COGNITION AND LANGUAGE

FEM 4102
(Unit 1 - 10/10)

Bachelor Science (Human Development) Programme

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INTRODUCTION

a. Course Information

**Name of Course:** Cognition and Language

**Course Code:** FEM 4102

**Credit Hour:** 3 (3+0)

This course comprises 3 hours of lecture per week. It focuses primarily on the relationship between language processes and cognition in the context of human development.

The authors of this module, Professor Dr. Rozumah Baharudin and Ms. Nor Sheereen Zulkifly would first of all like to welcome and wish you all the best in this course.

This course will introduce you to cognitive psychology; how the mind works, and its relationship to language processing among humans. The units in this module cover a wide range of topics, and specifically it is organized into three different parts: Information-processing stages, representation and organization of knowledge, and complex cognitive skills.
b. Authors Information

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c. Module Objectives

FEM 4102 is a compulsory course for the Bachelor Science (Human Development) programme. At the end of this module students will be able to:

1. Discuss basic concepts in psycholinguistic and cognitive psychology.
2. Discuss main aspect of language acquisition skills, communication and individual cognitive development.
3. Describe the relationship between language development and individual cognitive development.


d. Course synopsis

This course provides an introduction to psycholinguistic development and the psychology of cognition as well as discussions on the relationships between language processes and cognition processes in the context of human development.

(Kursus ini memberi pengenalan kepada perkembangan psikolinguistik dan psikologi kognisi serta perbincangan mengenai perkaitan antara proses bahasa dengan proses kognisi dalam konteks pembangunan manusia).
e. Course Content

This course will require a total of 42 hours of lectures (3 x 14 weeks). Given that this is a long distance education course you will need to organize your required study hours on your own. In addition to reading the learning units in this module, you are strongly suggested to read the main reference and other references noted below. This will help you to further understand the materials presented in this module. Your extra reading will surely enriched your knowledge on the topics focus in this course.

This module is divided into 10 units that cover the various main topics. Table 1 presents the weekly division of topics that students should follow closely in order to study the materials in this module. Table 2 provides a detail content of each unit in the module.

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| 5. | **Language Comprehension and Production**  
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Summary |
| 6. | **Language and Thought**  
Relationship between Language and Thought  
Sapir and Whorf's Linguistic Relativity Hypothesis  
Memory, Perception and Language  
Social and Cultural Factors  
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| 7. | **Information Processing**  
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Divided Attention  
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Summary |
| 8. | **Memory and Cognition**  
What is Memory?  
Short-term and Long-term Memory  
Forgetting and Remembering  
Limits of Memory  
Summary |
| 9. | **Language and Cognition Development**  
Definition of Language  
Language Development  
Speech  
Summary |
| 10. | **Language, Cognition and Cognitive Mastery**  
Definition of Cognition |
Assignment: Case Study (10-15 pages)

For this assignment you will need to do the following:

1. Find an article related to cognitive and language study. You can find such article in the internet or journals. (ATTACH THIS ARTICLE WITH YOUR REPORT).

2. Adapt or adopt the study from the article. This means that you need to conduct a similar (adopt) or almost similar (adapt) study on any case you like.

3. Make sure the case study helps you to demonstrate the relationship between cognition and language.

4. Write at least a 15-20 pages of report that describes your study and its findings using the guidelines on the next box (READ REPORT OUTLINE).

5. To help you with the assignment read-up the course topics first; this will give you some ideas on what to do for the case study, and how to discuss the study and its findings relevant to the course.
REPORT GUIDELINE

- **COVER:** TITLE, YOUR NAME & MATRIC NUMBER
- **TABLE OF CONTENTS**
  1.0 Introduction (± 5 pages)
    1.1. Introduce the topic – what are the concepts in the topic?
    1.2. Why is the topic important?
    1.3. List down the objectives of your study
  2.0 The study methodology (± 10 pages)
    2.1. Where did you conduct your study?
    2.2. Whom did you study?
    2.3. Describe the study step-by-step
    2.4. Describe the results of your study
  3.0 Discussion and Conclusion (± 5 pages)
    3.1 Discuss your study findings/results
    3.4. Draw a conclusion that indicates your understanding in relation to the course.

- **BIBLIOGRAPHY**
- **APPENDIX:** RESEARCH ARTICLE ATTACHED
Attention: The assignment must be typed using Times New Roman, size 12, double spacing on A4 paper. It must be written according to the format of the American Psychological Association (APA).

MARKS WILL BE DEDUCTED FOR LATE ASSIGNMENT

g. Course Evaluation

The course evaluation is conducted in 2 ways: 1) Course assignment and Mid-semester test (which covers Unit 1 to 4 = 25%), and 2) Final examination (which covers all topics - Unit 1-9 = 40%).

<table>
<thead>
<tr>
<th>Assignment</th>
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<tr>
<td>Mid-semester Test</td>
<td>(35%)</td>
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<td>Final examination</td>
<td>(40%)</td>
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h. Mid-semester Test

Students are required to sit for the mid-semester test. Questions in the test will be in both objective and subjective formats. The test will cover Unit 1 to 4, and aspects related to Assignment 1. This test carries 25% of the total marks.
i. Final Examination

The final exam is comprehensive. This means that questions will be developed based on all the units in this module. Students need to prepare to be tested on materials learned from Unit 1 to 10 and aspects related to Assignments 1. The questions will be in the objective and subjective format.

j. Main References


k. Additional References


I. Descriptions of icons used in the module

Icons are used to help students in understanding and memorizing the structure and contents of this module. The following are the icons used and their meanings.

a) ![Icon](image1)
   Introduction ➔ Introduction Unit, topic or sub-topic

b) ![Icon](image2)
   Objective ➔ Objective of module, unit or topic

c) ![Icon](image3)
   Important content ➔ Collections of important contents of the module

d) ![Icon](image4)
   Suggested reference ➔ Additional references suggested to further understand each unit or topic (books, journal or appendixes).

e) ![Icon](image5)
   Summary ➔ Summary based on the unit or topic.

f) ![Icon](image6)
   Checking Answer for the Exercise given ➔ Answer scheme included with the questions (however, not all questions have answer scheme)

g) ![Icon](image7)
   Questions in the text ➔ Questions prepared by the author for discussions on a certain topic

h) ![Icon](image8)
   Self-test Questions ➔ Questions prepared by the author to help students in their understanding on the topics discussed.

i) ![Icon](image9)
   Attention ➔ This symbol is used to indicate to students important facts that must be given attention.
Before you explore and understand the relationship between cognition and language, this introductory unit will provide you with an overview on the field of cognitive psychology. Cognitive psychology is a sub discipline of psychology. Most of you I believed are familiar with the word ‘psychology’ but, may be unfamiliar with the concept of cognitive psychology. Before we proceed let’s review the meaning of the word psychology.

Psychology refers to the scientific study of behavior and cognitive processes. This definition indicates that psychology describes how we think and behave. It also focuses on the relationships between the two (i.e., thinking and behavior). Additionally, it attempts to explain what causes thinking and behavior. Philosophers have for many years tried to understand the relationships between thinking and behavior. They wrestled with the questions on what drives thought, and what shapes human behavior?

The relationship between language and cognition has in addition long intrigued scholars. How exactly does language work? How does it interact with the other cognitive processes which shape the human experience? The investigation of language and thought is the focus of this course.
Unit Objective

At the end of this unit you will be able to:

1. Explain what cognitive psychology is.
2. The development of cognitive psychology.
3. Discuss psycholinguistic history.
4. Describe the concept of language, thinking process, and individual cognition.
5. Summary

Reference:


Content

1.1. What is Cognitive Psychology?
1.2. The Development of Cognitive Psychology.
1.3. Psycholinguistics history.
1.4. Language, Thinking Process, and individual cognition.
1.5. Summary.

1.1 : What is Cognitive Psychology?

To read the word cognitive psychology and to question its meaning is to be concerned in cognition. Cognition simply means think. As such, cognitive psychology is the study of thinking. What is thinking? It a mental process.
Cognitive psychology then could also refer to the study of processes underlying mental events (Solso et al., 2008). Cognitive psychology is also described as the way we perceived information, what we understand, and what we know. Additionally, cognitive psychology is defined by McMillan (Corey), http://www.Seas.upenn.edu/~mcmillan) as the scientific study of human thought and the mental processes that underlie behavior. He noted that this includes four aspects:

1. Memory
2. Problem solving
3. Perception, and
4. Language

Solso descriptions of the job or an air traffic controller give us some perspectives on the meaning of cognitive psychology. In addition to being responsible of the lives of hundreds of passengers, air traffic controllers have to coordinate the movement of air traffic to ensure that his airplane stay on the right route and at a safe distance from other planes. Air traffic controllers express their job as difficult, bored and with moments of complete terror. Cognitively, their jobs can be divided into several processes as below:

1) External inputs on information such as, the weather and the pilot;
2) Selective attention and perception of the external inputs;
3) Forming internal representation of the information and storing it in the memory;
4) Making decision and planning
5) Taking action such as communicating with a pilot.
Well, you can now probably see that the air traffic controllers’ job is cognitively demanding, and they are selected based on the cognitive abilities. There are surely other jobs which you can identify that require multiple cognitive processes.

To sum, let’s look at the broad and specific meaning of cognitive psychology (http://www.bsos.umd.edu/psyc/dougherty):

**Broad Definition**

*Cognitive psychology focuses on empirical investigation of mental events and knowledge concerning with object recognition, remembering a name, generating an idea, understanding a sentence, and problem solving.*

**Specific Definition**

*Cognitive psychology focuses on empirical investigation of mental processes, activities, and the act of perceiving, remembering, and thinking processes.*

There are several concepts that can be derived from the meaning of cognitive psychology. There are as shown in the table below:
Exercise 1:
In your own words, define the word cognitive psychology.

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Exercise 2:

Which of the following statement or statements is (or are) incorrect?

A. Cognitive psychology study on how our mind works.
B. Cognitive psychology is a systematic study of mind and behavior.
C. Cognitive psychology involves the act of perceiving, remembering, and thinking processes.
D. Psychology is a subdiscipline of cognitive psychology.
E. Psychology is the study of behavior, whilst cognitive psychology is the study of the brain.

1.2 The Development of Cognitive Psychology

The actual date for the emergent of cognitive psychology is not clearly stated in the literature. History of cognitive psychology evolved from the disciplines of philosophy and physiology. Influential figures include:

Wilhelm Wundt (1832-1920)

Wundt was born on August 16, 1832 in Neckarau Baden, Germany. Wundt taught at the University at Leipzig from 1875 to 1917. He was nominated as the first person in several positions as follows:

- established the first psychology laboratory
Edward Titchener was a student of Wundt. He was born in 1867 in a poor family. By scholarships, Titchener was able to attend prestigious school - Malvern College and Oxford. He teaches at Cornell University in New York state and, later become a professor of psychology and founding a psychology laboratory at the university. His work focuses on the elements or components of the mind. His approach became known as structuralism. What is structuralism?

**Structuralism**

The study of the structure of the conscious mind, including sensations, images, and feelings.
Titchener’s view was based on his belief that all consciousness was capable of being reduced to three states:

- Sensations
  - which are the basic elements of perception;

- images
  - which are the pictures formed in our minds to characterize what is perceived;

- and affections
  - which are the constituents of emotions.

Titchener published the *Outline of Psychology* (1897) and his monumental four-volume *Experimental Psychology* (1901-1905). A *Textbook of Psychology* (1910) became the bible of his school at Cornell. By 1915 Titchener had formulated his context theory of meaning. This theory emphasizes that circumstances give meaning to our experiences. To analyze the complex experiences of everyday life, Titchener uses introspection as his primary tool. According to Titchener, our emotions are intensified feelings that arise from sensations inside our body.

Introspection

Contemplation of one’s own thoughts, feelings, and sensations; self-examination.
Ebbinghaus was born in Barmen, Bonn, Germany. Higher mental processes and examine these processes that were neglected by Wundt. In 1885, the year he published his monumental work *Memory: A Contribution to Experimental Psychology* he was accepted as a professor at the university of Berlin. In Berlin, he founded the Psychological journal *Zeitschrift für Physiologie und Psychologie der Sinnesorgane* (*The Psychology and Physiology of the Sense Organs*). He also founded two psychological laboratories in Germany.

Hermann Ebbinghaus was educated at the University of Bonn. As a young doctor of philosophy, he was determined to study higher mental processes and examine these processes that were neglected by Wundt. The experiment began in 1879 with Ebbinghaus as his only subject. The result was Memory in 1885. Memory utilized the first use of nonsense syllables to discover the fundamental laws of learning. The nonsense syllables were meaningless, therefore uninfluenced by previous learning. He also used nonsense syllables because any one nonsense syllable is not easier to learn than another. Ebbinghaus also studied forgetfulness. He would memorize lists of nonsense syllables, 13 in each list, and measure how long it took him to forget the syllables. His results have been summarized in the forgetting curve.

- The mind’s ability to form associations
- A more objective technique/method for the study of cognitive activity
- List of nonsense syllables with CVC letter construction
  - Prevent previous knowledge from influencing memory
2. Prime word and target word
3. Studied savings and forgetting
iv. Associations

Nonetheless, we can categorize the development of the area of cognitive psychology into at least four eras along with its influential figures during that time (See scroll A, B, C, and D).

William James (1842-1910)

William James is a famously known as one of the greatest American philosopher. Alongside with William Wundt, he is considered to be a father of modern psychology. James was born in New York City to a family that was well accustomed with the literary and intellectual elites of his time.

James was one of the strongest advocates of functionalism. He described the consciousness as a stream that continually changes and cannot be reduced to its elements. Although James believed that consciousness could be studied, his interest was more towards the functions of consciousness rather than its composites. His interest was spurred by two factors which were:

1) His pragmatic philosophy which explains his attraction in the usefulness of things and ideas rather than their explanation.

2) Darwin’s Theory of Evaluation which implied that evolution has its own purpose.

James was keen in studying and understanding the purpose or function of human consciousness which led to the existence of functionalism. Based on his ideas, it
was suggestive that human memory consists of 2 components where one section processes information that is presently available in the awareness and another section that serves as a repository of past experiences.

John Watson was one of the famous and strongest Behaviorism’s supporters. In contrast to William James, Watson argued that behavior rather than consciousness should be the focus of psychology. He emphasized on external behavior of humans and how they reacted to situations rather than the consciousness or internal mental state of humans. Watson reported that consciousness was subjective nature, as in it would be hard to determine the reliability of the information collected while behavior was objective. As a number of psychologist and philosophers agreed with Watson’s view, consciousness was rejected as the center of interest in the psychology field.

Additionally, Watson aimed at achieving universal psychological laws which included animals. Watson pointed out that findings obtained from observing animals are highly applicable to humans. The two primary methods adopted by behaviorist were classical conditioning, which was developed by Ivan Pavlov and instrumental conditioning by B. F. Skinner.

Behaviorism ruled the psychology field for several decades. Behaviorist emphasized on the observable and chose to not discuss issues on memory, language and other mental activities. However, a mass migration in psychology occurred in the 1960s with the development of the cognitive revolution.
Noam Chomsky was an American cognitive scientist. He is well-known across the academic and scientific community as the father of modern linguistics. Chomsky is well-known for the development of his generative grammar theory which has played an important role in the development of linguistics. Furthermore, Chomsky has founded a classification of formal languages in terms of their generative power known as the Chomsky hierarchy.

At the early stages of the cognitive revolution, Chomsky reviewed Skinner’s book on verbal behaviour and argued with Skinner’s attempt to provide a functional, operant analysis of language. Chomsky highlighted that creativity in language cannot be explained by behavioristic theories. Furthermore, he believed that language development was inborn and held across cultures. His review on this matter became the point of reference that contributed to the cognitive revolution.

1.3 PSYCOLINGUISTIC HISTORY

Psycholinguistic or the psychology of language is part of the cognitive psychology fields that focuses on the psychological basis of linguistic competence and performance. In other words, psycholinguistic studies the comprehension and production of language in its spoken, written and signed forms. It is a field of study that includes the psychological and neurobiological factors that allows humans to acquire, use, comprehend and produce language. The history of the development of psycholinguistic up to its influential role in the development of cognitive psychology is listed as below.
One of the most well-known figures of psycholinguistic was Arthur Blumenthal (1987). He reported that the interdisciplinary field of psycholinguistics boomed twice, firstly around the turn of the century which mainly happened in Europe and secondly during the middle of this century, principally in the United States.

- Psychology in the early years was defined as the science of mental life. As noted in the previous section, William Wundt played a role in the development of the psychology field. He believed that it was possible to investigate mental events such as sensations, feelings and images by using procedures that was strictly adopt in the natural sciences.

- Wundt was mainly concerned with grammar, phonology of language comprehension, child language acquisition, sign language and reading.

- Wundt’s contribution to the psychology of language was developing a theory of language production. His believed that the sentence rather than the word are the primary unit of language. Furthermore he saw the production of speech as the transformation of a complete thought process into sequentially organized speech segments.

### 1.4 Language, Thinking Process and Individual Cognition

Humans use language in order to communicate or convey their thoughts to each other. Studies done in the psychology field shows that there exist a relationship between language and thought. Our thoughts or thinking processes enable us to produce language. Thinking processes can be defined as a series of cognitive and affective skills and behavior that we use. Additionally, our thinking...
process would include multiple thinking skills and dispositions. While individual cognition could be defined as a process of knowing or in other words the product of the process. The picture below shows how our thinking process and cognition plays a role in the production of language. A more detailed explanation on this issue would be further highlighted in the coming chapters.

Exercise:

Using your own words, describe briefly how human thinking process and individual cognition helps in the production of language.
SUMMARY

1. In general, cognitive psychology can be defined as empirical investigation of mental events. Specifically, this field of study focuses on mental processes, activities and the act of perceiving, remembering and thinking processes.

2. Psycholinguistic is a field that focuses on the psychological basis of linguistic competence and performance i.e. comprehension and production of language.

3. Humans communicate with each other using language which is produced by humans’ thinking processes.
UNIT 2
APPROACHES TO COGNITIVE PSYCHOLOGY

Cognitive psychology is the scientific study that focuses on internal psychological processes that involves in understanding human thought and mental processes that defines human behavior. Cognitive psychology would help us to understand our environment more and what internal processes that are involved in making appropriate decision in life. Internal processes that are involved in the cognitive processes include attention, perception, learning, memory, language, problem solving, reasoning and thinking.

Since cognitive psychology happens rapidly and within the head, cognitive scientist faces difficulties in studying the cognitive processes that happens in human beings. This however does not deter scientist from studying more about cognitive processes and hence developed four main approaches in studying human cognition. These four approaches are 1) Experimental cognitive psychology, 2) Cognitive science. 3) Cognitive neuropsychology, and 4) Cognitive neuroscience. Each of these sub-areas in cognitive psychology is known to have strength and weaknesses. Cognitive scientists have been known to use the combination of all four approaches to best study human cognition. These four areas related to cognitive psychology are further discussed in this unit.
Unit Objective

At the end of this unit you will be able to:

1. Understand the approaches that is involved in the nature of cognitive psychology
2. Explain each approach used in cognitive psychology.
3. Discuss the strength and weaknesses of each approach in studying human cognition.

Reference:

Content

2.1. Experimental Cognitive Psychology
2.2. Cognitive Science
2.3. Cognitive Neuropsychology
2.4. Cognitive Neurosciences
2.5. Summary
2.1 EXPERIMENTAL COGNITIVE PSYCHOLOGY

The experimental cognitive psychology is the core of all the approaches in cognitive psychology and involves conducting experiments on normal individuals, under laboratory studies.

Experimental cognitive psychologist would usually define a question of study, gather information and resource, form hypothesis, conduct scientific experiments and collect data, analyze data, interpret data and produce conclusion in order to generate a starting point for new hypothesis. Results from the study would then be published.

This area focuses on carrying out experiments on normal individuals under laboratory conditions. Scientific experiments are usually done in a controlled environment in order to further understand human cognition and thinking process. This approach has been known to be useful in providing with further information regarding cognitive psychology.

LIMITATIONS

Although this approach has its strengths it is not without its limitations. The limitations to experimental cognitive psychology are listed as follow.

- People tend to behave differently when they are in the lab performing an experiment (Heather, 1976). The differences in behavior in the lab and
outside the lab may cause the results of the cognitive experiments to not represent the true process of human cognition.

- Experiments designed by scientists are usually done in advance and does not pay much attention to a respondent’s response.
- Measures of the speed and accuracy of performance provide only indirect evidence about the internal processes involved in cognition
- Scientists tend to also ignore the difference in the respondent’s background that could affect the results of the study such as IQ and social and economic status.

Exercise:

Using your own words, describe briefly Experimental Cognitive Psychology.
2.2 COGNITIVE SCIENCE

Cognitive science is an approach that focuses on the relationship between artificial intelligence and cognitive psychology by developing computational models in understanding human cognition. A good computational model can show us how a given theory can be specified in detail and allow us to predict behavior in new situations. In addition, computational model helps to stimulate better specification of cognitive theories and generates new predictions.

There are three main types of computational models which are as the following:

1. semantic networks
2. production system
3. connectionist network

LIMITATIONS

Although cognitive science has its advantages, it is not without some limitations. Below are some of the limitations of cognitive science in studying human cognition.

1. Computational models are rarely used to make predictions; they are produced as a prop for a theory, but often have no real predictive function.
2. Connectionist models that are claimed to have neuronal plausibility do not really resemble the human brain.
3. Numerous models can generally be found to 'explain' any set of findings
4. Most computational model has been designed to simulate human performance on single task.
2.3 COGNITIVE NEUROPSYCHOLOGY

Cognitive neuropsychology is an approach that studies patterns of cognitive impairment shown by brain-damaged patients in order to understand normal human cognition. Cognitive neuropsychologists assume that the cognitive system consists of several modules or cognitive processors within the brain. For example, the modules or processors involved in understanding speech are presumably rather different from those involved in actually speaking. As a result there are some brain-damage patients who are good at language comprehension and poor at speaking and others who show the opposite pattern.

LIMITATIONS

Cognitive neuropsychology as we learned can be beneficial in understanding the impairment in cognitive functioning in individuals with brain injury. However, this approach is not without its criticism which is listed below.

1. It is assumed that the cognitive performance of brain-damaged patients provides direct evidence of the impact of brain damage on previously normal cognitive system.

2. The whole cognitive neuropsychological approach is very complex, because there are often large differences among individuals having broadly similar brain damage. Such individuals typically vary in age, socioeconomic status, and educational background.
3. The modular may exaggerate the extent to which cognitive functions are localized within the brain.

4. The study of brain-damaged patients can lead to underestimates of the brain areas involved in performing any given cognitive function.

5. The study of brain-damaged patients can lead to overestimates of the areas of the brain directly involved in certain aspects of cognitive functioning.

2.4 COGNITIVE NEUROSCIENCE

Cognitive neuroscience is an area that includes various fields such as cognitive science, cognitive psychology, biology and neuroscience (Ward, 2006). This area uses several techniques for studying brain functioning (e.g., brains scans) in order to identify the processes and structures used in cognition. Cognitive neuroscience includes neural basis of cognition including considerations of perception, attention, motor control, language, learning, memory, executive function, and, spatial and social cognition.

Scientists put effort in understanding the relationship between the brain and mind from various aspects simultaneously. Studies of the human brain are done scientifically in a control environment such as laboratory. Scientists make use of technological advances to establish where and when cognitive processes occur within the human brain. Most of the techniques used are limited in either spatial or
temporal resolution, and they are of most value when applied to areas of the brain that are organized neatly and tidily.

LIMITATIONS

As we have read earlier in this unit, each approach to cognitive psychology including cognitive neuroscience has limitations and is unable to stand alone in providing with the best answers and revelation related to human cognition. One of the limitations of cognitive neuroscience is described as below.

When collecting data and dealing with its validity, results obtained from the data would be generalized. This has raised some concerns regarding the generalization of the results since each individual that participated in the study has significant individual differences.

This limitation was further addressed by Raichle (1998), who stated that individual differences should be appreciated. However, an accepted solution to the generalization of emerging findings that transcend the differences has yet to be found.
**Exercise:**

Briefly list down the major aspects of the four approaches in understanding cognitive psychology.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Major Aspect</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Cognitive Psychology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive Science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive Neuropsychology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive Neuroscience</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY

1. Cognitive psychologist faces difficulties in studying the human thinking process as it happens rapidly within the head.

2. However, there are four main approaches in studying cognitive psychology which are Experimental Cognitive Psychology, Cognitive Science, Cognitive Neuropsychology and Cognitive Neuroscience.

3. All approaches have strengths and weaknesses and are mostly used in combination with each other to fully understand internal cognitive process of humans.
UNIT 3
PERCEPTUAL PROCESSES

Perceptual processes can be defined as deducing information obtained by our sensory organs in order to create an internal representation of objects in our surroundings. In order to fully understand perceptual processes, we must first understand the first stage of perception, which is sensation. Sensation can be clarified as a process of transduction, which is the process of converting the energy of light or sound into neural transmission. These impulses that have been converted would then help in identifying and categorizing objects in the environment and creating a meaningful interpretation that would be able to represent our environment.

Perception is a mean where information obtained from the environment by means of sense organs is transformed into experiences of objects, events, sounds, taste, etc.

Perception includes systems such as visual and auditory systems. In this unit, we will further discuss the visual and auditory systems and its roles in perceptual processes. Specifically the objective and content of this unit are as follows.
**Unit Objective**

At the end of this unit you will be able to:

1. Explain what is meant by perceptual processes
2. Explain the visual and auditory system
3. Discuss depth perception
4. Describe the perceptual development

**Reference:**


**Content**

3.1 The Visual System

3.2 The Color Perception

3.3 Depth Perception

3.4 Perceptual Development

3.5 Summary

**3.1 THE VISUAL SYSTEM**

One of the most complex sensory systems that human have is the visual system. Vision is enormously important in our lives and is perhaps even more important than out other senses. The human visual system carries out
complex activities. Our visual system can create an accurate, richly detailed, three dimensional perception. This is produced via a tiny, distorted, upside-down, two-dimensional retinal images projected upon the visual receptors lining the backs of our eyes.

The eyes play a vital role in transmitting information of surrounding objects to our brain. The human eye consists of about 7 million cones and 125 million rods. The rods and cones function as receptors that would accept information. A more detail information regarding their functions would be presented in the color perception section.

### 3.2 COLOR PERCEPTION

Color vision has value to all of us for at least two reasons:

1. **Detection:**
   
   Color vision helps us to distinguish between an object and its background.

2. **Discrimination:**
   
   Color vision makes it easier for us to make fine discriminations among objects (for example, between ripe and unripe fruit).
There are two types of visual receptor cells in the retina:

1). Cones: There are about six to 7 million cones and they are mostly found in the fovea or central part of the retina. The cones are specialized for color vision and for sharpness of vision.

2). Rods: There are about 125 million rods, and there are concentrated in the outer regions of the detection of movement.

Perception on color will not change although the environment and light registered by the eyes sense organ changes. This is because human had made a generalization that certain things remain the same (as perceived before) in whatever condition. For example, grass is green.
3.3 SPACE OR DEPTH PERCEPTION

Depth is the distance from a surface. You would normally use your body as reference surface to indicate your perception of depth.

Example: To reach for an object, you would adjust your body according to your perception of the depth between your body and the object.

There are times however; you would go beyond your body’s reach in determining depth.

Example: when driving on the road you understanding of depth to assess the distance of the incoming vehicle.

Space or depth perception can be divided into monocular, binocular and oculomotor cues.

- **Monocular** cues include linear perspective, texture, interposition, shading, familiar size and motion parallax.

- **Binocular and oculomotor** cues are convergence, accomodation, and stereopsis. These cues are only effective when objects are close to the observer.
3.4 PERCEPTUAL DEVELOPMENT

Perceptual development helps us to interpret the activities of our environment. Our sensory would be evoked by stimulus that exists in our surroundings. Information retrieved from hearing, seeing, and touching would help in promoting brain growth and development.

Information obtained through our senses differs for each individual. Infants for example, cannot express to us what they can see. In order to understand how perception develops including based on behavior, preference, habituation, eye movement, physiology and visual reinforcement, researchers have tried various methods to study it.

3.5 OBJECT RECOGNITION

All humans are born with an ability to recognize familiar objects. This cognitive ability allows us to recognize various familiar objects rapidly and accurately. For example, these characteristics allow us to recognize our friend amidst other faces. Our memory plays an important role in our ability to recognize an object. Object recognition involves the processes whereby we match an incoming stimulus from our environment with stored information in our memory for the purpose of identification. We could identify or recognize everyday things based on broad categories:
Object recognition can be explained by a three-stage model designed by Humphreys and Bruce (1989). The three stages are perceptual classification, semantic classification and naming.

- **Perceptual Classification**
  A matching of visual information about the viewed object with a structural description of that object in memory. In other words, it is the matching of the description of an object’s component and their arrangement.

- **Semantic Classification**
  Recognition of the object as something that relates to the world in a particular way and serves particular functions.

- **Naming**
  Retrieval of the object’s name from memory.

- Patterns (letter & number)
- Objects (everything in the environment around you)
- Faces
We rarely have problems in recognizing objects, but these processes are more complex than could be imagined:

- There are typically numerous overlapping objects in the visual environment and we have to decide where one objects ends and the next starts.
- Objects can be recognized accurately over a wide range of viewing distances and orientations.
- We recognized that an object is, say, a chair without any apparent difficulty.

Exercise:

Briefly described the three-stage model that can best described object recognition.
SUMMARY

1. Perceptual process which contains the visual and auditory systems; is a process where information received by sensory organs is deduced in order to create an internal representation of objects in our surrounding.

2. Human sensory is aroused by stimulus in the surroundings and information retrieved through hearing, seeing, and touching promotes brain development.

3. Humans recognize objects from their surroundings by matching incoming stimulus with stored information in their memory. Object recognition can best be explained using Humphreys and Bruce three-stage model i.e. perceptual classification, semantic classification and naming.
Language can be considered as one of the greatest cognitive achievements of human beings. Human language is unique, complex and flexible making it more superior than other species forms of communications. Language being unique and complex distinguishes us from other animals. Language requires every aspect of our cognitive abilities. The use of language by human reflects their mental behavior. Language and thinking are actually very closely related.

Unit Objective

At the end of this unit you will be able to:

1. Explain the definition of language
2. Describe language acquisition
3. Discuss speech perception
4. Describe the cognitive neuropsychology of speech perception
5. Explain Chomsky’s Theory of Language Acquisition Device (LAD)
Reference:

Content
- 4.1. The Definition of Language
- 4.2. Language Acquisition
- 4.3. Speech Perception
- 4.4. Chomsky’s Theory of Language Acquisition Device (LAD)
- 4.5. Model of Geschwind-Wernicke
- 4.6. Summary
4.1 WHAT IS LANGUAGE?

Language is defined in many ways especially across the fields in psychology. Language can be understood as a collection of symbols with rules and collectively they can create an infinite variety of messages. It could also be understood as a combination of words to communicate. The definition of language changes over time. Some of the many definition of language are presented below.

Language is….

"Purely human and noninstinctive method of communicating ideas, emotions, and desires by means of voluntarily produced symbols" – Edward Sapir, 1921

"A language is a set of (finite and infinite) sentences. Each is finite in length and constructed out of a finite set of elements" – Noam Chomsky, 1957.

"Means of communicating, generally through spoken sounds that express specific meanings, and are arranged according to rules". – Papalia and Wendkos Olds, 1985.

"Organized system of symbols with meanings that are shared, and are used to communicate". – Lyle E. Bourme and Mamcy Felipe Russo, 1998.
Nonetheless, scholars agree that language involves a system of symbols organized according to rules to create a message that has a common meaning for users and recipients.

Language has many attributes. Philosophers have come to a consensus on 6 different properties that are distinctive to language (Brown, 1965; Clark & Clark, 1977; Glucksberg & Danks, 1975).

<table>
<thead>
<tr>
<th>Properties</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicative</td>
<td>The most obvious and remarkable feature of language which enables humans to communicate with each other.</td>
</tr>
<tr>
<td>Arbitrarily symbolic</td>
<td>Language creates an arbitrary relationship between a symbol and its referent such as things, ideas, processes, relationship and description (Steadman, 2003). Arbitrary means the sound combination that leads to the meaning of the word.</td>
</tr>
<tr>
<td>Regularly structured</td>
<td>Language has a structure where particular patterns of sounds and letters from meaningful words.</td>
</tr>
<tr>
<td>Structured at multiple levels</td>
<td>Language structure can be analyzed at more than one level (e.g., in sounds, meaning units, in words, phrases).</td>
</tr>
<tr>
<td>Generative, productive</td>
<td>Limitless ability to produce language creatively.</td>
</tr>
<tr>
<td>Dynamic</td>
<td>Language constantly evolves.</td>
</tr>
</tbody>
</table>
Exercise:

Briefly explain the 6 key attributes of language.

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4.2 LANGUAGE ACQUISITION

Language acquisition is a process where one learns language. Learning language happens throughout an individual's life span where it progresses according to developmental stages. As an example, young children attain language at a great speed. By the age of two years, most children use language to communicate hundreds of messages. At five years old, children have mastered most of the grammatical rules of their native language.

There are two types of language acquisition which are shown below.

First language acquisition → Infants' acquisition of their native language

Second language acquisition → Additional languages learned by children and adult

Stages of Language Acquisition

As language is acquired throughout the stages in life, its development can be classified into: 1) Receptive language (language comprehension) and 2) Productive language (language expression or speaking). One year old children and adults have better receptive than productive language.
There are five basic stages in producing language. These stages happen from our early years as babies until we become a grown adult. The table below provides a description of the stages involved in language acquisition.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Typical Age</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooing</td>
<td>6-8 months</td>
<td>Comprises mostly vowel sounds.</td>
</tr>
<tr>
<td>Babbling</td>
<td>9-18 months</td>
<td>Comprises of consonant and vowel sounds. Infants start to selectively use phonemes from their native language.</td>
</tr>
<tr>
<td>One-word utterances</td>
<td>18-24 months</td>
<td>Limited in both the vowels and consonant. Single words or word stems.</td>
</tr>
<tr>
<td>Two-word utterances and telegraphic speech</td>
<td>24-30 months</td>
<td>Simple sentences that lack function words</td>
</tr>
<tr>
<td>Basic adult sentence structure</td>
<td>30+ months</td>
<td>Presence of grammatical and functional structure and continuing vocabulary acquisition.</td>
</tr>
</tbody>
</table>

References: [http://www.ling.upenn.edu/courses/Fall_2003/ling001/acquisition.html](http://www.ling.upenn.edu/courses/Fall_2003/ling001/acquisition.html) and [http://www.andrew.cmu.edu/course/85-211b/language_acq.html](http://www.andrew.cmu.edu/course/85-211b/language_acq.html)
Exercise:

Briefly described the stages involved in language acquisition.

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4.3 SPEECH PERCEPTION

In order for humans to be able to communicate with one another, they must first understand what is being spoken to them. This process is known as speech perception, which refers to the process by which humans are able to interpret and understand the sounds used in language.

Speech is perceived by humans at an amazing pace. Language is spoken at a rate of up to 12 phonemes (basic speech sounds) per second. Amazingly, we can understand speech artificially speeded up to 50-60 sounds per second. In a normal speech, phonemes overlap, and there is coarticulation, in which producing one speech segment affects the production of the following segment.

Children need to learn four kinds of knowledge about language:

1. Phonology: The sound system of language.
2. Semantics: The meaning conveyed by words and sentences.
3. Syntax: The set of grammatical rules indicating how words may be combined to make sentences.
4. Pragmatics: The principles determining how language should be modified to fit the context (for example, we speak in a simpler way to a child than to an adult).
Cognitive Neurophysiology of Speech Perception

- Evidence from brain-damaged patients suggests that saying a spoken word can be achieved using three different routes.

- Patients with pure word deafness have problems with speech perception because of impaired phonemic processing in the auditory analysis system.

- Patients with word meaning deafness can repeat familiar words without understanding their meaning, but have problem with non-words.

4.4 CHOMSKY’S THEORY OF LANGUAGE ACQUISITION DEVICE (LAD)

Noam Chomsky (1957) was a linguist who took a biological approach to language acquisition by suggesting the ability is innate (inborn) in humans. According to Chomsky children will automatically acquire language merely by being exposed to it regardless of any external reinforcement or operant conditioning.

Chomsky proposed that human children have an *innate language acquisition device (LAD)*, an inbuilt mechanism which automatically allows a child to decode any spoken language it hears around it, to reveal the basic rules and principles. The child is therefore pre-disposed to recognize and use the *linguistic universals* (e.g., nouns, adjectives, verbs) that every language contains.
Chomsky suggested that languages differ only in the surface structure but all share a similar underlying deep structure (the fundamental meanings and actions that the words convey). For example the sentences “Mary ate the apple” and “The apple was eaten by Mary” both have different surface structures but the same deep structure.

4.5 MODEL OF GESCHWIND-WERNICKE

Carl Wernike developed an early neurological model of language that was later refined by Norman Geschwind which is known as the Model of Geschwind-Wernicke. This model put forth the following key points.

- Individuals suffering from brain damage to a particular part of the brain (i.e. temporal lobe which is called Wernicke’s area) may experience receptive aphasia. Individuals with this condition may no longer understand speech although they could articulate words as fluently as before, their speech is meaningless. Hence, this area of the brain was proposed to be responsible for language comprehension.

  *For example, “Well this is ……Mother is away here working her work out o’here to get her better, but when she’s looking, the two boys looking in the other part. One their small tile into her time here. She’s working another time because, she’s getting, too”*  
  
  *(Goodglass & Geschwind, 1976).*
• Damage to other part of the brain as noted by Broca’s area (the frontal cortex) causes individual to suffer from the expressive aphasia. Individuals find themselves almost impossible to speak although they were found to still understand the speech of others. Therefore, it was suggested that Broca’s area is responsible for the production of knowledge.

• The model suggests that the Wernicke’s area contains the auditory codes (i.e. information about what they sound like) and meaning for words while the Broca’s area consists of articulatory codes (the motor commands that tell the mouth and larynx how to form for words).

• This model has generated a great deal of research due to its idea that language comprise two basic functions:
  o Comprehension- sensory or perceptual function
  o Speaking – motor function

• Although the model has contributed a lot to the understanding of language, it is now out of date.
The classical Wernicke-Geschwind model of language

(Available at http://en.wikipedia.org/wiki/Wernicke-Geschwind_model)
SUMMARY

1. Language is known as a means of communication generally through spoken words and has 6 key attributes which are communicative, arbitrarily symbolic, regularly structured, structured at multiple levels, generative and productive, and dynamic.

2. Language acquisition is process where one learns language that happens through different stages in life from cooing, babbling, one-word utterance, two-word utterance and telegraphic speech.

3. Speech perception is the process by which humans are able to interpret and understand the sounds in language. In order to do so, humans from as small as children learn about the phonology, semantics, syntax and pragmatics of language.
UNIT 5
LANGUAGE COMPREHENSION AND PRODUCTION

In the previous unit we focused on the processing of individual words and sentences. In real life, however, we are generally presented with connected discourse, that is, written text or speech). This will be discussed first in this unit. According to Graesser, Millis, and Zwaan (1997, p. 164), there are important differences between the processing of sentences and discourse. In the second section of this unit, we will focus on the production of language and speech. In addition, we would discuss the stages involved in speech production.

Unit Objective

At the end of this unit you will be able to:

1. Describe discourse processing.
2. Discuss story processing.
3. Explain language and speech production.
Reference:


Content

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<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>3.1</td>
<td>Discourse Processing</td>
</tr>
<tr>
<td>3.2</td>
<td>Story Processing</td>
</tr>
<tr>
<td>3.3</td>
<td>Language and Speech Production</td>
</tr>
<tr>
<td>3.4</td>
<td>Summary</td>
</tr>
</tbody>
</table>

5.1 DISCOURSE PROCESSING

As we encounter spoken and written language daily, it is important for us to be able to process our conversation. Therefore, we need to understand the processes that are involved in discourse processing. In other words, discourse processing is the steps involved in analyzing or interpretation of our daily conversations.
In discourse processing, it is important for us to retrieve information from our stored memory before we come to a conclusion or inference from our reading, listening or talking. There are three types of inferences that are commonly involved in discourse processing which are logical, bridging and elaborative inferences.

### Types of inferences in discourse processing

- **Logical**
- **Bridging**
- **Elaborative**

Bridging inferences requires us to utilize our previous world knowledge even in simple graphic design (Graesser, Singer & Trabaso, 1994). Logical and bridging inferences are both essential for full understanding of language as compared to elaborative inferences.

In identifying the types of inferences chosen by an individual during discourse processing, McKoon and Ratcliff (1992) suggested the minimalist hypothesis. According to the minimalist hypothesis, relatively few inferences are drawn automatically based on the pursuit of the individual’s goal. However, this hypothesis emphasizes constraints on the number of automatic inferences. In contrast, the constructionist approach claims that numerous automatic inferences are drawn in order to facilitate full comprehension.
A theory proposed by Graesser et al. (1994), the search-after-meaning theory was similar to the minimalist hypothesis where it highlighted that readers engage in a search after meaning based on the reader goal, coherence and explanation assumptions. This theory provides a clear identification of the types of inferences generally used by individuals. In comparison to the previous hypothesis and approach, the search-after-meaning theory predicts more inferences than the minimalist hypothesis but lesser than the constructionist approach. However, Greasser stated that this theory maybe less correct than the minimalist hypothesis when readers do not have sufficient background knowledge. Furthermore, the theory does not consider individual differences. Calvo (2001) found that individuals with low working memory capacity face difficulty in drawing elaborative inferences as compared to those with high working memory capacity.

Exercise:

In your own words, describe what you understand by discourse processing.

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5.2 STORY PROCESSING

If someone asks us to tell them about a story or book we have read recently, we discuss its major events and themes, and leave out the minor details. In other words, our description of the story is highly selective and is determined by its meaning.

Gomulicki (1956) showed the selective way in which stories are comprehended and remembered. One group of participants wrote a précis (summary) of a story that was visible in front of them, and a second group recalled the story from memory. A third group of participants who were given each précis and recall found it very hard to tell them apart. Thus, story memory resembles a précis with people focusing mainly on important information.

Story memory resembles a précis. It has been claimed that the structure of all stories is consistent with a story grammar, but there is no agreement on its main features. According to Kintach’s construction-integration model, 3 levels of text representation are formed: surface, propositional and situational. The evidence supports this hypothesis, but a situational representation is sometimes not formed because of limited processing capacity.

5.3 LANGUAGE AND SPEECH PRODUCTION

Language production is the construction of spoken or written language. It involves all stages from having a concept to translating the concept into linguistic
forms. Speech nearly always occurs as conversation in a social context. Grice (1967) argued that the key to successful communication is the Cooperative principle, according to which speakers and listeners should try to be co-operative.

In addition to the Co-operative Principle Grice proposed 4 maxims the speaker should heed:

1). Maxim of quantity: The speaker should be as informative as necessary, but not more so.
2). Maxim of quality: The speaker should be truthful.
3). Maxim of relation: The speaker should say things relevant to the situation.
4). Maxim of manner: The speaker should make his or her contribution easy to understand.

Stages of Speech Production

There are four stages that are involved in speech production which are listed as follow:

1. Conceptualization of thought
2. Formulating a linguistic plan
3. Articulating the plan
4. Monitoring the speech
This stage involves generating a framework on which to hang the units of speech. A formulation of a linguistic plan includes three essential phases which are as stated in the diagram below.

Speech production includes two processes which are the thought and speech process.
This stage emphasizes on saying what is intended to be said. Preparing and implementing a plan is organized in an alternate manner which can be proven by our alternation of hesitation and fluency in speech.

When we talk, we tend to convey parts of our intended message. We would then pause to plan the next portion and articulate that portion before pausing again. This alternation of sequence between pausing and speech is continuous. Speech production is cognitively demanding and is hard to plan an entire sentence at once. We tend to pause in their speech when we face the following situations.
The last stage requires individuals to monitor their speech. Individuals tend to self-repair their speech by overtly monitoring, editing and correcting their speech. At times, individuals may even self-interrupt themselves when they detect an error. These self-interruptions occur very shortly after the error occurs and is usually made at the first word boundary after the error. When individuals realize they have made an error in speech, they would tend to edit their expression such as by saying "Oh, sorry. I meant...", 
Exercise:

Briefly explain the process involved in language and speech production.

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SUMMARY

1. Discourse processing is needed to interpret our daily conversation by retrieving information from our memory and coming to a conclusion about what we read, listen or talk about. There are three types of interferences that aid us in understanding communication i.e. logical, bridging and elaborative interferences.

2. Story processing is our description of an event by selecting certain information that is determined by its meaning. Generally, story processing happens when we discuss major events and themes and purposely choose to ignore minor details.

3. Language production is the construction of spoken and written language which involved various stages from having a concept to translating the concept into logistic forms.
Humans interact with each other and their surroundings using what we call as language. There are many languages around the world, developed by humans of different regions and culture. How then do humans understand each other when their language comprises different words and grammars?

Theorists such as Piaget, Whorf and Vygotsky differ in their views on the relationship between language and thought.

**Piaget:** As a result of mental development, the ability to think also developed, and this support language development. To learn a word and use it grammatically, one would first need to develop the mental concept of the word.

**Whorf:** Thought is expressed in language, thus a person’s language ability could limits or shaped his thoughts. Language provides the categorical distinctions or boundaries between things, and it guides what conceptual features or characteristics a person can acquire.
Vygotsky: Language and thought are not intrinsically linked. Nonetheless, both came from the same mind and will surely influence each other. At the beginning of life, infants could not understand language, and will need to do some thinking in order to understand his environment especially what his parents are saying. This goes to show that before the age of two thought precedes language. Later, when language is acquired, children will use it to represent their thoughts.

Unit Objective

At the end of this unit you will be able to:

1. Discuss the relationship between language and thought.
2. Understand the Sapir and Whorf's Linguistic Relativity Hypothesis
3. Describe social and cultural factors related to language and thought.

Reference:


6.1 The Relationship between Language and Thought

Language and thought and the relationship between them have been an interest to many researchers for centuries. Language being the most important tool in communication are claimed to be inseparable from thought. Plato described the idea of thought and language originating or carrying abstract concept called “forms” and which all the “entities and qualities designated thereby can be subsumed” (Gill, 1977).

A well-known German scholar and diplomat from the 18\textsuperscript{th} century, Wilhelm von Humboldt stated that language determines many aspect of thought. Most experimental studies have focused on aspects that are easiest to assess without relying on language. This is because of the risk of finding the influences of one aspect of language on another aspect of language rather than some aspect of thought. Among the common cognitive variables studied were as follows.

- Perceptual discrimination
- Availability in memory
6.2 Sapir and Whorf’s Linguistic Relativity Hypothesis

The main idea of the Sapir and Whorf’s Linguistic Relativity Hypothesis is that cognitive classification is affected by the different cultural concepts and categories that are inbuilt in different languages. Therefore, different people from different countries think and behave differently because of the cognitive classification.

The Sapir-Whorf hypothesis theorizes that thoughts and behavior are influenced by language.

In the Sapir-Whorf hypothesis, Whorf attempted to illustrate that language is the medium by which one views the world, culture, reality and thought have aroused an intense desire in not only scholars but also for non-scholars to validate or disprove this hypothesis.

Researchers have argued and debated about the following three positions in relation to the Sapir-Whorf Hypothesis which are:

1. Language heavily influences thought (strong interpretation)
2. Language does not influence thought
3. Language partially influences thought (weak interpretation).
Benjamin Whorf was a student of Sapir and strongly suggested that thought is based on language. His hypothesis was supported from findings from his research on Native American language. The Hopi language does not consist of words, grammatical constructions that refer to the English concept of “time”. Whorf suggested that the Hopi language is able to express the word “time”.

However, Whorf’s findings and suggestion that language strongly influence thought was solely based on his study of the Native American. Many researchers criticized his findings because Whorf concludes the cognitive difference between two speakers from the examination of their respective languages which were Hopi and English.

Although some researchers agreed with Whorf that thought and language is clearly dependent on each other, many researchers believed that Whorf’s findings were unsuccessful in showing a relationship between language and thought.
Researchers came to a general agreement when it came to the second position in relation to the Sapir-Whorf Hypothesis. The majority of researchers agreed upon three main key points being:

1. Translatability
2. Differences between linguistic and non-linguistic
3. Universals

**Translatability**

One of the arguments against the Sapir-Whorf Hypothesis was translatability. Although language may vary in terms of the way of expressing certain details, it is still likely possible to translate the details from one language to another (Fishman, 1976).

**Differences between linguistic and non-linguistic**

A researcher named by Eric Lenneberg argued against the hypothesis by saying that there is no means to define language as influencing thought when there is no differences between the two (i.e. language and thought) especially when the evidence that supports the hypothesis is solely based on linguistic differences.


**Universals**

The concept universal was viewed as evidence that went against the notion of language influencing thought. The context universal could best be described based on the theory of Universals. This theory which was attributed to Chomsky emphasized that there are deep structures that are common to all language (Fishmann, 1976). Therefore, all cultures would be related and have similar realities which is in contrast to the main idea of the Sapir-Whorff's Hypothesis that claims all cultures see the world differently due to their language.

The idea of universals can be traced back to the Port Royale:

*There are in the grammar observations that apply to all languages; these observations constitute what one calls general grammar. Grammar, which has for its object the expression of thought by the help of speed, spoken or written, thus admits of two sorts of rules. One kind is immutably true and universally followed, they apply to the form of thought itself, they follow from the analysis of it and are only the consequence of it*

*Cowie (1999).*
Most researchers up to this time have found it hard to conclude that language determines thought, however through examples from Whorf's studies in Hopi and other observations from researchers it is valid to suggest that language does partially determine thought. In determining linguistic relativity the question is not whether a language affects one's thoughts but to what degree (Wierzbicka, 1992:7). Many examples are given to support a weak interpretation of linguistic relativity as shown in diagram below.

**LANGUAGE PARTIALLY INFLUENCES THOUGHT**

*Linda Rogers gives evidence to support a weak interpretation between language and thought by reading a story to a group of bilingual children while recording their brain-wave patterns. She first read the story in English while observing that the children's brains were active in the left hemisphere and then read the story in Navaho and observed their brain activity in the right hemisphere. This according to Rogers gave evidence to the fact that English as a noun-centered language was processed in the left side of the brain and the Navaho as a verb-centered language was processed in the right side of the brain. This gave evidence to the fact that although the same story was told to the same children they processed the story differently according to which language it was told in*
Another example is a study contrasting Japanese and English passive constructions done by Agnes Niyekawa-Howard in 1968. The study explains that Japanese has two types of passive constructions in which when one is combined with the other the meaning changes so that the subject of the sentence was "caused" to take the action that is found in the verb. In translating stories from Japanese to English this construction was not seen, however, in the translation from English to Japanese the Japanese translators included this construction. Similarly when asked to interpret cartoons that dealt with interpersonal conflict, the Japanese "were found to attribute responsibility for the negative outcome to others" more than did the English. The study's purpose was to show that although not consciously seen by native Japanese, this construction of grammar contributes to a "perceptual habit or cultural outlook" in the Japanese culture (Salzmann, 1993:).
Codability

Codability is the ability to translate a word, phrase or idea from one language to another. Codability supports the notion that language partially influencing thought because in one language a person may be able to perceive a lexical category better than another but that in no way limits another language from being able to perceive the same category.

Note

The Sapir-Whorf Hypothesis has changed the way many people look at language. It has influenced many scholars and opened up large areas of study. While many like Sapir and Whorf support the notion that language strongly influences thought and others argue that language does not influence thought, the evidence from research indicates that language does influence thought and perception of reality but language does not govern thought or reality.
Exercise:

Using your own words, briefly describe the Sapir-Whorf Hypothesis.

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6.3 Social and Cultural Influence on Language and Thought

We acquire communication skills within a socially and culturally influence context. Researchers have been aware of the social and cultural aspects that could promote the development of language and thought. A theory that could help shed light on the social influence on language is the social interaction theory.

**The Social Interaction Theory**

This theory puts forth the belief that the interaction between a child and caregiver, including of biological and environmental influences, is responsible for the development and acquisition of language (Snow, 1981).

The general elements of this theory are as follow.
- The interaction of communicative functions.
- The influence of the child's social world, social relationships, and communicative interactions.

Based on the theory, children learn verbal and nonverbal communicative behaviors from adults or significant others. They would also know the polite and impolite ways to communicate in society based on the interaction with adults. However, the rules for communicative competence are influenced by social and cultural factors. One may seem to be appropriate language for one culture may not be acceptable in another culture.
Social and cultural rules help in developing our beliefs and values and often can be seen in the way we communicate with others. These rules taught and guided us in our actions and interactions in our environment (Agar, 1994; Goffman, 1986). Cultural differences are promoted through one’s socialization practices and enhanced and strengthen through social interactions.

There are several ways culture can be transmitted from one individual to another. Among them are as listed below.

- **The socialization of children** (Vygotsky, 1986; Wertsch, 1985).
  - Cultural philosophy, values, and beliefs are communicated through both verbal and nonverbal means.
  - Cultural values are shared from one generation to another through parenting practices that teach social and communicative behaviors.

- **The media, policies, laws, and the philosophies or pedagogy of such institutions as schools** (Vygotsky, 1986; Wertsch, 1985).
  - To understand cultural variations in communicative interactions, we must understand the ways cultures vary and how cultural constructs are communicated by parents and other involved adults.
"Language and society are so intertwined that it is impossible to understand one without the other. There is no human society that does not depend on, is not shaped by, and does not itself shape language."

(Chaïka, 1989).

SUMMARY

1. Communication depends on the relationship between language and thought. Past scholars has emphasized that language influences many aspect of thought.

2. Sapir and Whorf’s emphasized that cognitive classification is affected by different cultural concepts and categories within different languages.

3. The development of an individual’s language and thought are influenced by social and cultural aspects in the environment.
UNIT 7
INFORMATION PROCESSING

Listening and visualization is an important element in communication. An individual would be able to understand what others are conveying to him and respond appropriately to his surroundings based on his auditory and visual perception. Information processing allows an individual to digest what information he has learned from his environment and store them in the memory. The process involved in understanding and comprehending communication are highlighted and further discussed in this unit.

Unit Objective

At the end of this unit you will be able to:

1. Discuss information processing.
2. Explain issues regarding attention and divided attention.
3. Describe automaticity processing.

Reference:


Content

7.1 Auditory and Visual Information Processing
7.2 Divided Attention
7.3 Automaticity
7.4 Summary

7.1 Auditory and Visual Information Processing

The Stage Theory Model (Atkinson & Shiffrin, 1968) would help in explaining the system of information processing.

Stage Theory Model (Atkinson & Shiffrin, 1968)

Atkinson & Shiffrin (1968) proposed that information processing and storage happens in three stages. This model believes that information is processed in a sequential and discontinuous manner from one stage to another. The three stages involved in the theory are 1) Sensory memory, 2) Short-term memory, and 3) Long term memory.

Sensory memory is the first level of memory. Its role is to retain the brief impression of a sensory stimulus after the stimulus has ended. The sensory
memory retains an exact copy of what is seen or heard (visual and auditory). Sensory memory is stored in our sensory registers and it has a very short period. Information received will fade within seconds if chosen to be neglected. Only information that is transferred to another level of memory will be preserved for more than one or two seconds.

For an example, a student who lost his concentration in class will suddenly pay attention when he hears a significant word being said by the lecturer. This student will be able to remember what was said before the significant word since the information has been stored in the sensory register.

**Short-term memory** (STM) is also known as the working memory. Its main function is to temporarily store information for a limited time only. STM plays a role in selection, initiation, and termination of information-processing functions such as encoding, storing and retrieving data.

**Long-term memory** (LTM) differs from STM due to its ability to store information for a longer duration. Information from STM that are rehearsed meaningfully associated will be transferred to LTM. In contrast to STM, there will be little delay of information from LTM. However, natural forgetting process would cause LTM fading. Recalling and retrieval of the information would help in retaining it in the LTM for a longer period.
**Exercise:**

The Stage Theory Model highlights that information is processed in three stages i.e. sensory memory, short-term memory and long term memory.

1) Briefly describe what is sensory memory.

2) Explain using your own words the difference between short-term memory and long-term memory.
7.2 Divided Attention

What do you understand by attention? Attention can be defined as a cognitive process of selectively concentrating one aspect of the environment while ignoring other things. For example, a driver is still able to concentrate on a conversation he is having on the phone while driving on the road. According to Banich (2004), psychologist agreed that the brain has a limitation to the amount of information that can be processed at a given time. The brain will be able to function effectively when specific information is selected for processing. This process is known as attention.

An individual’s attention can be divided between two verbal or visual tasks. His performance on these simultaneous tasks would depend on various factors. A person with a high level of practice in dividing attention will acquire a degree of automaticity which then enables us to deal with more demanding simultaneous activity.

7.3 Automaticity Processing

Divided attention was found to initiate further research. Based on the results obtained from the various research conducted, it was found that practice played a major role in determining one’s performance. One of the most plausible
reasons for this key phenomenon is that processing activities become automatic as a result of prolonged practice.

Automatic processing are usually fast and do not reduce the capacity for performing other tasks. Furthermore, automatic processes do not have any capacity limitations and is very hard to modify once learned. However, automatic processing has its limitation. It lacks flexibility which is likely to interrupts performance.

Exercise:

Briefly explain how automaticity processing occurs in an individual.
SUMMARY

1. Information processing is essential for an individual to digest information obtained from the environment by listening or visualizing and storing them in the memory. Information processing happens in three stages which are sensory memory, short-term memory and long-term memory.

2. Our brain has the ability to pay attention to selected aspect of the environment and further divide the attention between two verbal or visual tasks.

3. A high level of practice in dividing attention increases individual’s performance until it becomes an automatic process.
Memory is the core to most all of our cognitive processes. It is essential to us humans since it helps us retain and recall information, personal experiences and procedures. Memory is found to be related to learning. Memory and learning are the basis of all our knowledge and abilities. Learning is a process where one acquires new knowledge while memory helps retain learned knowledge. In addition, memory helps us change our behavior through information and experiences that are stored in memory. Due to its major role in our ways of thinking, our memory and how it functions has been an interest for many researchers worldwide. Theories regarding memory have been generated by renowned researchers such as Atkinson and Shiffrin (1968). This unit aims to enlighten readers on human memory especially the classification and types of memory and its limitations.
Unit Objective

At the end of this unit you will be able to:

1. Understand the meaning of memory.
2. Discuss the types of memory store.
3. Explain the theories involved in memory loss.
4. Describe the limitations of memory.

Reference:

Content

8.1 Memory
8.2 Forgetting and Remembering
8.3 Limits and Failures of Memory
8.4 Summary

8.1 Memory

Memory is the brain's ability to acquire, store, retain and later retrieve information. Memory can be classified into two primary types which are explicit and implicit memory.
Explicit memory

Explicit memory or declarative memory is memories that are available to conscious access and reflection. Explicit memory allows an individual to recall consciously and describe verbally information such as facts, people, and daily places. Therefore, this type of memory contains information regarding specific events that happened at a specific time and place. The process of forming and storing explicit memories are associated with previous related stimuli or experience. Hence, explicit memory can be remembered and recalled based on experiences and knowledge. Explicit memory can be further divided into Short-term memory and Long-term memory which would be further discussed in the following section.

Implicit memory

Implicit or procedural memory is a type of memory that is automatic and unconscious. Previous experiences would help an individual in a performance of task without any conscious awareness of these past experiences. There are three basic types of implicit memory which are repetition priming and skill learning (conditioning and motor skills). Through repetition priming and skill learning an individual would show improvement on task performance for which they have subconsciously prepared.
Short-term memory (STM)

Short-term memory (STM) is a temporary storage area that is used for unprocessed visual or auditory information that last up to approximately 30 seconds. STM has limited capacity up to seven pieces of independent information. Memory loss is primarily due to decaying of information. There are three basic operations in STM:

1. Iconic memory – the ability to hold visual images.
2. Acoustic memory – the ability to hold sounds.
3. Working memory – process that temporarily store and manipulate information for immediate use.

**Long-term memory (LTM)**

Long-term memory (LTM) can be further divided into memory for episodic memory and semantic memory. Episodic memory is memory for specific events or episodes that an individual has experienced. Semantic memory includes knowledge of word meanings and is an essential element of language.

![Diagram of Memory Systems](http://cmap.ihmc.us/Publications/ResearchPapers/TheoryCmaps/Flg4MemorySystems-small.png)
Exercise:

1. In your own words, describe explicit and implicit memory and how do they differ from one another?

2. What is Short-term memory? Describe briefly the three basic operations in STM.

3. What is the difference between episodic and semantic memory?
8.2 Forgetting and Remembering

Information stored in the sensory, short-term and long-term memory may be lost. Theories that can explain forgetfulness are Decay theory and Interference theory.

Decay theory suggests that time plays a role in fading memory. The fading is a basic biological function where an alteration of metabolic rate would alter decay rate and memory retention.

Interference theory proposed that memories disrupt with each other. Individuals are more likely to encounter new information that may overwrite existing memories. There are two types process involved in this theory. The first is retroactive interference where new learned information would disrupt an older memory. The second process is proactive interference information that has already been learned would hinder the learning of new information.

There are three major processes involved in remembering memory which are 1) encoding, 2) storage and 3) retrieval. Encoding is changing information into a usable form. After information has been successfully encoded, information would be stored until further use. Retrieval of information happens when stored memories are brought into conscious awareness.
8.4  Limits and Failures of Memory

It is important to understand how our memory succeeds and fails because it will help us to uncover the limits of memory in our everyday life. How the normal memory functions were analyzed mostly through the study of memory failures after a brain damage. The following listed the different kinds of memory with its own function, limits and failures.

1. **Good Memory** – we can recognize easily using visual stimuli, but poor recall for pictures and faces.
2. **Autobiographical Memory** – recall personal events especially those that are emotionally based.
3. **Prospective Memory** – remembering to do things or failure to do so rather than remembering past events or facts
4. **Memory across lifespan** – our memory improves as we get older, but slower around 65 years old.
5. **Eye-witness memory** – memory details of events we just saw is often difficult
6. **False memories** – the question of whether a memory is genuine or distorted due to misleading questions or information.
7. **Memory damage** – loss of memory due to brain damage through infection, stroke or head injury.
SUMMARY

1. Memory, which is the brain’s ability to acquire, store, retain and retrieve information, can be further classified into explicit and implicit memory.

2. Information stored in our memory can be remembered and forgotten. The Decay theory proposed time as agents in fading memory while the interference theory suggests that memories interfere with each other, and new memories may overwrite existing memories.

3. There are several types of memory including good memory, autobiographical memory, prospective memory, memory across lifespan, eye-witness memory, false memories and memory damage. Regardless of its function and advantage to us, it not without limitations and failures.
UNIT 9
LANGUAGE AND COGNITION DEVELOPMENT

Language and cognition development is interrelated and closely linked to one another. Language and cognitive development is a gradual process that occurs in humans as young and early as six months old. For example, a baby prior to speech production is able to understand sights, sounds and actions in the environment. The baby will then place actions within his or her surroundings within the context of language. This process is known as cognitive development. Language development is further enhanced with cognitive development. Therefore, it is important to stimulate individual's cognition especially in young children in order for their language to be fully developed. In this unit, we will focus more on how language develops and its relationship to cognition development.

Unit Objective

At the end of this unit you will be able to:

1. Understand the meaning of language
2. Explain the stages involve in language development
3. Describe the theories of language development.
9.1 Definition of Language

Language is a basic tool in communication. As we develop from infancy to
adults, we also developed our language and cognition. Full development would
allow communication to take place without facing any problems. There are two
types of languages which are receptive and productive language.
Receptive language refers to an individual’s comprehension and ability to identify objects and pictures, understand basic concepts and follow directions.

Productive language or language expression is an ability to communicate thoughts and needs through gestures or words, answer questions, and relate experiences.

9.2 Language Development

In order for language to develop, children must be taught from a young age to communicate and socialize with others. Therefore, it is essential for children to be involved in a communicative environment that would promote their language development. There are four stages to language development. The types are as follow:

1. Phonology Development
2. Semantic Development
3. Syntax Development
4. Pragmatics Development

Phonology Development

Phonology is the sound system of language and describes the way sounds function within a language. Phonology development occurs in three stages:
• Early phases
• Beginning of phonology strategy
• Last phases

A description of the phonological development is presented in the table below.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 months</td>
<td>Baby will engage in cooing which mostly contains vowel sounds.</td>
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<tr>
<td>4 months</td>
<td>Cooing turns into babbling which is a repetitive consonant-vowel combination.</td>
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<tr>
<td>1-2 years</td>
<td>Children are able to recognize the correct pronunciation of familiar words and use phonological strategies to simplify word pronunciation.</td>
</tr>
<tr>
<td>3-5 years</td>
<td>Phonological awareness in children continues to improve as well as pronunciation.</td>
</tr>
<tr>
<td>6-10</td>
<td>Children can master syllable stress patterns which aids them in differentiating between similar words.</td>
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</tbody>
</table>
Semantic Development

Semantic is the meaning conveyed by words and sentences. The word semantics origins from the Greek word *semantikos* or “significant meaning” derived from *sema*, sign.

<table>
<thead>
<tr>
<th>Age</th>
<th>Description of Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth – 1 year</td>
<td>Children are able to comprehend language before they manage to produce language. Babies are able to recognize familiar words and use preverbal gestures.</td>
</tr>
</tbody>
</table>
| 1-2 years | Children’s vocabulary expands to several hundred words. At this stage, they are able to learn new things quickly. Majority of words learned consists of nouns and verbs. Semantics development in a 2 year old child would focus on:   
  - Object an action
  - Statement of condition
  - Personal or social words.
  - Function of words. |
| 3-5 years | Children face difficulty in using the correct words. For example, children may use overextensions by taking a general word and applying it specifically or vice versa. Children can also understand metaphors. |
| 6-10 years | Children can understand the meanings of words based on their definition. In addition, they are able to appreciate the multiple meaning of words and use words precisely through the metaphors and puns. |
Syntax is the set of grammatical rules that strings words to make sentences. Originating from the Greek word *syn* or together and *taxis* (order), syntax studies the relation that govern the way the words in a sentence come together. The two phases involved in children syntax development are:

- Easy sentences – combination of the first word
- Complex communication – combination of easy words.

Pragmatics is the standard that determines how language can be altered to fit context. Pragmatics is also known as the area of language function that embraces the use of language in social context. Pragmatics uses three following aspects of language which are as follow:

- The study of discourse and conversational skills.
- The study of the relationship between pragmatics and other levels of language.
- The study of the situational determinants of the use of language.
<table>
<thead>
<tr>
<th>Age</th>
<th>Description of Development</th>
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<tbody>
<tr>
<td>0-1 year</td>
<td>Babies can engage in sharing the attention with other people. They could also take turns in engaging in activities.</td>
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<tr>
<td>1-2 year</td>
<td>They can engage in conversational turn taking and topic maintenance.</td>
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<td>3-5 years</td>
<td>Children can master illocutionary intent. Additionally, the following conversational social language skills would be developed:</td>
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<td></td>
<td>- Requests for objects</td>
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<td>- Request for actions</td>
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<td></td>
<td>- Assertions</td>
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<td></td>
<td>- Denials</td>
</tr>
<tr>
<td></td>
<td>- Requesting for information</td>
</tr>
<tr>
<td></td>
<td>- Callings or summons</td>
</tr>
<tr>
<td></td>
<td>- Stated information</td>
</tr>
<tr>
<td>6-10 years</td>
<td>Children are able to communicate effectively in demanding settings and changing conversation topic.</td>
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</tbody>
</table>
**Exercise:**

Using your own words, describe briefly the stages in language development.

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9.3 Theories of Language Development

There are several theories that have been put forth to explain language development. However, only four major theories of language development are selected to be discussed in this unit. The theories are as follows.

1. The Behaviorist Theory
2. The Nativist Theory
3. The Cognitive Theory
4. The Interaction Theory

The Behaviorist Theory

This theory was developed by Skinner where he proposed that language is learned through operant conditioning such as reinforcement and imitation. The main central idea for this theory is that children imitate adults. When a child correctly imitates speech, he would be reinforced by getting praised or getting what he wants, while incorrect speech would be ignored by adults. Based on this theory, parents are engaged in intensive tutoring in order for language to be taught properly.
Limitations

Although Skinner’s theory was able to explain language development, it is not without its limitation. Among the limitation are listed as below.

1. Language is structured or has a set of rules. Therefore, it could not be worked out simply by imitating individual speech. The mistakes revealed by children that they are not simply imitating but actively working out and applying rules.

2. Majority of children go through the same stage of language development and acquisition. This shows that language is learned through different steps that may be referred to as the developmental milestone. It is believed that the milestone is not affected by the type of degree of interaction the child receives from adults of the type of environment he grows in.

3. Children often tend to be unable to repeat adult’s speech especially if the speech contains a structures that children has not yet understand or use.
Language according to the founder of the Nativist Theory, Chomsky, is a unique human accomplishment. He reported that children have an innate language acquisition device (LAD) that allows children to generate consistent sentences once vocabulary is learned. In other words, this theory suggests that nature is more important than nurture and that experiences are important to activate LAD.

Although, this theory was largely accepted in explaining language development, it was found to have some weaknesses. However, researchers generally agreed on one main limitation which is the theory does not put much emphasis on the degree of influences that cognition and language have on each other’s development.

The Cognitive Theory supports the notion that language is one important aspect of a child’s overall cognitive development. This theory which was designed by Piaget strongly claims that children have to understand a concept before they can obtain the particular language form which expresses the concept.

Limitation

1. Although the relation between language and cognitive development were found to be evident, the continuous development of a child causes the relationship to
become harder to detect and examine. There were studies on children who have learned to speak fluently despite having abnormal mental development.

2. Another issue highlighted for this theory was that syntax was not dependent on a child’s general intellectual growth.

The Interaction Theory

Recent researchers have emphasized the importance of language input between children and their care-givers. Language is an important tool for communication. Therefore, this theory established by Burner believes that language can only be learned in the context of interaction with people. Burner suggested that communication between adult and children is adapted to support the acquisition process. This process could be also known as the Language Acquisition Support System (LASS).

Limitation:

1. Although children will learn quickly with frequent interaction, it must be noted that children go through the same stages in acquiring language.

2. There are some cultures where adult communication with children does not adopt the LASS. Therefore, this LASS system may be useful but not essential in different cultures.
Note:

The various theories regarding language development should not be taken separately or seen simply as an alternative. It is suggested that each theory provides partial explanation of the language development process and thus supports each other’s strength and limitation.
**Exercise:**

Briefly list down the major idea of the four major theories of language development.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Major Aspect</th>
<th>Strengths</th>
<th>Limitations</th>
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<tr>
<td>The Behavioral Theory</td>
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<tr>
<td>The Nativist Theory</td>
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<tr>
<td>The Cognitive Theory</td>
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<tr>
<td>The Interaction Theory</td>
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</table>
SUMMARY

1. Language, a very important tool for communication can be categorized into receptive and productive language.

2. Language develops gradually and within four stages which are phonology, semantic, syntax and pragmatics development.

3. Four main theories aim to explain language development. Each theory has its own strengths and weaknesses. All of these theories support each other’s strength and limitation, and must be taken into account when understanding language development.
UNIT 10
LANGUAGE, COGNITION AND MEMORY

What are Language, Cognition and Memory?
Cognition is the study of mental processes which is the core element in our ability to perceive the world, store information in memory, learn and share from experiences and change behavior appropriately. Cognition involves functions of perception, memory, language and thought and is the act or process of knowing including both awareness and judgment. As mentioned in the previous units, language, cognition and memory are interrelated and influence the development of one another. In this unit, we will focus more on cognitive processes and how it relates to language and memory.

Unit Objective
At the end of this unit you will be able to:
1. Understand the cognitive concepts.
2. Explain reasoning and decision making.
3. Discuss the key steps involved in solving problems.
4. Understand creativity and its role in problem solving.
10.1 Piagetian Cognitive Concepts

Piaget’s developed a very unique concept that looked at cognitive development. According to Piaget, there are three key ideas that are the essential elements in cognitive. The three concepts are cognitive structure, function and content.

Cognitive structure focuses on the form (shapes or patterns) that cognition takes during each of Piaget’s stages of mental growth. Each stage in cognitive development has its own unique set of structures.

Cognitive functions are purposes or goals that express where cognitive development is heading. These functions are statements of direction.
Cognitive contents are the specific acts that comprise intelligence at any given stage of development. It can be directly measured. Examples are mathematical concept and abstract symbol.

### 10.2 Reasoning and decision making

Reasoning is a cognitive process by which people start with information and come to conclusions that go beyond original information. There are three types of reasoning which are analogical, deductive and inductive reasoning.

1. **Analogical reasoning** is when an individual resolves a current problem based on similarities of previous problems. There are two major processes involved in analogical thinking which are access and mapping. Access is the process of retrieving a familiar analogue or information from long-term memory when faced with a new problem. Mapping on the other hand involves identifying elements from the new problem that are similar to previous problems.

2. **Deductive reasoning** is a conclusion that is logically followed from premises. This reasoning argues from general to specific.

3. **Inductive reasoning** on the other hand argues from the particular to the general and arrives at conclusions that are probably true, based on evidence.
Decision making is an outcome of cognitive processes leading to selection of a course or action between more than one alternative. Decision making is a continuous process integrated in the interaction with the environment.

Problem Solving has been defined as higher-order cognitive process that requires the modulation and control of more routine or fundamental skills (Goldstein & Levin, 1987). Problem solving occurs when an individual does not know how to proceed from a given state to a desired objective. To solve a problem, process involved would include problem finding and shaping.

Exercise:

Using your own words, describe briefly reasoning and decision making.
10.3 Problem Solving

What is problem solving? Problem solving is a process that helps solve immediate problem or achieve a goal. Problem solving involves various steps that are presented in the problem-solving cycle below. A successful problems solving incorporates the steps in a flexible manner.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Problem Identification</td>
<td>Determine the problem in order to find the suitable solution.</td>
</tr>
<tr>
<td>2. Problem Definition and representation</td>
<td>Crucial step where problems are defined and represented so that it can be solve.</td>
</tr>
<tr>
<td>3. Strategy formulation</td>
<td>Plan strategy that may involve analysis or synthesis of the problem.</td>
</tr>
<tr>
<td>4. Organization of information</td>
<td>Integrate all of the information that is needed to effectively deal with the problem. Information is organized strategically and represented that help to enable the implementation of strategy.</td>
</tr>
<tr>
<td>5. Resource allocation</td>
<td>In problem solving, people may tend to have problems with limited resources such as time, money, space and equipment. Therefore, one must know when to use his or her resources when solving a problem.</td>
</tr>
<tr>
<td>6. Monitoring</td>
<td>During problems solving, it is important to monitor progress to ensure that the goal is within reach.</td>
</tr>
<tr>
<td>7. Evaluation</td>
<td>A person needs to evaluate their solutions when the problem has been solved. This will allow the problem to be redefined and new strategies be developed.</td>
</tr>
</tbody>
</table>
Exercise:

Briefly describe the process involved in problem solving.
10.4 Creativity

Creativity is a mental process that involves the generation of new ideas or concepts, or even new associations of creative mind between existing ideas or concepts. An alternative conception of creativity is that it is simply the act of making something new. Creativity could also be defined as a cognitive activity that results in a new way of viewing a problem and solution (Solso, Maclin & Maclin, 2008).

Creativity may be explained by a model created by Wallas & Smith (1926). This model highlighted 5 stages that may explain creative insights and illumination. The five stages are as follow.

<table>
<thead>
<tr>
<th>Stages</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
<td>Preparatory work on a problem that focuses the individual's mind on the problem and explores the problem's dimensions.</td>
</tr>
<tr>
<td>Incubation</td>
<td>Problem is internalized into the unconscious mind and nothing appears externally to be happening.</td>
</tr>
<tr>
<td>Intimation</td>
<td>The creative person gets a 'feeling' that a solution is on its way.</td>
</tr>
<tr>
<td>Illumination</td>
<td>The creative idea bursts forth from its preconscious processing into conscious awareness.</td>
</tr>
<tr>
<td>Verification</td>
<td>The idea is consciously verified, elaborated, and then applied.</td>
</tr>
</tbody>
</table>
SUMMARY

1. Cognitive development consists of three essential ideas which are cognitive structure, function and content.

2. Reasoning and decision making are both cognitive processes that allow us to conclude information and select a course of action between several alternatives.

3. Problem solving helps us solve problems by implementing various steps while creativity generates new ideas between existing ideas or concepts.