Applied Ergonomics

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Lecture – 20

So, welcome to this lecture, this lecture is in series with the understanding of cognitive ergonomics. So, today we will cover the design guidelines for various cognitive task. So, as per our previous covering is concerned, we covered human information processing model to large extent. So, based on the various component of human information processing model so we initiate at our discussion and in fact, in the, in discussing those component, we also covered some the guidelines in that particular task.

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So, we will start with the design guidelines for cognitive work.

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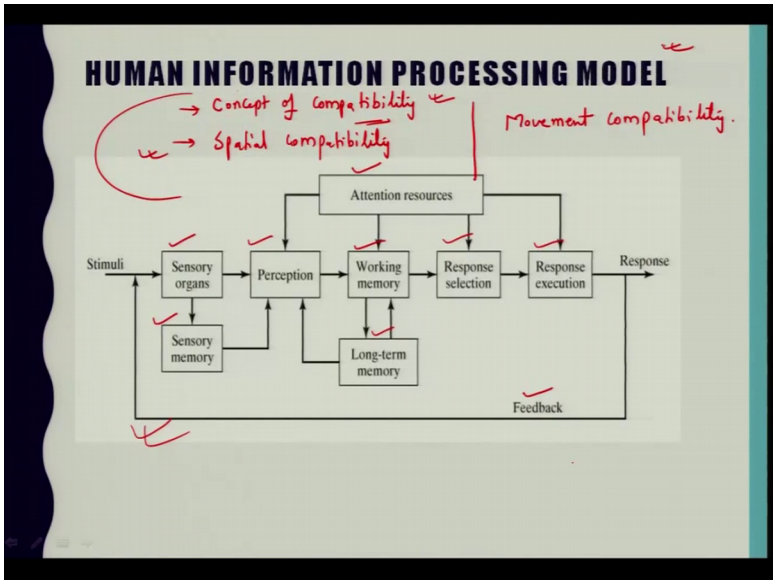

So, just to recall this particular human information processing model in which we discussed about the sensory organs, sensory memory, perception, attention resources, working memory, long term memory, response selection, response execution and feedback. So, number of guidelines that can be used in cognitive work situations we discussed although this discussion is only one way, but I hope you have developed understanding towards this model that I am again and again putting in front of you so that the thing could be stored in your long term memory.

So, the kind of guideline we covered in the form of let us say concept of compatibility, in previous lecture which is useful in design of controls for operation, you want the controls to be located in a logical position relative to operation. So, that is its spatial compatibility we covered in the previous lectures and we want the actuation of controls to be consistent with operations expectation so that is moment compatibility.

So, whole coverage of these topics is organized according to the principal features of this human information processing and now we will go to understand the guidelines for various cognitive work elements.

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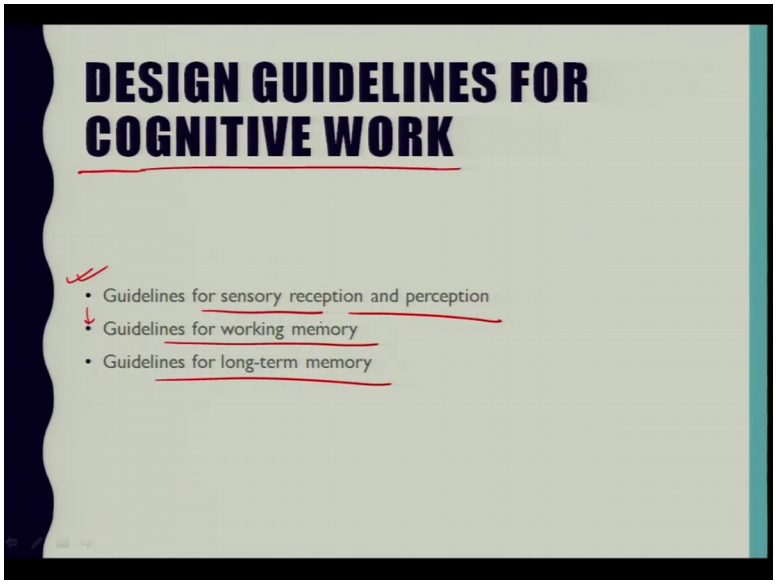

So, in that series first we will try to discretize our discussion on the basis of various component of human information processing model. So, this design guidelines and principles we will discuss first for sensory reception and perception, then we will discuss about the guidelines for working memory and then guidelines for long term memory. So, here in this lecture we will try to complete this sensory reception and perception and if time permits then we will go for working memory otherwise we will cover in next lecture.

So, first the guidelines for sensory reception and perception.

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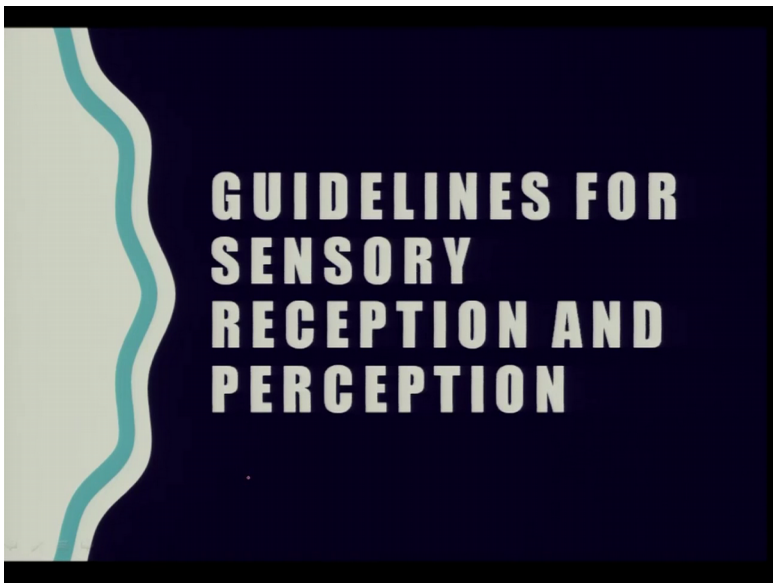

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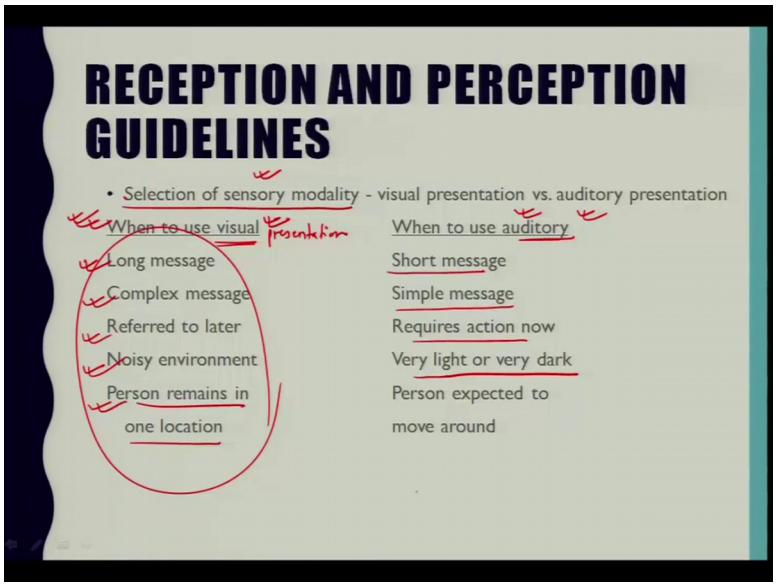

So, in this particular topic so the selection of sensory modality, so what could be the design guidelines for the selection of the sensory modality. So, as we know that as far as this human senses are concerned. So, about 90 percent 95 percent of the information that we capture and that we execute based on our action and so that information with us about 95 percent of the information we received with the help of only to human senses. So, those are the information by means of visual and hear hearing sensory moods, in many situations the question arises that whether it is better to present the information by means of visual or an auditory stimulus.

So, there are some guidelines on selecting the sensory modalities which is present here. So, like other sensory modes are not usually considered accept in spatial cases like for blind people or the persons who are differently abled. So, as a general rule it is better to present warning messages using both visual and audible stimuli. So, if only one stimulus can be used as a warning message then the auditory mode is more effective in another thing people. So, here some of the guidelines for selecting visual or auditory presentation mode so when to use visual mode or when to use audit.

So, when to use visual presentation, when message is long, when message is complex, when message will be referred to later, when your environment is noisy, when a person receiving the message is expected to remain in one location. So, in these situations you use visual presentation and when to use auditory presentation. So, the message is short,

message is ship simple, message requires immediate action, very light or very dark location is either very bright or very dark and person receiving the message is expected to be moving around.

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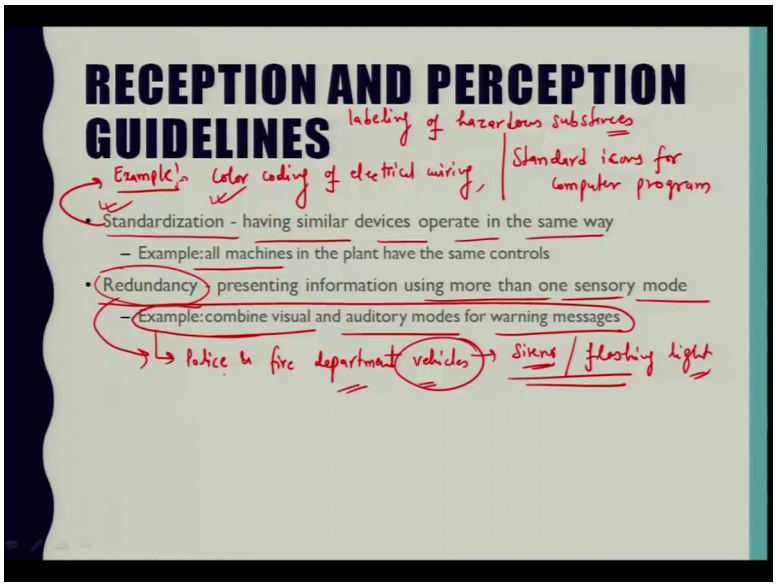

So, reception and perception guidelines in that station, it is an accepted principle in nearly all designer situations and ergonomic design it means that having similar devices operate the same way for example, a person can work in one machine and then relocate to another machine and that second machine has the same kind of control. Other example of standardization you can take as, like color coding you can take as an example like color coding of electrical wiring or labeling of hazardous substances, one more example we can take as standard icons which we produce or which does particular computer has. So, for programming purpose and all system the all icons for computer program so these are the some of the standardization which is being used in order to have situation in a more comfortable way. The second is redundancy, so in that redundancy it is sometimes important to present information using more than one sensory mode.

So, the combination of a visual and auditory modes for warning messages is we can take as a very good example, another example we can take as that police and fire departments though vehicles they use. So, basically police and fire department vehicles in fact, those vehicles use sirens and they also use flashing light. So, at the same time both things are happening. So, you can take as a combination of this visual and auditory mode as an

example of this redundancy. So, another kind of example you can take in any industry a machine operator is more likely to be alerted with the help of like that if something is going wrong with his machine. So, some sort of signal with the help of use of both auditory and visual signals. So, those auditory and visual warnings can be taken as an example of redundancy. So, another case is graphical displays.

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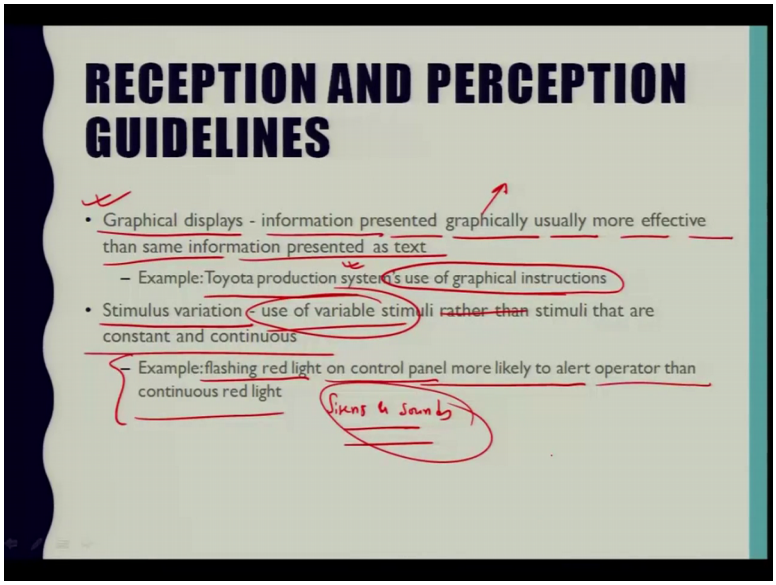

So, in graphical displays information presented graphically usually more effective then same information presented as text. So, this graphically it may be a any photograph bar or pie charts. So, in the graphical display one example we can take as in Toyota production system the work instructions are documented using combination of written instructions and pictures. So, that combination you can take it as an graphical displays, like a photograph of various kinds of defect that piece that is produced in that production system.

So, the, we can take photograph and the machine operate operator should done watch out those parts in and take the necessary course of action at that particular time. So, another case is stimulus variation. So, it is often useful to provide stimuli rather than stimuli that are constant and continuous. So, this variable stimuli is used rather than constant and continuous for example, flashing a red light on a control panel is more likely to grab and operators attention than a continuous red light that is going on when the operator was

looking away so silence and sounds intermittently or variant tone or more effective warning than a tiled and monotonous sirens.

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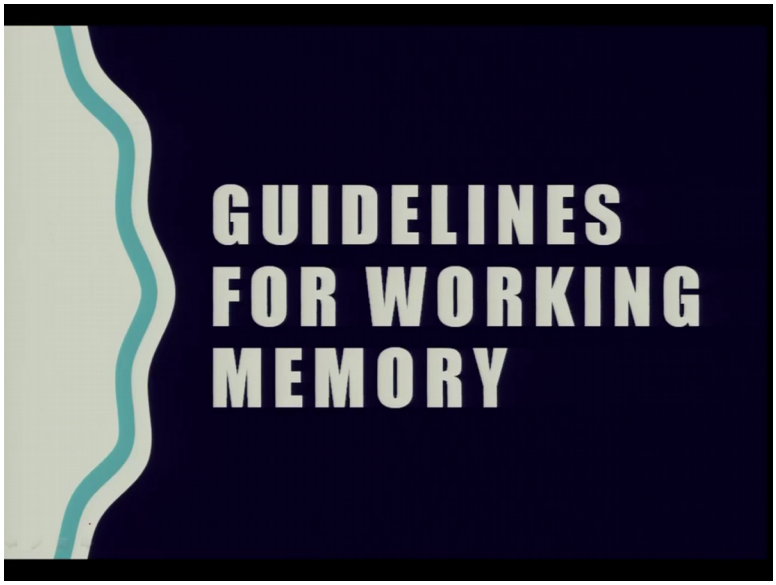

So, now we will also cover this guidelines for working memory.

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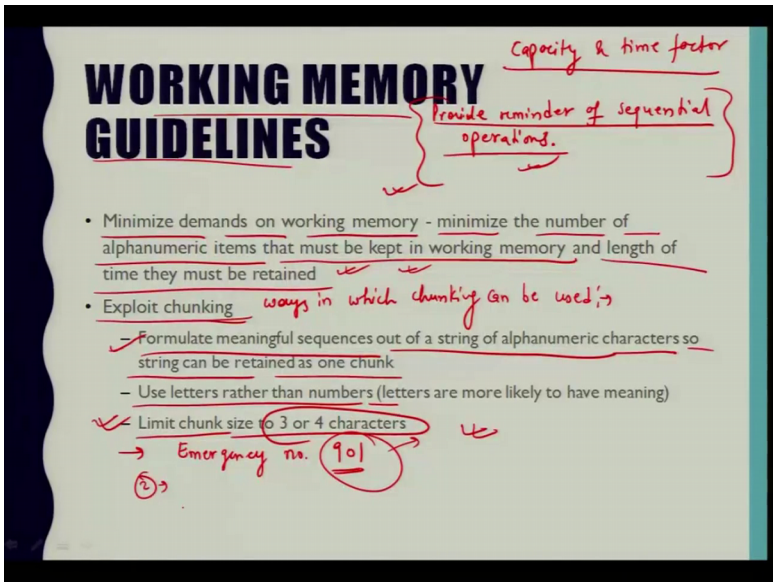

So, in these working memory guidelines the most of the design guidelines which we are going to discuss are aimed at mitigating the limitations of a working memory. So, the limitation of working memory is its capacity and time factor that we have understood in some previous lecture. So, in that context like minimize demands on working memory so

this is a common rule; that means, that, that we have to design the mental workload. So, as to minimize the number of alphanumeric items and that must be kept in working memory and length of the time they must be retain. So, for example, a manufacturing company could implement this kind of rule by adopting a part number system with few word digits, like we know that the capacity of our memory is only he can recall 7 digits information at particular time, which we termed as a chunk.

So, it is better to have a for a manufacturing company that instant of having a long digit number let us say more than 7 it may split into 5 or less than that 5. So, so using a 5, let us say 5 digit number instead of more than 7 digit number. So, people in the company would have a much easier time working with these small numbers, another guideline for this is the exploit chunking. So, the working memory is limited to processing 7 or so chunks of information at one time, chunk is nothing, but a one piece of information that has that has some meaning. So, if it is not limited to the single digit or characters.

So, a given the way working memory manages chunks there are several ways in which chunking can be used. So, ways in which this chunking can be used, those are formulate a meaningful sequences out of a string of alphanumeric character so that the string can be retained as one chunk like for example, here it is not mentioned. So, another example I can take like any emergency number let us say it is 9 0 1 which is sufficiently familiar to the people that is written as a single chunk, second is favor the use of letter one numbers because they are more likely to have meaning so use letters rather than number. The third kind of possible way in which chunking can be done or in can be performed that is the limit the chunk size to size of 3 or 4 characters.

So, in which way, in this way we can retain that particular information in working memory and it can be used for further thing, take another kind of thing that we can add up here like if we could provide reminders for sequential operation. So, this kind of guideline is intended for work site is consists of multiple steps during which the worker might become distracted you can say and forget which steps have been completed. So, most of us have found our self saying now where was I. So, where we were interested in the middle of doing something and implementing this kind of guideline means providing some form of a visual feedback to help operator from where he has started and where exactly his a particular task is at that moment. So, for that the if you could provide

reminder. So, that could be also one of the helpful technique. So, in this way the guidelines for working memory have described in these 3 or 4 aspects.

So, now some of the guidelines for long time memory. So, here let us say in non repetitive and batch operations the workers are often required to remember facts and procedures that are retrieved from long time memory.

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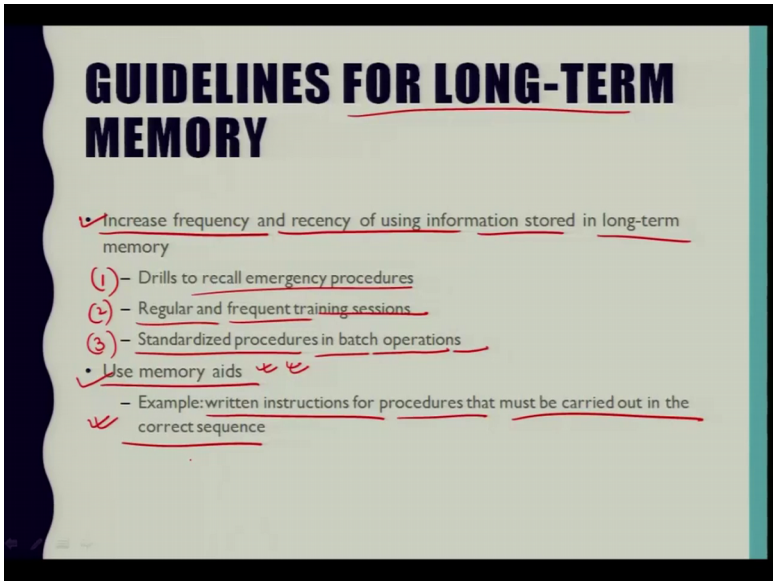

So, when they must perform a task that was last performed some months ago or like performed some months or years before. So, the following guidelines are intent to avoid problems that might be encountered due to the limitation of long term memory. So, what we can do like increase the frequency and decency of using information stored in long time memory and also use memory aids. So, retrieval of specific pieces of information from long time memory is added by increasing the frequency and decency with which it is record. So, there are several ways these guidelines can be represented or implemented. So, the first kind of guideline maybe having address to recall emergency procedures, holding a regular and frequent training sessions and third is standard procedures or standardizing procedures in batch operation. So, that all kind of job consists of similar steps or approaches, second kind of guideline for long time memory is using memory aids. So, for task that are performed in frequently or where it is important that steps in the task carried out in the correct order and that none be omitted. So, we will use the set a

written instructions for the procedures that must be carried out in correct sequence. So, memory aids can take the form of a paper document or any a digital instructions.

So, in this way those some of the possible guidelines which researchers have experienced and based on their experiences they have listed down some of the guidelines for using a short time memory or for enhancing the performance of several memories like working memory and long time memory. So, in this way we will close this chapter and just for the fact do you know that I crying is good for health.

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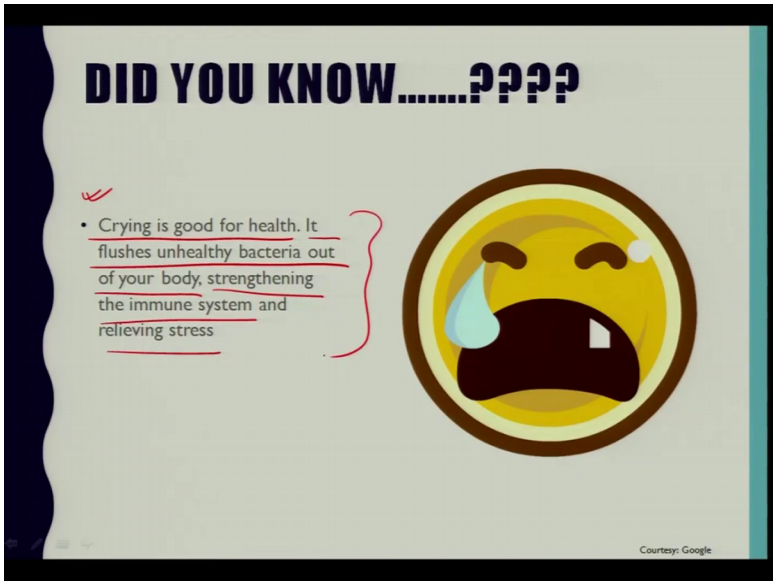

So, keep on crying and it flushes unhealthy bacteria out of your body is strengthening the immune system and relieving stress. So, there is no harm in crying and when you are crying you have to relieved condition that you are going to be healthy after one cry.

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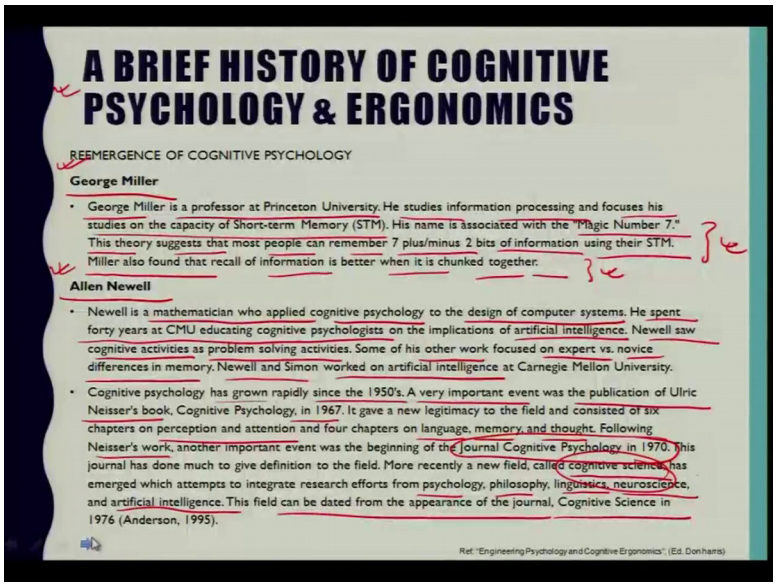

So, now, again as far as our history of cognitive psychology that we are covering from a pass lectures which is I am putting at the very last. So, that a refreshing can be performed in terms of the cognitive psychology is various progress. So, George miller and Allen Newell work we will we will we will know today that George miller is a professor at Princeton university and he is study is information processing and focuses his a studies on the capacity of short time memory, his name is associated with magic number 7.

This theory suggest that most people can remember 7 plus or minus 2 bits of information using this their STM. So, this we have learned, miller also found that recall of information is better when it is chunked together. So, that we were learning in the, in on our previous slides and another scientist Allen Newell, he is a mathematician who applied cognitive psychology to the design of computer systems. He is spent 40 years at CMU educating cognitive psychologist on the implication of artificial intelligence, Newell saw cognitive activities as problem solving activities.

Some of his work focused on experts versus noise and differences in memory, Newell and Simon worked on a artificial intelligence at Carnegie Mellon university. Cognitive psychology has grow rapidly since 1950's a very important events the publication of uric Neissers book cognitive psychology in 1967, it gave a new legitimacy to the field of and consistent of 6 chapters on perception and attention and 4 chapters on language memory and thought. Following Neissers work another important event was the beginning of the

general cognitive psychology in 1970, this general has done much to give definition to the field more recently and new field called cognitive science has emerged which attempts to integrate research efforts from psychology philosophy linguistics neuroscience and artificial intelligence, this field can be deleted from the appearance of general cognitive science in 1976. So, another field that is cognitive science as a now is having proper attention from various researchers.

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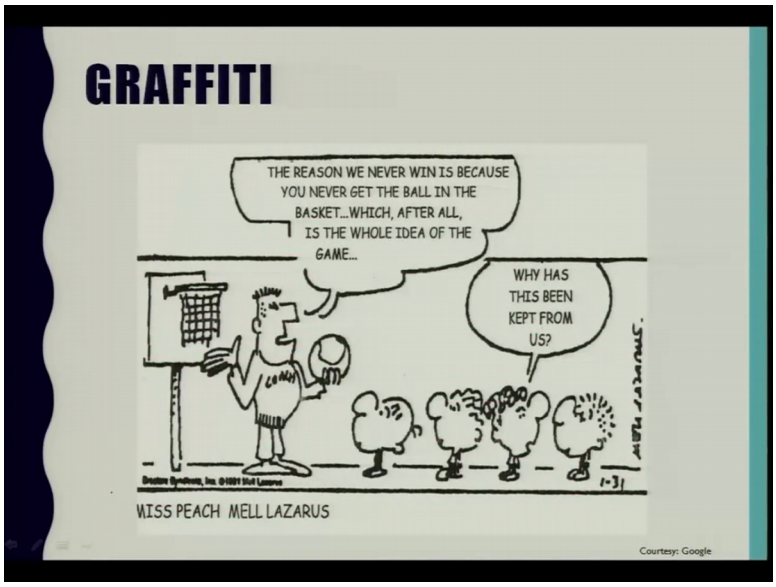

So, there is a graffiti for you I am giving you for you to read and enjoy that is all for now.

Thank you.