Digital And The Everyday: From Codes To Cloud
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Lecture – 22
Creating a Machine Zone through Affected Feedback: Leisure and Entertainment on Social Media: Part 03

What about the human body itself? I mean of course, here the body cannot exist without the brain and so just for simple survival I mean. So, you can see the do can I mean something that related to reward it is not something that is very primitive, it is not, it may not be it may be perhaps essential for survival, but maybe this the rewards is more to thrive rather than to simply live ok.

So, can we try to understand a are there similar neurotransmitters are there similar mechanisms that allow the human body the human species to simply survive we have talked about evolution. So, how is it that wave come to this point me, how is it that you and I in this form I have continue to remain this way for so many I do not know millennium perhaps.

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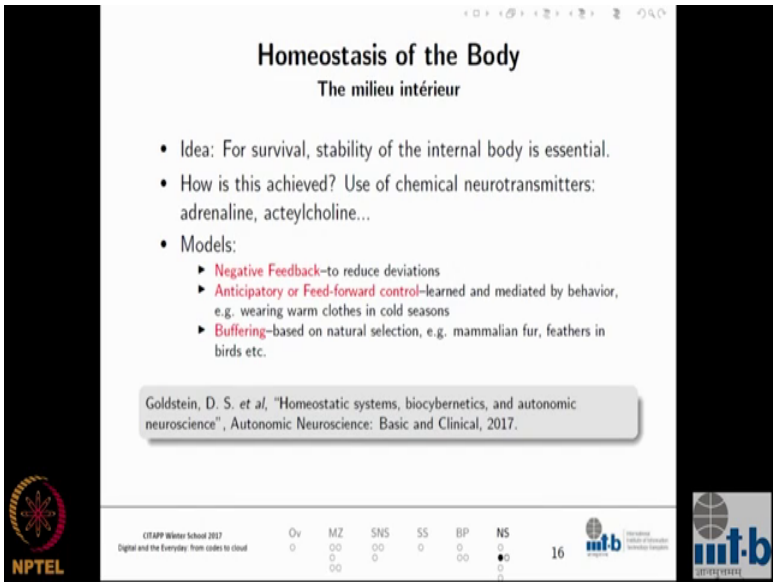

So, again a lot of primitive, lot of fundamental research has gone on into saying what are the neurotransmitters that are that are responsible to ensure that we survive as a species. So, and what are the models that have been proposed in order to explain why is it that

these systems have been so successful and this is my queue into using into selecting this particular topic. Because if you look at these words here negative feedback, feed forward control, and all that, so these are terms that we use on an everyday basis in the domain of control systems in theory.

All our mathematical results when we talk about designing controllers for engineering systems are based on these primary concepts. So, this is my positive reinforcement if you will in selecting this particular topic, because I know that I can maybe say something of some value at the end. So, just to exp very briefly explain what it is that these systems actually do. So, these are the neurotransmitters that basically ensure that your body is kept in a very stable condition. So, there are several variables that are that are typically controlled here.

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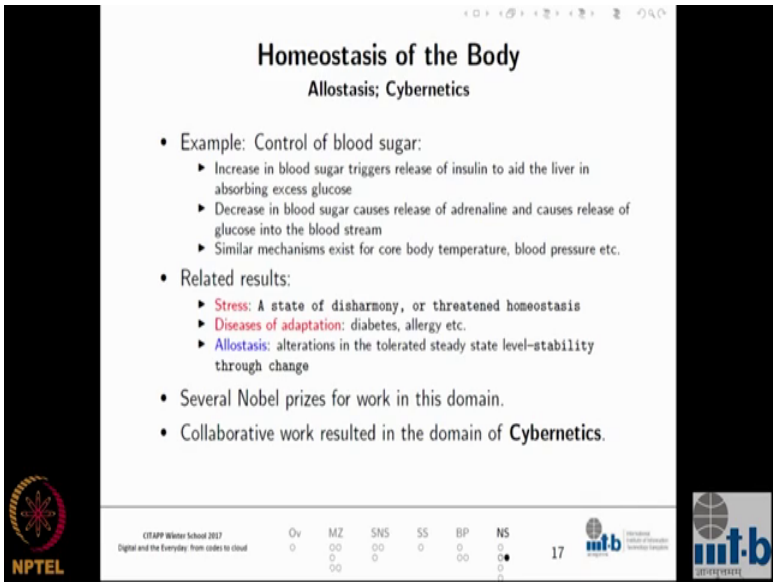

So, few of them are like body temperature, blood sugar, blood pressure and so on. So, there are actually internal feedback mechanisms within the human body that make sure that these variables are kept at some balance temperature in order to ensure survival ok. So, that is the roles of these neurotransmitters suggest to give you an example here. So, control of blood sugar how is it that our blood sugar is maintained at a particular level, what are the internal mechanisms that are responsible in order to ensure that this happens. So, if there is an increase in blood, if there is an increase in blood sugar then there neurotransmitter is that trigger the release of insulin that kind of dissolves is excess

blood sugar and if there is a decrease in blood sugar then there are other neurotransmitters that are released which ensure that more glucose is fit into the blood streams of the level of blood sugar comes back to what is considered as optimal.

Now, it is the, it is a variation in this feedback mechanism that has lead to all these other issues things like stress and diseases of adaptations is diabetes is something that I am sure a lot of for family members here suffer from for which they take they take external medication and so on. And another term that has been identified here in this topic is what is known as allostasis. So, allostasis is the change in the stability levels overtime. So, my father who is now close to 70 years old does not have the same were with all to regulate these are these variables the same way that I can, I am close to 40 years about 70.

So, the human body is able to adapt to things like agent you know how are these internal feedback mechanisms change when some of the variables change. So, this homeostasis is for a body taken in itself. So, allostasis is a term that is being coin to see how this table values change over time, maybe for a person my father's age, some of these levels some of these variable levels could change. So, for me maybe a blood sugar of some number is may be satisfactory, but for him maybe say 1.5 times that particular number or smaller ratio is what would be acceptable. Now, how is it that the human body of the human brain is able to take care of these variations? So, some of these concepts have therefore, being given name of allostasis.

So, I want to point out that this work is actually not very trivial may people have Nobel Prizes for this work and this work has started in 1920s, 1930s and so on; the identification of these neurotransmitters very crucial role that they play in the regulation of the human body and to ensure its survival. Again I told you my queue to choosing this topic is the topic of research known as cybernetics. So, this our term that was coined in the 50s by a bunch of interdisciplinary researchers may be have you heard of the term, you heard of the name Norbert Wiener, he was a one who proposed this term cybernetics.

So, there was, there was a collaborative work between there was collaborative work between biology's neuroscientist as well as electrical engineers in identifying some of the similarities between what the human body is seeing and whether it can actually be used in intelligent machines ok. So, it is what let to that term here.

So, can we now understand this role of homeostasis which is being required which is been identified as a phenomena that is there to ensure survival in context of the machine zone. So, again I am going back to what we started off with. So, I started off by simply giving you a lot of statements that were made by people, now can you understand the machine zone as an altered homeostatic balance level ok. So, I have told you that people actually spend hours on length in front of these gambling machines, I mean I am sure all of us have been victim of spending 2 3 hours continuously on social networking sites and other such technologies. Why is it? So, why is it that we are able to focus so much on this site for such a long time? So, you can think of this as an altered stable level in our brain.

And so again I have also given you some background from psychology and neurosciences actually enables you to appreciate what it is that is changing when we spends such a extended durations on the systems.

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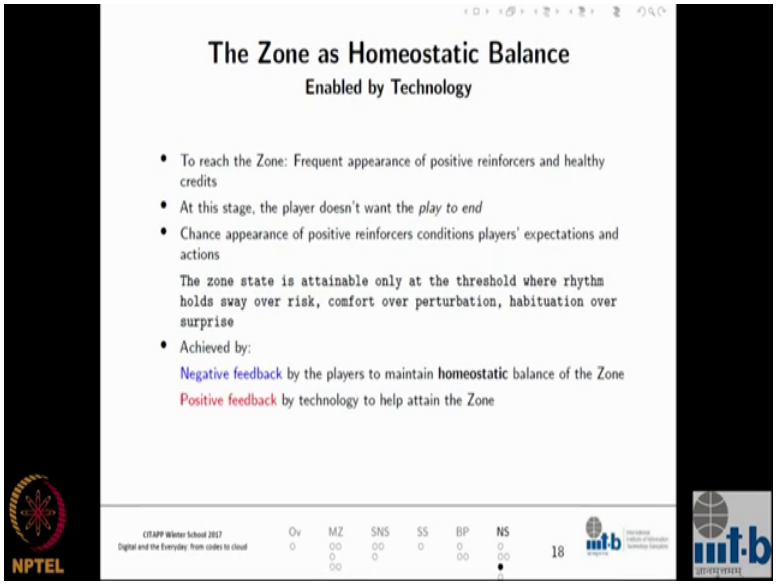

So, again I told you that these are this is what interested me in this topic the role of negative feedback. So, people want to they change their actions, they change their sensory inputs in such a way that they make sure they continue to play for a really long time. So, that is a negative feedback, that is used by the users themselves and there is positive feedback that is enabled by technology. So, technology will keep on upping the

ante each time you move ahead in playing in a yes one second, in when you are continuing to play.

Now, this has been seen the first example that typically studied in positive feedback is a game of tetras which may be many of you have played some time ago. So, you seen that if you continue if you play this game for a long time the rate at which those bricks fall becomes is increases. So, your challenges keep increasing the longer you play on them that is positive feedback. Yeah please.

Student: I am here also notice that you know out from that zone that you are (Refer Time: 07:39) actually on the site.

Yeah.

Student: They definitely not there is almost (Refer Time: 07:44) involving to the like (Refer Time: 07:46) or (Refer Time: 07:48).

Yeah.

Student: Or (Refer Time: 07:49) two seconds told or.

Exactly.

Student: (Refer Time: 07:51) also dose not mean that (Refer Time: 07:53) constantly.

See, that is the you your not, but then see that the you remember those few lines that I could that I stated before that everybody is distracted.

Student: Right.

You are always thinking about that because of the variable ratio scheduling. It is not that you know every 30 seconds you are going to get an email or you are going to get a message or something. You go on to constantly check whether you are getting something that is your reward system telling you, if I get something I know I am going to feel happy and they figured it out that it should not be in a fix schedule it should be intimated it should be variable ratio. Even the design of the pull to refresh, it is so simple, all you have to do is move your thumb by a few mm and you know you can see whether your

that is your that is a stimulus I may and then you will find see whether you want to get a reward or not it has become so simple.

Student: And I think that kindly directly (Refer Time: 08:43) smart phone right that even the (Refer Time: 08:46) technically constantly connected (Refer Time: 08:49)

Yeah.

Student: (Refer Time: 08:50).

Yeah. So, so that is why I said. So, actually the if you look at the newspaper article that I had sited earlier about which focused on Mister Harries he talks about detoxing workshops there is something known as a national day of unplugging ok. So, where he people spend the day without the cell phones and I am sure you all of us have received enough whatsapp forward that you know with people are sitting at a restaurant is a basket in front of you people all put their phones, the first person to pick up their phone and answer a call or message pays everybody's bill like maybe you seen that. So, its yeah it seems like it is a fairly severe thing ok. This is the body that is at rest or that is at a stable condition.

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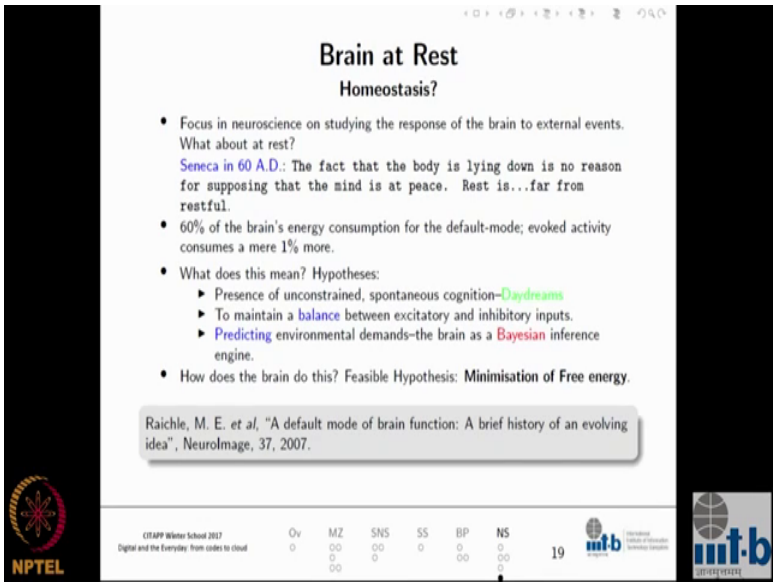

Now, can we explain can we see if something similar exists for the brain itself. So, this is what is been term as the where some where here it is been termed as a default mode of the brain ok. So, even when you are a sleep or even when a person is under anesthesia it

is been identified that the brain is nearly is actually not at rest. So, this was identified as early as 60s, 80s Seneca was a roman philosopher. So, he said that another fact that the body is lying down is no reason for supposing that the mind is at peace, rest is far from restful ok.

So, the brain is actually constantly thinking or the there is a lot of activity that is going on even when you are under anesthesia or when your under a or even when you are asleep. Now, why? Can we explain why is it that there is so much neural activity that happens even in such cases? Like see, suppose I do not undertake any activity you know I sit in this room for me you always sitting here for more than one and half hours and assuming that my talk is been interesting enough that your dopamine systems are being rewarded in some way. But I am sure after sometime you feel hungry right.

So, there are things that will say look I am feeling hungry that is a more primitive need I should go satisfied. What happens when you are in a sleep? What is the brain actually doing? So, there are several theories that have been again proposed here one of them is day dreams, there is actually a lot of work that is being going on these days about mind wandering behavior can we explain why is it that you get distracted, why is it that the mind go wanders so on? Is there a need to for the mind do this and to maintain a balance between excitatory and inhibitory input so.

Now, inhibition is something that I think requires little bit of effort and understanding what is inhibition you are actually, you whenever you take an action you may take one particular action, but you are also do you also do not performed several other things. It is like when you are crossing a road, you do not cross when a bus is coming in front of you right, you actually stop and see and then you cross the road. So, these are the inhibitory actions. Inhibition place in equal amount equally important role as does excitation in actually telling you to do some particular of thing. Stopping you from doing something seems to be more as important as actually doing it ok.

So, the brain is suppose is has been, so you know all these activities typically happened in order to strike a balance here. Perhaps one important thing this is what I want to end with and give you one other slide is that during rest the brain is actually working to predict what it could potentially see in the future ok. So, this is why the concept of learning and memory comes, and it actually processes all the stimuli all the sensory

inputs that it has processed overtime and takes suitable actions for you to predict what it is actually going to, what you can potentially do in the future ok.

So, it is been termed as a Bayesian inference engine you know what is the Bayes rule in probability theory are some of you familiar with this people with in engineering on mathematical background good. So, the Bayes rule is one of the most fundamental theorems that have been proved in probability theory which basically says that in a nutshell what it enables us to do is to update our believes based on new events and new occurrences.

So, I mean when I teach I teach a class of probability here then should and I always give the example of cricketers. So, imagine that you had you know you did not know who Sachin Tendulkar was I mean before he reached his status, as we know of today. He is a debit on he is just come out to play and maybe you are you want to know whether he was going to get out in the first ball or not ok. So, the odds are fairly high, I mean either he going to play or is either going to get out or not get out in the first ball, but that is your first belief. So, the probability that you think is going to get out in the first ball is a 50 percent, but then now you have seen him play over years you know how much of a talented batsman he is. Now, this is all the information that you have collected over time and it is based on this information that you can now update your belief that when Tendulkar comes to.

Bat you know that the odds of him getting out in the first bowler very low it started off as 50 percent now it has come down to a very small number. It does not mean that he has not I am sure he has enough golden talks to his name, but the odds of that happening are very low primarily because you know what sort of a player he is. So, this is a fundamental, this is a very simple explanation about the base rule and this is what the brain has been attributed to be doing when it is at rest. I have had a series of experiences now how can I use these experiences to update my believes or for my actions about what is going to happen in the future ok.

So, some different things to think about how does a brain do this or why does it is even take these actions. In why does it have to do all these things about predicting what the future is going to bring and so on. Can they are there theories that I have been propose to

explain this? Yes, there is one and I will tell you why I have chosen this particular one too. This is something on the minimization of free energy principle.

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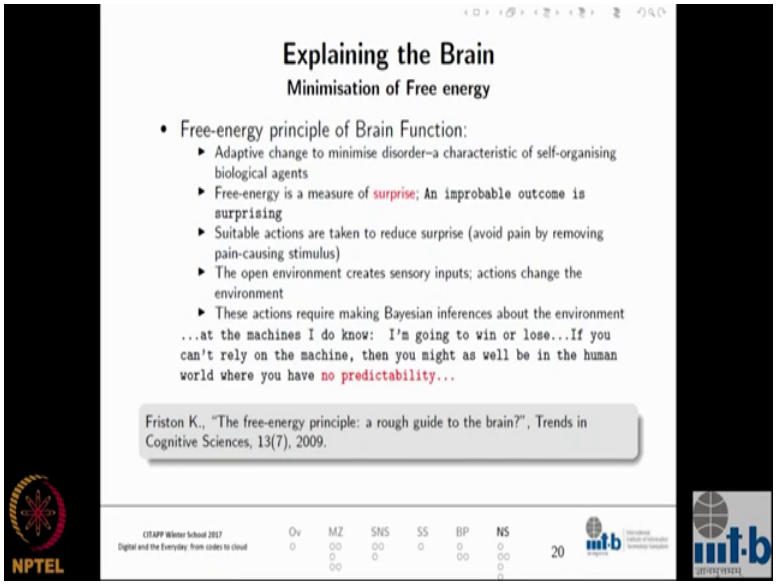

Basically what it says is that the brain works to minimize the element of surprise ok, thus an improbable outcome is surprising. Now, leaving this few lines in side I want you to pay attention to this phrase again which is been taken by the book about gamblers.

So, here they say that at the machines I do know I am going to win or lose if you cannot rely on the machine then you might as well be in the human world where you have no predictability ok. So, the human world for these gamblers is becomes so in predictable, so surprising that they want to seek a refuge in what technology offers them. So, the if you were to subscribe to this minimum energy principle which is being used to explain the brain. So, brain is always going to work to ensure that you receive no surprises and the belief of all these gamblers is that my life is become so unpredictable that I am going to seek refuge in these machines where I know that I am not going to have any surprises.

So, the brain autonomously is actually telling these people that looking to go spend some time, here you are not going to have any surprises, you are going to minimize the free energy that is present in your brain it is actually asking you to take these actions ok. So, again the reason why I have chosen this particular theory I am sure there are several others that have been proposed to you know explain the overall function of the brain. I mean right now I have only spoken to you about the dopamine transmitter is another

neurotransmitters there, but one of the overall structure of the brain there is a reason why I have chosen.

This is primarily because it uses dynamical systems theory which is again very closely related to my experience in control systems in theory where we use very similar approaches, very similar language in trying to understand how systems work. So, in a way my choice of selecting this free energy principle to understand the brain is I am minimizing my own element of surprise. I am minimizing my own lacunae in understanding how the brain works. It is up to you to agree with me or not, but this is evidence in front of you ok. So, you can get more details about this on this on this particular from this particular papers. So, lot this economic has done a lot of work in this just to make.

So, that is that is my last slide, but I am going to leave you with some questions that you can that you can think about and of course, the reading list that is are all the citations that have given you through the lecture.

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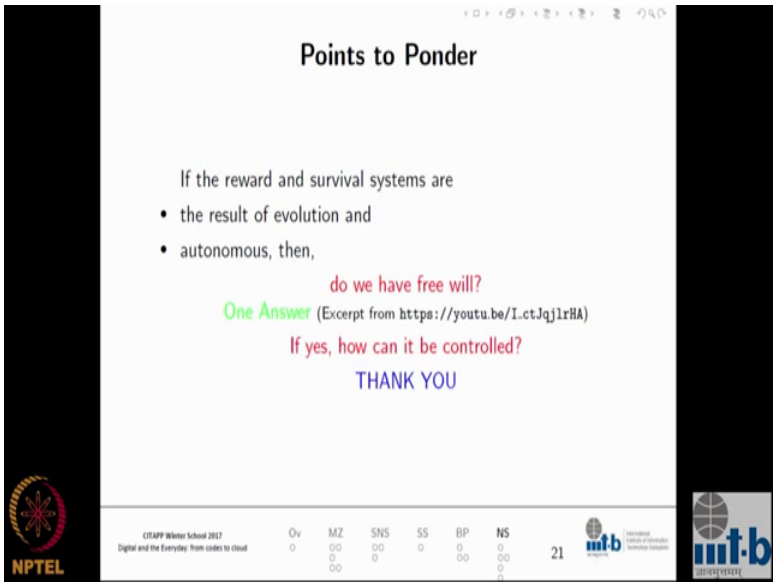

So, we have seen that if the reward and survival systems as a result of evolution. So, this is what has been described here the emergence of these dopamine systems and so on. So, there as a result of evolution if there are autonomous. So, they act independently of us they merely a respond to what the world is throwing at you this is my first question. Do we have free will? Something for you to think about. I will give you one answer. But I do

that I will give you I will pose another question to you. This is the answer I will play that in the minute. If yes, how can it be control? You can either agree or disagree whether we have free will or not. If you do things that we have free will then can we control.

So, then again unit becomes a circular loop if I can control it does not again mean that I have free will have done it out of my own free will or with a forced to do it. So, very circular argument let us not get in that. So, what I want to tell you here is, so we came from the phenomena of machines zone, we tried to explain with psychology, behind one level deeper to neuroscience aspects. What you think is the next level deeper, beyond this?

Student: (Refer Time: 18:31)

Sorry, no I do not mean I do not mean technology wise, I mean conceptually in terms of topics.

Student: (Refer Time: 18:38).

Philosophy.

Student: (Refer Time: 18:40).

You have no attraction at least with the brain place you can you can use all your new tools and techniques to measure what is what is happening, beyond that I do not know. Thank you, I will show you this answer and then we can wind up the lecture.

So, this is a second part of that video that I shown you earlier by Professor Skinner.

Well, is a life favor because we all (Refer Time: 19:06) you have a choice where is a doing things or not doing things.

Yes, if you say we live in the precisions of our fiction where we have a shown somehow or others that these in general (Refer Time: 19:16) feelings and so on, have initiated something, and will started something, I have created, we have done something in a voluntary way, we have will to act. If you now look at the actual history you find there are extend reason why this is happened. In other words by discovering the causes of behavior which we can disposed of the image in internal cause, we dispose of free will as an American define the 18th century done is in (Refer Time: 19:45). Instead we believe

in free will because we know about our behavior, but not about its causes and of course, it is a (Refer Time: 19:53) they just say (Refer Time: 19:55) behavior we discover causes and once you have found those causes there is less you (Refer Time: 20:00) and eventually I think we did tribute nothing to it.

I will end with that. Thank you very much indeed.

Student: (Refer Time: 20:10) used in creating (Refer Time: 20:20) used we creating TV show content in the movie content.

I am sure they are, I am sure they are. I have not personally read papers in this topic, but I can give you lead on that paper which I which I sited here, which book which give a relation between how slot machine research can be used in the development of games. So, maybe this virtual reality games is another implementation of games in the large. So, yes, I think so. You can definitely get leads from that paper by following the references and so.

Student: In the TV shows we know that (Refer Time: 20:56).

Yeah. So, that has actually, so if you if you read that essay if you go to the website of Mister Harris and so he has a lot of the terms that uses there. So, this is called what is known as a bottom less bowl, it never stops. You always keep getting new content. I mean I have seen this with my son my son sometimes you know I create first to eat and we put them on YouTube and I always seen that he does not want to go full screen ok, he does not want to watch it full screen. Why? I have a feeling that he is things he is going to miss out and all the queues you know the other recommendations that come on the right side. And it never stops right like you press one it gives you 100 recommendations, you go to the next one again you get 100 more.

So, this is what has been termed as a bottomless bowl and this is what Mister Harris feels is this is where the designers have to step in and say let look I am not going to give you any more ok. These are all there is or if you do have to do something then you search for it yourself, I am not going to keep on giving you queues you know your variable ratio reinforcement. I am not going to give you that or at least that is how design should be design should be made. So, that it does not become one of these things, yeah.

Student: (Refer Time: 22:17) keep the children be more (Refer Time: 22:22).

Well, I mean I think this very debatable you know the I am guessing that must be closely related to saying whether if you play violent video games do you become violent. Is it somehow closely related?

Student: No, no (Refer Time: 22:35) students will use calculators the lose occurs mindly calculating what is 22 plus 28 (Refer Time: 22:42) again they want to use the calculator only.

Ok.

Student: (Refer Time: 22:45).

So.

Student: If the same thing.

Yeah.

Student: Because I passive for so many of (Refer Time: 22:48) the brain is so in active becomes (Refer Time: 22:53).

I do not know whether you can call it inactive, I think I mean we have seen that there is a experimental evidence to show that you know your brain is actually very active, but the signals I mean the appropriate signals that it gives to you know those parts of the brain which controls a your physical movement and so on and those could be suppressed. And only those which enable you to get your satisfaction from virtual games or by sitting idle and being and been passively entertainment being passively entertain only those could be activated. It is not necessary that your brain is it stops working, it is selectively activates and suppressors some parts of it and that comes from learning and memory and so on.

Student: No, just (Refer Time: 23:32) activates what actually it helps in terms of (Refer Time: 23:36).

I do not have an answer to that, that when you talk about creativity that is our mind field I think.

Student: (Refer Time: 23:43) something very fault for (Refer Time: 23:45).

So, I mean would you call would you call the development of the machine zone create a (Refer Time: 23:50) I mean it has both parts.

Student: (Refer Time: 23:52), but does not contribute your creativity what (Refer Time: 23:55).

Yeah, I am not in a I do not have the.

Student: (Refer Time: 24:00) their creative no doubt, but there in contributed (Refer Time: 24:02).

the people who built is there creative but.

Student: See, in the very act of developing all these things.

Sure.

Student: By using the creativity (Refer Time: 24:12).

Ok.

Student: Does not mean that people who make use of them there will be creative.

Student: Yeah it (Refer Time: 24:18).

Say, it is say exactly I mean that is why the.

Student: Yeah, like when (Refer Time: 24:22). So, using the book description or character (Refer Time: 24:26) I picturize the page, but when I looked at a movie (Refer Time: 24:30) my creativity because he gave this person is this person.

Student: Yeah, reading books, novels (Refer Time: 24:35) supporting (Refer Time: 24:37).

Well.

Student: (Refer Time: 24:39).

I think way when you use phrases like better and bad that is a very subjective opinion. I really do not know it subjective, but anyway I mean if people in the audience have opinions please contribute.

Student: (Refer Time: 24:50) some of those learning (Refer Time: 24:54) lot of example.

Yes, I think so.

Student: (Refer Time: 24:57).

Yeah.

Student: Out that pushing learning apps (Refer Time: 25:00).

Yeah, sure.

Student: (Refer Time: 25:01).

Sure.

Student: (Refer Time: 25:03), you can (Refer Time: 25:07) positive (Refer Time: 25:09).

I think so, yes I think. So, I think I mean I was I have a friend who runs in automation company here in Bangalore and I think lessons from behavioral psychology for instance can be used. Maybe fairly successfully in semi automated building of semi automated equipment, such that the users attention is not diverted too much. You know like let us say that this is an operator whose that a machine for yeah somebody is automation for like 6 7 hours a day and I am sure after while you get tired distracted you know leave it may lead to more accidents and so on.

But suppose you were to use some of these lessons that behavior behavioral psychology offers maybe you can try to minimize some of these things. I mean like think of you that way your fission the in the discovery of the invention discovery of fission, reaction of the invention of it has both sides of the coin right you have an atom bomb one side you have nuclear power reactors on the other. So, depends how you want to use it you can use this.

Student: (Refer Time: 26:09).

I personally have not, but I think it can be done.

Student: (Refer Time: 26:15) children.

Say, I am sorry say it again.

Student: (Refer Time: 26:21).

Ok.

Student: (Refer Time: 26:23).

Ok.

Student: (Refer Time: 26:24).

One close, one close example that I can perhaps give you is the use of this virtual reality devices in exercise, like you know how can I make exercise more interesting. So, you know you have this video game consoles that allow you to immerse yourself virtually, now maybe if you give this virtual rewards while you are there you know in rehabilitation for instance, video game based rehabilitation. There I have seen there is a lot of this actually you are right. There is a lot of research work that has gone on in video game based rehabilitation, you know let us say that you want to bring about the activity of your arm for instances or your wrist, maybe you had a stroke or some other some other issue because of your last activity of these arms.

There are robotic devices that are coupled with virtual games that will make the experience of rehabilitation more interesting. There are in the opportunities where you can use these use the lessons that we have learnt so far and making in you know of may be creating a positive different if you will.

Student: (Refer Time: 27:41).

Yeah.

Student: (Refer Time: 27:43) if you explaining (Refer Time: 27:51).

Exactly, yeah.

Student: (Refer Time: 27:56) again be useful

Yeah.

Student: (Refer Time: 27:58).

Why? I mean now you know why that was my intention. I mean you can use this in several places, but there are you both sides to it. It is nice you brought this up. So, so there you have it you have one instance like there. Yeah, I am sure all of you are hungry those neurotransmitter being triggered.

Student: (Refer Time: 28:17).

Thanks and all the best.