GENERALIZABILITY THEORY (G THEORY)

- A brief history
- Concepts and principles

Data structure

Facet-level sampling

Study focus

G coefficients

D studies

A BRIEF HISTORY

- Shortcomings of CTS model

1. Ignoring the interaction of different sources of error
2. No differentiation between systematic and unsystematic errors

- Conceptual framework

1. CTS based on classical correlational paradigm
2. G theory based on ANOVA

- Model symmetry (during the 1970s and 1980s)

Any factor as the object of measurement

- Lee Cronbach as the originator of G theory
- Cronbach, L. J., Gleser, G. C., Nanda, H., & Rajaratnam, N. (1972). *The dependability of behavioral measurements: Theory of generalizability for scores and profiles.* New York: Wiley.
- Cronbach, L. J., Rajaratnam, N., & Gleser, G. C. (1963). Theory of generalizability: A liberalization of reliability theory. *British Journal of Mathematical and Statistical Psychology, 16*(2), 137–163.
- In applied Linguistics:

Bolus, R. E., Hinofotis, F. B., & Bailey, K. M. (1982). An introduction to generalizability in second language research. *Language Learning, 32*(2), 245-258.

KEY TERMS

- Facet:
- Condition:
- Universe score:
- Universe of admissible observations
- Universe of generalisation

KEY CONCEPTS AND PRICNCIPLES

- Observation design

1. Facets and their inter-relationships

a. Crossed designs

b. Nested designs

2. Variance partitioning

EXAMPLES OF DESIGN

- Examples of a crossed design

Items

		1	2	3	...	k
Students	1					
	2					
	...					
	n					

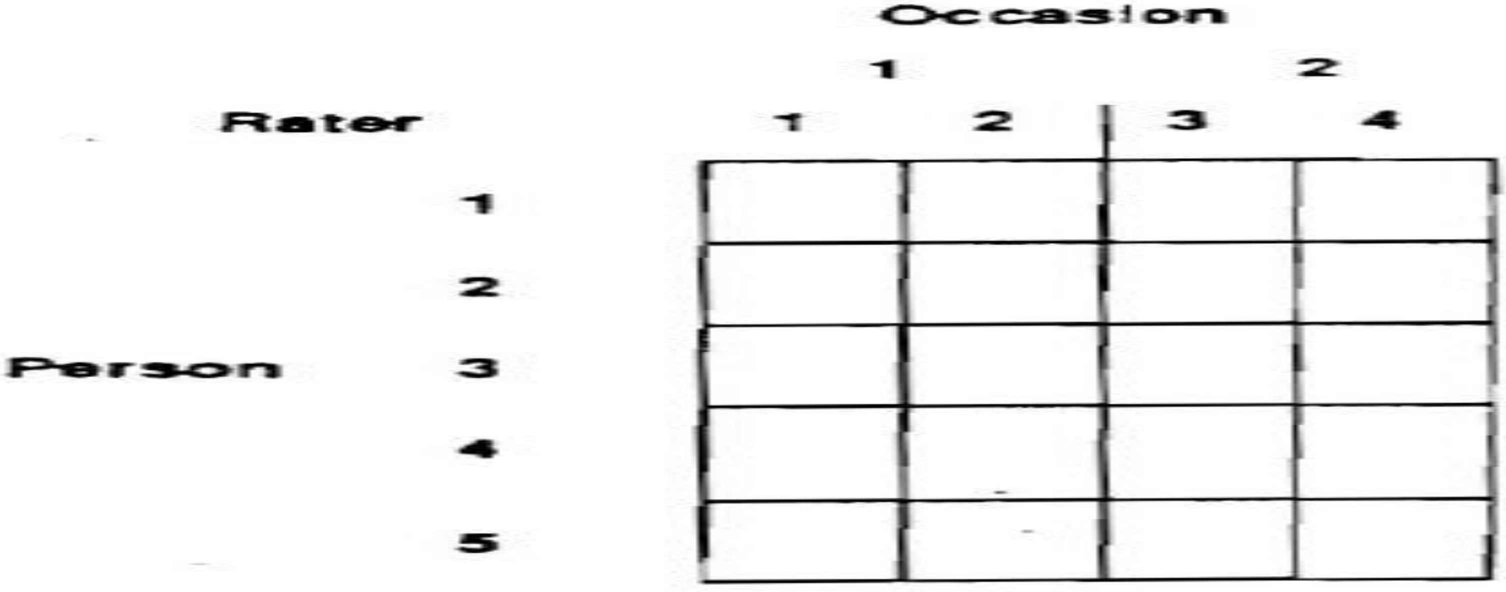
Grid illustrating the crossing of Students with Items (SI).

		Occasion			
		1		2	
Rater		1	2	1	2
	1				
	2				
Person	3				
	4				
	5				

EXAMPLES OF A NESTED DESIGN

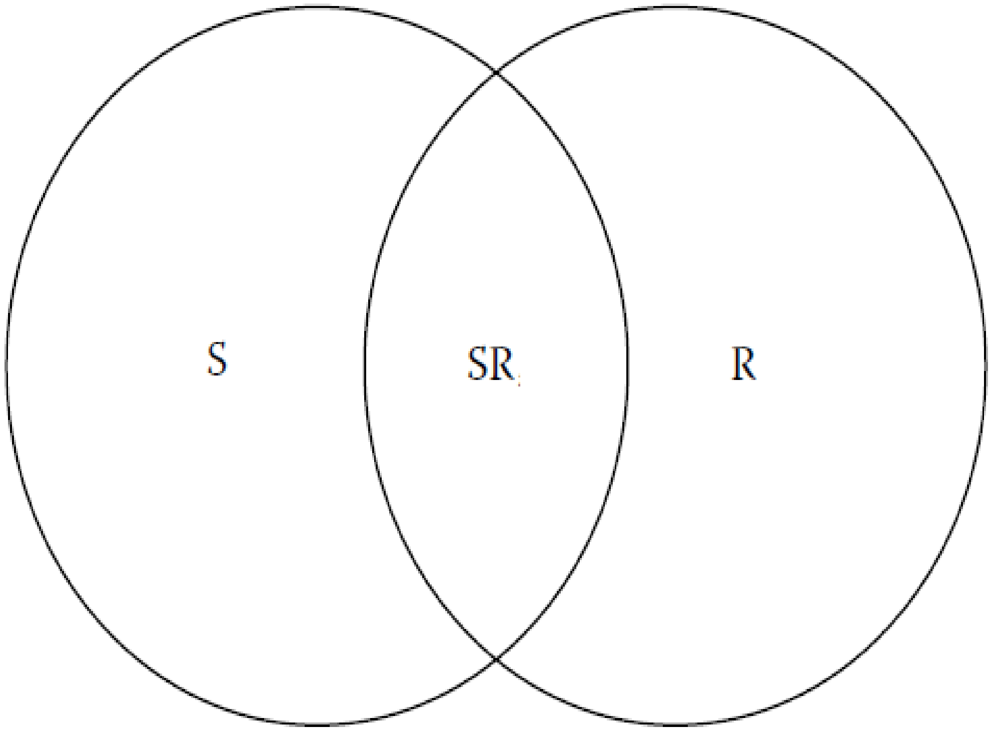
Methods	Method A					Method B				
Classes	1	2	3	4	5	6	7	8	9	10
Students										

Grid illustrating the nesting of Students in Classes and in teaching Methods (S:C:M).



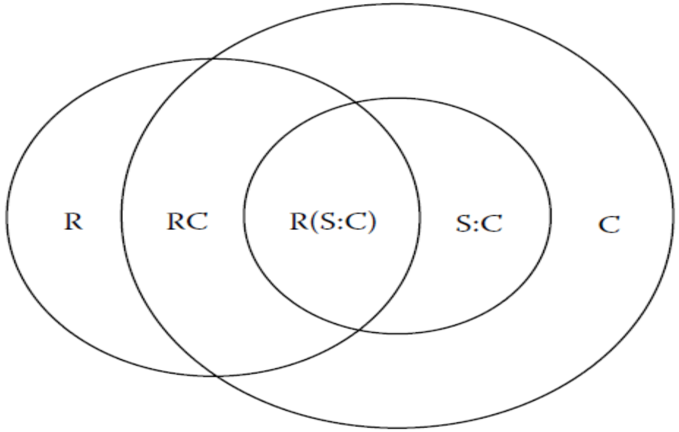
EXAMPLES OF VARIANCE PARTITIONING

- Crossed designs

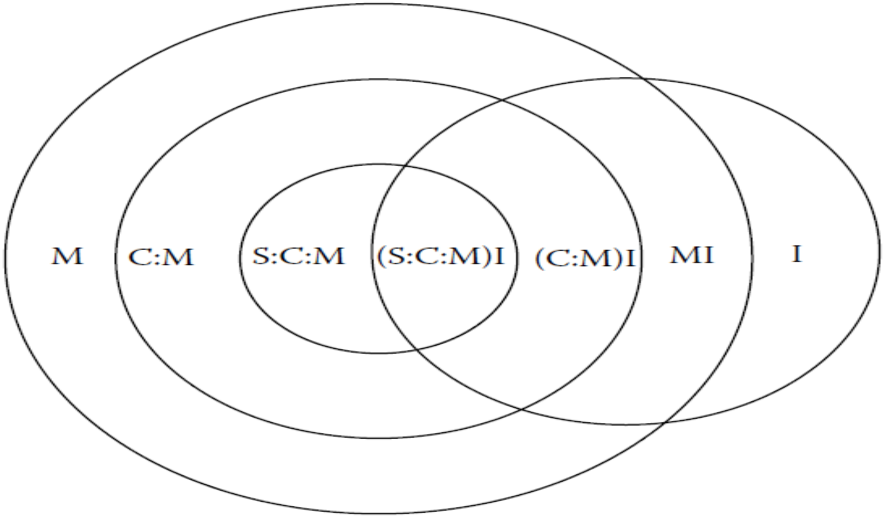


Variance partition diagram for the simplest model SR, where S and R represent Students and Raters, respectively

VARIANCE PARTITIONING FOR NESTED DESIGNS



Variance partition diagram for the model R(S:C), where R, S, and C represent Raters, Students, and Classes, respectively, and all facets are random.

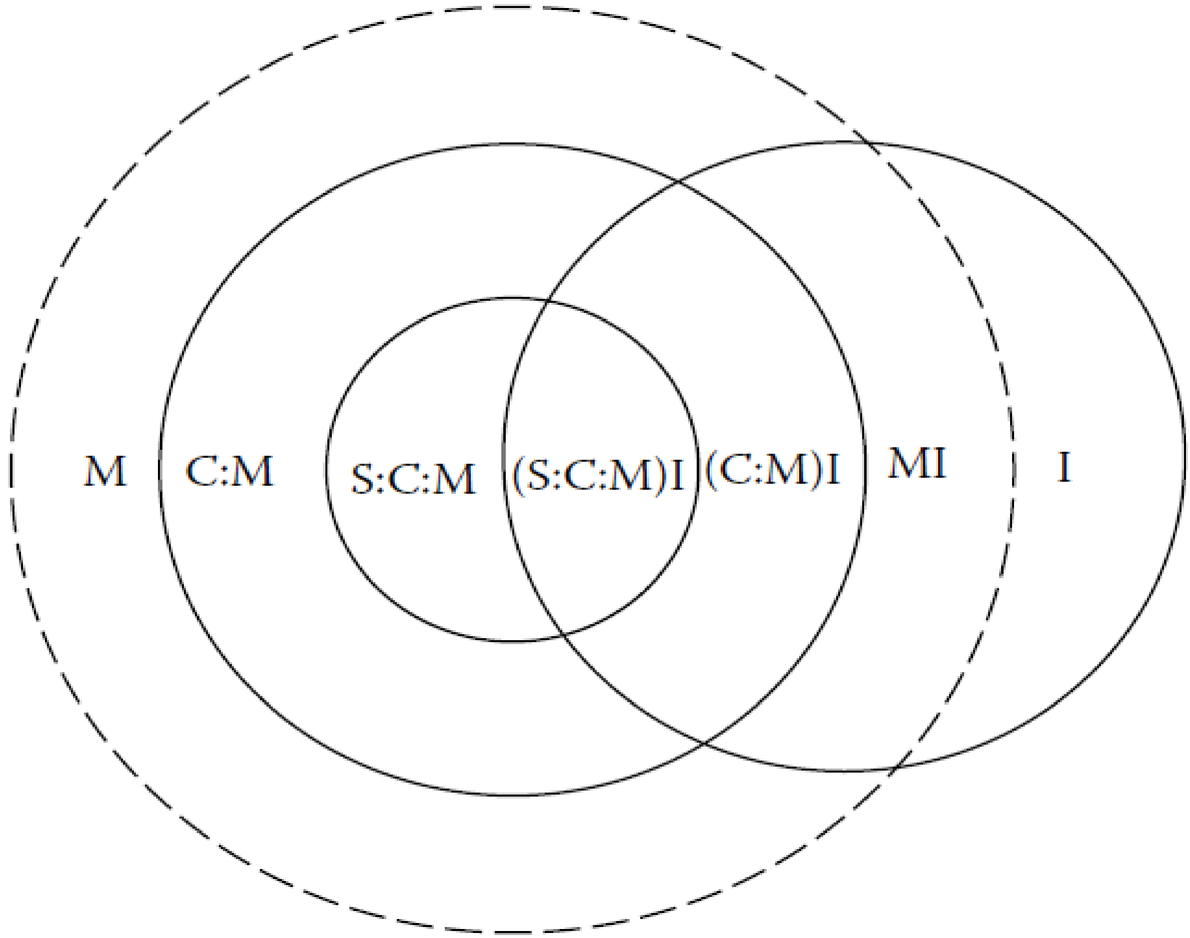


Variance partition diagram for the model (S:C:M)I, where S, C, M, and I represent Students, Classes, Methods, and Items, respectively

- Estimation design (facet-level sampling)

1. Random facets
2. Purely random (infinite random) facets
3. Finite random facets
4. Fixed facets
5. Mixed facets

AN EXAMPLE OF ESTIMATION DESIGN



Variance partition diagram for the estimation design (S:C:M)I, where S, C, M, and I represent Students, Classes, Methods, and Items, respectively, M is a fixed facet.

MEASUREMENT DESIGN

- Measurement design (study focus)

1. Object of study
2. Relative and absolute measurement

- Design evaluation (G coefficients)

Four types of indices in G theory

1. generalizability coefficient
2. phi coefficient: dependability coefficient
3. absolute error variance
4. relative error variance

- Optimization (D studies)

1. Changing the number of facets sampled
2. Eliminating atypical levels for certain facets
3. Changing the nature of facets

WHAT IS GENERALIZABILITY THEORY?

- G theory is an approach to measurement precision which tries to identify various sources of variability and improve the measurement procedure.

Sources of variation	*VCS for G study* $n_t = 2$ & $n_r = 3$	*VCs for D study* $n_t = 2$ & $n_r = 1$	$n_t = 2$ & $n_r = 2$
$\sigma^2(p)$	0.149	0.149	0.149
$\sigma^2(t)$	0.000	0.000	0.000
$\sigma^2(r)$	0.000	0.000	0.000
$\sigma^2(pt)$	0.098	0.098	0.049
$\sigma^2(pr)$	0.015	0.015	0.008
$\sigma^2(tr)$	0.007	0.007	0.002
$\sigma^2(ptr)$	0.181	0.336	0.045
$\sigma^2(\delta)$ relative error		0.290	0.102
$\sigma^2(\Delta)$ absolute error		0.301	0.103
$E\rho^2$ G coefficient		0.336	0.594
$\hat{\Phi}$ phi coefficients		0.331	0.590