MPB-1

{Methodology of Research on Biology I}

Credit: 2 (Theory) & 1 (Practice)

Dr. Paidi, M.Si

Urgency of MPB I

STATISTICS / BIOMETRY

↓

MPB I

↓

MPB-2 / MPPB

↓

(SEMINAR)

↓

FINAL TASK

Main Learning Content

PRINCIPLESS OF RESEARCH AND ITS METHODOLOGIES

↓

Designing a research

↓

Conducting a research

↓

Data Analysis

↓

Reporting/Communicating

MPB I
Methodology of Research on Biology I

Research:

- Application Scientific Approach on analyzing a problem
- Systematic and objective procedure to find out a confidence/faith knowledge

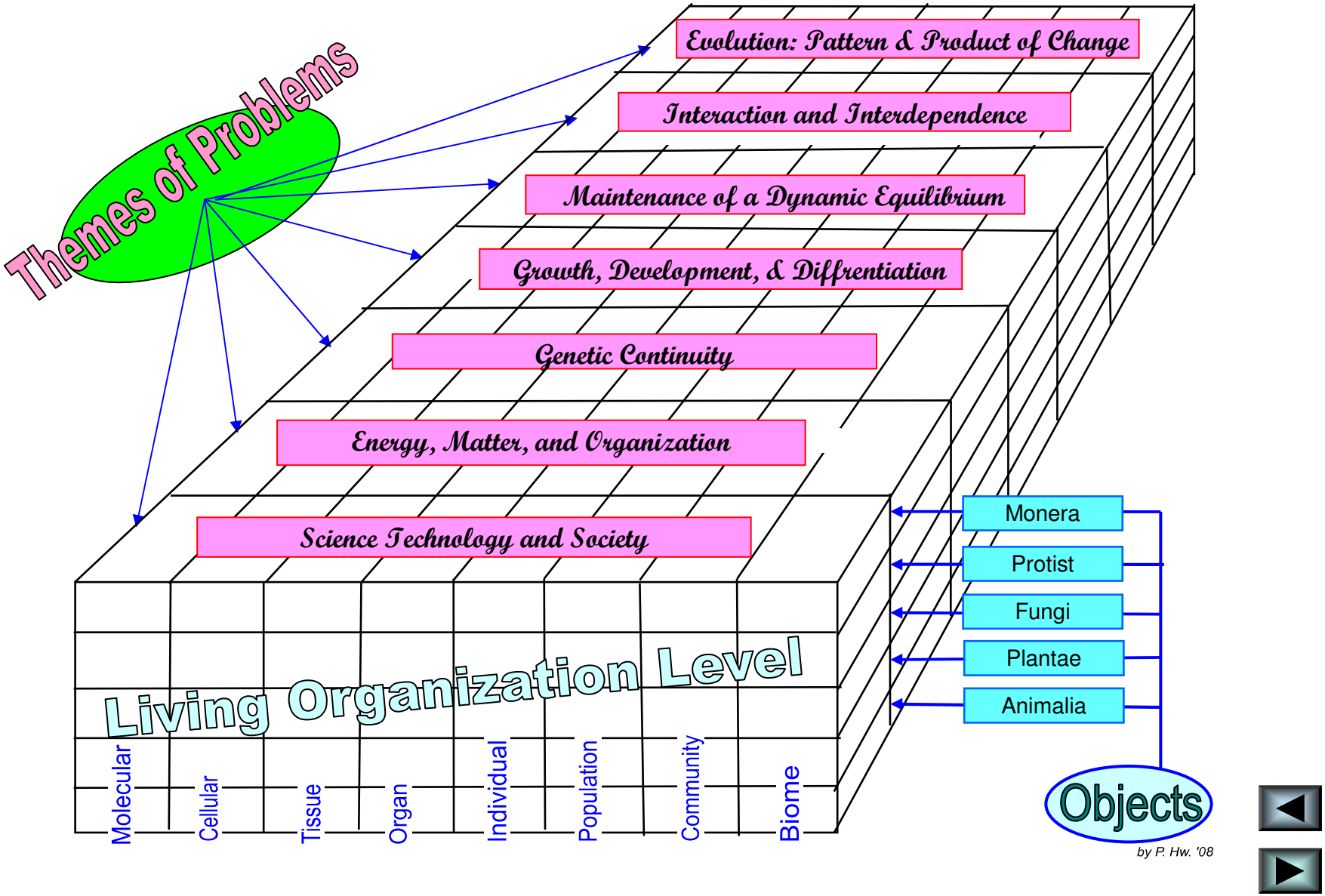
Methodology of Research:

- A science of studying how research is done scientifically
- A way to systematically solve the research problem by logically adopting various steps
- Aims to describe and analyze methods, throw light on their limitations and resources

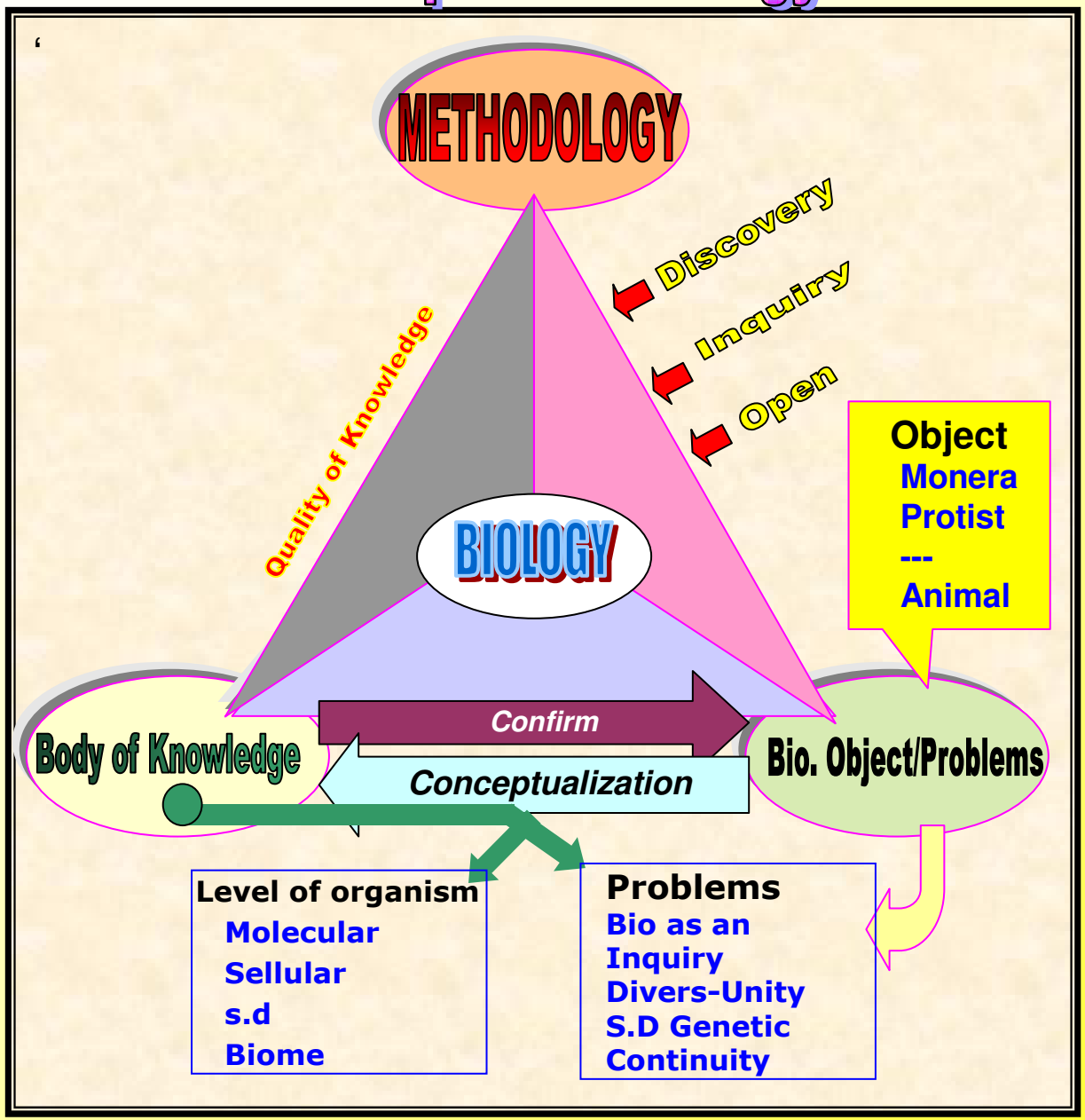
Biology:

- Next page

Struktur Biologi Menurut BSCS



Principles of Biology



RESEARCH APPROACH

Qualitative

Quantitative

Mix Method

QUANTITATIVE RESEARCH

Philosophy	Positivistic Limited Variable
Method	Experiment Correlation Observation
Data	Number Statistic Test

Types Research on Bio

P. Hw.

Descriptive

Experimental

Action Research

Types of Research

The End

Types of Research

P. Hw.

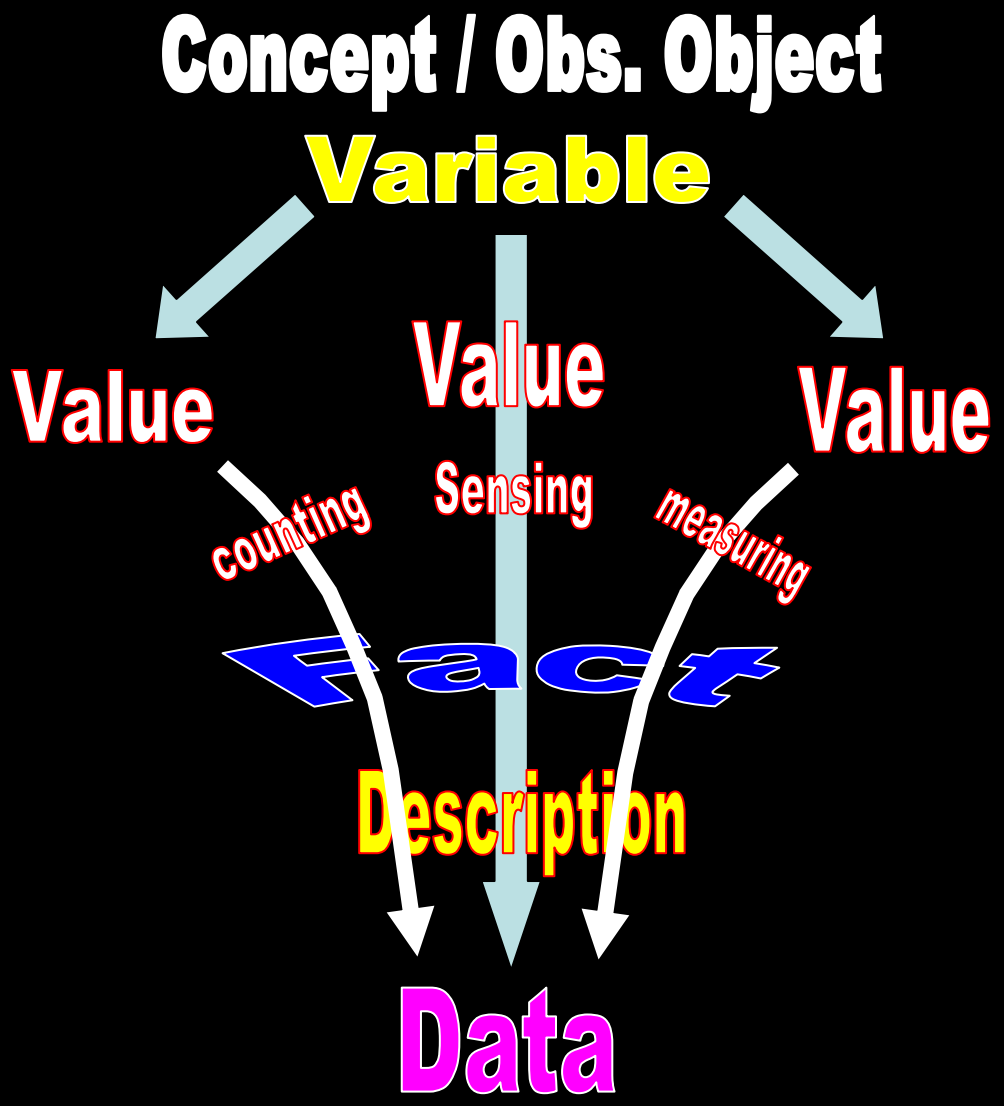
A. Descriptive

- **Observation/Survey**
- **Case Study**
- **Historical**
- **Etc.**

B. Experimental

C. *Ex post facto*

VARIABLE & DATA



Measuring Scale of Data

P. Hw.

- Nominal
- Ordinal
- Interval
- Ratio

Measuring Scale

DATA

The End

Blood Type
(Data in Nominal)

Next Table

Student	Blood Type	
	ABO	MN
Student 1	2	1
Student 2	1	2
Student 3	2	3
Student 4	3	3
Student 5	4	3
Student 6	3	2
Student 7	2	2
Student n	2	2

Note ABO
1=O
2=A
3=B
4=AB

Note MN
1=M
2=N
3=MN

Type of Vegetation
(Data in Ordinal)

Next Table

Vegetation	Domination Type of Vegetation	
	Plot I	Plot II
A	2	1
B	3	2
C	2	4
D	3	3
E	4	3
F	3	4
G	2	2
Veget. n	2	2

Note:
1=grass
2=scrub
3=clump
4=tree

Air Temperature at Morning & Evening at Some places
(Data in Interval)

P. Hw.

Places	Air Temperature (°C)	
	Morning	Evening
1	**24**	**27**
2	**25**	**25**
3	**32**	**33**
4	**16**	**28**
5	**21**	**30**
6	**26**	**27**
7	**22**	**32**
8	**25**	**35**
n	**38**	**44**

Number & Proportion Child in Some Family Keluarga
(Data in Ratio)

Family	Age		
	Child	Young	Adult
A	2	1	0
B	0	2	0
C	1	2	3
D	4	0	0
E	2	1	0
F	0	0	4
G	1	1	0
H	0	0	0
I	1	0	1
J	0	2	1

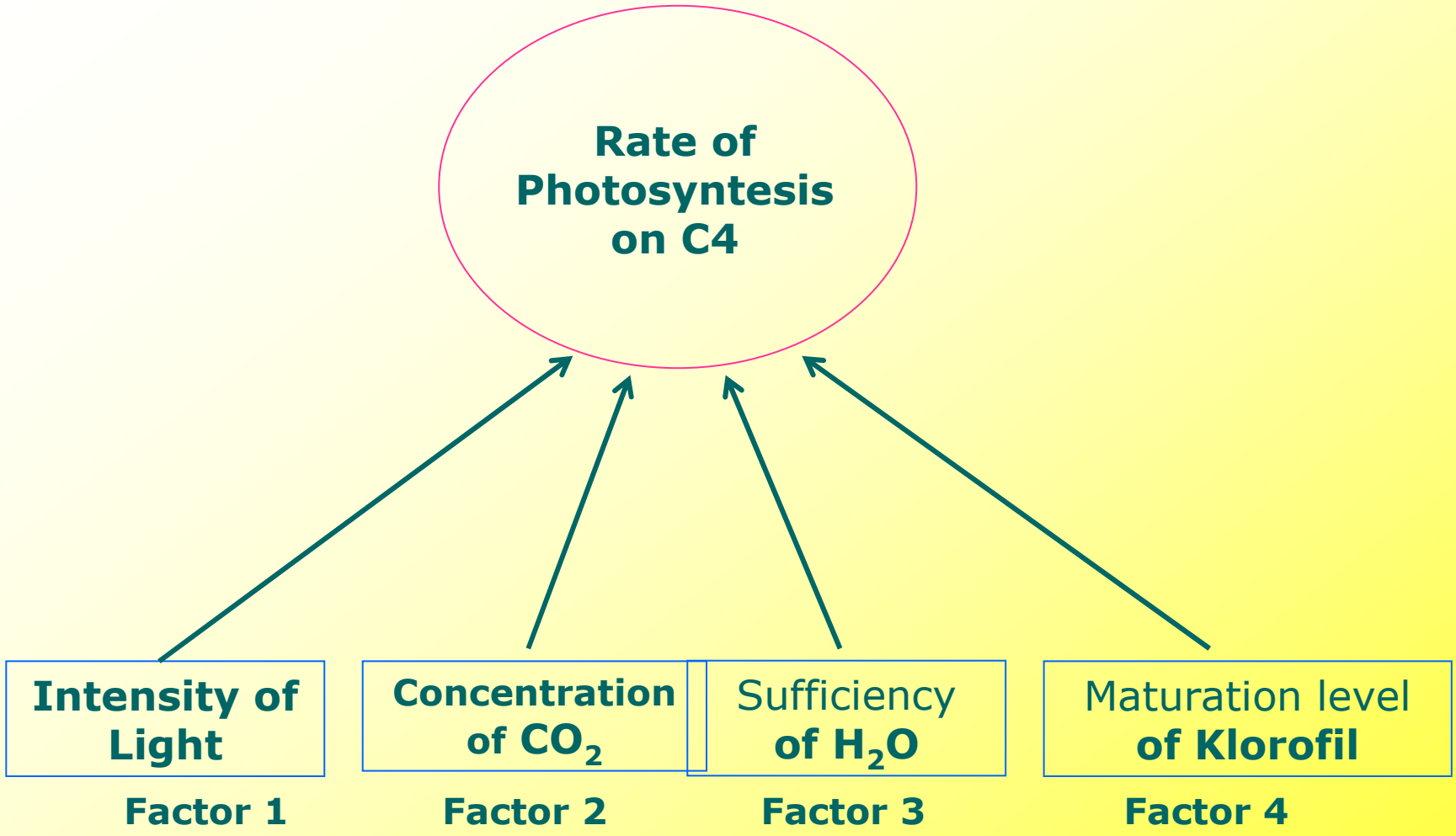
Variable:

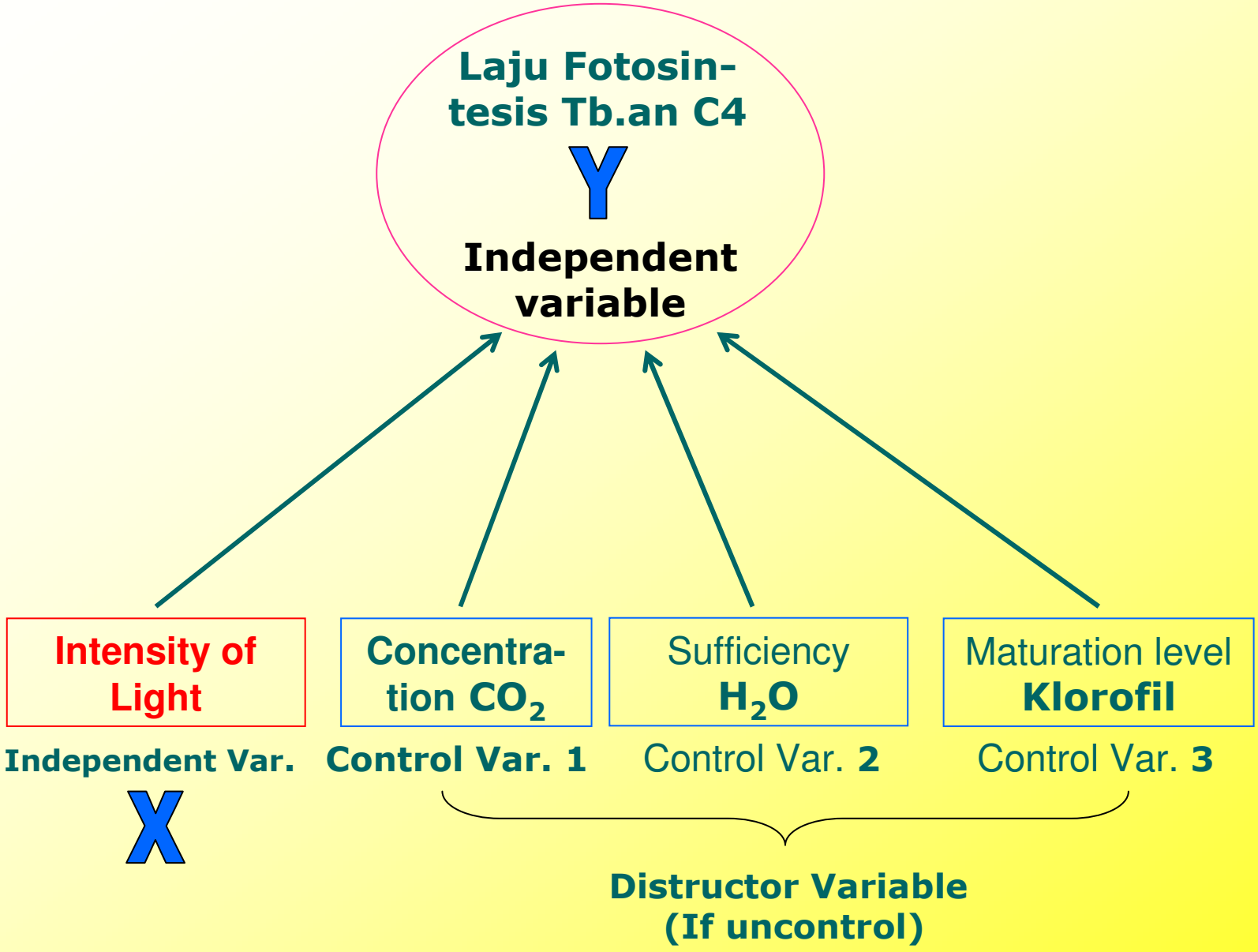
Part of concept, phenomena, or observation object explaining characteristics of the concept or differences among observation object, concept, or phenomena.

Part of concept or observation object differing and characterizing the concept or observation object itself

Types of Variable

- Qualitative Variable v.s quantitative
- discrete variable v.s continue variable
- Stimuli Var./ Predictor Var./ Independent Variable
- Response Variable/Dependent Variable
- Control variable
- Intermediate Variable
- Random variable
- Etc.


Rate of Photosyntesis on C4
Intensity of Light
Concentration of CO_2
Sufficiency of H_2O
Maturation level of Klorofil
Factor 1
Factor 2
Factor 3
Factor 4


Laju Fotosin-
tesis Tb.an C4
Y
Independent
variable
Intensity of
Light
Concentra-
tion CO_2
Sufficiency
H_2O
Maturation level
Klorofil
Independent Var.
X
Control Var. 1
Control Var. 2
Control Var. 3
Distructor Variable
(If uncontrol)

Independent Var. & Dependent Var.

P. Hw.

Intensity of light

X

Independent variable

Photosintesis Rate of C4

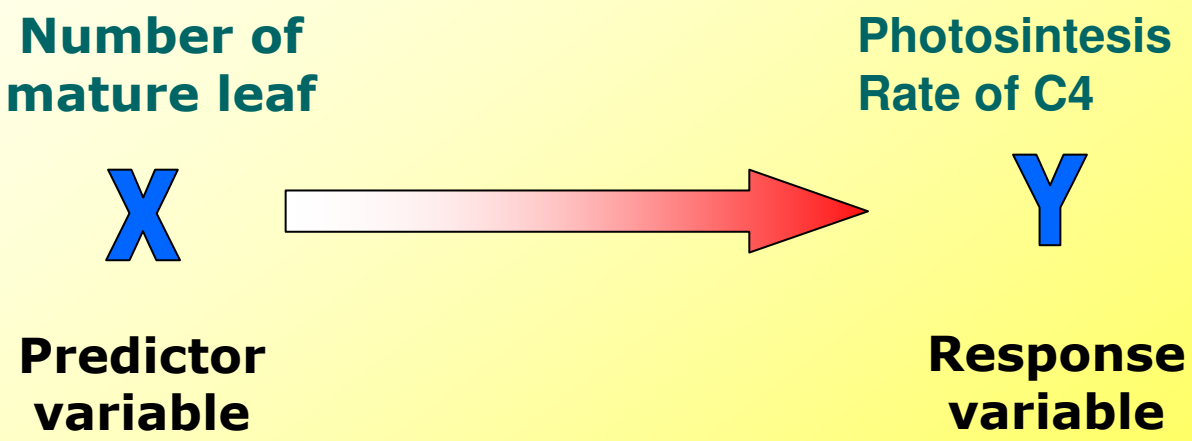
Y

Dependent variable

Causal Correlation

variable Prediktor & Var. Respon

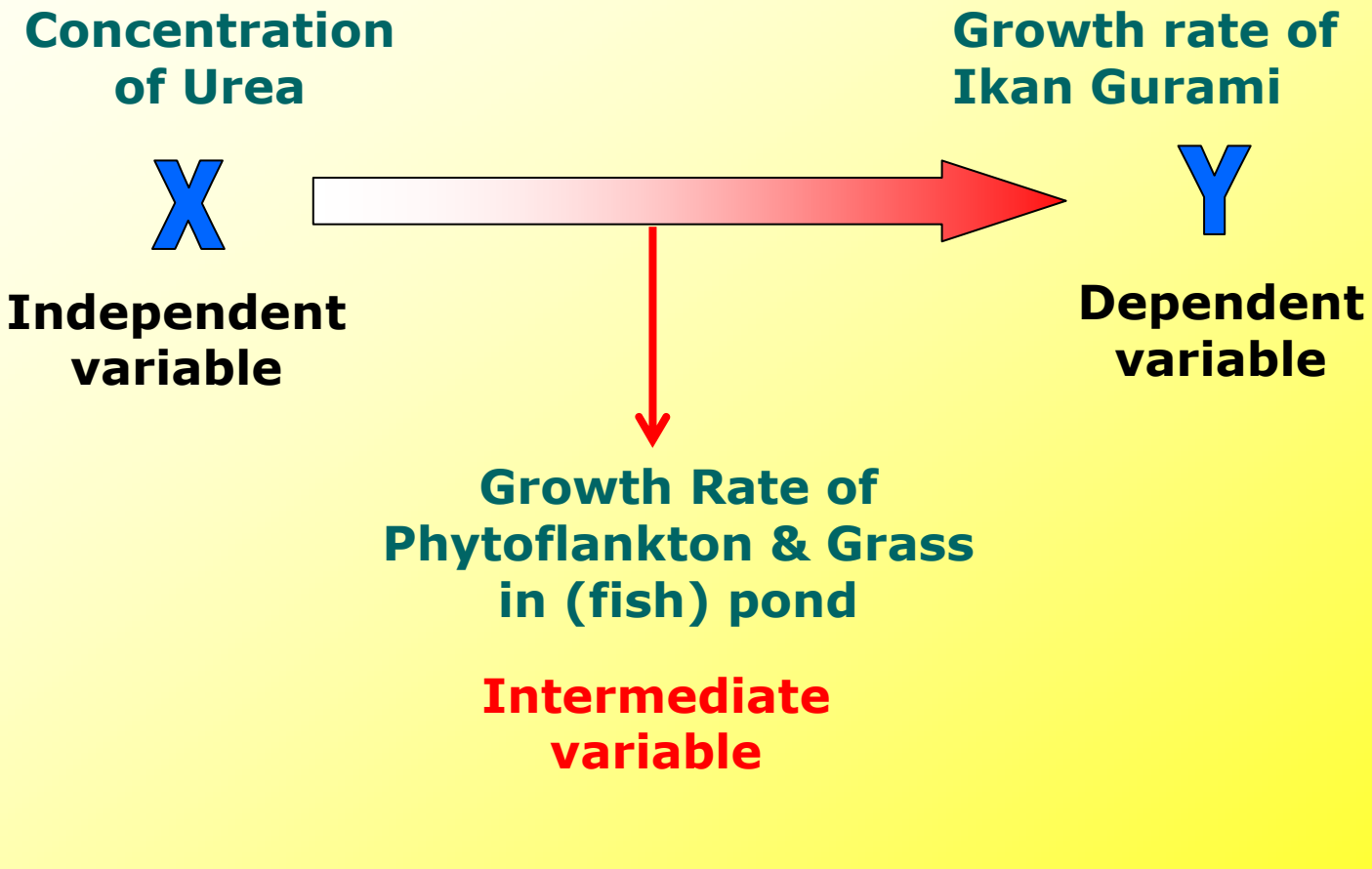
P. Hw.



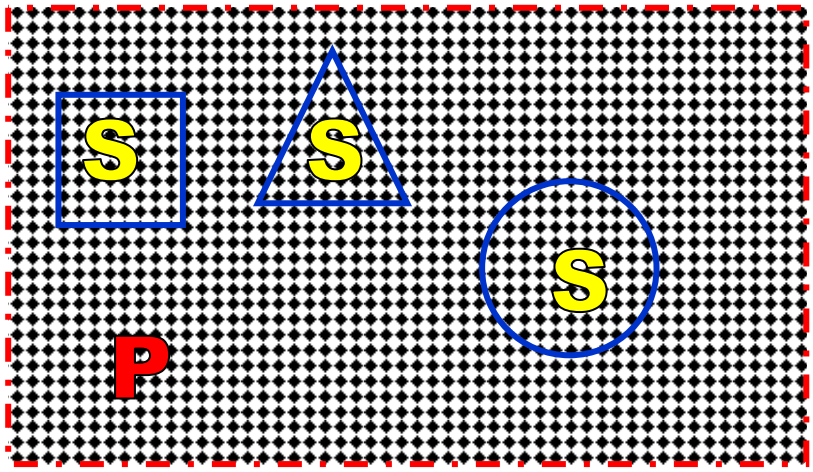
Functional Correlation (Regresional)

Independent & Dependent Var.

P. Hw.



Population & Sample



Population (vs. Sample)
Population is entity or accumulation of units, objects, or individuals.

Population is a totality of all “individuals” or “items” which is each the individual or object is smallest thing.

Sample is part or represent of population

Techniques of Sampling

A. *Definite Population*

1. ***non-random sampling***
   quota sampling
   purposive sampling

2. ***Random sampling***
   Simple random sampling
   Systematic sampling
   Stratified Random Sampling
   Cluster sampling

B. *Infinite Population*
   simple random sampling (n=txr)

Basic Characteristic of Experimental Research

- Giving Treatment (to manipulate an independent variable)
- Controlling (to control destructors variable)
- Randomizing (to randomize in giving a category or level of factor to an experimental unit)

Exp. Research. 1 Fact, 2 Dep. Var.

P. Hw.

a. Research Question *)
b. Hipothesis *)
c. Variabel of Research *)
d. Experimental Design *)
e. Population & sample *)
f. Data & technique for gathering data *)
g. Procedure of research *)
h. Technique of Data Analysis *)

Hipothesis

Research Hipothesis:

a. A affects to B
b. A affects to C
c. Category/Level A ….. Has highest affect to B
d. Category/Level A ….. Has highest affect to C

Next

Research Question

a. Does A affect to B?

b. Does A affect to C?

c. Which category/level of A have highest affect to B?

d. Which category/level of A have highest affect to C?

Hipothesis

Statistical Hipothesis:

For Hipothesis b:

A affects to C

H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4$

H_1: there are at least 2 means different each others

Next

Research Variable

a. Independent Variable : A
b. Dependent Variable: B & C
c. Control Variable: D, E, F, dst
d. Intermediate Variable (if any)

Experimental Design

a. Design: RAL (1& 2 factor (s))
b. Lay Out
c. Randomizing

Next

Exp. Research. 1 Fact, 2 Dep. Var.

P. Hw.

a. Research Question *)
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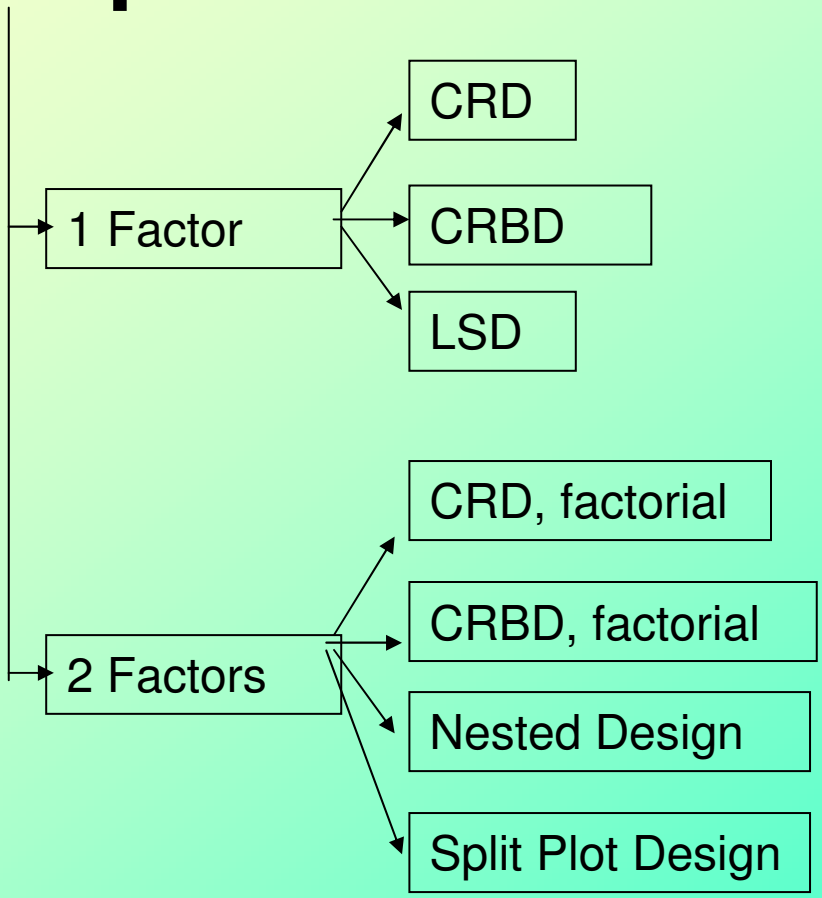
h. Technique of Data Analysis *)

Experimental Design

Experimental Design



Next

Population, Sample, & Sampling Technique

P. Hw.

a. Population …….. (N)
b. Sample …….. (n)
c. Sampling Technique: SRS

Procedure of Research

a. Object/sample preparation
b. Treating and its randomization
c. Controlling technique for destructor variable
d. Technique of observation

Next

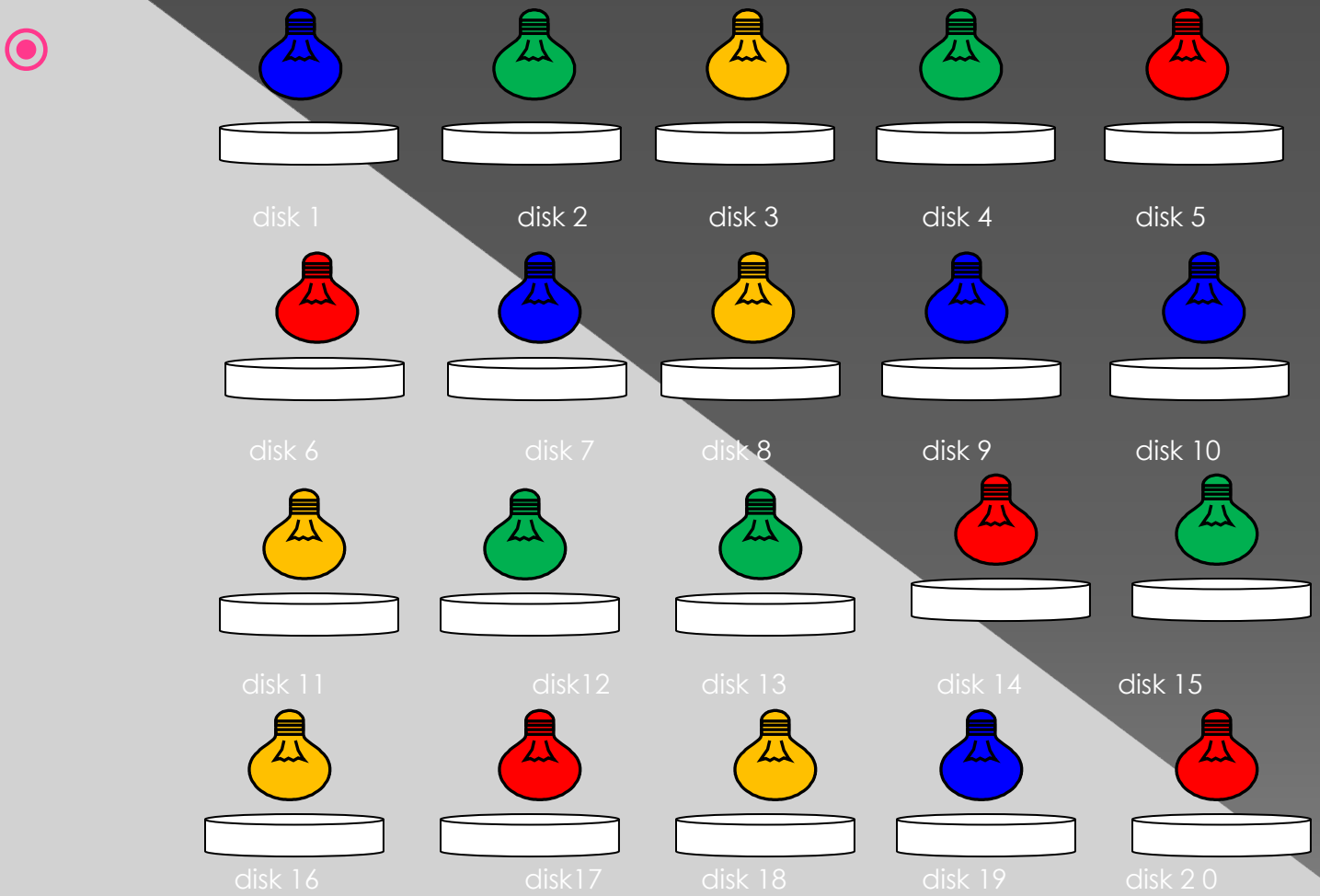
Data & Its Collect Techniques

a. Data on …….. is gathered through……..
b. Data on …….. is gathered through……..

Next

Lay Out & Randomizing Result

1 B	2 C	3 D	4 C
5 A	6 A	7 B	8 D
9 B	10 B	11 D	12 C
13 C	14 A	15 C	16 D
17 A	18 D	19 B	20 A


disk 1
disk 2
disk 3
disk 4
disk 5
disk 6
disk 7
disk 8
disk 9
disk 10
disk 11
disk12
disk 13
disk 14
disk 15
disk 16
disk17
disk 18
disk 19
disk 2 0

Table…. . Number …… caused by Category of Treatment Monochromatic Light ……..

Replica-tion	Type monochromatic light			
	A [Red]	B [Blue]	C [Green]	D [Yellow]
1	Y1 (disk 5)	Y6 (disk 1)	Y11 (disk 2)	Y16 (disk 3)
2	Y2 (disk 7)	Y7 (disk 6)	Y12 (disk 4)	Y17 (disk 9)
3	Y3 (disk 14)	Y8 (disk 8)	Y13 (disk 12)	Y18 (disk 11)
4	Y4 (disk 17)	Y9 (disk 10)	Y14 (disk 13)	Y19 (disk 16)
5	Y5 (disk 20)	Y10 (disk 19)	Y15 (disk 15)	Y20 (disk 18)
Mean	Mean A	Mean B	Mean C	Mean D

Data Analysis

a. To understand B, data is analyzed using……..
b. To understand C, data were analyzed using……..
c. If ANOVA significan, data were analyzed post hoc, using…….

Next

Hipotesis Testing

ANOVA

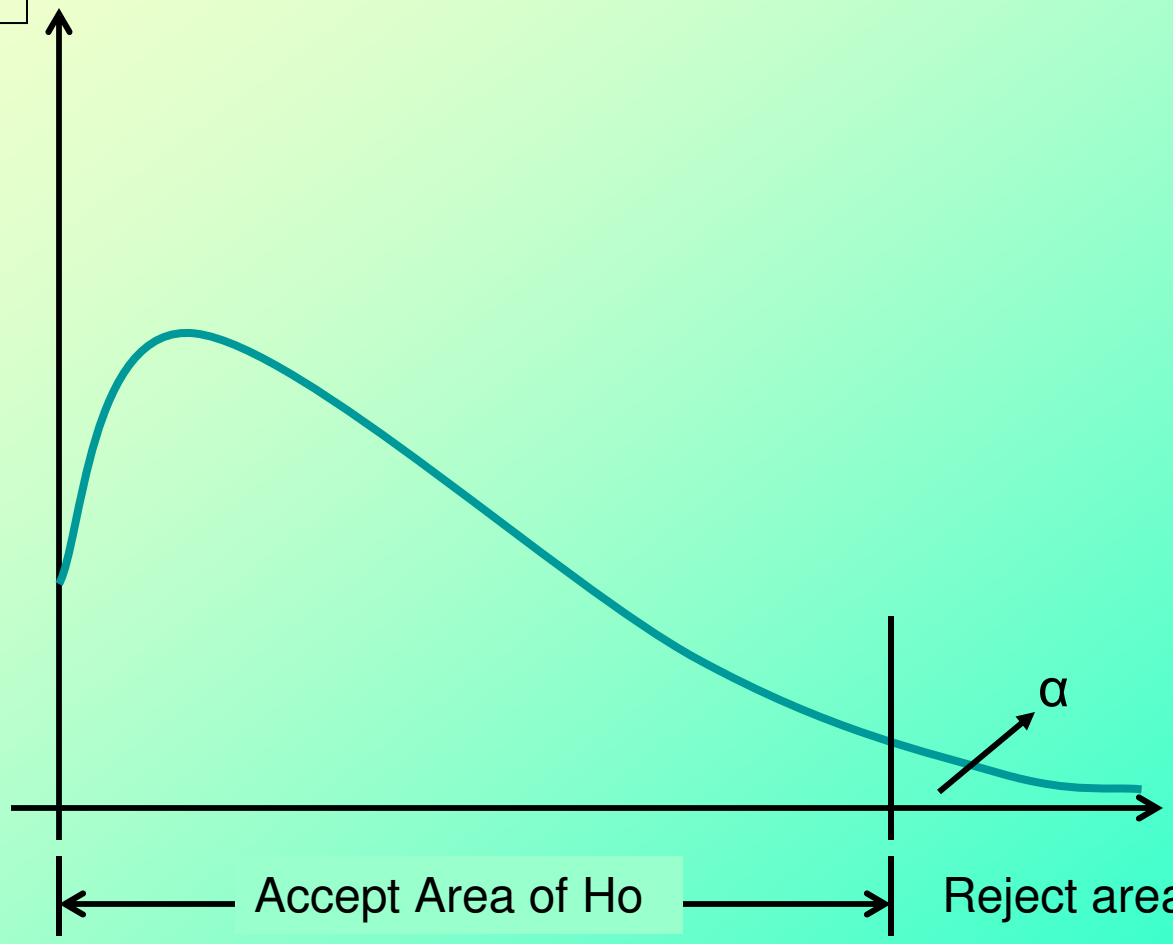


Table of Anova…….

Resources	df	SS	MS	F_{ratio}	F_{table}
Treatment (Between)	**3, ie: (t-1)**	**SST**	**MST** (SST/dbP)	**MST/MSE**	$F_{0.05}$ (dfP;dfE)
Error/Galat (Within)	**16, ie t(r-1)**	**JKE**	**MSE** (SSE/dfE)	**-**	
Total	**19, ie: (n-1)**	**SST**	**-**		

Next

ANOVA

KEAWETAN

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	444,000	2	222,000	71,040	,000
Within Groups	65,625	21	3,125		
Total	509,625	23			

Hipothesis Testing

P. Hw.

Next

T-Test, Z-Test