Physical Modelling for Electronics Enclosures Using Rapid Prototyping

Prof. N. V. Chalapathi Rao
Department of Electronics Systems Engineering
Indian Institute of Science – Bangalore

Lecture - 05
Products Detailing

Initial stages we did not know what to do, so we over did it know, we have put huge hexagonal you know pieces here and we tried to build a step.

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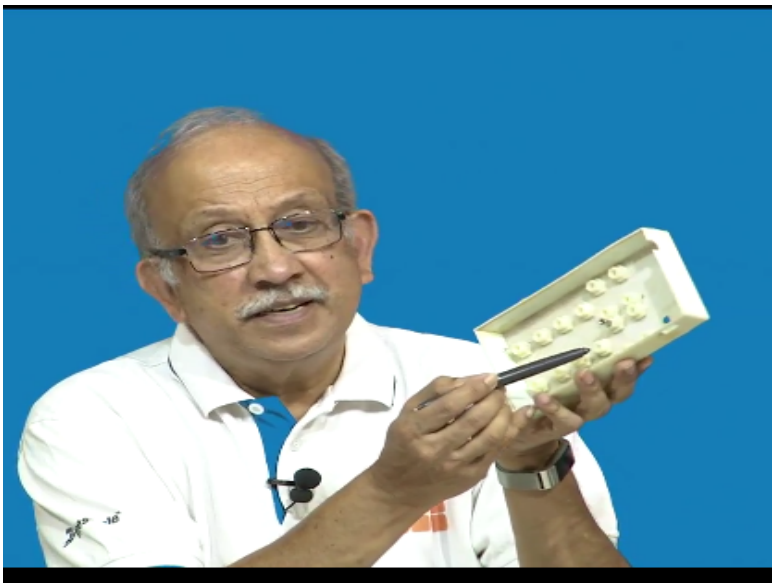

And then after that we tried to put the what you call this insert here and it is really too much, it has occupied too much space and wasted so much material and finally after the printing is over when you try to release the part we end up with absolute nuisance of a part.

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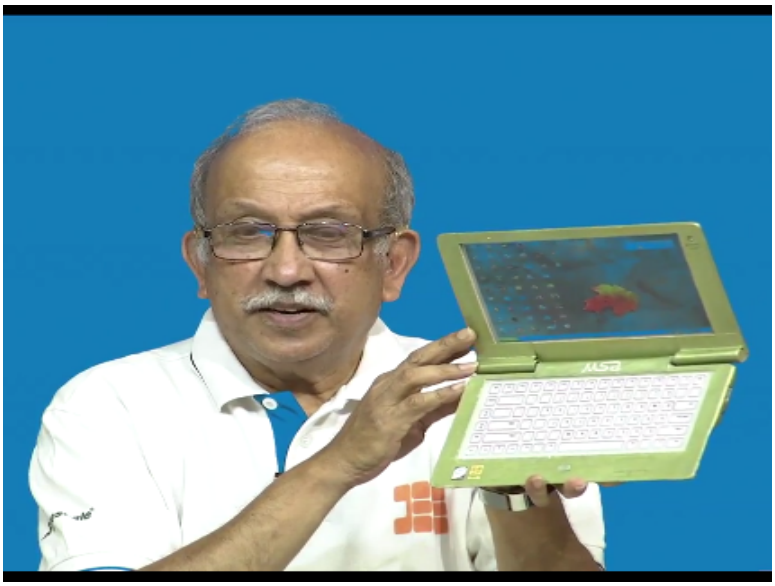

And you see this, cannot believe around 20 years ago one student of us he came with this product concept saying in the future we may have a tablet PC, it was there already tablet PCs were coming saying both display section and this section will still be made of glass and this can be used for some purpose as a normal display, this can be used for as keys and all that end. In case we want we can change this we can make it flat.

Now you see here there is an hinge, I am sure all of you have this hinge here thing and the more critical or the concept stage was saying if I am holding my PC here like this, I should be able to see you from inside, I should be able to see you a little like that one way glass we are talking about and I should be able to see all my desktop also here, but you should be probably able to see me but not the desktop, you understand.

There is visual communication from both, so you will know where I am looking and desktop is only visible to me and not to you. He made this concept and presented it to us. Now for you to do this obviously it is not that easy, but if you see here, I do not know whether you can this camera will catch here. You see here there are small steps at that time our 3D printing machine was not ready.

So what he has done it is he has taken styrene sheets, stuck them together and we said leave it like that, it seems to get a very, very interesting effect and actually they are not even styrene sheets, they are cardboard sheets. This whole thing is made out of cardboard, okay, except that to make the level this thing is the glass piece, this one is a shear glass and inside the parts are real.

These are all have been taken from probably go to the shops and buy the things and if I have a concept which is as good as real. In one of the slides I showed you earlier know people say can you sell it to me in fact when we showed it to one of our manufactures he says can you please kindly ship 500 numbers, we will try to put it in the market and we will keep the profits, if it is a loss, you bear the loss.

So fortunately he is a design student, probably he has a better job and he is well-off and I am very, very happy. So wherever you are student I am very thrilled to show this to the public.

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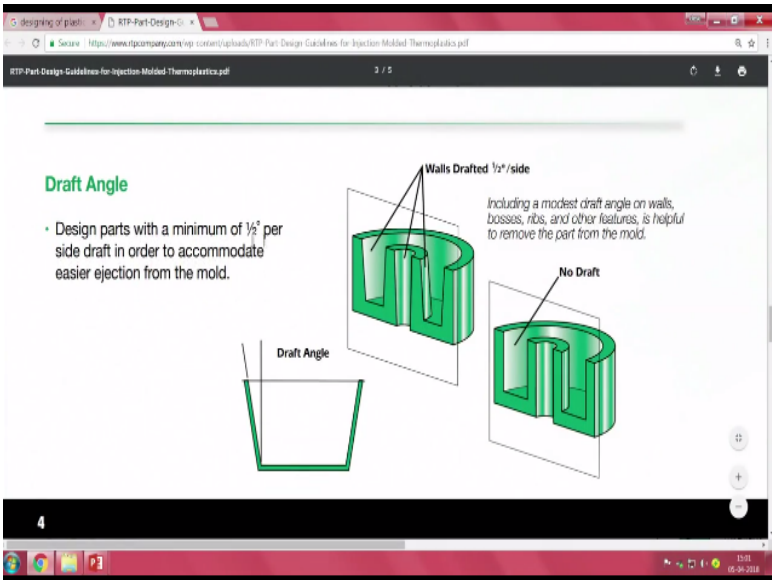

If you have to make something like this inside all this detailing know, this draft angle is not this, this is a critical thing. This is half a degree per side is critical, so if you see here know, there is a taper here both side, there is a one draft here and similarly there is one more draft on the inside. You see here even this know the whole direction of the hole is there in contrast we have for 3D printed parts, no draft is possible to be made.

So even if you try to make this to see how well it is, a small stepped construction will come. Though they claim the resolution is 0.1 or 0.2 millimeter usually one and a half times that we can assume. Because as it builds up they what you call the material keeps building up layer by layer and all next thing is only limited by the resolution of the printing head which most. So we have lot of this data regarding how this parts can be made seen here.

So it is possible for you just go and check very, very up-to-date books are available and all the stuff is available it is for you to follow read up a little about how parts are produced first. If you read up how parts are produced first now you know why these things have been what they are. Observe this after this you know I will try to jump maybe we will get back again by the time we come here.

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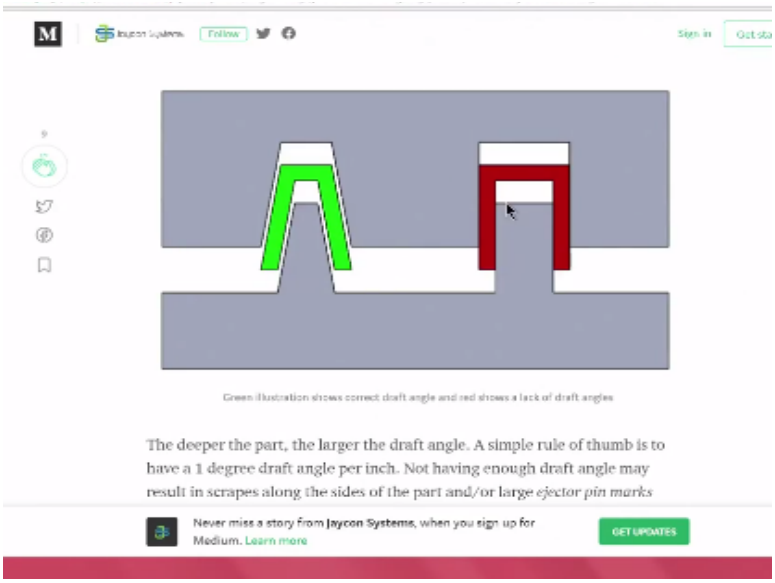

You see here this is without the draft, this is with the draft, how parts behave and so on. So stuff about this radius edges and so on. So it goes on and on and on. You can, my suggestion is you have a look at it.

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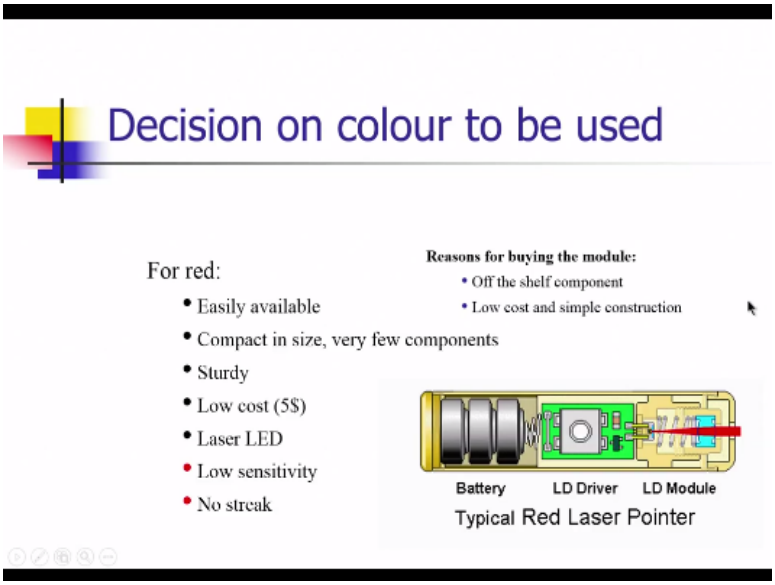

Now let me come back to the presentation which has been now made by our student.

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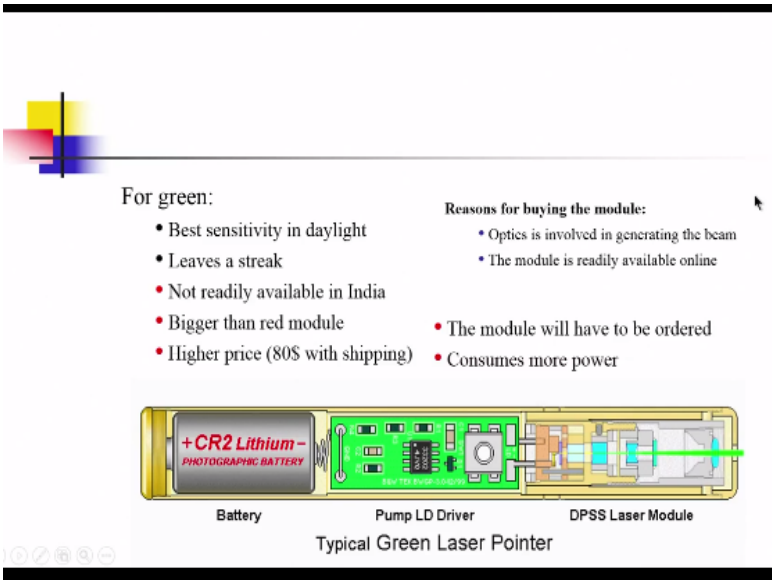

Do not worry too much about the technical details. My interest is how has he come out with these things. One of them is you need to study all the components that go into it and how well a component can be held together here. It is a circular feature here. Now does it directly sit here how to do.

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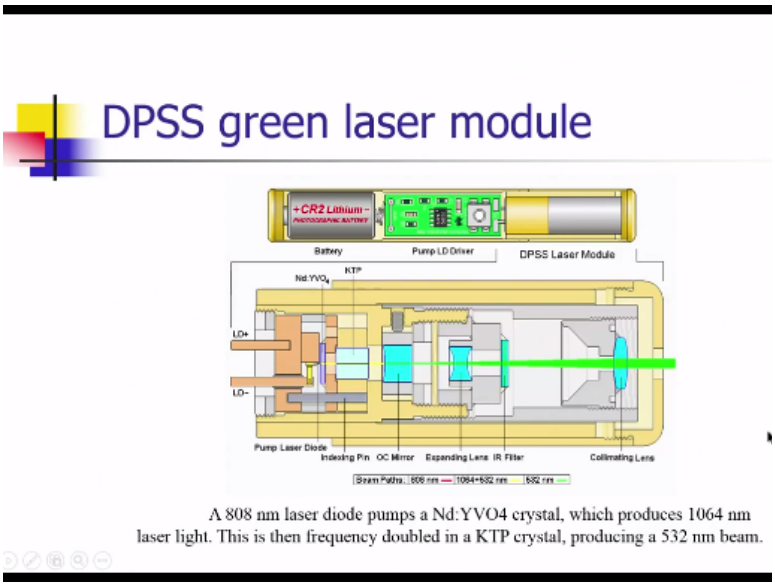

And then you see here now he has gone to the typical manufacturer, found out how you have seen this you know from here to here. This is the laser module from the manufactures.

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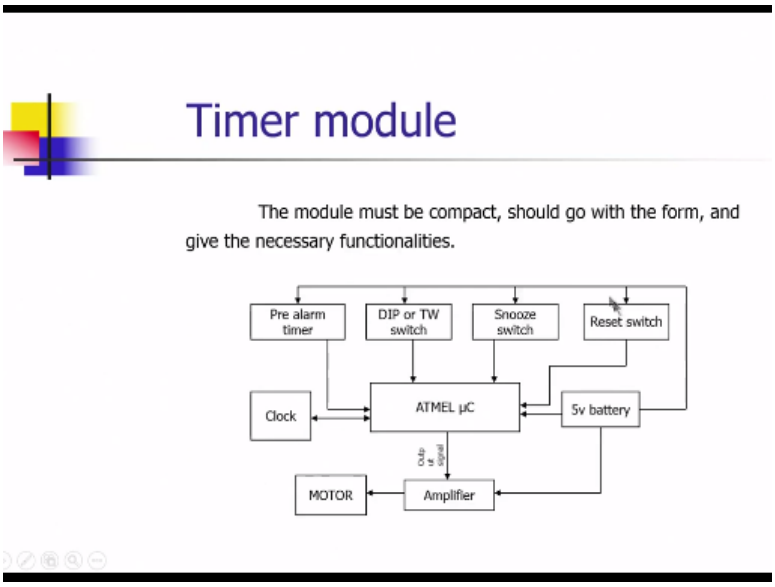

And you see here all the detailing regarding what goes and is there.

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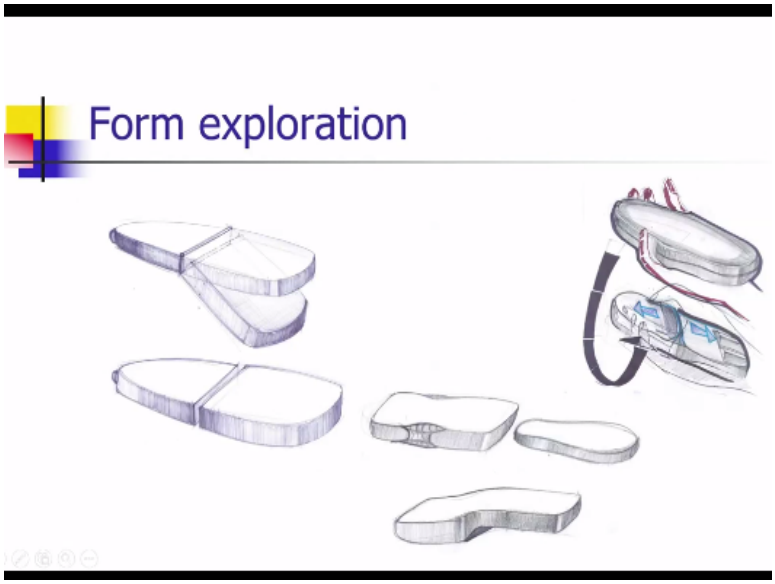

This is actually crucial stage in which you know we do the exploration of form so I was a little only the integrator, enclosure integrating things so it was the detailing and all was held made by somebody else and in the end, you see here we have a nice this thing here, can you see here something is indicating here saying how it sits in the hand. Morning I was trying to show you that how it nestles comfortable in the hand and how do we press the switches.

You see here this thumb is put over this here and then it is there is a switch here, which moves it up and down and we have the switches on this side or do we need this step, how do you handle with these things.

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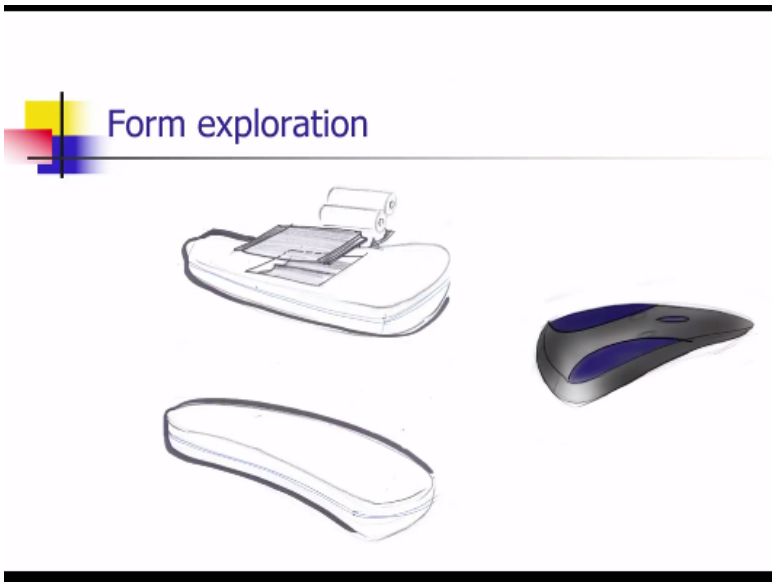

And you see here where the cells go because it is powered and then another most important question is how long does the cell last. How do you make this covers and usability?

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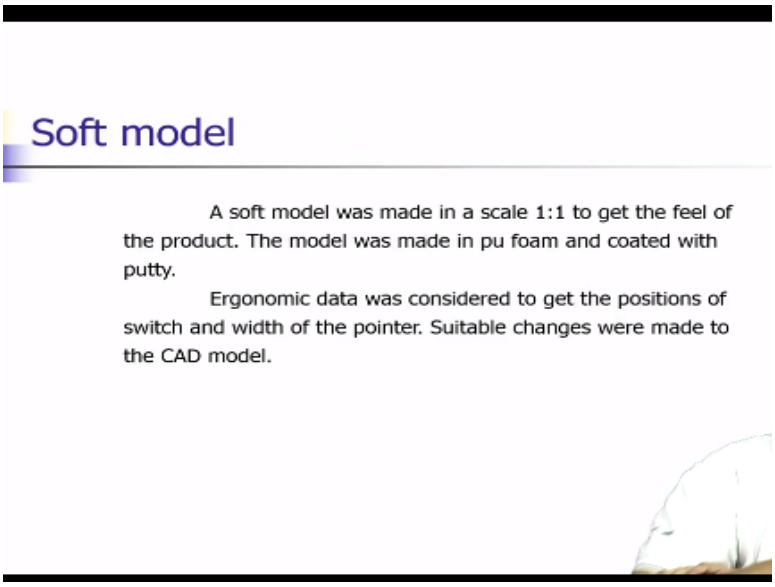

Interpretation regarding how usability is done. Soft model was made in a scale of 1:1 to get the feel of the product. The model was made in polyurethane foam and coated with putty. Polyurethane foam is typically a cellular structure and rough and if you touch it, it does not feel good after this you see ergonomic data was considered to get the positions of the switch and width of the pointer.

Suitable changes were made to the CAD model, you have seen this, that seems to be actually the starting point. You have a concept switch. If you go back some time you need a structure module saying you know we have a what is the core of it and then how do these things you

know work. How do you integrate all these parts into, so if you see here there how the switches are pressed, how all these things are joint together?

So we have made a, here it is a small play on the word, it is a software model based on CAD as well as a model for touch saying corners and all are smoothened.

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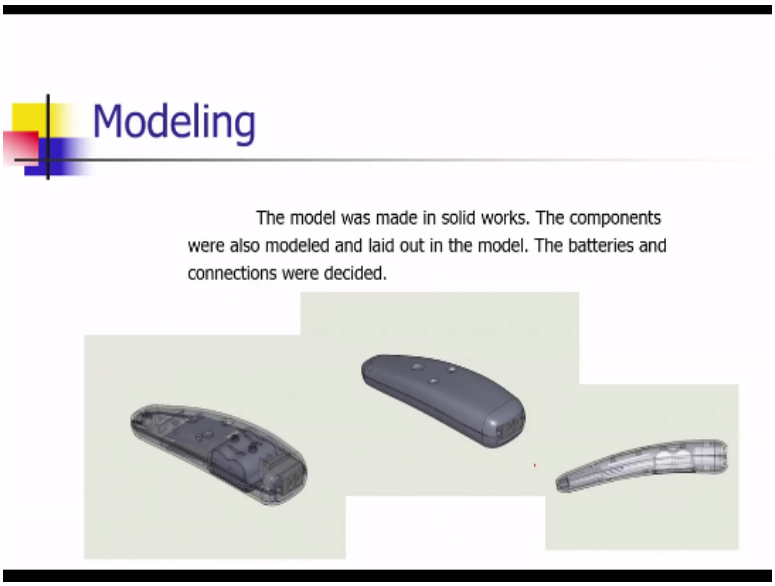

And eventually as seen here a model was made in a 3D modelling package. Over here where we work in Karnataka, both Dassaults and Siemens packages are procured by the colleges. So we have solid works as well as solid edge. It is not a limiting factor because any of them can be used including I am sure some open source material is available. So it is for you to do and then in the sense this is being probably being watched by students or people who are interested, it is about time you buy one of these solid modeling packages.

So generally at the trial end if it is only for you to look at a part like what they have shown here. For example, it is only about looking at it the way it is here. See here this is a see through model if you alter the material characteristics you can see through it and say how well things are setting inside. So allow me to get back to one thing which does not go well but it is very real is that what you see in the merchants YouTube videos and all that saying you can make anything including a gun.

It is only (()) (10:40) you can make anything including a gun provided you have the downloadable file. So a full STL file is already frozen, it is little like a PDF document, you cannot do anything; however, you can download some DXF or IGS models in which parts of

the features you can use, you can cut and freely use it. Now if you see here in this thing here can you seen this.

There is a things like even the keys and then there is a window here which I do not know if it is meant for, what is the purpose of it, because this side, that side it looks like something which is used for the actual laser probably these are for some other you know adjusting things that looks like a switch end. Actually these are details have been exchanged from a thumbwheel switch.

Some of you may remember thumbwheel switch for which you know we were used to setting the time. So there are 2 small keys here. If you press the keys there is wheel which rotates and you can set the timer so that either this thing buzzes in your hand saying your time is up or you can get better feedback in that it and you see there is a still an opening here. If you see carefully this one is the better thing.

Probably it is the what you call 2 * 1.5 or 2 * 3.7 volts small battery pack. So we have this nice product.

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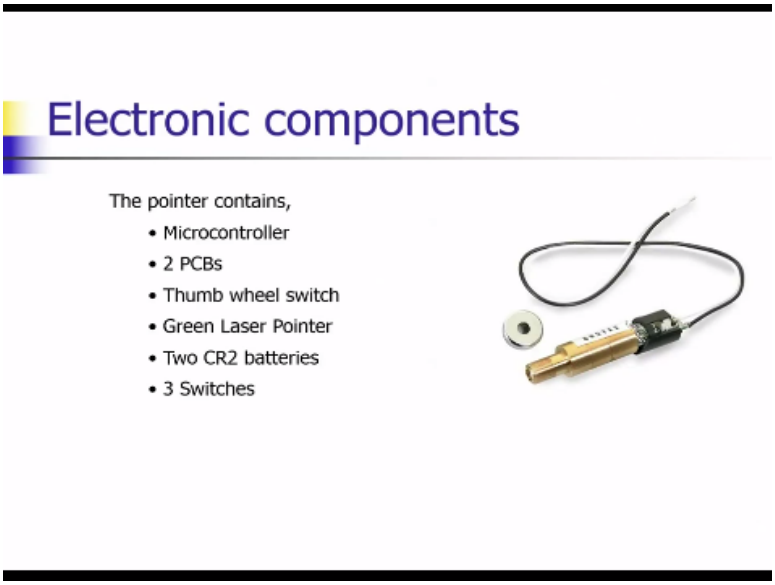

Component you see what seems to be critical is the laser pointer and then there are so many of these things. All this go into the product.

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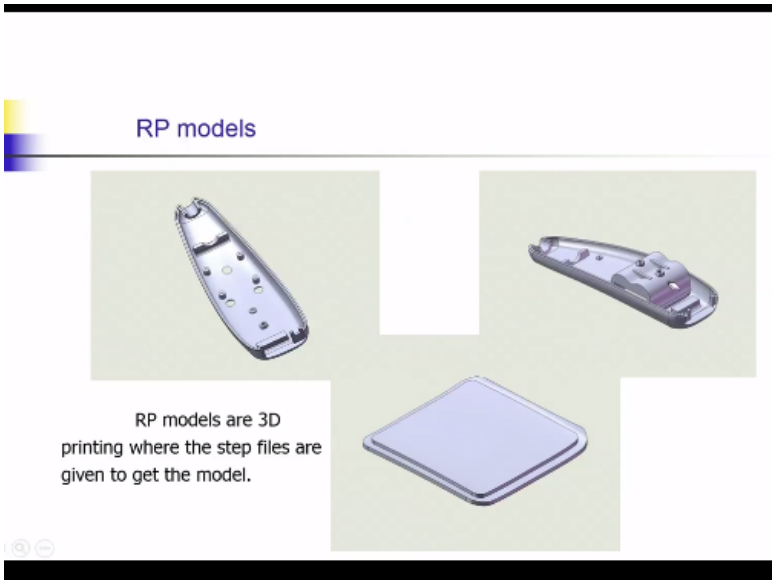

We have now the rapid prototyping models, fantastic is not it, but before you have come here the student has spent tremendous amount of time coming to this detailing part of it. See here there are 4 bosses, there are places for the switches as the support for the laser module and there is a place here for the thumbwheel switch at the back. Turned over place for the batteries, 2 cells and I am not sure what it is, that is probably, I do not know what it is and why it is sitting here.

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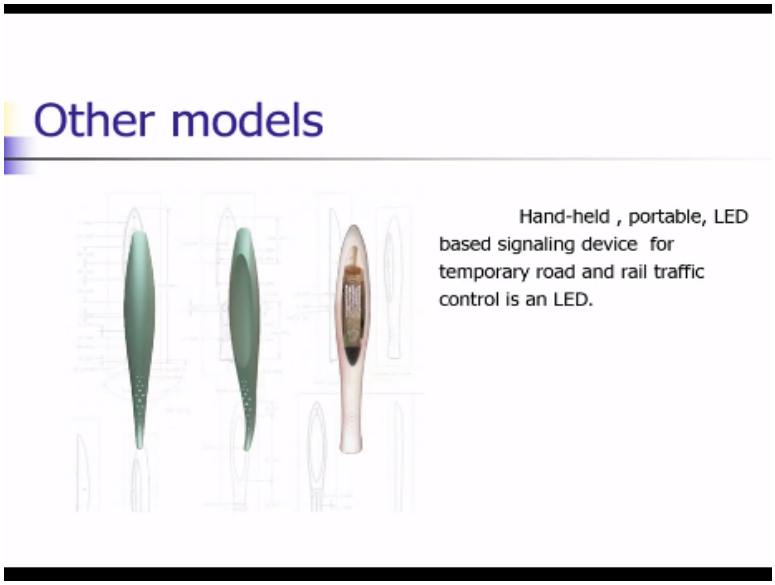

It has gone off well, if you ask me they are able to do those things well. Same thing now is that possible for us to make larger parts? Yes. While that one is a small handed thing maybe a size of a torch this is now these days you would have seen know whenever you see this traffic cops especially parking people they have a torch light like thing which has what looks like laser wand which is, I mean, now it is also available for child's thing.

So you just have a torch to big handheld thing and then the long thing and then whole thing will be shining. So they try to make something which is in the background if you see know, clearly you can see lot of detail has gone inside. What should be the dimensions and then what should the taper, there should be a grip, you see there is a gentle thing such that you can hold it. It does not slip and is not heavy and then various you know explorations in form, oh very interesting thing.

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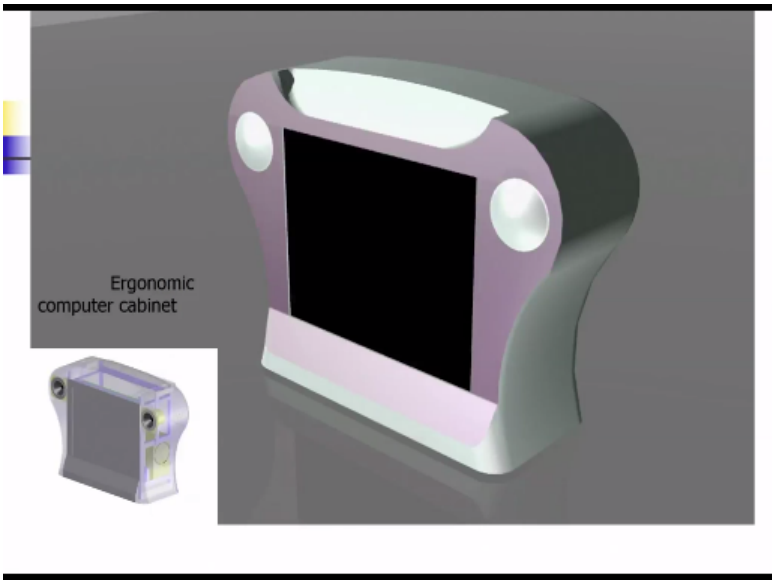

I do not know whether it is an old game console or is it something else. When I asked they said sir this is a concept of a display with speakers here probably meant for a standalone ATM or a dispensing machine. So this one is a very normal monitor, flat monitor at that time this thing and then there are 2 small speakers and then there is something else and soon.

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So people have been making all these things. Now you see here while such geometric things are easy when we come to things like these it is not that easy to make in (()) (15:16) it will be grainy, so after it comes out somebody has to continue to finish it and finished model is what will after all the finishing and all that it comes out extremely well. I will just skip through this because it is not of any use.

It is a little like a lamp for book reading. You have kindles, you have kindles, you have kindle paperweight, you have several readers, you have Sony and probably you have Samsung various things and ubiquitous I pad, macro, mini, micro, nano, everything but then they were trying to see whether they can make something which you can use while reading a book.

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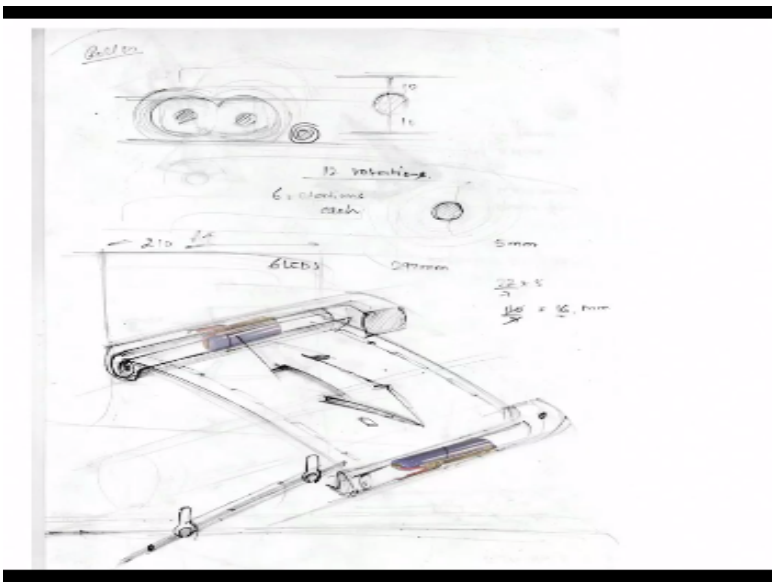

So this is a concept is, it looks like the old scrolls. So I have a scroll you open it and then I know you go on top of a thing.

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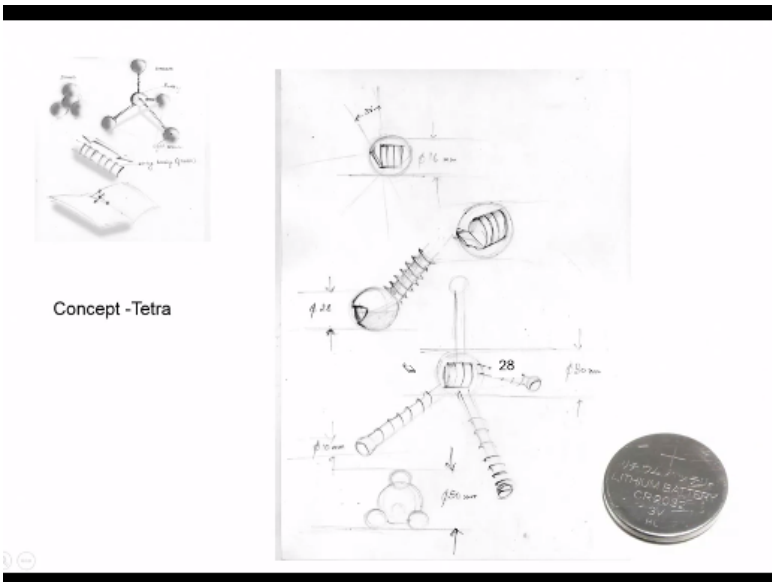

And then why not a tetra.

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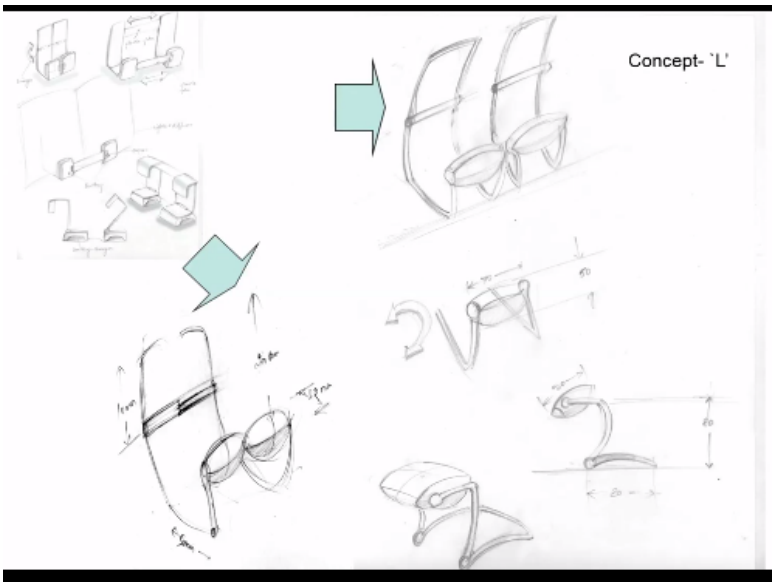

And then why not all these things and L shaped you know book like thing you keep the book in this you see here nicely it seems to be, so normally closed then you open it then you park your book inside and there is something you know the cells are there and then it is lights up and so on like that. This if you ask me is essential. You cannot jump directly saying to the final model saying we will print it.

As I told you the concept of a prototype is to avoid surprises and if you do not prepare yourself the really more surprising prototype will come.

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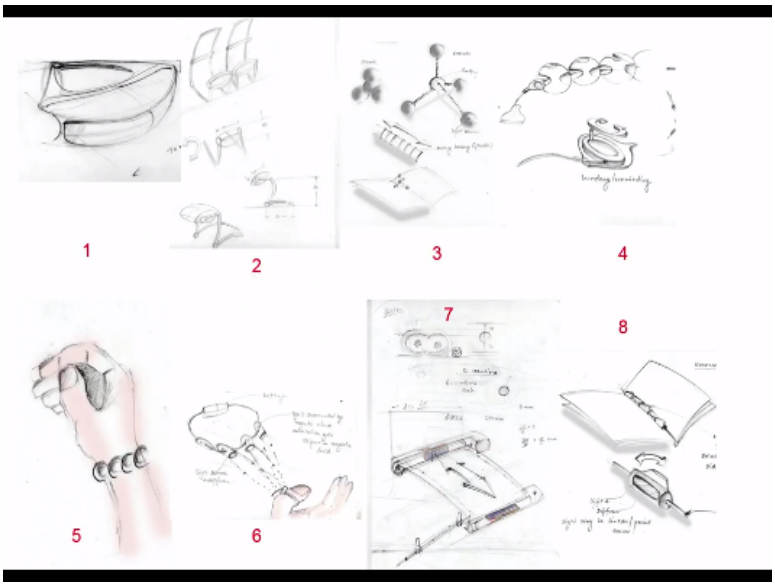

A surprise on have a prototype can be made. So you see here lot of things you know saying something and all is there then most important is how do you select thing.

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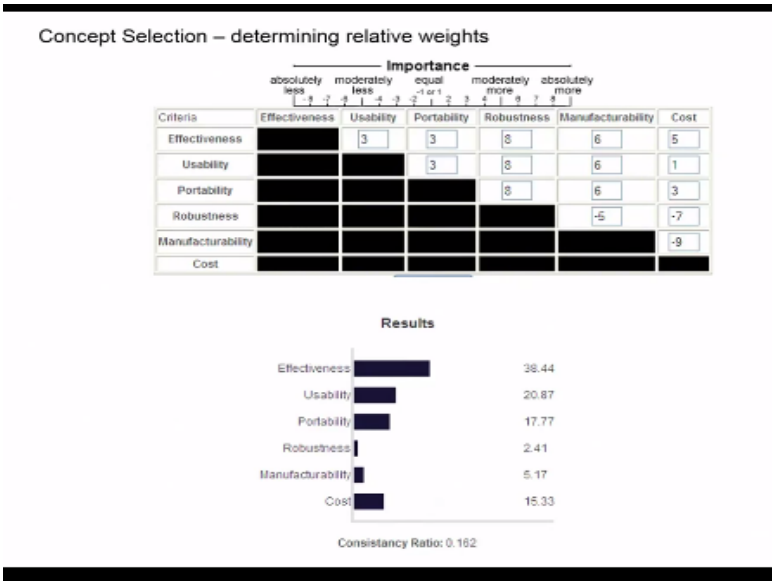

I will leave all this I will skip everything.

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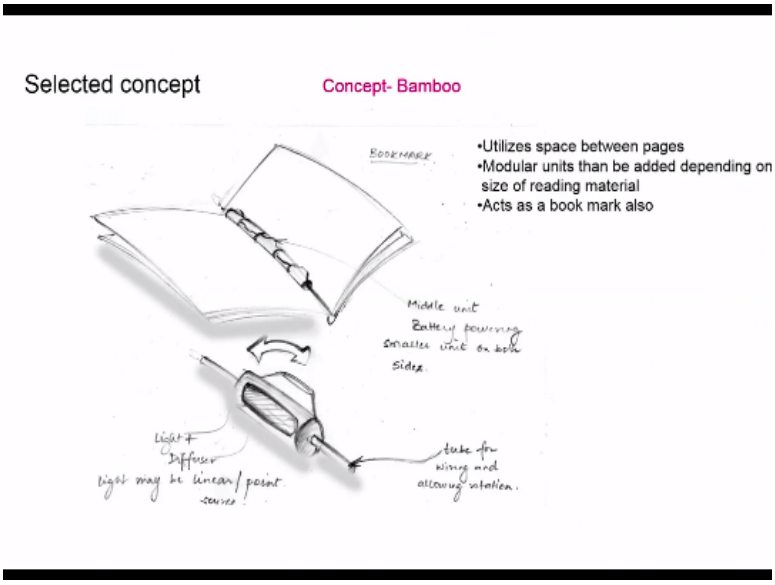

Finally, something called a bamboo concept was selected.

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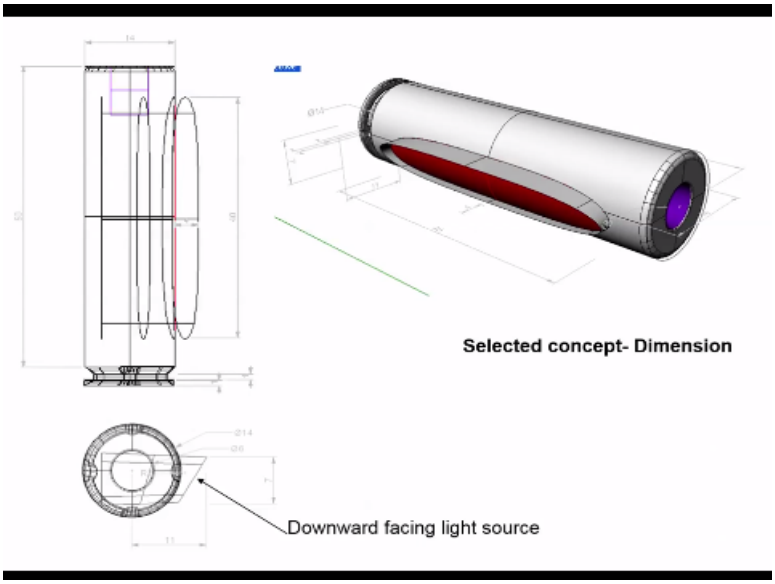

Saying my product is going to be a long rod shaped thing. There is an opening there, something here and then detailing.

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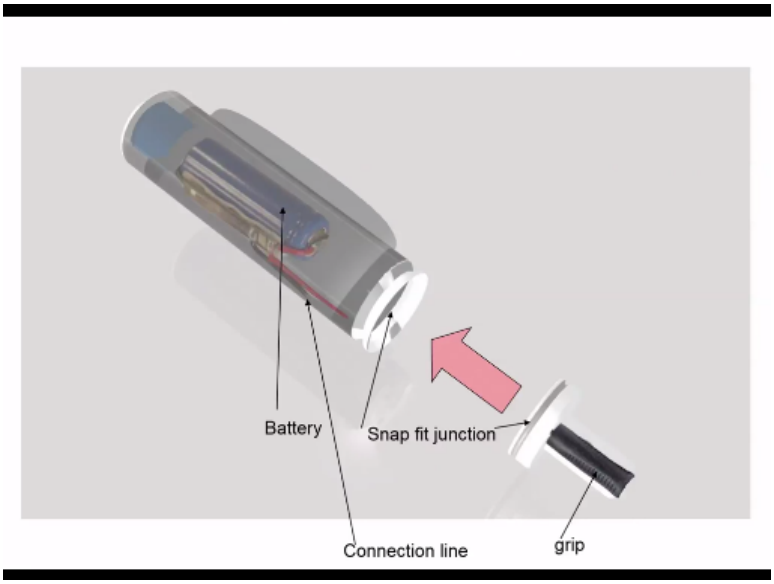

And then you see the full CAD model which shows insides also. You see that beautiful lithium (()) (17:37) nickel metal hydrate lithium iron polymer had not come, take a cell and then put all the this things here. There is a window in which you see this right side is the window through which you know light comes out and then how you know things are there. You see here most important snap fit.

You have a small ring like thing here and then you push it insider here and then it sits nicely, getting interesting.

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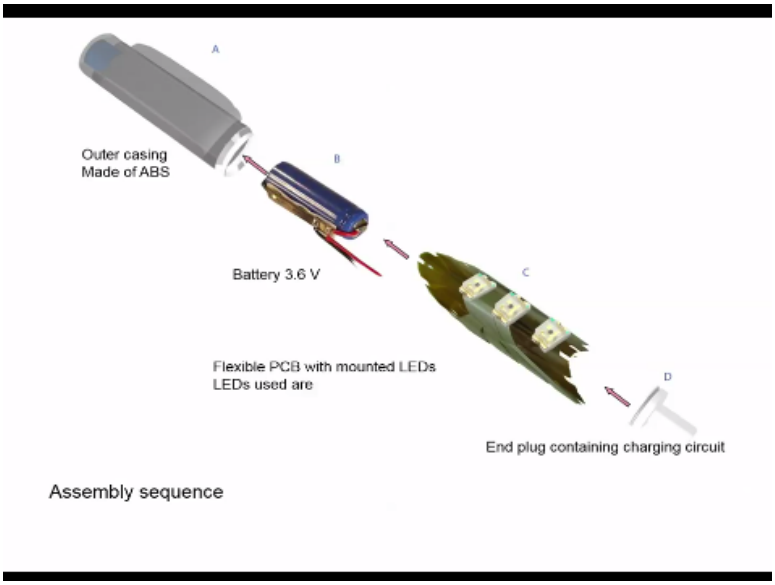

In the previous slide I showed you this place, battery and then you see here there are 3 chip LEDs which are there. You should remember that all these are very, very old, now it is common. This LED business is extremely common model.

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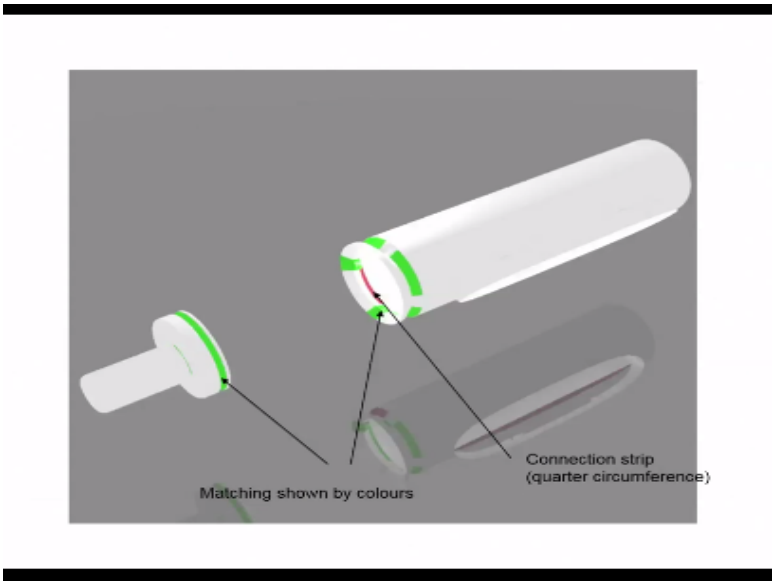

And you see finally how well it is sitting there.

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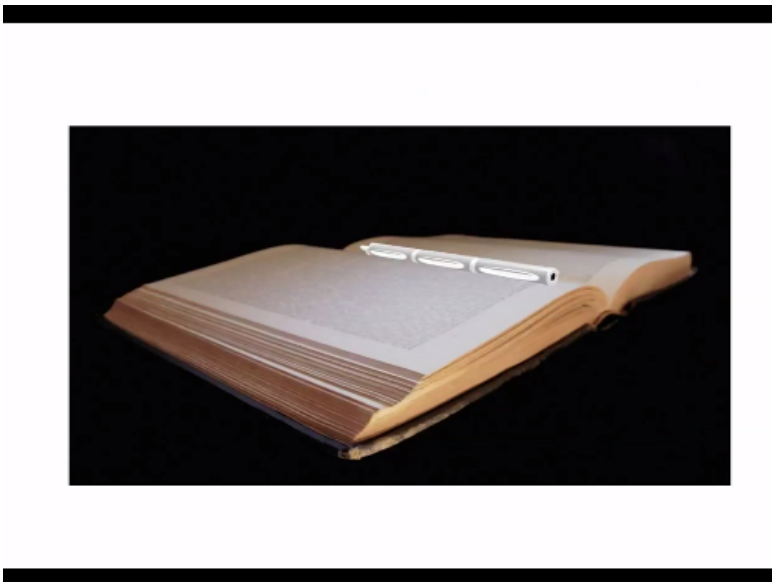

It is comfortably nested in the middle of the book. Saying you just rest it in the middle of the book. If you want, you can hold the book up or you leave it there and it lights up the thing. This is just a concept, okay.

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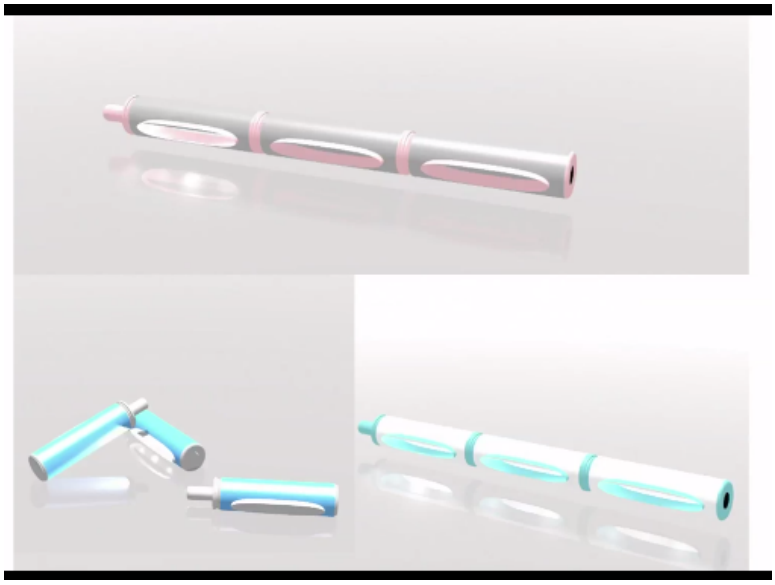

Now this is where you know probably a piece like this can easily be printed. It look a little rough but still it is okay. Now why cannot we make it out of a tube. Cannot we make it and make it out of YouTube and this thing maybe the initial things and that is not how eventually you are going to produce it. In the initial stages if you remember will make a simple prototype.

Take any tube I am sure you know you can even make a tube out of cardboard, push everything inside and push everything and see whether that light falls on the side or not. If this were an opening and then take a book and see whether it lights up the book, but finally if you want to make it, you must make it in injection moulding. If you want to make it in injection moulding you need all the full sequence what we have talked about.

So this is all of course little bit of presentation well I would not called it a gimmick, it is part of the game. So for the moment I will stop here, next time I will continue in another what you call topic a little related to actually using a computer and then trying to make a small unit, add few of the bosses, how to make 2 of the parts together and see how to start at and then later on how to save it as a STL model as a step lithography model if you save it, how it will go and all that will come to it later. So thank you for today.