

# W4: ■ COGNITIVE ASPECT

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CGNITIVE?

# COGNITION

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Cognition refers to "the mental action or process of obtaining knowledge through experience, observation, and the senses"

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# COGNITIVE PROCESSES

It is important to note that many of these cognitive processes are interdependent: several may be involved for a given activity

ATTENTION

PERCEPTION

MEMORY

LEARNING

READING, SPEAKING AND LISTENING

PROBLEM-SOLVING

PLANNING

REASONING AND

DECISION-MAKING

# ATTENTION

The behavioral and cognitive phenomenon of reflecting selectively on a particular aspect of knowledge, whether considered personal or logical, while avoiding other noticeable information, is attention.



A: FIND THE PRICE OF A DOUBLE ROOM

AT THE HOLIDAY INN IN BRADLEY

	Pennsylvania				
1	Bedford Motel/Hotel: Crinaline Courts				
	(814) 623-9511 S: \$118 D: \$120				
2	Bedford Motel/Hotel: Holiday Inn				
	(814) 623-9006 S: \$129 D: \$136				
3	Bedford Motel/Hotel: Midway				
	(814) 623-8107 S: \$121 D: \$126				
4	Bedford Motel/Hotel: Penn Manor				
	(814) 623-8177 S: \$119 D: \$125				
5	Bedford Motel/Hotel: Quality Inn				
	(814) 623-5189 S: \$123 D: \$128				
6	Bedford Motel/Hotel: Terrace				
	(814) 623-5111 S: \$122 D: \$124				
7	Bradley Motel/Hotel: De Soto				
	(814) 362-3567 S: \$120 D: \$124				
8	Bradley Motel/Hotel: Holiday House				
	(814) 362-4511 S: \$122 D: \$125				
9	Bradley Motel/Hotel: Holiday Inn				
	(814) 362-4501 S: \$132 D: \$140				
10	Breezewood Motel/Hotel: Best Western Plaza				
	(814) 735-4352 S: \$120 D: \$127				
11	Breezewood Motel/Hotel: Motel 70				
	(814) 735-4385 S: \$116 D: \$118				

B: FIND THE PRICE OF A DOUBLE ROOM

AT THE HOLIDAY INN IN COLUMBIA

	South Carolina				
	City	Motel/Hotel	Area code	Phone	Rates Single Double
1	Charleston	Best Western	803	747-0961	\$126 \$130
2	Charleston	Days Inn	803	881-1000	\$118 \$124
3	Charleston	Holiday Inn N	803	744-1621	\$136 \$146
4	Charleston	Holiday Inn SW	803	556-7100	\$133 \$147
5	Charleston	Howard Johnsons	803	524-4148	\$131 \$136
6	Charleston	Ramada Inn	803	774-8281	\$133 \$140
7	Charleston	Sheraton Inn	803	744-2401	\$134 \$142
8	Columbia	Best Western	803	796-9400	\$129 \$134
9	Columbia	Carolina Inn	803	799-8200	\$142 \$148
10	Columbia	Days Inn	803	736-0000	\$123 \$127
11	Columbia	Holiday Inn NW	803	794-9440	\$132 \$139
12	Columbia	Howard Johnsons	803	772-7200	\$125 \$127
13	Columbia	Quality Inn	803	772-0270	\$134 \$141
14	Columbia	Ramada Inn	803	796-2700	\$136 \$144
15	Columbia	Vagabond Inn	803	796-6240	\$127 \$130

# DESIGN IMPLICATIONS FOR ATTENTION

- **Make information significant when it needs attending to**
- **Use techniques that make things stand out like color, ordering, spacing, underlining, sequencing and animation**
- **Avoid cluttering the interface with too much information**
- **Search engines and form fill-ins that have simple and clean interfaces are easier to use**

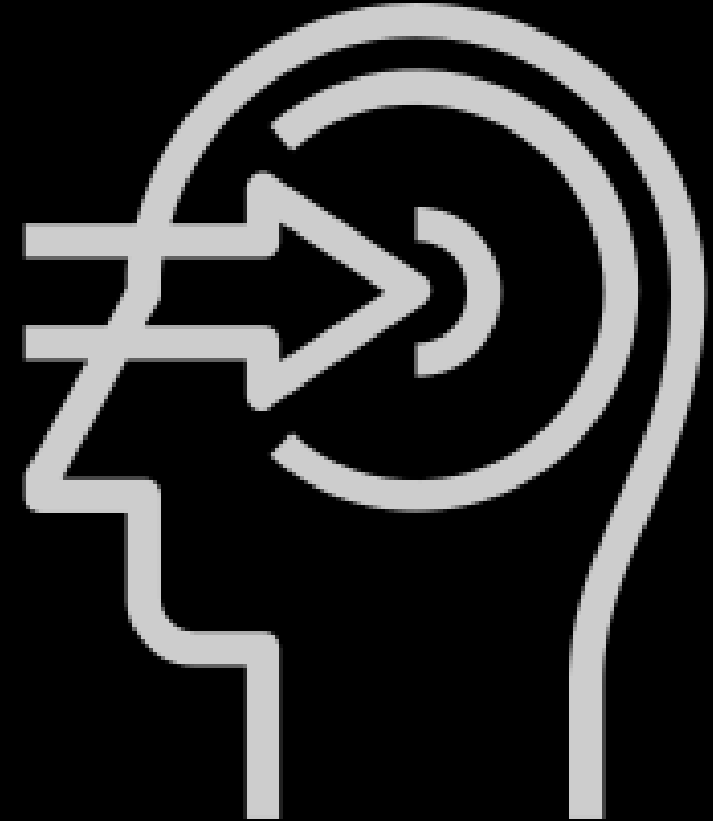
# NOTE!



- Tullis (1987) found that the two screens produced quite different results
  - 1st screen - took an average of 5.5 seconds to search
  - 2nd screen - took 3.2 seconds to search
- Why, since both displays have the same density of information (31%)?
- Spacing
  - In the 1st screen the information is bunched up together, making it hard to search
  - In the 2nd screen the characters are grouped into vertical categories of information making it easier

# PERCEPTION

Perception is the organization, recognition and interpretation of sensory input in order to represent and comprehend the information or environment provided.





## A: IS COLOR CONTRAST GOOD?

## FIND ITALIAN

1	Black Hills Forest Cheyenne River Social Science South San Jose Badlands Park Juvenile Justice	Peters Landing Public Health San Bernardino Moreno Valley Altamonte Springs Peach Tree City	Jefferson Farms Psychophysics Political Science Game Schedule South Addison Cherry Hills Village	Devlin Hall Positions Hubard Hall Fernadino Beach Council Bluffs Classical Lit
2	Results and Stats Thousand Oaks Promotions North Palermo Credit Union Wilner Hall	Highland Park Manchesney Park Vallecito Mts. Rock Falls Freeport Slaughter Beach	Creative Writing Lake Havasu City Engineering Bldg Sports Studies Lakewood Village Rock Island	Sociology Greek Wallace Hall Concert Tickets Public Radio FM Children's Museum
3	Performing Arts Italian Coaches McKees Rocks Glenwood Springs Urban Affairs	Rocky Mountains Latin Pleasant Hills Observatory Public Affairs Heskett Center	Deerfield Beach Arlington Hill Preview Game Richland Hills Experts Guide Neff Hall	Writing Center Theater Auditions Delaware City Scholarships Hendricksville Knights Landing
4	McLeansboro Experimental Links Graduation Emory Lindquist Clinton Hall San Luis Obispo	Brunswick East Millinocket Women's Studies Vacant News Theatre Candlewood Isle	Grand Wash Cliffs Indian Well Valley Online Courses Lindquist Hall Fisk Hall Los Padres Forest	Modern Literature Studio Arts Hughes Complex Cumberland Flats Central Village Hoffman Estates

## B: ARE BORDERS AND WHITE SPACE

## BETTER? FIND FRENCH

1	Webmaster Russian Athletics Go Shockers Degree Options Newsletter	Curriculum Emergency (EMS) Statistics Award Documents Language Center Future Shockers	Student Life Accountancy McKnight Center Council of Women Commute Small Business	Dance Gerontology Marketing College Bylaws Why Wichita? Tickets
2	Geology Manufacturing Management UCATS Alumni News Saso	Intercollegiate Bowling Wichita Gateway Transfer Day Job Openings Live Radio	Thinker & Movers Alumni Foundations Corbin Center Jardine Hall Hugo Wall School	Career Services Doers & Shockers Core Values Grace Wilkie Hall Strategic Plan Medical Tech
3	Educational Map Physical Plant Graphic Design Non Credit Class Media Relations Advertising	Beta Alpha Psi Liberal Arts Counseling Biological Science Duerksen Fine Art EMT Program	Staff Aerospace Choral Dept. Alberg Hall French Spanish	Softball, Men's McKinley Hall Email Dental Hygiene Tenure Personnel Policies
4	English Graduate Complex Music Education Advising Center Medical School Levitt Arena	Religion Art Composition Physics Entrepreneurship Koch Arena Roster	Parents Wrestling Philosophy Wichita Lyceum Fairmount Center Women's Museum	Instrumental Nursing Opera Sports History Athletic Dept. Health Plan

# DESIGN IMPLICATIONS FOR PERCEPTION

- Icons should enable users to readily distinguish their meaning
- Bordering and spacing are effective visual ways of grouping information
- Sounds should be audible and distinguishable
- Speech output should enable users to distinguish between the set of spoken words
- Text should be legible and distinguishable from the background
- Tactile feedback should allow users to recognize and distinguish different meanings

# NOTE!



- Weller (2004) found people took less time to locate items for information that was grouped
  - using a border (2nd screen) compared with using color contrast (1st screen)
- Some argue that too much white space on web pages is detrimental to search
  - Makes it hard to find information
- Do you agree?

# MEMORY

Memory is the brain faculty that encodes, stores, and retrieves data or information as needed. That is the basis for learning over time in order to affect future action.



# LETS TRY THIS!

- Try to remember the dates of your grandparents' birthday
- Try to remember the title of the last movie bought, rented or watch
- Which was easiest? Why?
- People are very good at remembering visual cues about things
  - e.g. the color of items, the location of objects and marks on an object
- They find it more difficult to learn and remember arbitrary material
  - e.g. birthdays and phone numbers

# DESIGN IMPLICATIONS FOR MEMORY

- Don't overload users' memories with complicated procedures for carrying out tasks
- Design interfaces that promote recognition rather than recall
- Provide users with various ways of encoding information to help them remember
  - e.g. categories, color, flagging, time stamping

# LEARNING

Learning is a method of developing new insight, experience, behavior, talents, beliefs, attitudes and desires.



# COGNITIVE PROSTHETIC DEVICES

- We rely more and more on the internet and smartphones to look things up
- Cognitive resource cf. extended mind
- Expecting to have internet access reduces the need and extent to which we remember
- Also enhances our memory for knowing where to find it online (Sparrow et al,2011)
- What are implications for designing technologies to support *how* people will learn, and *what* they learn?



# DESIGN IMPLICATIONS FOR LEARNING

- **Design interfaces that encourage exploration**
- **Design interfaces that constrain and guide learners**
- **Dynamically linking concepts and representations can facilitate the learning of complex material**

**READING,**

**SPEAKING, &**

**LISTENING**

- The ease with which people can read, listen, or speak differs
- Many prefer listening to reading
- Reading can be quicker than speaking or listening
- Listening requires less cognitive effort than reading or speaking
- Dyslexics have difficulties understanding and recognizing written words

# APPLICATIONS

- **Speech-recognition systems allow users to interact with them by asking questions**
  - e.g. Google Voice, Siri
- **Speech-output systems use artificially generated speech**
  - e.g. written-text-to-speech systems for the blind
- **Natural-language systems enable users to type in questions and give text-based responses**
  - e.g. Ask search engine

# DESIGN IMPLICATIONS FOR R.S.L

- Speech-based menus and instructions should be short
- Accentuate the intonation of artificially generated speech voices
  - they are harder to understand than human voices
- Provide opportunities for making text large on a screen

# PROBLEM-SOLVING, PLANNING, REASONING & DECISION-MAKING

- All involves reflective cognition
  - e.g. thinking about what to do, what the options are, and the consequences
- Often involves conscious processes, discussion with others (or oneself), and the use of artefacts
  - e.g. maps, books, pen and paper
- May involve working through different scenarios and deciding which is best option

## DESIGN IMPLICATIONS FOR PS.P.R.DM.

- Provide additional information/functions for users who wish to understand more about how to carry out an activity more effectively
- Use simple computational aids to support rapid decision-making and planning for users on the move

# EXTERNALIZING TO REDUCE MEMORY LOAD

- Diaries, reminders, calendars, notes, shopping lists, to-do lists
  - written to remind us of what to do
- Post-its, piles, marked emails
  - where placed indicates priority of what to do
- External representations:
  - Remind us that we need to do something (e.g. to buy something for mother's day)
  - Remind us of what to do (e.g. buy a card)
  - Remind us when to do something (e.g. send a card by a certain date)

# DESIGN IMPLICATIONS FOR ERML.

- Provide external representations at the interface that reduce memory load and facilitate computational offloading
  - e.g. Information visualizations have been designed to allow people to make sense and rapid decisions about masses of data