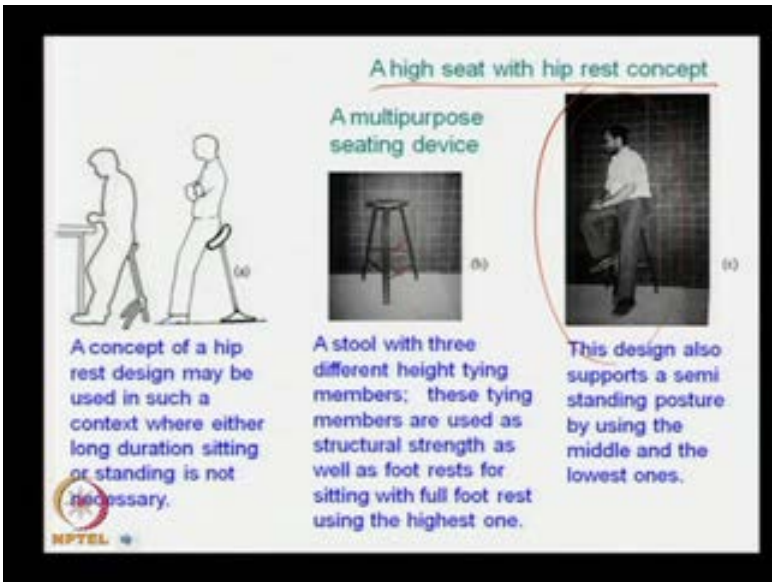

And the basic principle is that, when a person draws normally, when they draw some mechanical engineering drawing, that type of drawings, and others. Normally, people refer to stand and draw, but for a longer time standing is also a problem, and if a person sits, it also does not give much comfort for that use. So, constraints all this things, it was dec decided, if a hits a sit-stand device can also be included with that. So, the concept of

a hip rest design may be used in such a context, where either long duration sitting or standing is not necessary, so this type of hip rest there.

So with this basic principle, how it designs can be developed? Here, one design develop it is being shown and another design development also follows them like, a stool can be developed is, was developed a multipurpose seating device, where the three time rods of this three legs are in different heights. A stool with three different height tying members; these tying members are used as structural strength, as well as foot rests for sitting with full foot rest using the highest one.

If a person sits here, the top one, the highest one can be used as foot rest and while standing with these the lowest foot ware, the tying member can be used for normal foot rest in a standing position and if a person have this type of feature, this type of posture, while delivering some lecture or some or some other activities then, the middle one can be used to for the semi like this. This design also supports a semi standing posture by using the middle and the lowest ones. So, a high seat with hip rest concept was developed, it can be used in different context and different places.

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Now, in the student class room it is found that, this type of tables and chairs are normally used. Make occasional use of a pedestal stool in standing work that is a heap rest, further we can use it or not in this context.

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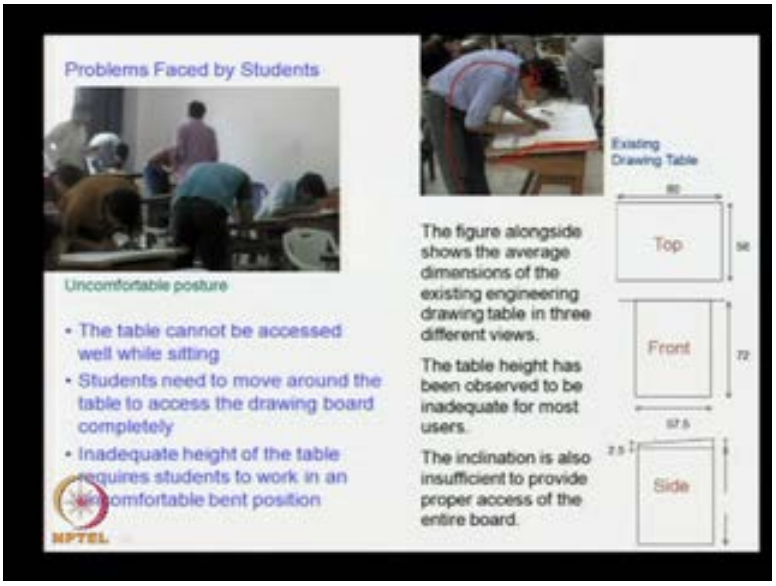

Now, at I I T Guwahati, mechanical engineering design drawing studio, a small study was carried out just to see that, how the students use the existing designs. Now, the designs were simple like this and problems faced by students that uncomfortable posture, because the height is too low. The table cannot be accessed well in sitting; students need to move around the table to access the drawing board completely, to use the total whole drawing board drawing board, they have to move around; inadequate height of the table requires students to work in an uncomfortable bending posture like this.

The figure along sides shows the average dimensions or the existing engineering drawing table in three different views; it obvious it is 80 and 58 centimeter, from the front 72 and 50 it is a 7.5 centimeter height and from the side table, height was the, table height has been observed to be inadequate for most users the inclination the other table, this there is a two fold inclination, two fold inclination is here. So, the inclination is also insufficient to provide proper access of the entire board.

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So, with this the concept was taken like this, here what has happen, thus whole structure this right hand side they did, the left hand side is that table with a Z line, Z type of a structure. So, it gives a slick look, where the basic frames structure and asset is given like this as a the total frame on the frame, on the square frame like these in a square frame, but total the normal drawing board is placed. So, the frame width 50 centimeters, frame length is 60, the frame depth is 17 like that, and normal drawing board is being used. Now, here the height this is a this is the triangular area, this is circle movement this and then, the height of this area was, this height from the floor this was kept only within 4 centimeter, because while working without getting any tension on the timer source we normally lift our leg at around 4 to 5 centimeter.

So, if it is kept at that level, so while working or while crossing over this, it would not hit or leg would not hit this structure. So by that, all the dimensions were considered and now here, what has happen with that, the three level of mechanical point was given. So that, at three different levels it can be of used operated, so means horizontal and maximum the 30 degree and in between two different, two other positions are kept. And the tool was developed like this, where here one can you have this as a foot rest, if you seats here or can be used, if you stand also here if you stand then, a back leg he can keep like this way. So, these were the developments. So, engineering drawing table with stool, the specialized stool developing was developed.

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Now, units arranged in a hall like a table top and then, seat like this way.

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Work in wise the possibilities with units are in use.

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This area is used as a foot rest to the front foot rest, as well as backward here also it can be used as back foot rest and when it is not used, it may be used for a long larger papers can also be kept it here, when the foot rest it is not used as foot rest.

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The top was given a single bending, the top is bent used in angles as required, so as required the students can change, modify the bending the angles.

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Now, the fourth development school classroom seat-desk furniture, a context specific design.

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First, the common disadvantages faced with some existing school furniture, was studied. Like here, how they use summer, how they feel with the features with that double layer table top, what are the problem, the leg room problem. If they sitting then, going in and coming out to that problem, the book keepings and etcetera, it is a problem here like this

and as this is supposed to be used as arm rest, but it does not provide that arm rest, as well as it restricts free going in and coming out.

Now, if the furniture does not match with the student, what happens, now this type of furniture if it is their then, to take out some material from the lower platform is a difficulty like this and then, so these are the some of the problem areas, where this was noticed and then, how this problem areas can be considered in a new furniture design, that we have to see it.

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Now, the design development of a new seat-desk unit suitable for Indian school children, first we have to done the growth pattern study. Now, with this it is found that, till tenth year we do not recover any anthropometric dimension variation wise, different furniture. Different school, stool seat and desk units in the higher institution studies classes still it is found that, the furniture is not necessary to be different with male and female. So, the criteria considered; one, unisex design second, seating for two persons, so that, if in the seat three persons seats, then the two side person their getting freedom, but the center one finds problem.

So, we decided that, it seating for two persons, seat-desk combined unit, why we have decided that it will be combine in, because in a school environment a chair, if a seat and desk is always separate then, it is to maintain a specific position is difficult. So, we decided that, seat-desk combined unit, design conforms users behavior, because students

what is their behavior, the example or whatever on that furniture and how the behave, so where the strength and etcetera to be given in the structure. User's body geometry and design dimension match.

Short duration books and other belongings storage is necessary, easy in and out and comfortably use. Three different sizes were developed, three different three sizes for age group; number one, 6 to 8 years that is first to third standard. Second level, 9 to 12 and 13 years, that is third to seventh standard and third development, at 12 to 13 to 16 years that is seventh to tenth standard, as per age and standard of study respectively. Storage space at seat side was considered.

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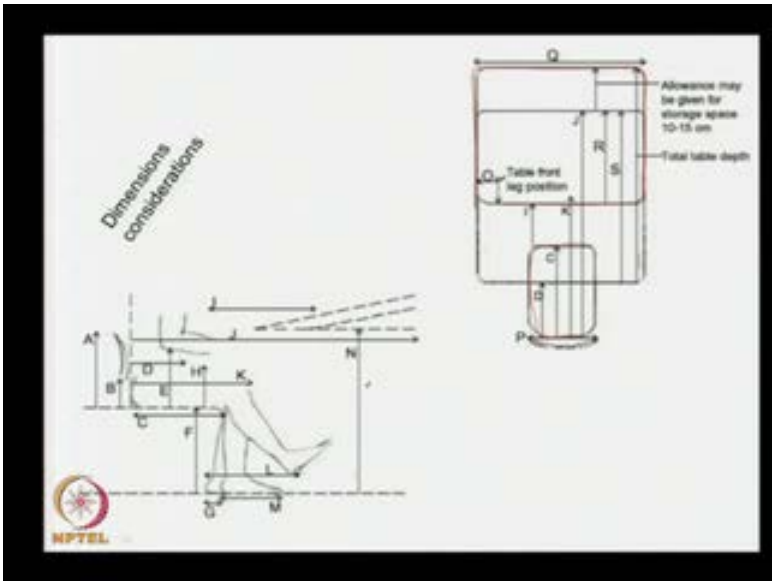

Now, then we can say that, so the dimensions was considered here and what are the anthropometric dimensions was considered, mention here and now in this right hand corner drawing it say that, if this is the chair unit then, length, breadth and all dimension were considered, are the children anthropometric dimensions specific to Indian context. Thus, data reference was taken from anthropometric that ergonomics activity, ergonomics laboratory of industrial design center, I I T Bombay, professor G Dev has conducted a study on that, is children anthropometric and the data was taken from that. Now, if it is a joint unit then, chair and the table as to be separate, if it is a separate unit then, chair and this is the table unit, so it is consider that.

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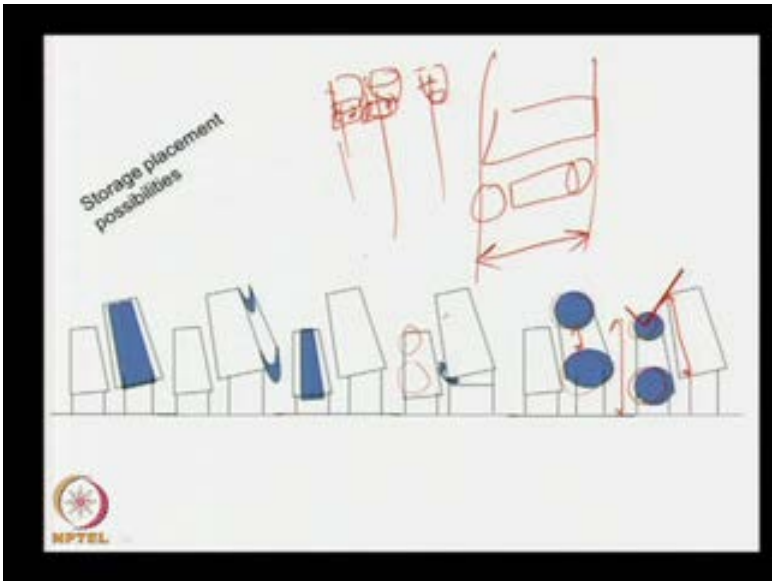

So, based on this the next step was that, where the book, etcetera storage space would be for that a study version that, if this blue part is the storage area. If it is below the table top then, there is problem that we found earlier. If we keep at the outside or the distance side or the table then, to take out is a problem. Here, if it is a below the bench or a seat to collect it from that, there is also problem, then if it is a triangular this type with a cover open shop the problem is that, when the this person is writing and this person we says to open and it is a problem of to open this, the top has to be cleared, then only it can be opened there is a problem.

Then it comes, if we can have on the table tops both the sides, if we both the sides then what is happen the man writing table, top reduces in size then only where that, if we can have a little larger table size and the seat with the side storage places and that length and this table length remain same, then it would be a possible means this is the table, this is the bench and then this is the things. So, these will remain within the same distance. So, these units we can make in a row, in a row like this way, this is table and this is will, this is the table and this is the bench. This is a table and this is the bench kind of thing, so a row may be maintained in a classroom.

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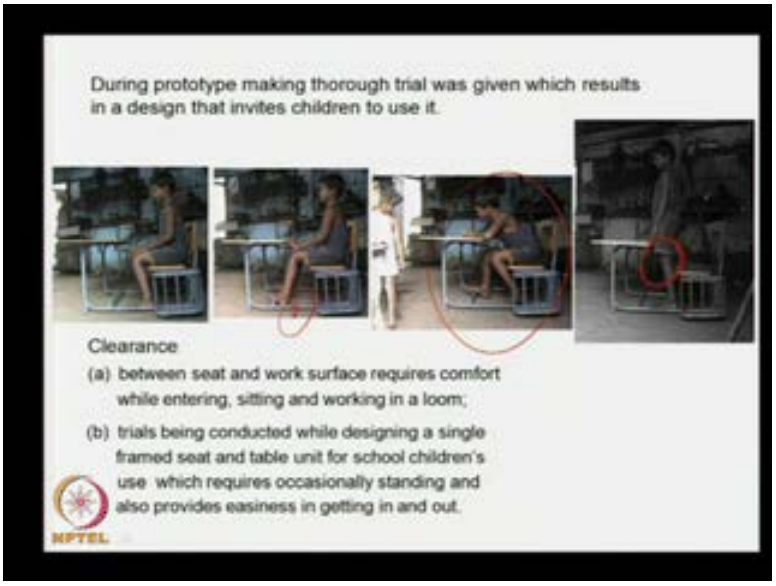

While making the models, during prototype making throughout trail was given which results in a design that invites children to use it. So, different size and nature of students are considered for trials and then, while making this trial are made. So, what would be the angle obvious thing, and what would be the height, what would be the length, etcetera, was considered here. Basically, then this height was kept within 4 centimeter because, they can go and come in easily.

So, here one consider for that, the clearance. So, that while sitting he can stand up and come out and go in, as well as he can read and write with bending, without any problem; a, between seat and work surface requires comfort while entering, sitting and working in a loom; b, trials being conducted while designing a single framed seat and table unit for school children's use, which requires occasionally standing and also provides easiness in getting in and out.

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With this, this is the final product development. Now, here only one seat, a product were showing that is a new seat-desk device, the prototype for age group 6 to 8 years first to third standard, it was shown it is being shown here. And other total three was developed and then other two, the total was three, so other two have different dimensions. Now, here the facility is that, this is high degree invert inclination easier to write and read in. This is the basic structure of the side wise trey. The bottom has a porous plate, where the if any liquid metal is hold here then, it may go out to and this is rod and it is source straw and it is higher than the floor.

So, that cleaning would be easier and then, this rod is made in such a way that, if someone jumps on it or sit on it, there will be no problem. This is little higher and this either back side little lower, because when you extend leg forward and use it is foot rest then, you require little higher height and then one backward, it requires lower height. So, that the all the dimensions were considered with thus children anthropometric that a stored at just now mention that from ideas Bombay, the initial data was taken and then I I T Guwahati as conducted, another study to get the reliability of the total information that can be used for this design development.

Now, here with this then two, then there is a hook from is table top. So, the water bottle etcetera can be hanged on this. So, that you do not require to go always to somewhere to get water or you do not need to keep the water bottle, etcetera on that table top itself.

Then another thing comes, mostly what is happen this is considered that, in a classroom all the walls will have some almirah type of racks, where main bag, books etcetera will be kept there and for each and every class requirement wise, the material books and papers etcetera to be collected and to be kept here for that specific class or may be one, two classes together.

For a map or some drawing type of classes, where you require additional storage or the last papers and etcetera for that two floating, these two floating things have been provided. So, that it will be kept at the wall side, when it is necessary it will be taken from that and will be kept it here. So, it will maintain a straight line. So, it will not so total unit it will be there.

So, with this, now we can say that, the dimension consider follows children's body dimensions and behavior pattern helps maintaining seating column and row in a classroom, because like this way, it will develop like this the front may also be used. So, the total length of this was that, 115 centimeter total of the total unit was 90 centimeter. So, this was developed one for age group of 6 to 8 years, first to third standard and to other variations having larger or specific body dimensions.

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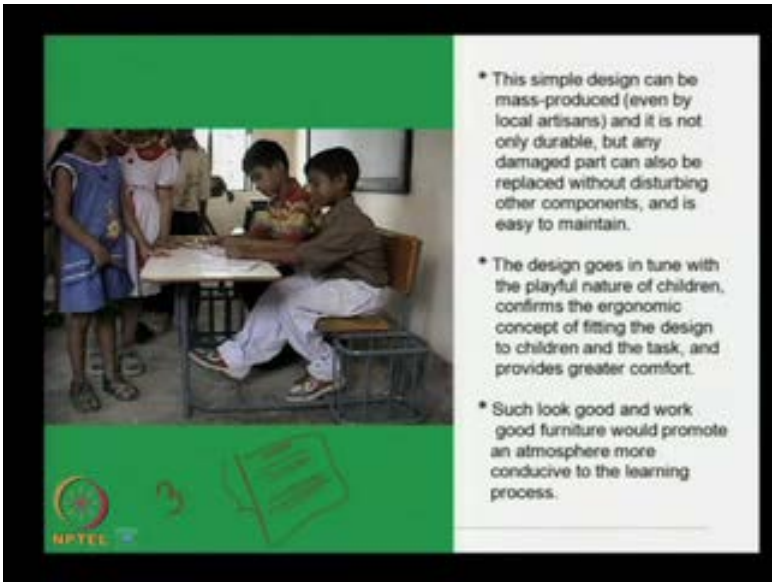

It was, now with this we can after making the final product also, it was kept in a school for many few days, still then used it and then we got that feedback and finally, and a different size to filled in the city. Now, question comes we have developed the three

different sizes in a class room, the front rows will have the furniture's, meant for that class is group wise, there may be some taller sizes people.

So, the next level of furniture can be placed at the rear, if there is some smaller size children are there then, the below level furniture may be kept at the beginning few like that, a classroom management can be considered and that also influence by the design development of a furniture that, while developing this furniture, it is only the total system design approach was taken the way it is discussed right now.

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So, with this it can be said that, with this figure can we think a design intervention suitable to this context, that is up to you, how you are looking at your surroundings and you are identifying the need what would be the considerations and then accordingly, give your ideas and see, if it can be a it become a good design solution for that.

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So, whatever we discussed today in summary it can be said that, design development attempt must have proper need identification, followed by design ideation exercising and incorporation of context specific human compatibility and comfort issues to be considered. Similar to the above mentioned concepts, that we have just now four concept developments relevant need based and anticipated need based design ideation exercises, may be initiated to meet our varied nature requirements.

So, with this we do except that some similar type of design ideation an exercise we can take in. With this we are concluding today's session (Refer Slide Time: 46:39), the furniture support with a specific context. And the next session would be the class number 38, that vertical arm reach and relevant design application possibility, where not only the vertical arm reach, but will specifically stress on, how it design development is possible keeping arm moment and arm activities in consideration in a specific context that, we will see in the next day till then, thank you see you next day.