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# Written home-exam in human cognition in human-computer interaction 2020

## INSTRUCTIONS (read these carefully!):

The length on the answers to the essay questions can vary depending on how things are expressed, but aim for at most 2 pages/question. The time devoted to writing the exam need not be more than 4 hours, i.e. the time that would have been allowed should the written home exam have been a regular written exam at DSV.

* Structure your answer and your argumentation.
* Use headings as a support in structuring your answers.
* Use references to the literature in your answers. The course literature must be referred to in your answers (use conventional referencing procedures – which system does not matter as long as you stick to one system).
  + Anderson, J. R. Cognitive Psychology and it´s implications
  + Winograd, T., & Flores, F. Understanding computers and cognition.
  + You can also refer to other literature should you want to do so.
* Name the file with your name and write your name and student ID in the document!
* The essays will be checked for plagiarism using Urkund.

Write your answers in this document and submit it in the “Written home exam/Post your written exams here” - assignment submission box, no later than 12:00 hours Thursday 22nd of October.

## INSTRUKTIONER (läs dessa noggrant!):

Längden på svaret på frågorna kan naturligtvis variera beroende på hur man uttrycker sig, men sikta på som mest 2 sidor text/fråga. Den tid som läggs ner på att svara på frågorna behöver inte överskrida 4 timmar, d.v.s. den tid som normalt tillåts vid ordinarie salstentamen vid DSV.

* Strukturera ditt svar och din argumentation.
* Använd rubriker som ett stöd för att strukturera ditt svar.
* Använd referenser till litteraturen i dina svar. Kurslitteraturen måste refereras till i svaren (använd konventionell referenshantering – vilket system spelar ingen roll, bara du är konsekvent).
  + Anderson, J. R. Cognitive Psychology and it´s implications
  + Winograd, T., & Flores, F. Understanding computers and cognition.
  + Du kan också använda annan litteratur om du skulle vilja göra det.
* Spara dokumentet i ditt namn och skriv ditt namn och student-ID i dokumentet!
* Essäsvaren kommer att plagiatkontrolleras med Urkund.

Skriv dina svar i detta dokument och posta det i ”Written home exam/Post your written exams here” - uppgiftslådan senast kl 12:00 torsdag 22:a oktober.

## QUESTION 1:

Within cognitive psychology, theories about how people represent knowledge are discussed. The course book (Anderson) presents and discusses two main ways of knowledge representation; perception-based knowledge representation and meaning-based knowledge representation.

What possible impact do these theories have for the design of multimedia ICT support for learning? In your answer, select the aspects you consider to be central, exemplify and argue for your positions and suggestions, based on the course book (Anderson).

## FRÅGA 1:

Inom kognitionspsykologin diskuteras teorier om hur vi människor representerar kunskap. I kursboken (Anderson) presenteras och diskuteras två huvudsakliga representationssätt; perceptionsbaserad kunskapsrepresentation och meningsbaserad kunskapsrepresentation.

Vilken möjlig inverkan har dessa teorier för design av multimediala IKT stöd för lärande. I ditt svar, välj ut aspekter du anser vara centrala, exemplifiera och argumentera för dina ståndpunkter och förslag förankrat och baserat på kursboken Anderson.

### MY ANSWER TO QUESTION 1

**Introduction**

Within cognitive psychology one very important topic that takes in lots of discussion is knowledge representation. Knowledge is processed information that comes from data and has some value for us and then we move on and represent in in a way “convenient for us”. Two main ways of how we represent knowledge are discussed and analyzed more deeply, perception-based representation and knowledge-based representation. Perception-based representation refers to the representations of knowledge that preserve the structure. On the other hand meaning-based representation refers to the representation of knowledge that preserves the meaning.

**Perception-based representation and its impact for the design of multimedia ICT support for learning**

(1)Lets take in consideration Paivio’s dual-code theory. He claims that we represent information in combined verbal and visual codes. According to him when we hear a sentence, we also develop a visual image of what it describes. Same when we look at an image we make a verbal description of it. The significant features are those that we ”transform” into verbal/visual code of what is given to us. Taking this theory in consideration and having acknowledgment of it helps the design of the multimedia ICT. Knowing one aspect of how we “translate” information helps those designing the ICT put the learning information in such way that it will be better perceived by humans. Now they will know that the very important aspects of what they are trying to teach should be pointed out in such way that the people will consider them important and therefore also give that important information an extra visual/verbal coding.

**Meaning-based representation and its impact for the design of multimedia ICT support for learning**

When talking about meaning-based representation semantic networks come in play. (2)According to Quillian people store information about various categories in a network structure. Links between the networks provide useful information. It can be said that semantic networks just store properties with concepts and cannot capture general knowledge(e.g. the typical size of a house). Therefore schemas are presented. Schemas are similar to data structures. They represent categorical knowledge. The term slots is associated with them and is referred to the attributes that a category has. Concepts are presented as supersets, parts etc. Taking in consideration the above it impacts and helps the design of multimedia ICT support. That is because if the designers know how humans organize/categorize information/knowledge they will present it in such ways that comes as close to that structure as possible. This could also be called reversed engineering because they “know” how we will process the information so they go backwards from that and make a design that comes close to that way of processing.

**Suggestions**

Taking in consideration what was stated above I could suggest the following when it comes to the design of the multimedia ICT support for learning:

* Based on Paivio’s dual-code theory. It could be preferred to accompany text with images. When getting text we create our own image, but it could be better to get a precise image from those who teach/show the knowledge. Same applies for when providing an image, in many cases it could be useful to accompany that with some text explanation.
* The parts of text/image that are more important should be pointed out in some way(e.g bold letters, center the most important part of the image etc). Doing this gives a better chance that the learners(humans) will actually consider those parts/features as the most important ones(as they are).
* If we take in consideration Quillian’s theory about semantic networks and how we store the information, I could suggest that it’d be better if the information presented starts as abstract and then dives into more details and specializes on it.
* In the slots mentioned above humans usually have some default values. (3)That was also verified by the experiment conducted by Brewer and Treyens(1981) where they had subjects wait in an office for 35 seconds and then move them to another room and ask them about the objects they saw there. The subjects though didn’t know that they were going to be tested and therefore they may have not payed much attention to the objects in the office. The results showed that the participants recalled the objects that were there and were also default values for the schema(e.g chair, desk) but also recalled objects that are default values of the schema but were not there. The reason i’m pointing this out is because we will automatically make association with default values for some catoegories. The information should be presented in that way that no such assumptions could be allowed to made if the default values do not hold, by that we avoid misinterpretation of the infromation. Or if the defaults values do hold then encourage the learners to make such assumptions so that the learning becomes easier and more remembale.

**Conclusion**

There are many aspects that may affect the way we represent, perceive and give meaning to information and turn into knowledge. By defining them, helps present information in ways that people can get the most out of it and get the right messages from what is presented. Therefore perception-based representation and meaning-based representation should be studied and taken into account when it comes to providing efficient learning.

**References**

(information from the lecture slides was also used)

-Cognitive Psychology and Its Implications Eighth Edition, John R. Anderson:

(1)Chapter 5: Representation of Knowledge

(2)Chapter 5: Representation of Knowledge

(3)Chapter 5: Representation of Knowledge

### MITT SVAR TILL FRÅGA 1

Skriv ditt svar här …

QUESTION 2:

The driving school "Honk-the-horn" in Stockholm, has renewed its teaching and training strategy and is in particular stuck for ideas of "learning by doing” and that learning is best done in contexts where the knowledge is used. The result is that students are literally thrown out into the Stockholm traffic. Teachers at the driving school marvel, however, that their students, despite the new pedagogy, seem to have severe difficulties to learn to deal with changing gear in a car, steering the car with the steering wheel, problems with the clutch, gas and brake. It has been particularly noticed that these problems seem to get bigger in traffic situations involving the interpretation of traffic signs, pedestrians, cyclists, etc., i.e. situations that are more intense.

The traffic school has now called you in as an expert and advisor on the subject. The traffic school wants to do an evaluation of the new pedagogy and therefore demands that a document is written that they can have as a basis for evaluation of their new pedagogy. What is pictured is a document related to the problems they have experienced (described above) and that deals with relevant processes and concepts in cognitive psychology, and more specifically attention, memory, and perception. Write the document that is asked for and base and anchor your writing on the facts from the course book Anderson, particularly

-perception, attention and memory.

FRÅGA 2

Trafikskolan ”Tuta-och-kör” i Stockholm har förnyat sin pedagogik och särskilt fastnat för begrepp om ”learning by doing” och att lärande bäst sker i kontexter där kunskapen ska användas. Resultatet har blivit att elever bokstavligt talat kastas ut i Stockholmstrafiken. Lärare vid trafikskolan förundras emellertid över att deras elever trots den nya pedagogiken verkar ha väldigt svårt att lära sig hantera redskapen i en bil, såsom ratt, att byta växel, koppling, gas och broms. Man har särskilt lagt märke till att dessa problem verkar eskalera i trafiksituationer som inbegriper tolkning av trafikskyltar, gående, cyklister, etc., dvs. situationer som är mer intensiva.

Trafikskolan har nu kallat in dig som expert och rådgivare i ämnet. Trafikskolan vill göra en utvärdering av den nya pedagogiken och efterfrågar därför ett dokument man kan ha som grund för utvärdering av sin nya pedagogik. Man ser framför sig ett dokument som relaterar till de problem man har och behandlar relevanta processer och begrepp inom kognitionspsykologi, och mer specifikt om uppmärksamhet, minne, och perception. Författa dokumentet som efterfrågas och basera dokumentet på fakta från kursboken Anderson, särskilt

-perception, uppmärksamhet och minne.

### MY ANSWER TO QUESTION 2

**Introduction**

Now days a very common technique called “learning by doing” is used in many situations that require learning. That technique is also implemented by the driving school “Honk-the-horn”. At first this idea seems very good and that it could be efficient since practice and doing things leads to eventually learning them. The results though are the opposite and the driving students had many difficulties into learning. When in traffic the student will be susceptible to lots of stimuli. The stimuli will attract attention and that will lead to perception. Then memory will also be activated. These three factors together can explain why the students are not performing well and are facing difficulties. So lets dive deeper into the problems and first see how attention, perception and memory on their own have an affect and then all combined together.

**Role of attention**

When driving lots of attention is required. Being in traffic means that lots of stimuli is presented. (1)According to The Filter Theory by Broadbent(1958) sensory information comes through the system until some bottleneck is reached. At that point the person chooses what stimuli/information to process and filter out the other information. In our case the problem is that the student is new to that kind of stimuli so how could he decide what information to keep and what to ignore. Therefore when the student is in traffic situations that involve the interpretation of traffic signs, pedestrians, cyclists, etc he will face lots of stimuli and a panic of how to handle it will be presented. Even if he has the knowledge of that(e.g when light is green go, pedestrians line stop) combination of all these may confuse him even more and maybe some useful information will be filtered out.

**Role of perception**

Lets now suppose that attention was achieved perfectly. Perception means awareness and understanding of a situation which will lead to an action. That action in our case might be steering the car wheel, changing gear etc. So based on the stimuli the student must act out. When the student may have never been in that situation before or only a few times the action may not be the correct one or maybe acted out wrong since there is lack of practice of the action. Also since many stimuli may need to be considered and lead to combined actions another factor of confusion maybe introduced. Lets not forget that at the moment of driving, especially when learning to drive there is high mental workload combined with high situation awareness. Those two together at high levels do not lead to the best performance.

**Role of memory**

Memory can be divided in two parts, working memory and long term memory. When learning how to drive both of them may play a part of it. Lets have a look at the theory of memory before we explain how working and long term memory affect the driving lessons experience. Two concepts are involved, activity and strength. Activity decides the availability of a memory at a certain time. Strength decides the duration of memory. The student may have some theoretical knowledge. But when it comes to performing some acts, like change the gear that takes time to master. So the activity will be high but strength will be low. Therefore those will be learned so eventually they can be part of the long term memory and that takes some time. That explains them have difficulties to learn and deal with gas, brakes etc.

**Extra factors**

Something than may also play a role into the bad performance of the students is stress, anxiety of performing well and fear of big/tragical mistakes since they are put immediately into real life situations. Anxiety may distract them from really perceiving what they should and therefore not a good performance.

**Conclusion**

Since attention, perception and memory individually impact the students’ performance in the way they are learning it only makes sense that all together have a big impact on it. They all together are needed for us to achieve every day tasks, as learning, driving and learning how to drive.

**References**

(information from the lecture slides was mainly used)

-Cognitive Psychology and Its Implications Eighth Edition, John R. Anderson:

(1)Chapter 3: Attention and Performance

### MITT SVAR TILL FRÅGA 2

Skriv ditt svar här …