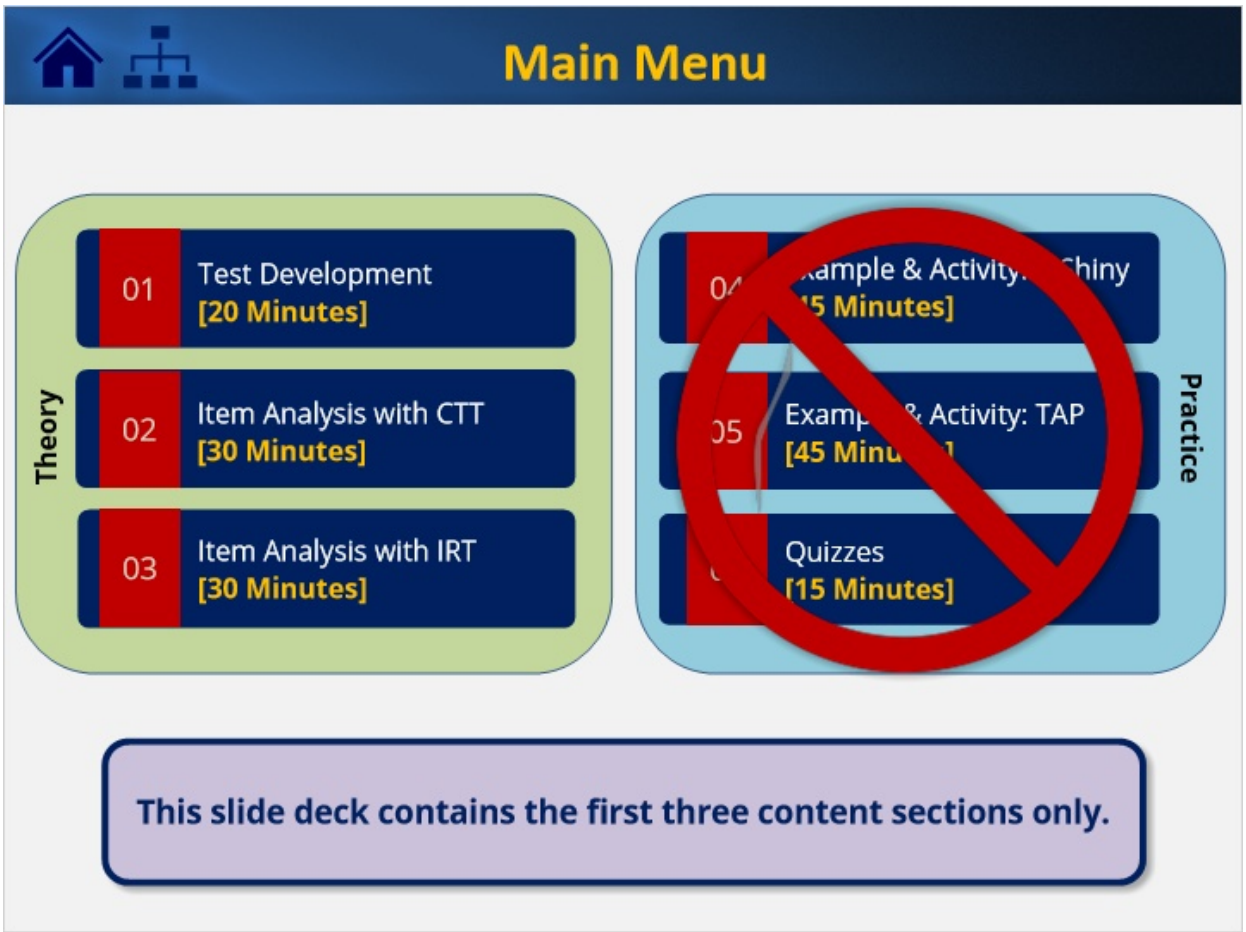
ITEMS Digital Module 08: Foundations of Operational Item Analysis

---

This document contains all core content slides from sections 1-3 with the exception of slides that show video screens. In the digital module all slides can be accessed individually.

Module Organization

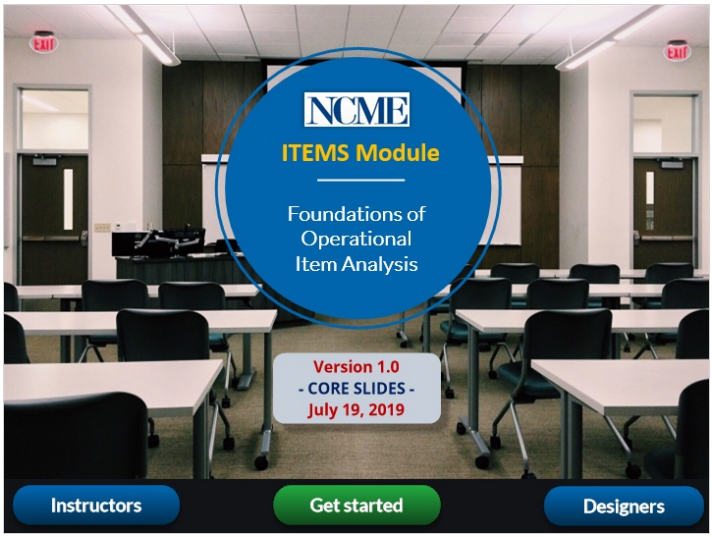
The module starts with an introductory section that leads to the main menu from which learners can select individual content and activity sections:



DM08 (Item Analysis, Version 1.0)

1. Module Overview

1.1 Module Cover (START)

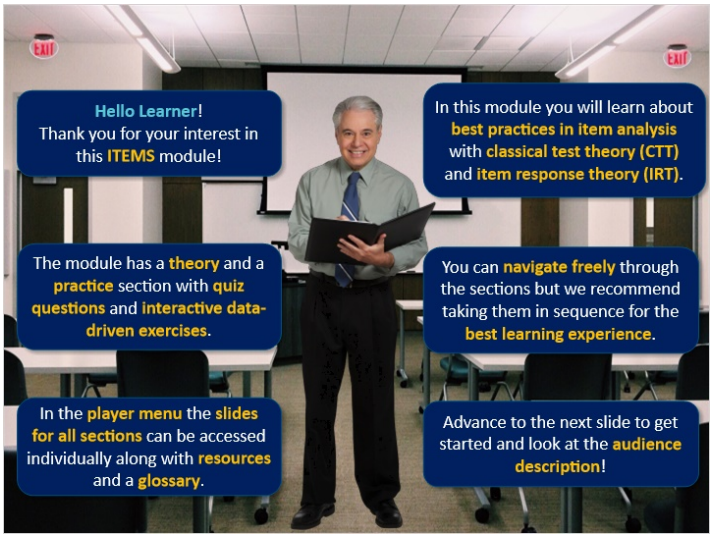


1.2 Instructors

1.3 Designers

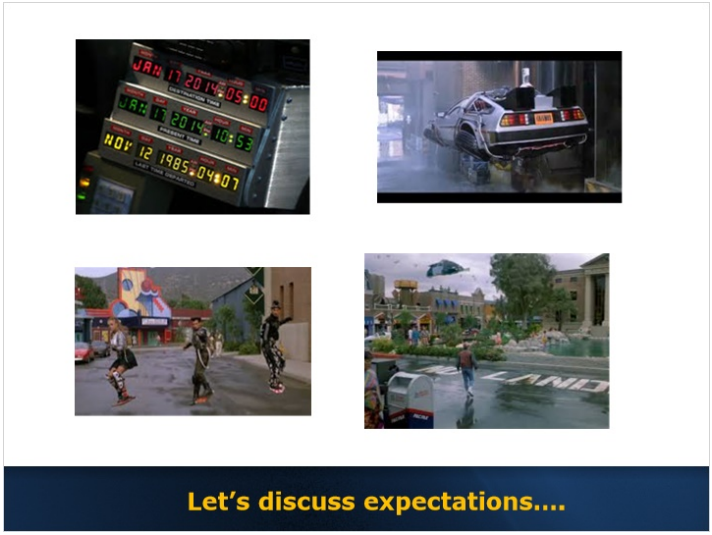
1.4 Welcome

1.5 Overview

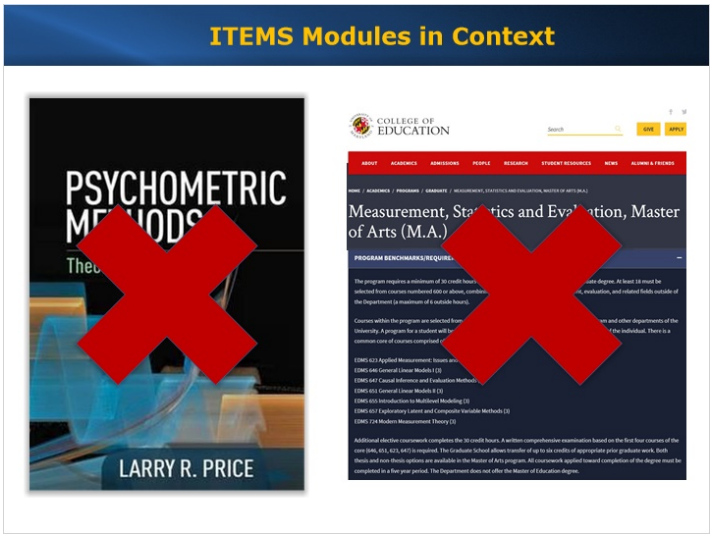


1.6 Target Audience

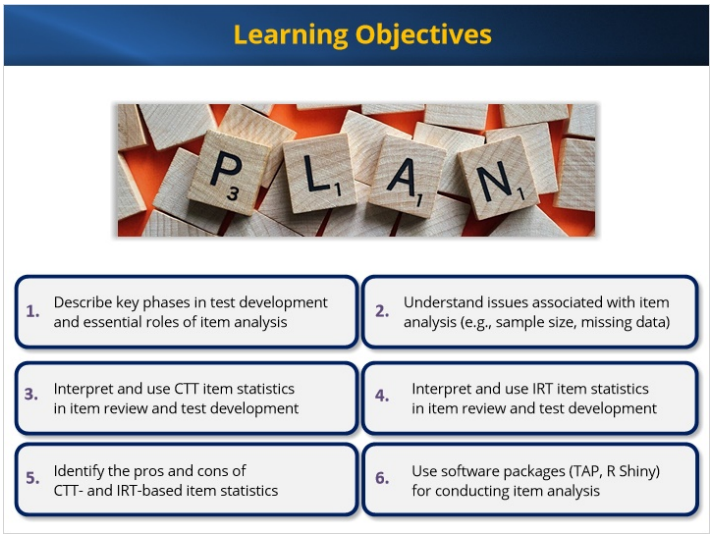
1.7 Expecations (I)



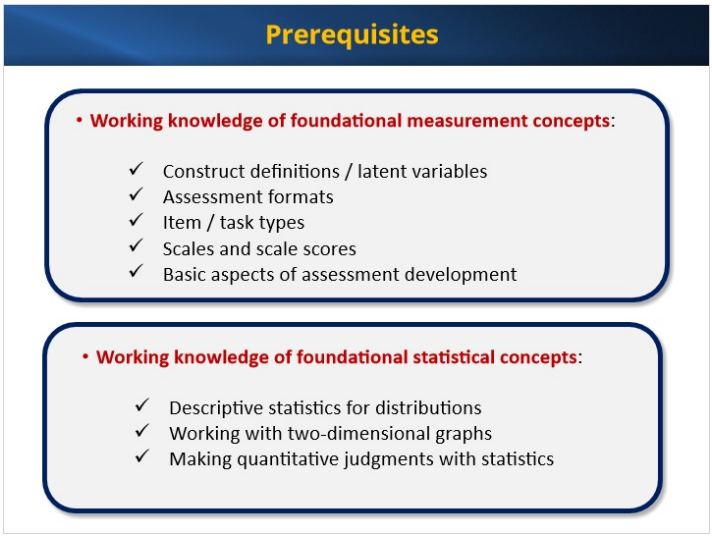
1.8 Expectations (II)



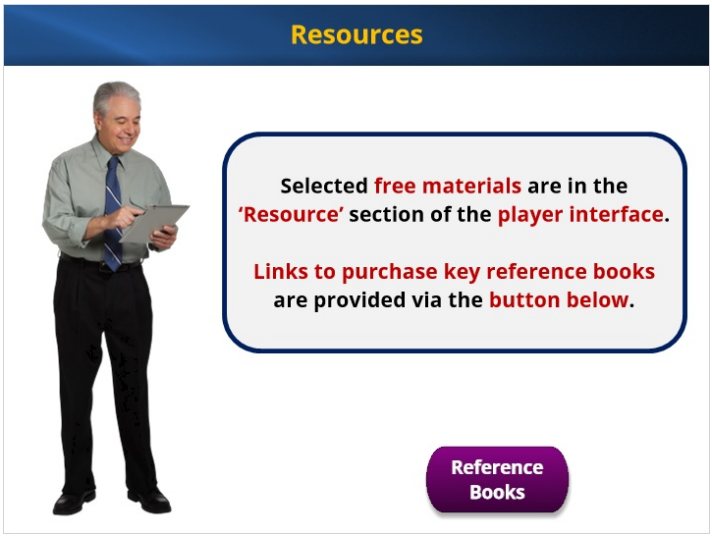
1.9 Learning Objective



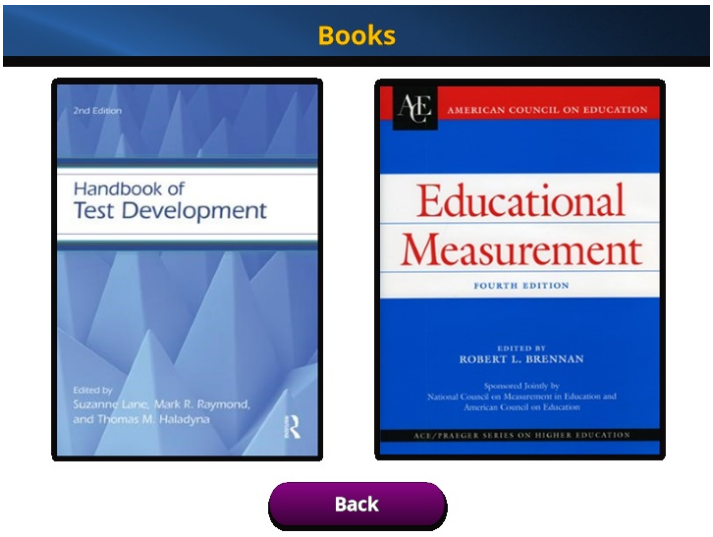
1.10 Prerequisites



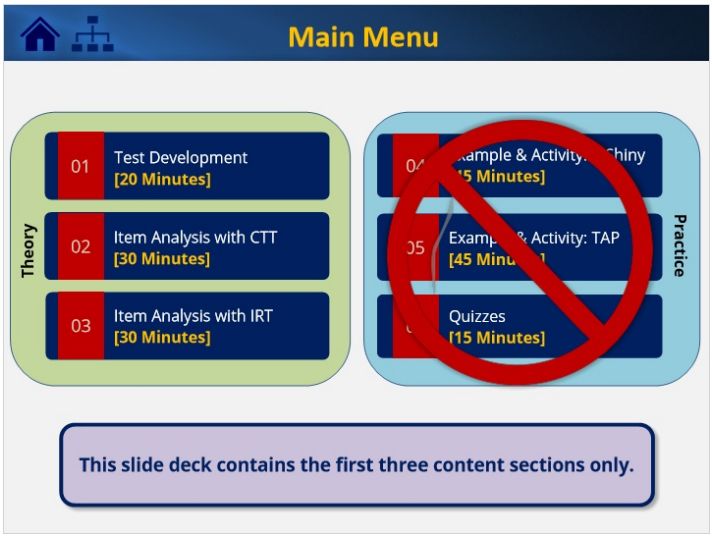
1.11 Resources



Books (Slide Layer)

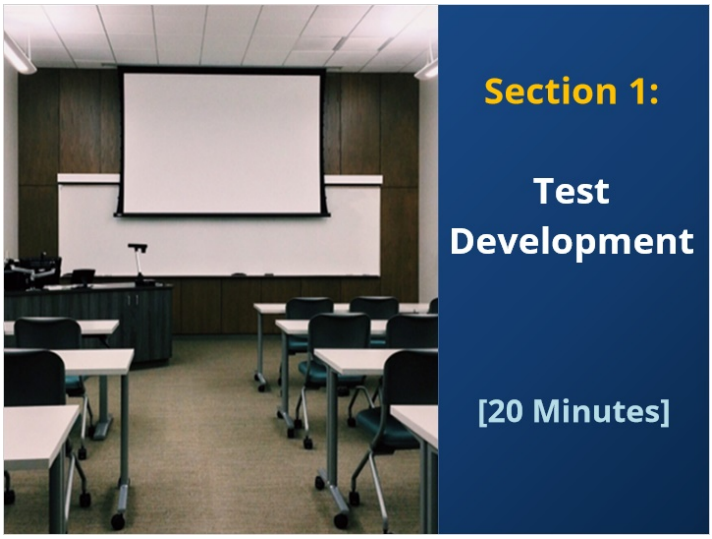


1.12 Main Menu

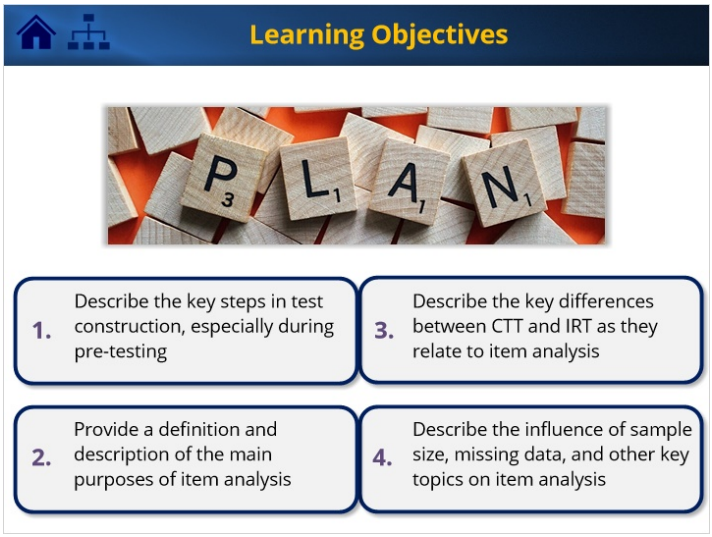


2. Section 1: Test Development

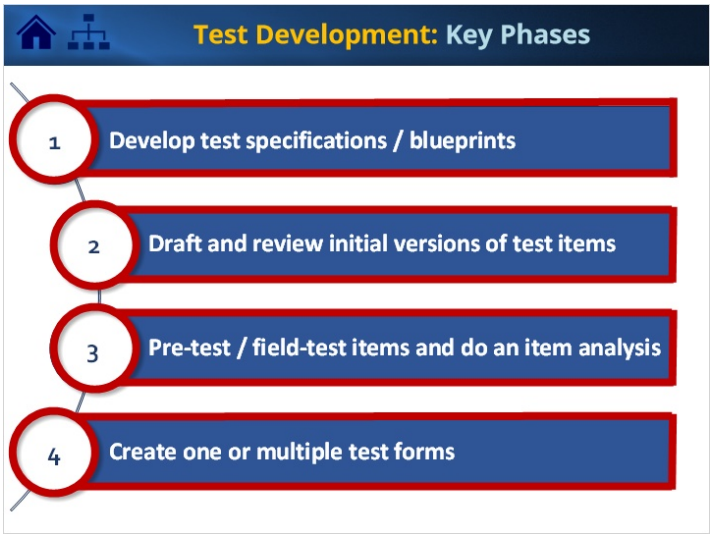
2.1 Cover: Section 1



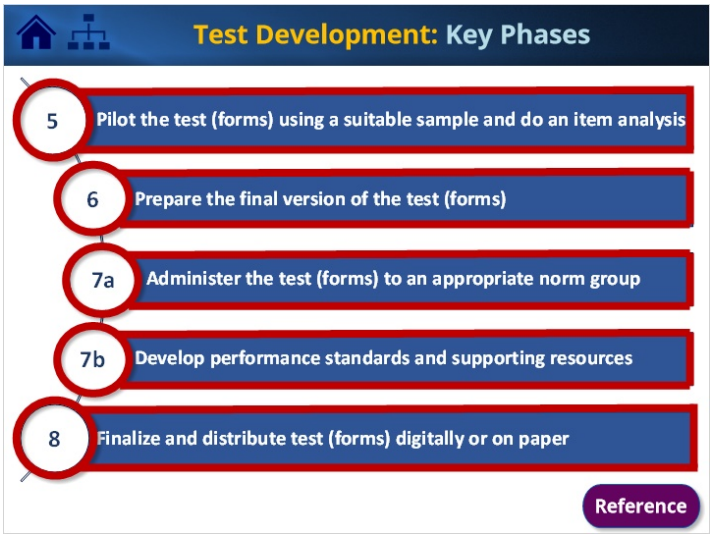
2.2 Objectives: Section 1



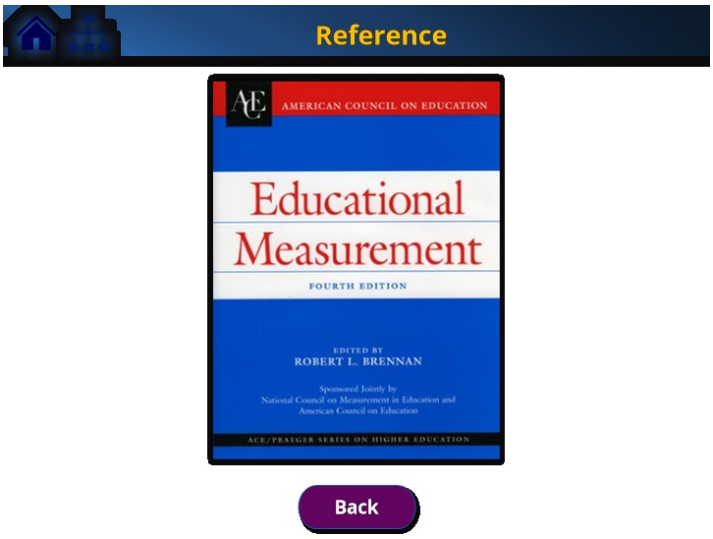
2.3 Test Development Phases (I)



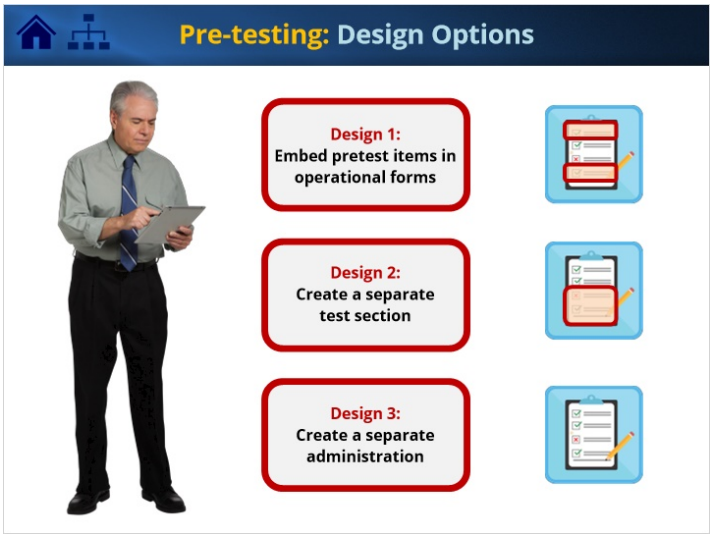
2.4 Test Development Phases (II)



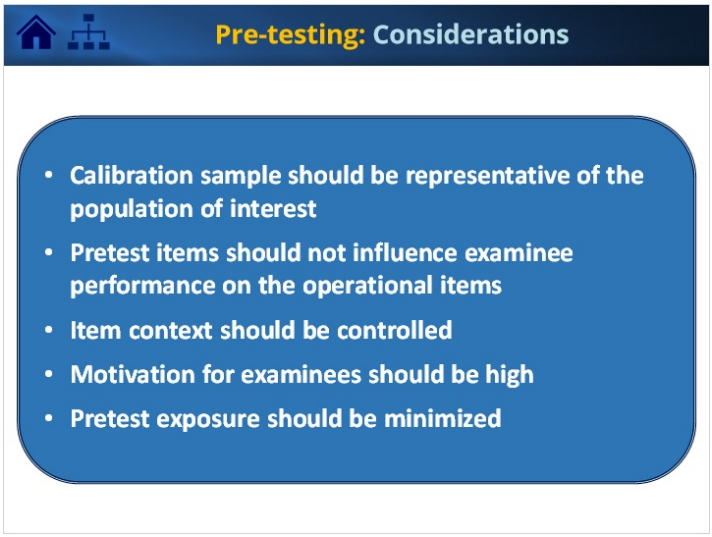
Reference (Slide Layer)



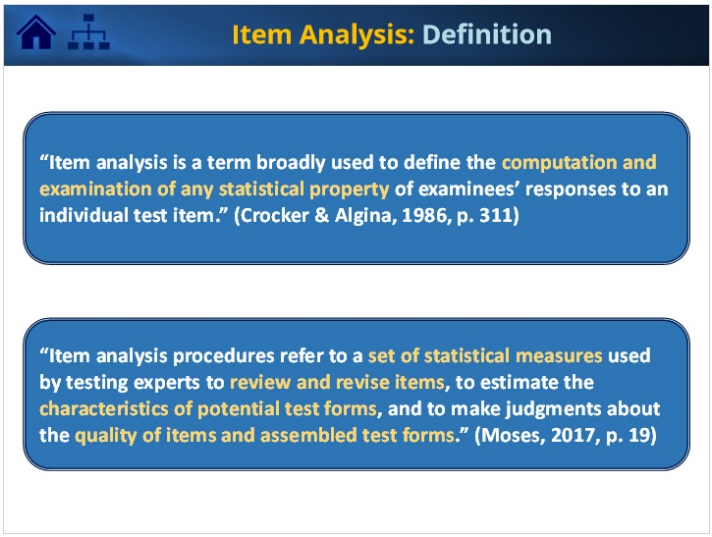
2.5 Pre-testing: Design Options



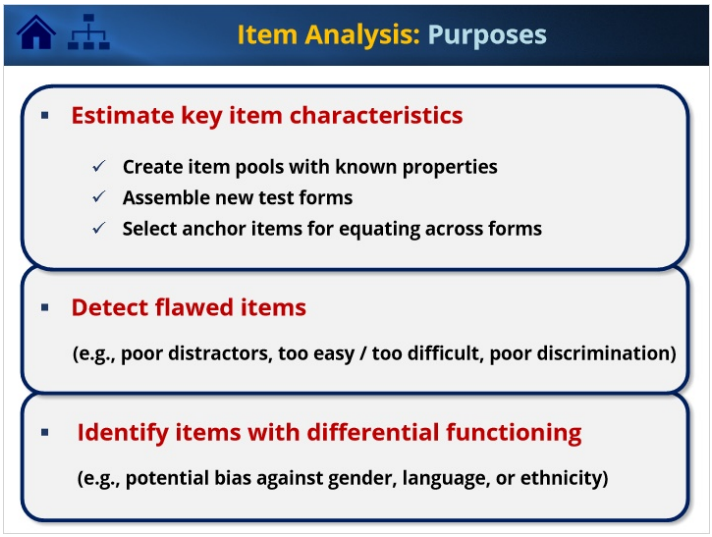
2.6 Pre-testing: Considerations



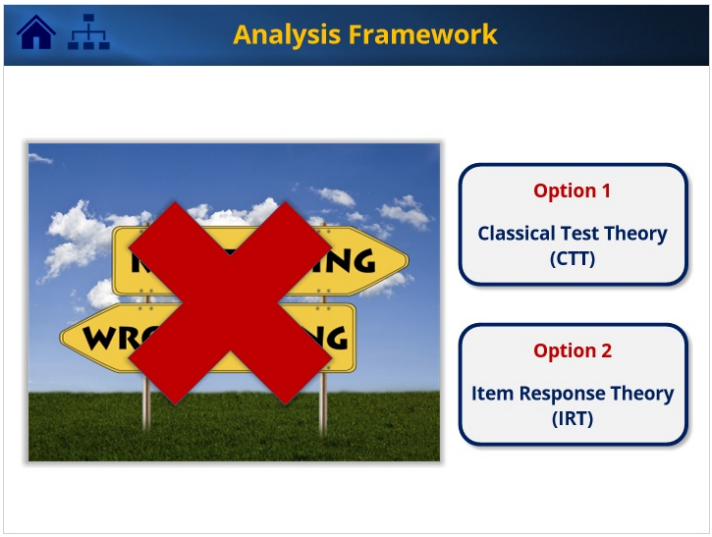
2.7 Item Analysis: Definition



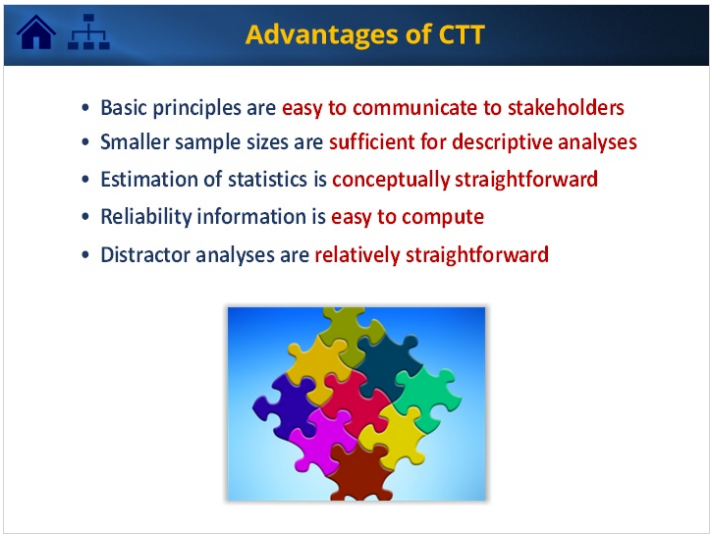
2.8 Item Analysis: Purposes



2.9 Analysis Framework



2.10 Advantages of CTT



2.11 Item Analysis: CTT

Item Analysis: CTT Details

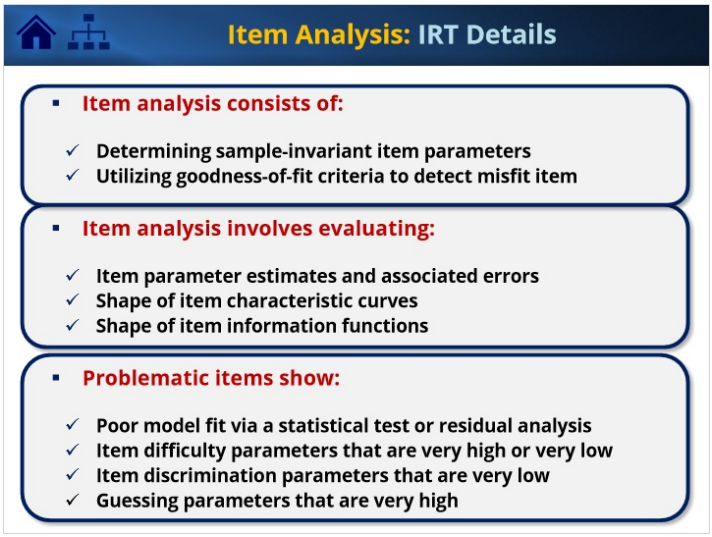
- **Item analysis consists of:**
  - ✓ Determining sample-specific item parameters
  - ✓ Deleting items based on statistical criteria
- **Item analysis involves evaluating:**
  - ✓ Item difficulty indices
  - ✓ Item discrimination indices
  - ✓ Answer choices (for selected-response items)
- **Problematic items show:**
  - ✓ Item difficulty values that are very high or very low
  - ✓ Item discrimination values that are very low
  - ✓ Item choices / distractors that are selected rarely or oddly

2.12 Advantages of IRT

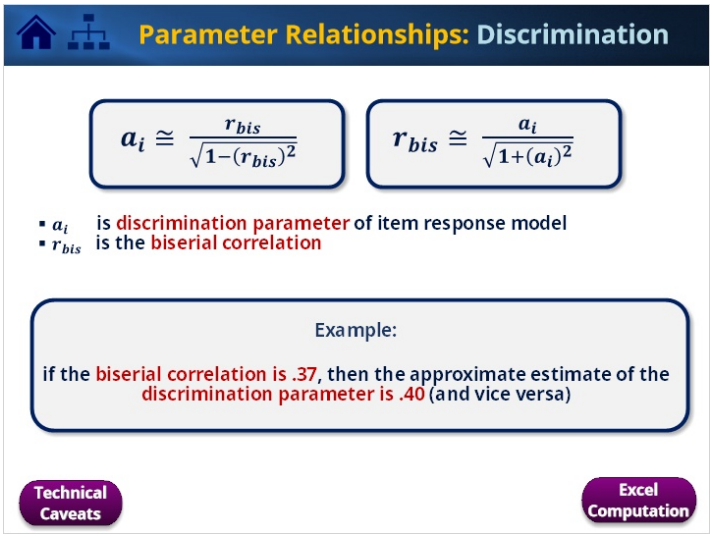
Advantages of IRT

- Models are expressed at the item-level rather than at the test-level
- Item statistics are not sample dependent
- Examinee proficiency scores are not item dependent
- Examinees and items can be placed on a common reporting scale
- Parameter estimates can be used for item banking and adaptive testing
- Models can be easily extended to multiple dimensions, levels, and so on

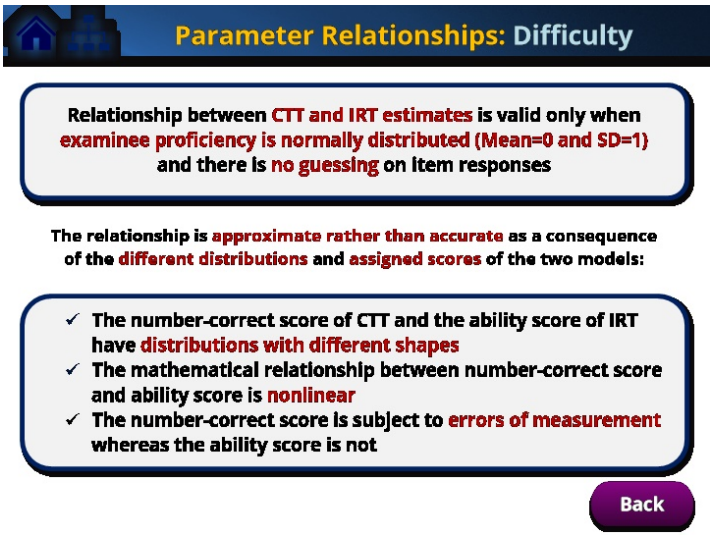
2.13 Item Analysis: IRT



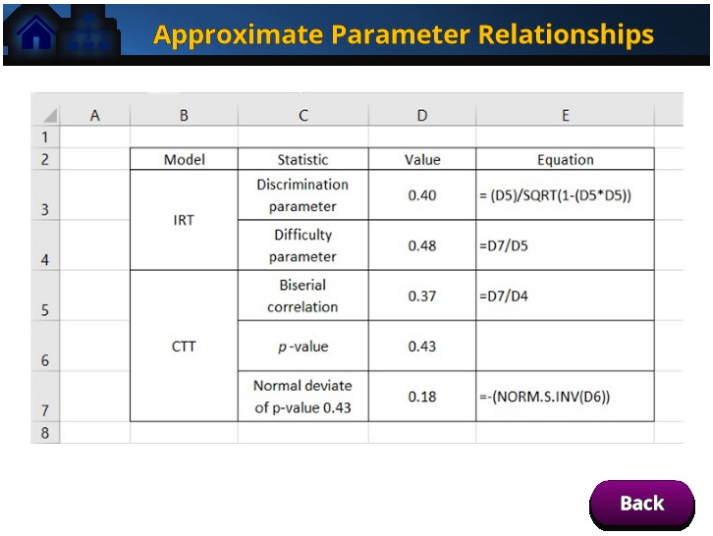
2.14 Parameter Relationships: Discrimination



Caveats (Slide Layer)

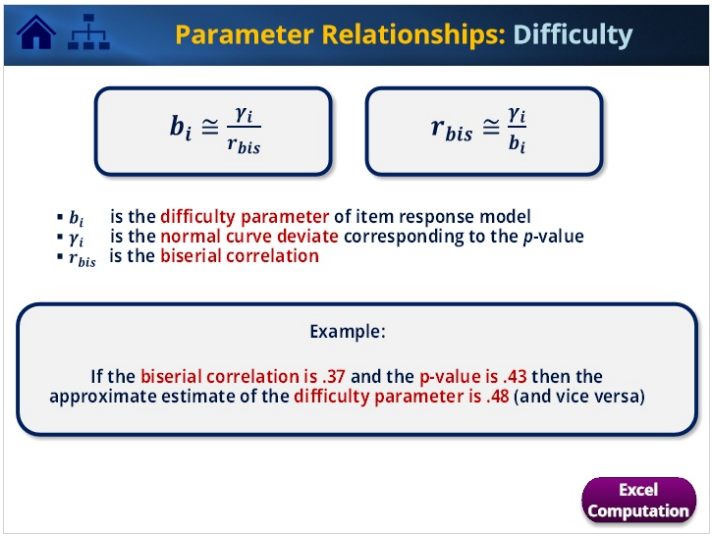


Excel (Slide Layer)

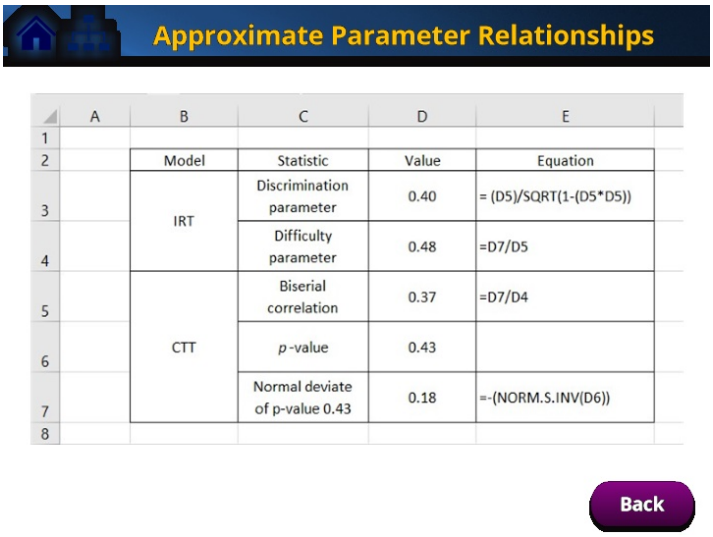


	A	B	C	D	E
1					
2		Model	Statistic	Value	Equation
3		IRT	Discrimination parameter	0.40	= (D5)/SQRT(1-(D5*D5))
4			Difficulty parameter	0.48	=D7/D5
5		CTT	Biserial correlation	0.37	=D7/D4
6			*p*-value	0.43	
7			Normal deviate of p-value 0.43	0.18	=-(NORM.S.INV(D6))
8					

2.15 Parameter Relationships: Difficulty

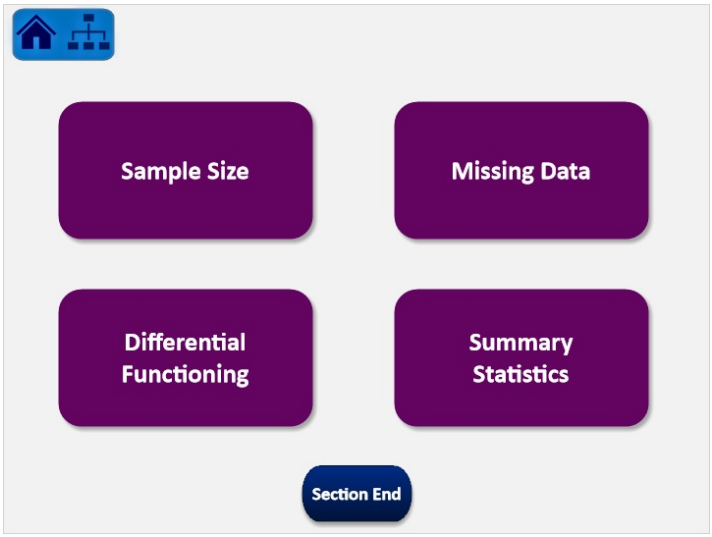


Excel: parameter relationship between CTT & IRT (Slide Layer)



	A	B	C	D	E
1					
2		Model	Statistic	Value	Equation
3		IRT	Discrimination parameter	0.40	= (D5)/SQRT(1-(D5*D5))
4			Difficulty parameter	0.48	=D7/D5
5		CTT	Biserial correlation	0.37	=D7/D4
6			p-value	0.43	
7			Normal deviate of p-value 0.43	0.18	=-(NORM.S.INV(D6))
8					

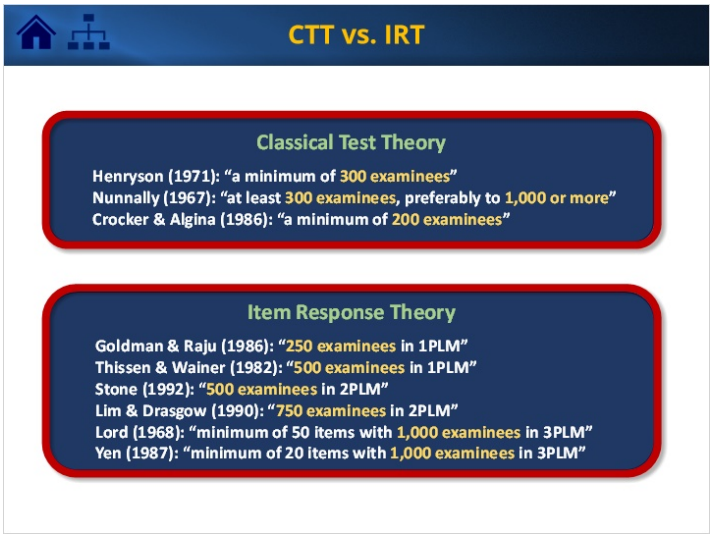
2.16 Topic Selection



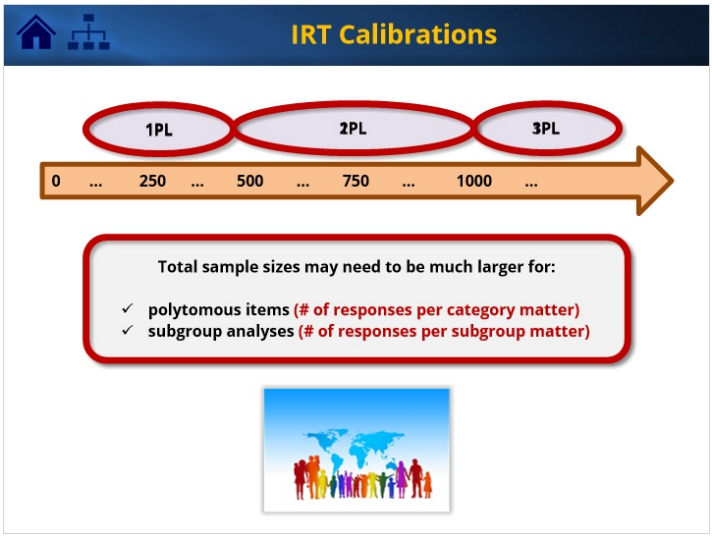
2.17 Bookmark: Sample Size

2.18 Sample Size (I)

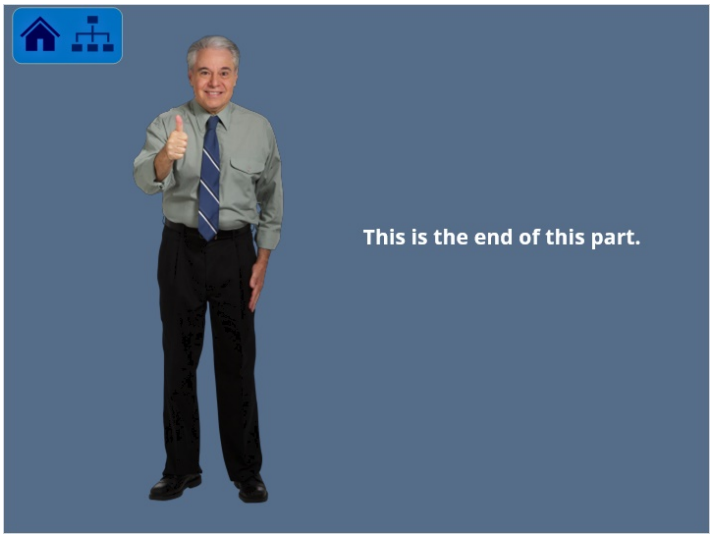
2.19 Sample Size (II)



2.20 Sample Size (III)

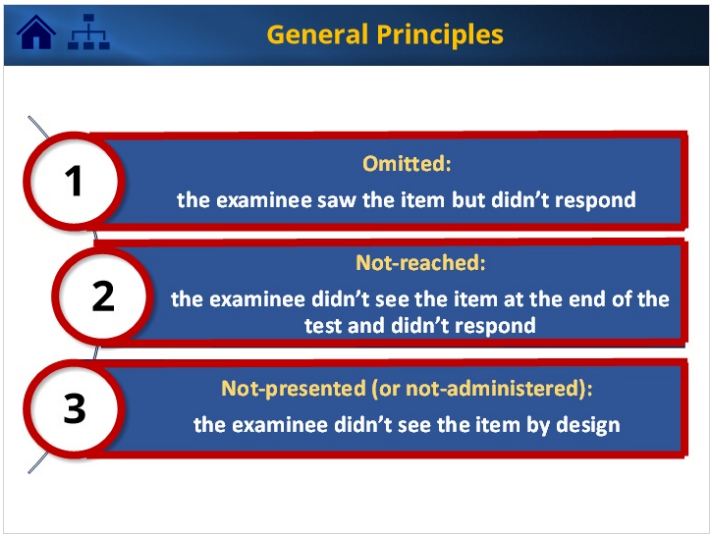


2.21 Bookend: Sample Size

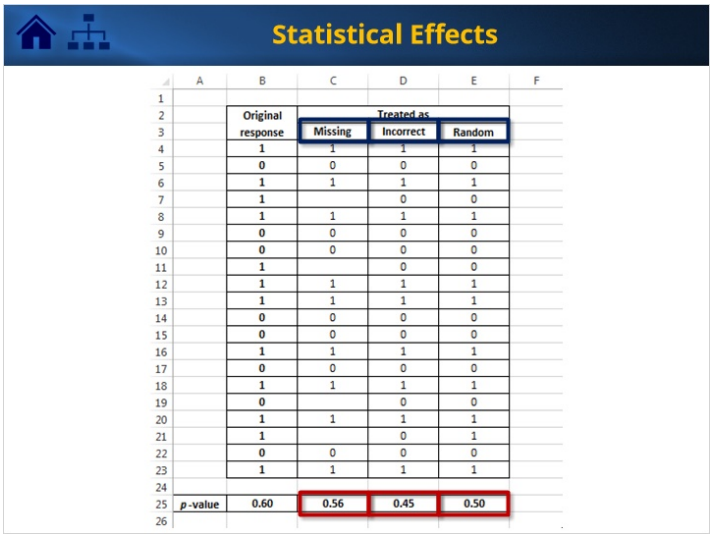


2.22 Bookmark: Missing Data

2.23 Missing Data (I)

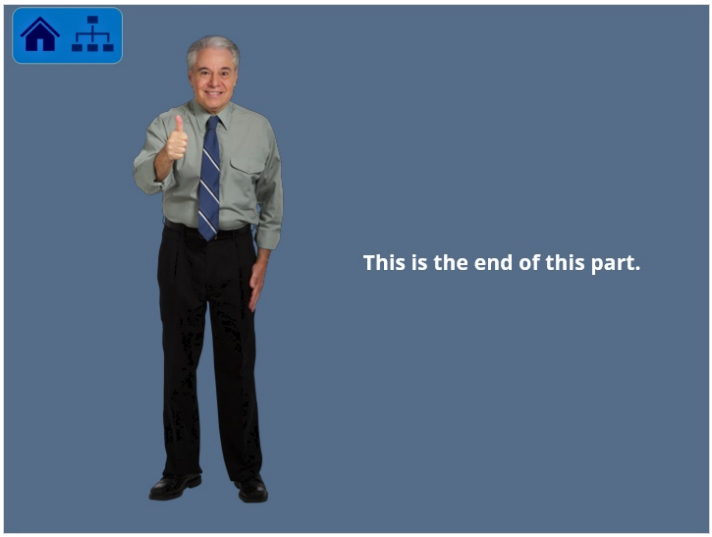


2.24 Missing Data (II)



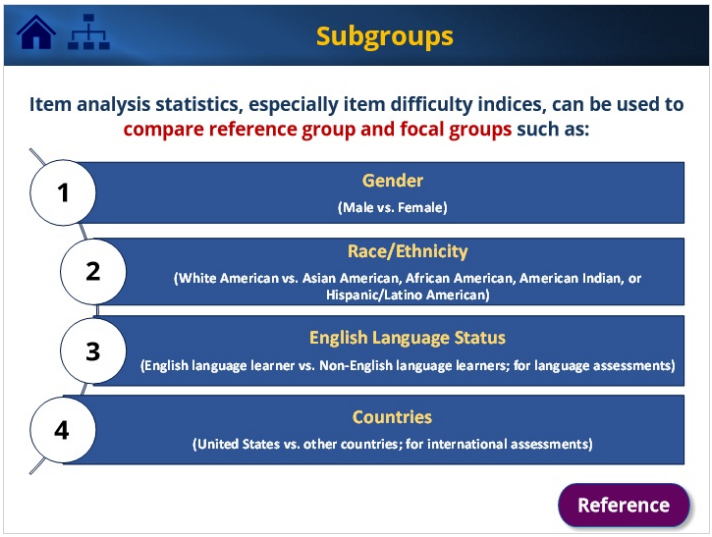
	Original response	Treated as Missing	Treated as Incorrect	Treated as Random
	1	1	1	1
	0	0	0	0
	1	1	1	1
	1		0	0
	1	1	1	1
	0	0	0	0
	0	0	0	0
	1		0	0
	1	1	1	1
	1	1	1	1
	0	0	0	0
	0	0	0	0
	1	1	1	1
	0	0	0	0
	1	1	1	1
	0		0	0
	1	1	1	1
	1		0	1
	0	0	0	0
	1	1	1	1
p-value	0.60	0.56	0.45	0.50

2.25 Bookend: Missing Data

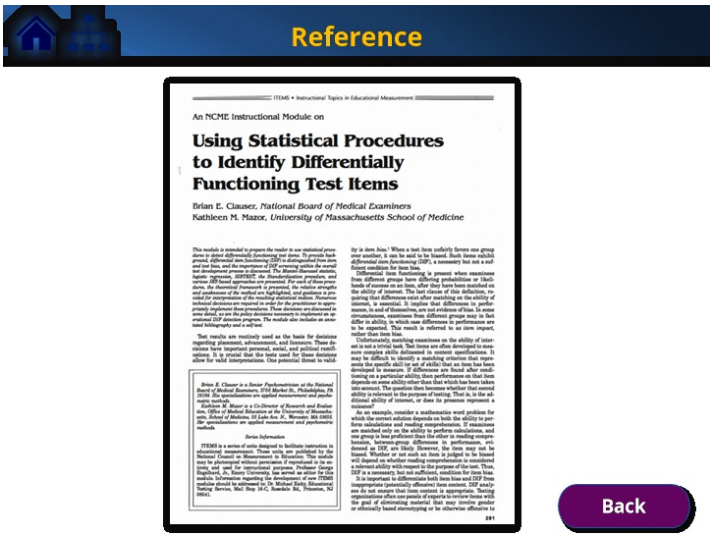


2.26 Bookmark: DIF

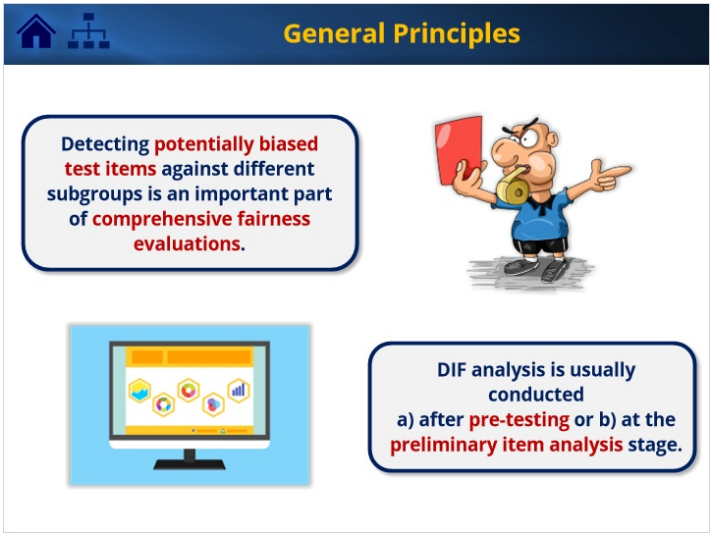
2.27 Differential Functioning (II)



Reference (Slide Layer)



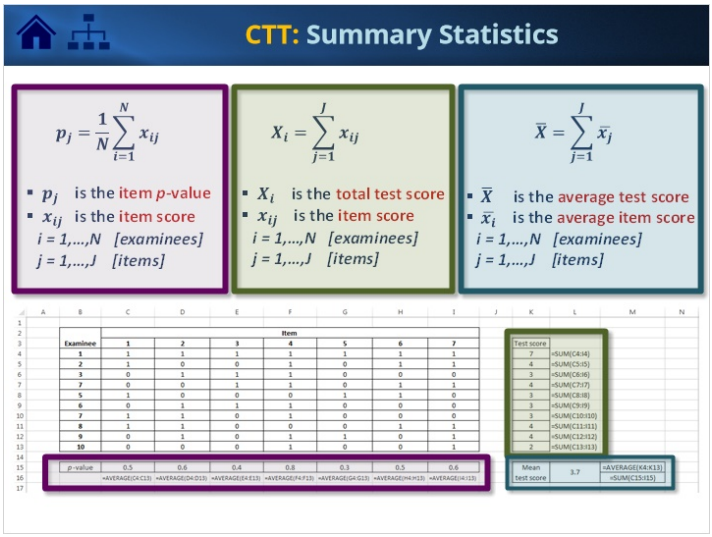
2.28 Differentitial Functioning (I)



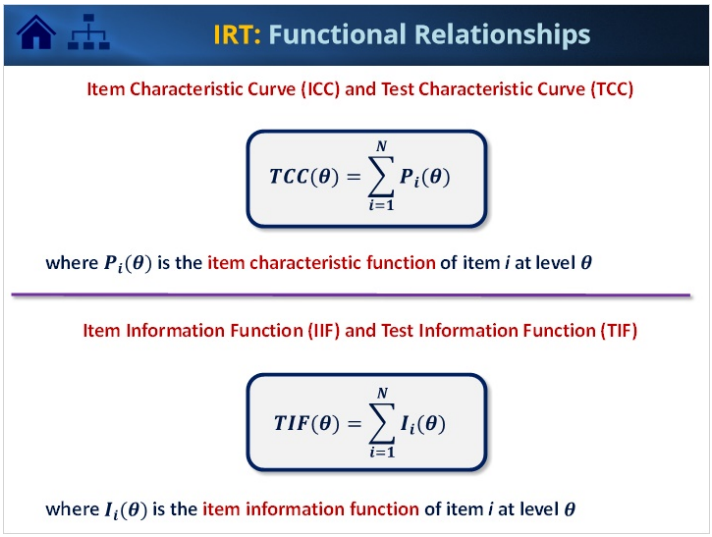
2.29 Bookend: DIF

2.30 Bookmark: Summary Statistics

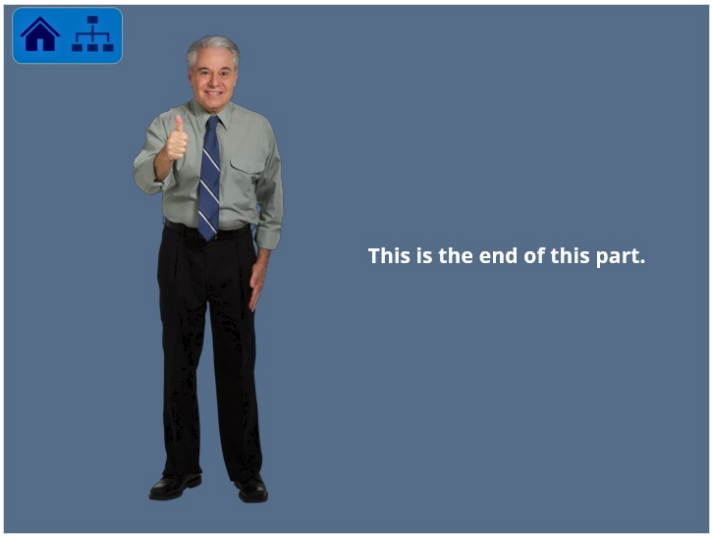
2.31 Summary Statistics (I)



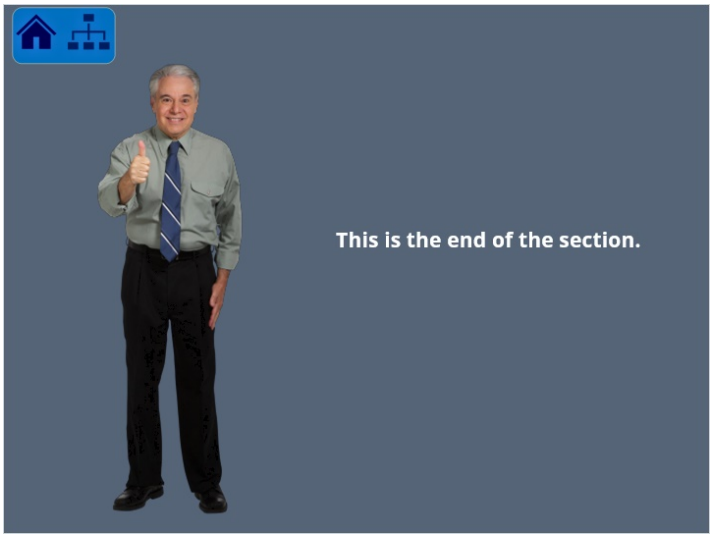
2.32 Summary Statistics (II)



2.33 Bookend: Summary Statistics

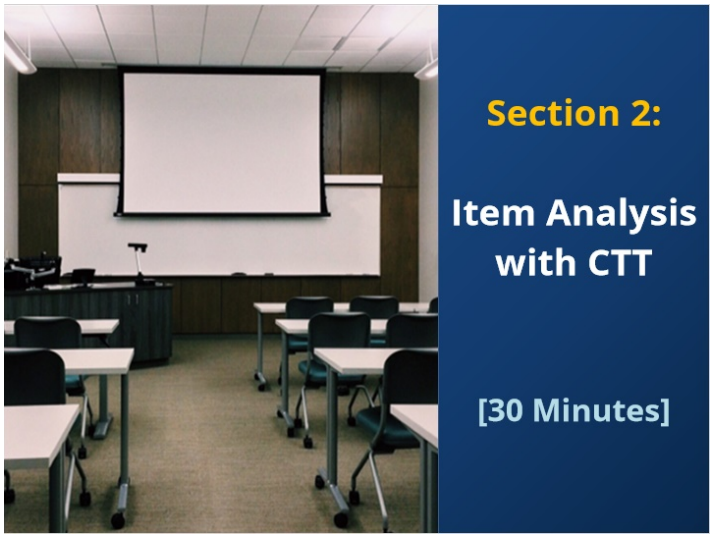


2.34 Bookend: Section 1



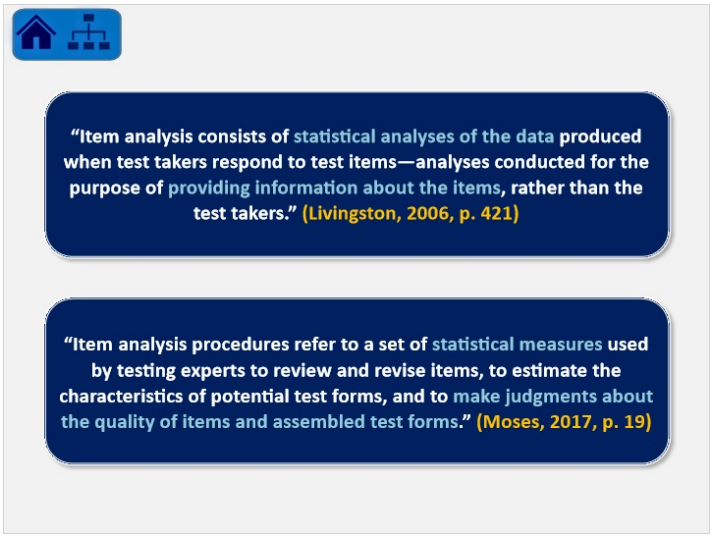
3. Section 2: Item Analysis with CTT

3.1 Cover: Section 2

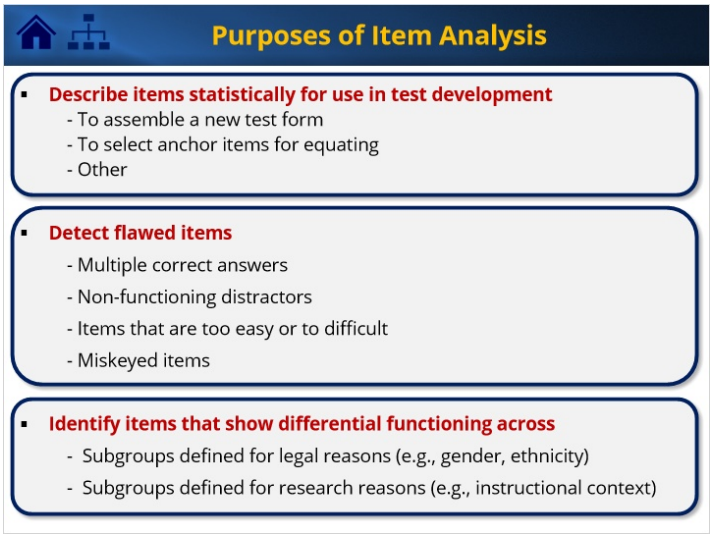


3.2 Objectives: Section 2

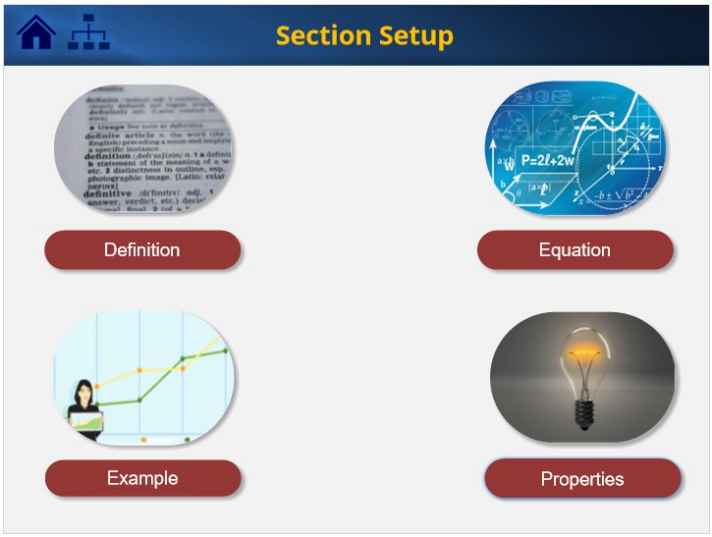
3.3 Definition of Item Analysis



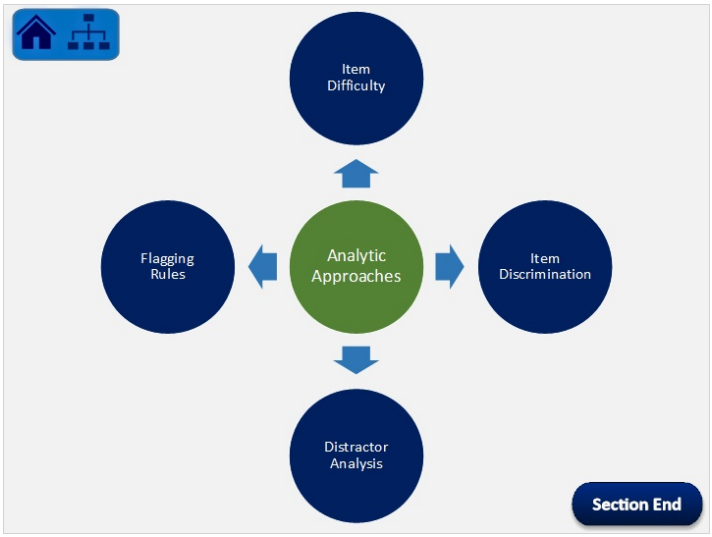
3.4 Purposes of Item Analysis



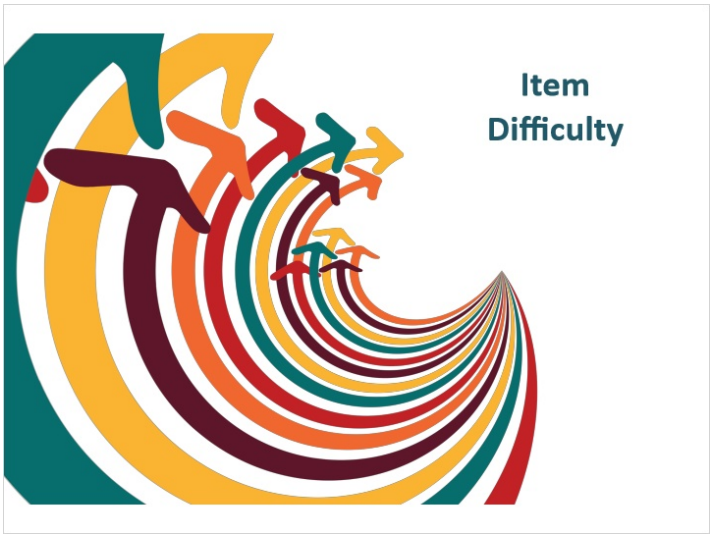
3.5 Section Setup



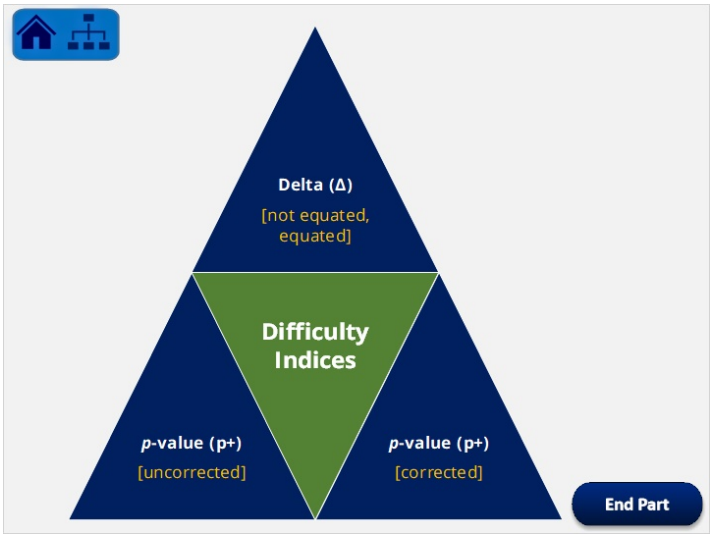
3.6 Topic Selection: Approaches



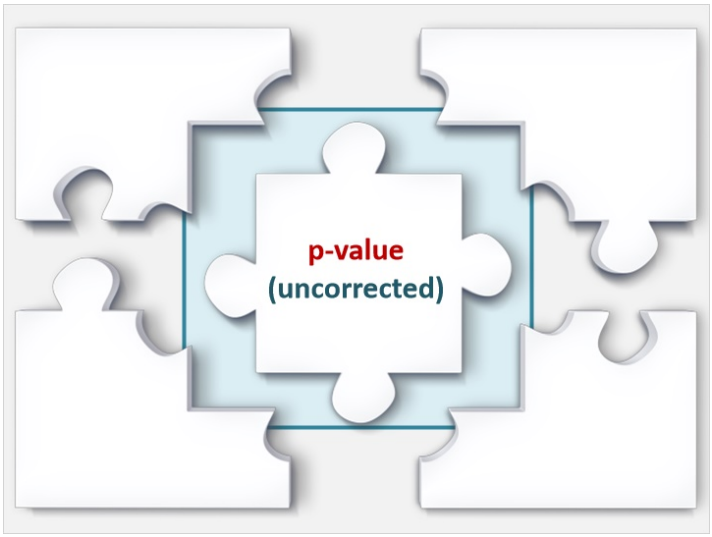
3.7 Bookmark: Item Difficulty



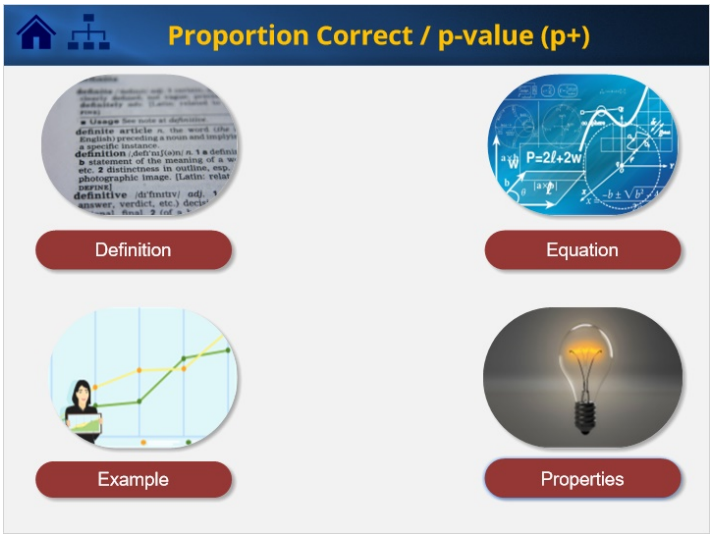
3.8 Topic Selection: Difficulty



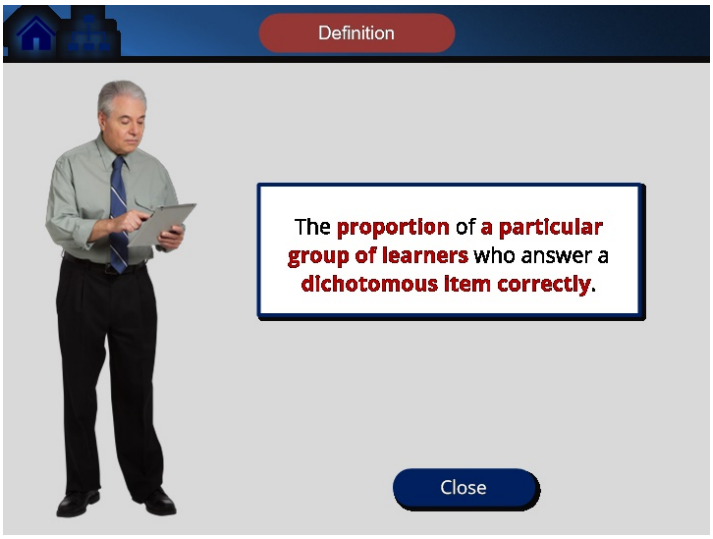
3.9 Bookmark: p-value



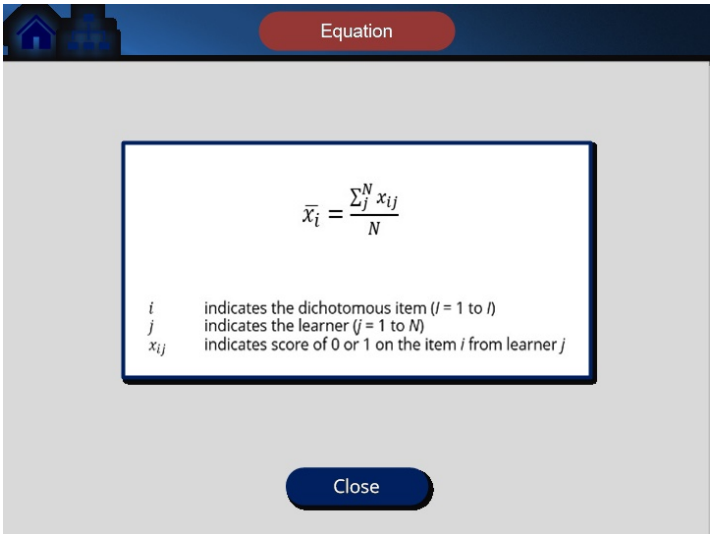
3.10 Proportion Correct / p-value (p+)



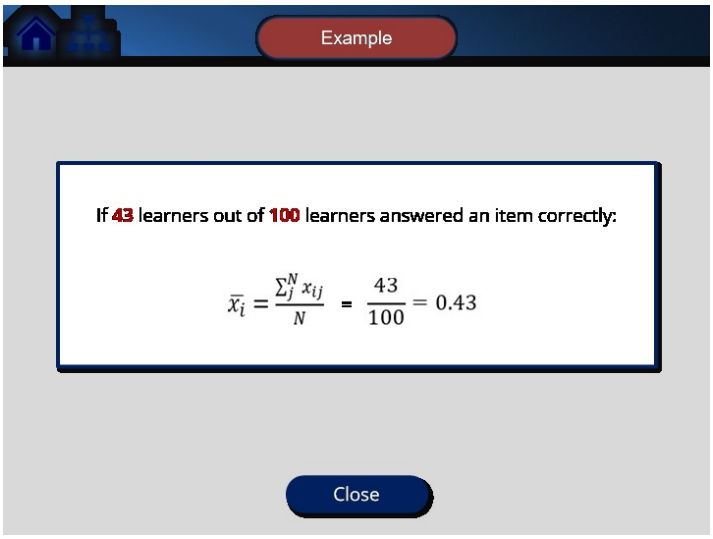
Definition (Slide Layer)



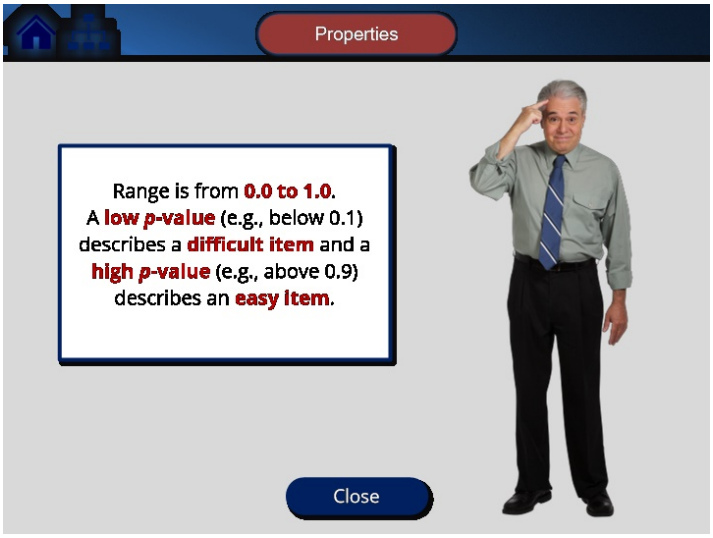
Equation (Slide Layer)



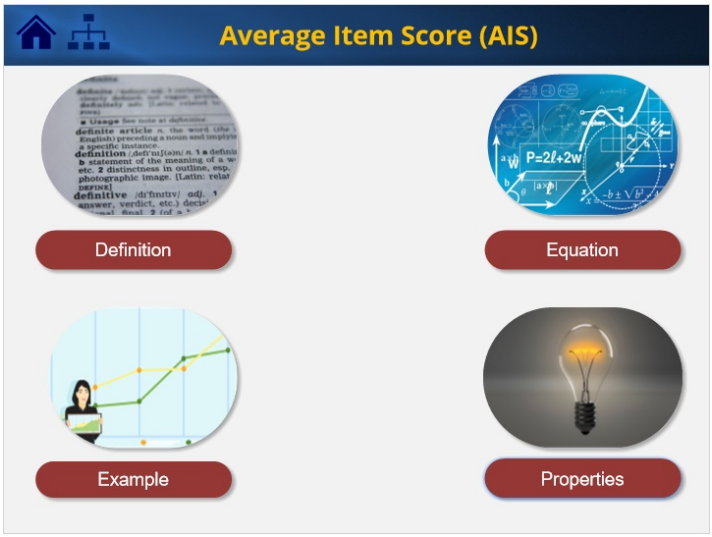
Example (Slide Layer)



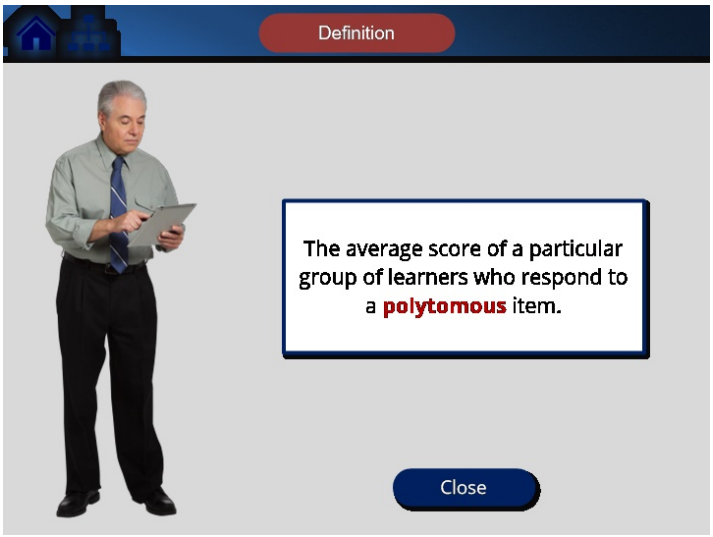
Properties (Slide Layer)



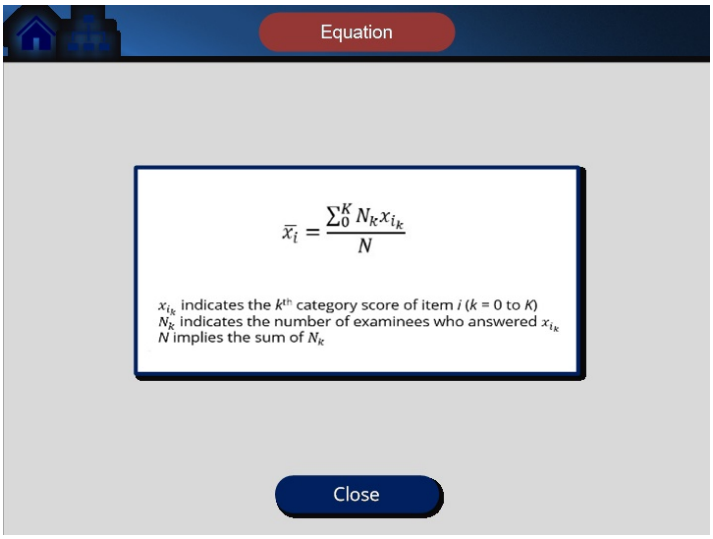
3.11 Average Item Score (AIS) (I)



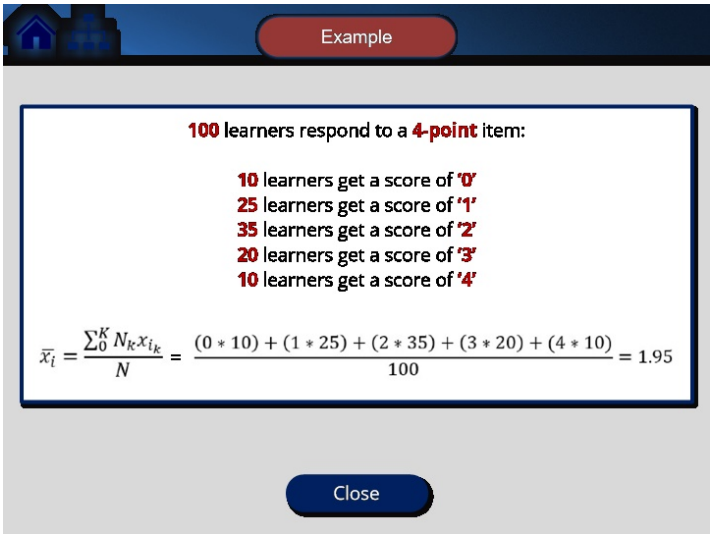
Definition (Slide Layer)



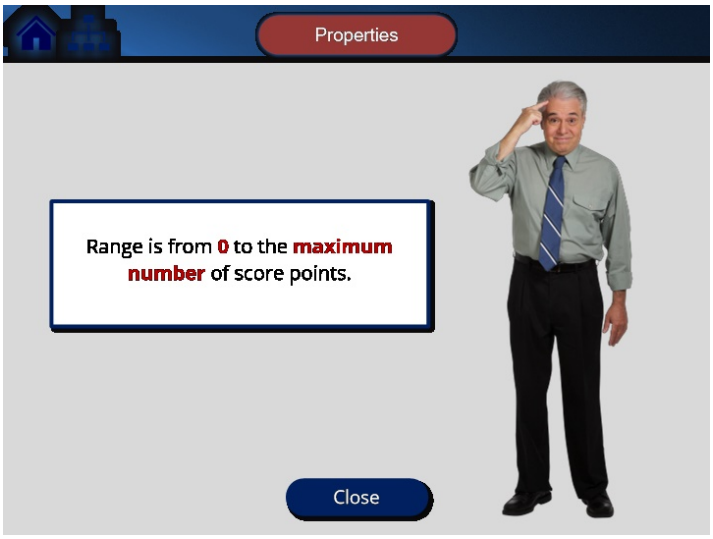
Equation (Slide Layer)



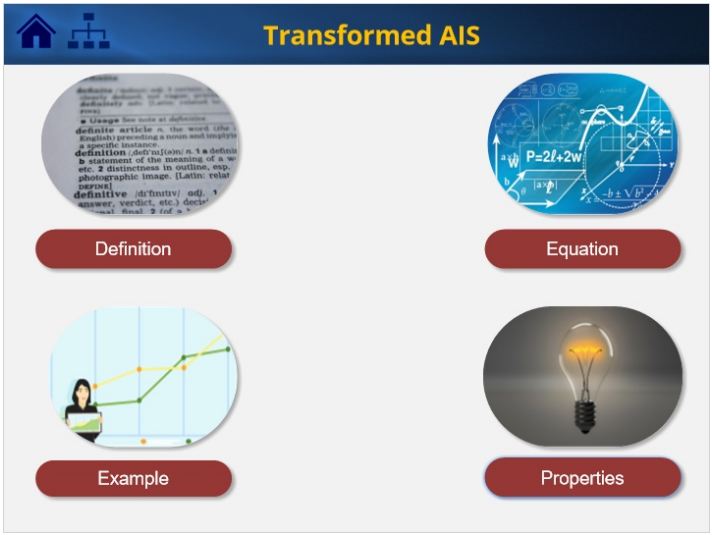
Example (Slide Layer)



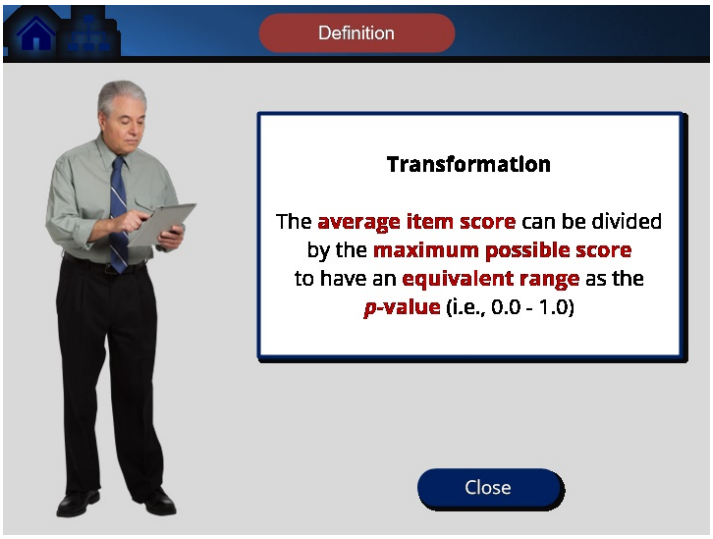
Properties (Slide Layer)



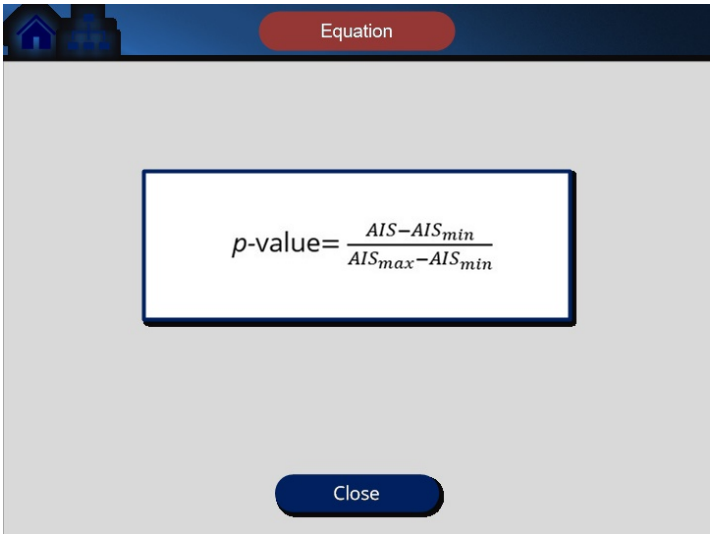
3.12 Average Item Score (AIS) (II)



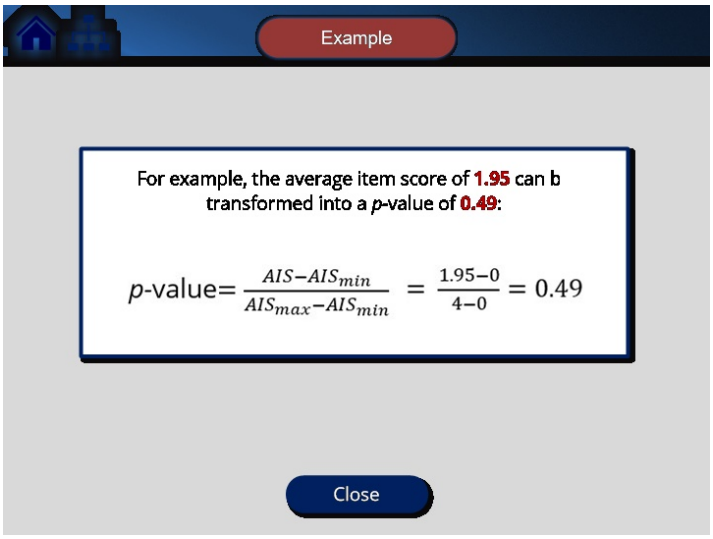
Definition (Slide Layer)



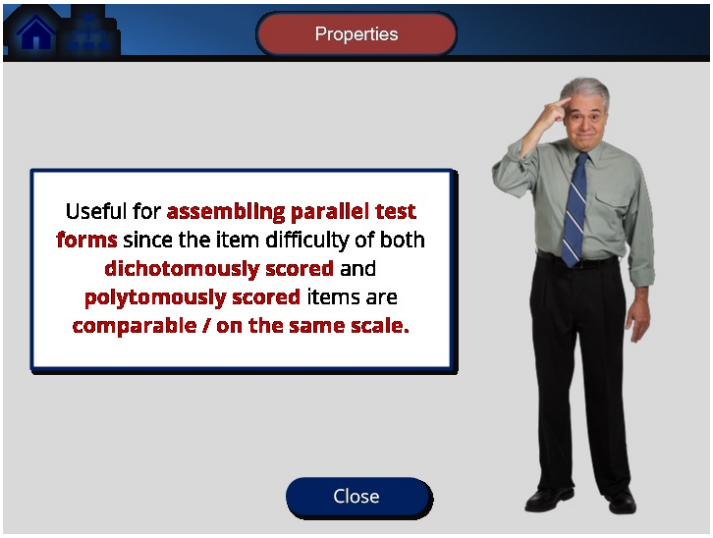
Equation (Slide Layer)



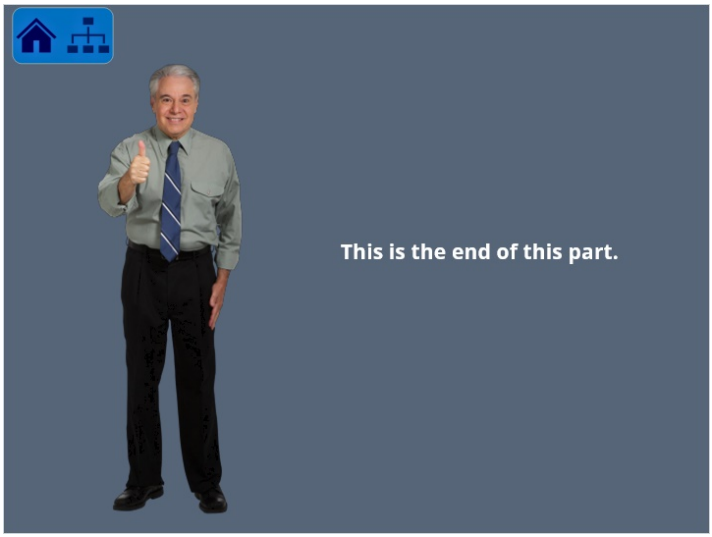
Example (Slide Layer)



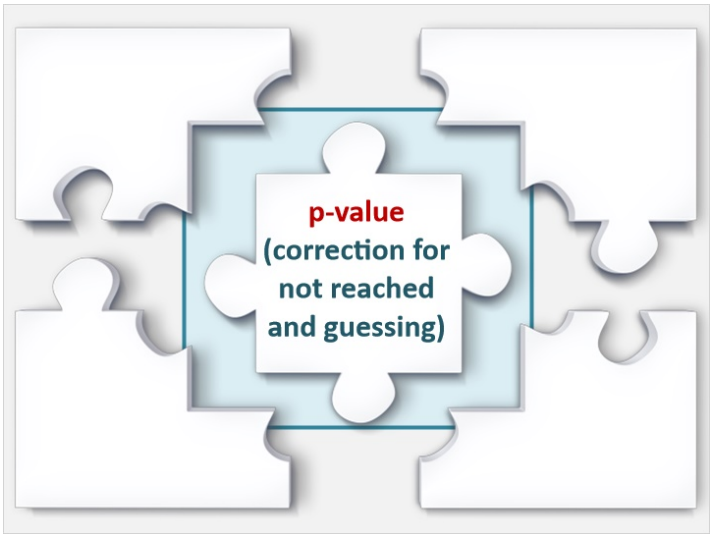
Properties (Slide Layer)



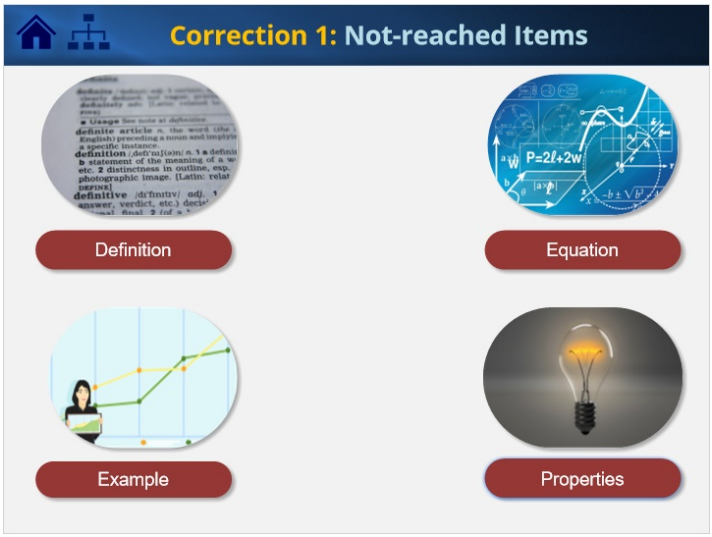
3.13 Bookend: p-value



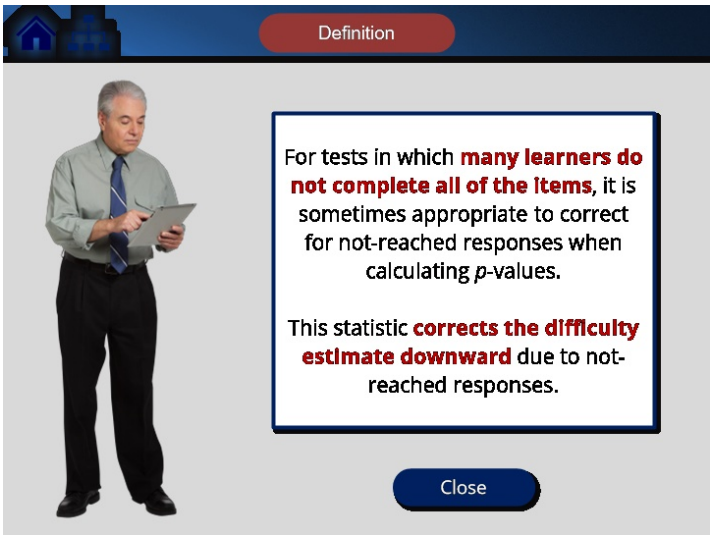
3.14 Bookmark: Corrections



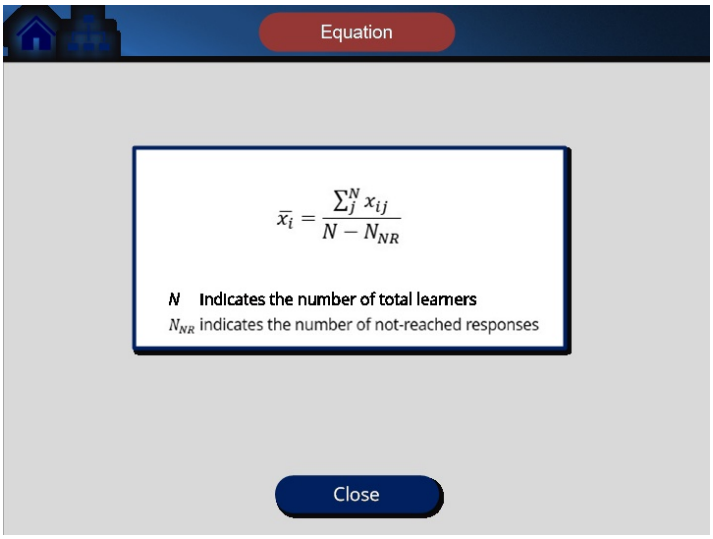
3.15 Correction 1: Not-reached



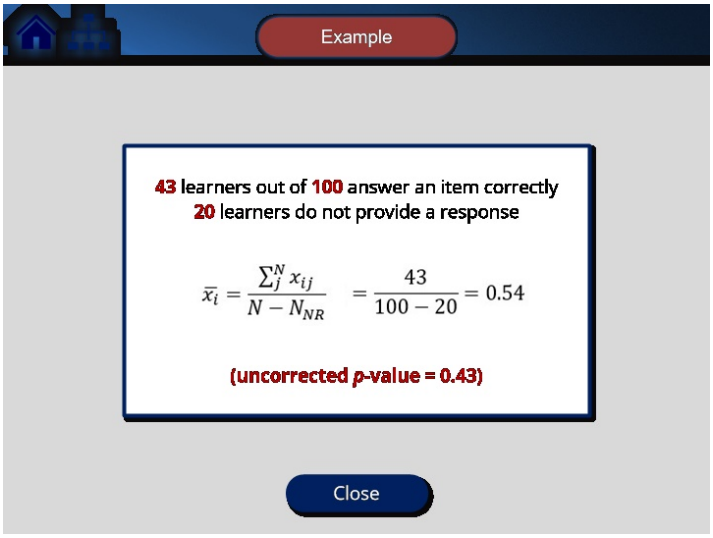
Definition (Slide Layer)



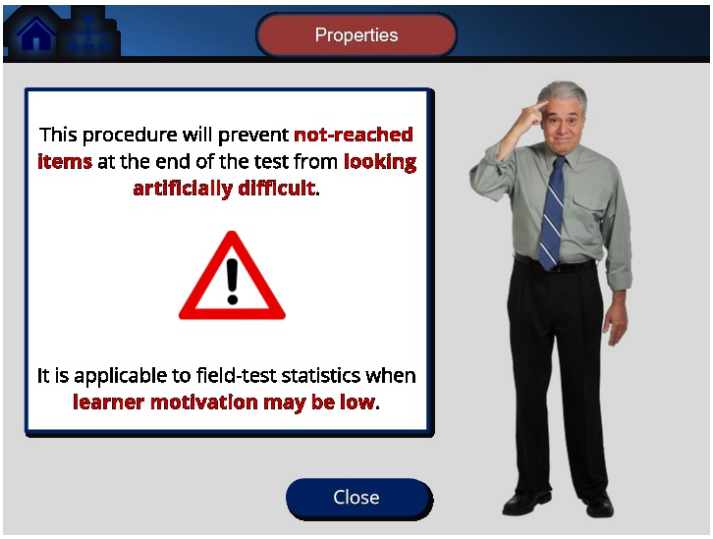
Equation (Slide Layer)



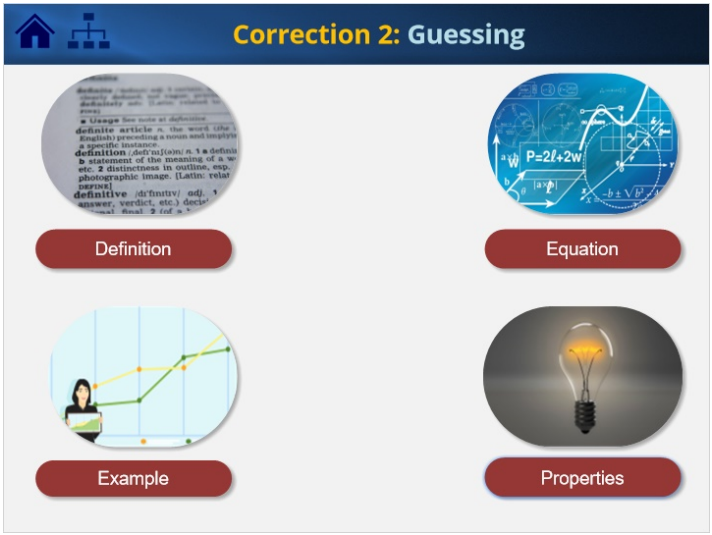
Example (Slide Layer)



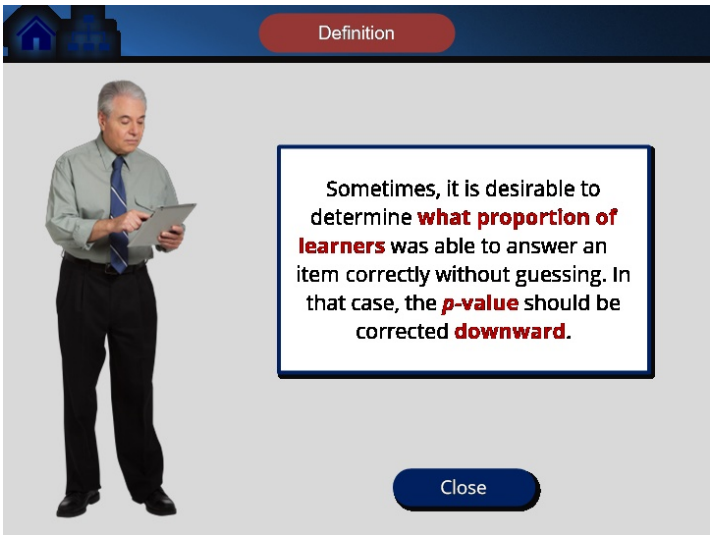
Properties (Slide Layer)



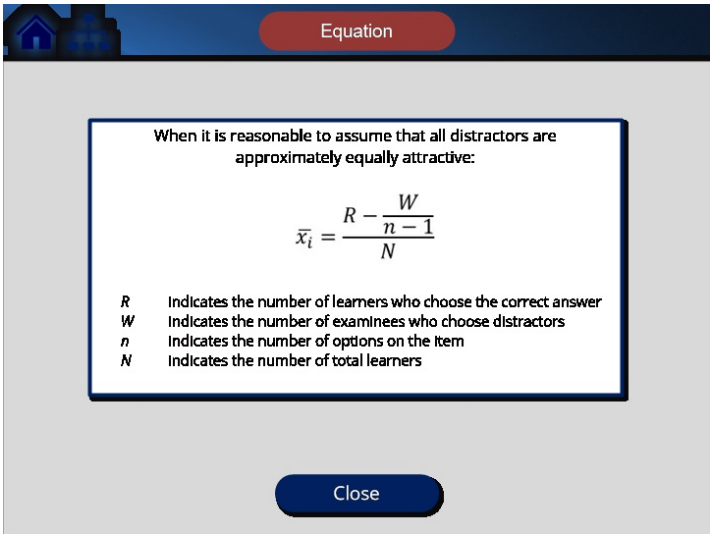
3.16 Correction 2: Guessing



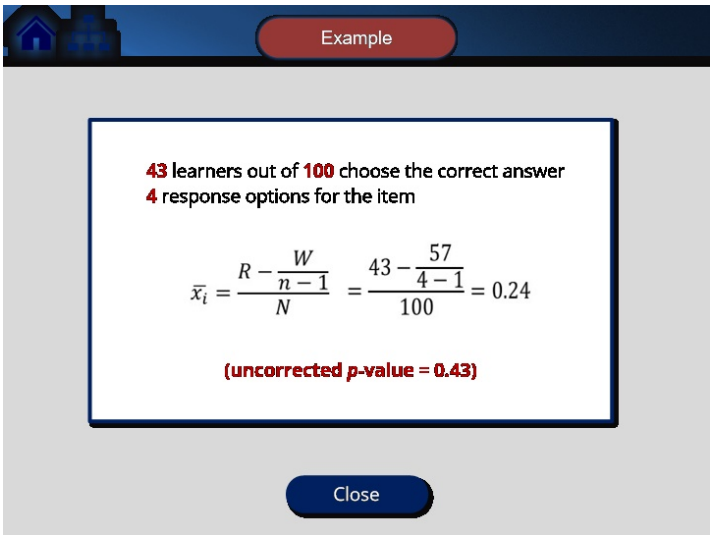
Definition (Slide Layer)



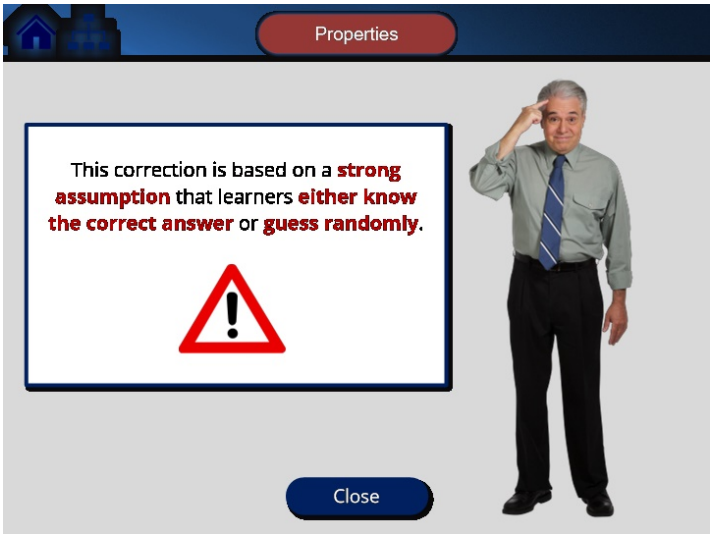
Equation (Slide Layer)



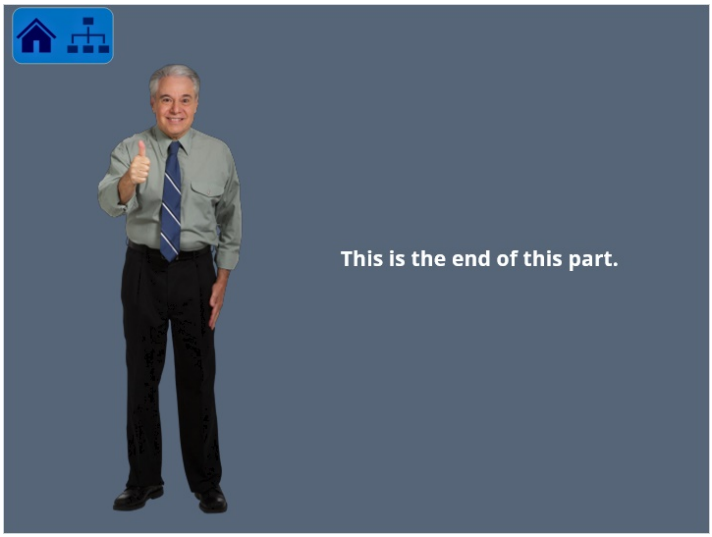
Example (Slide Layer)



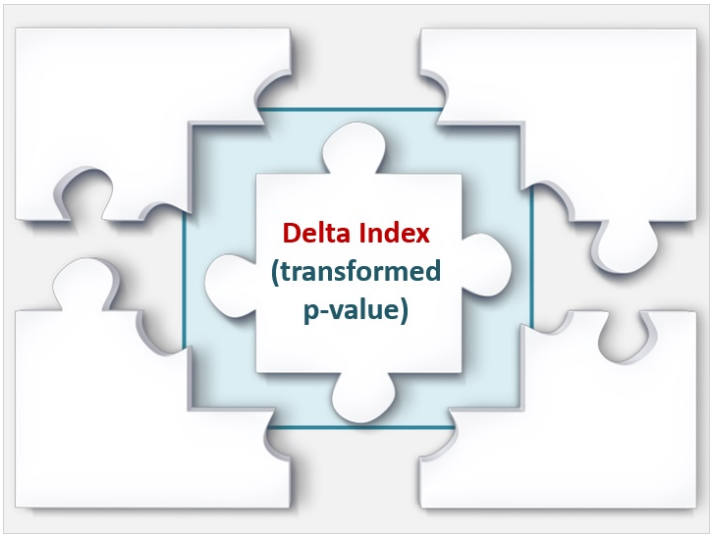
Properties (Slide Layer)



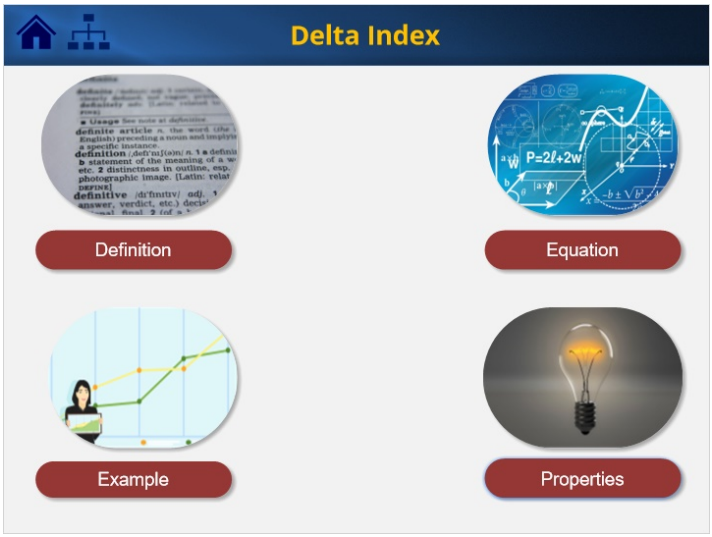
3.17 Bookend: Corrections



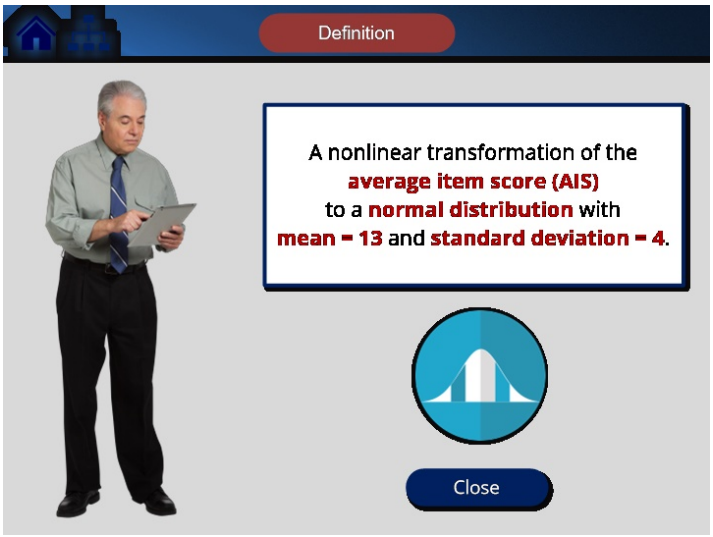
3.18 Bookmark: Delta Index



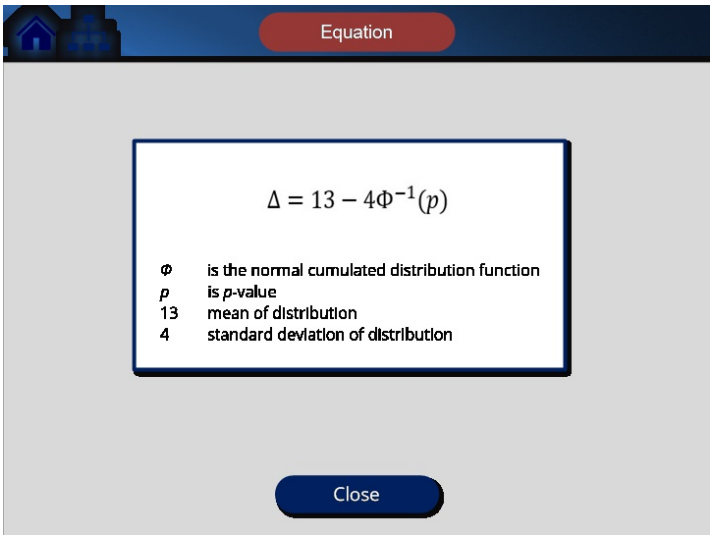
3.19 Delta Index



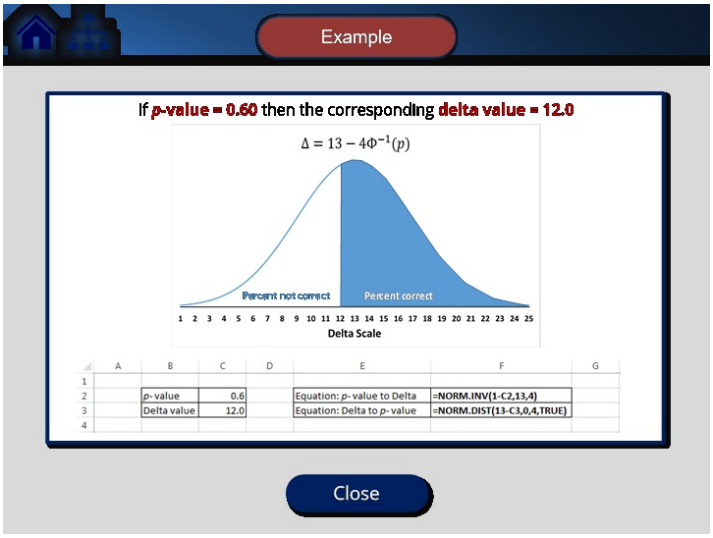
Definition (Slide Layer)



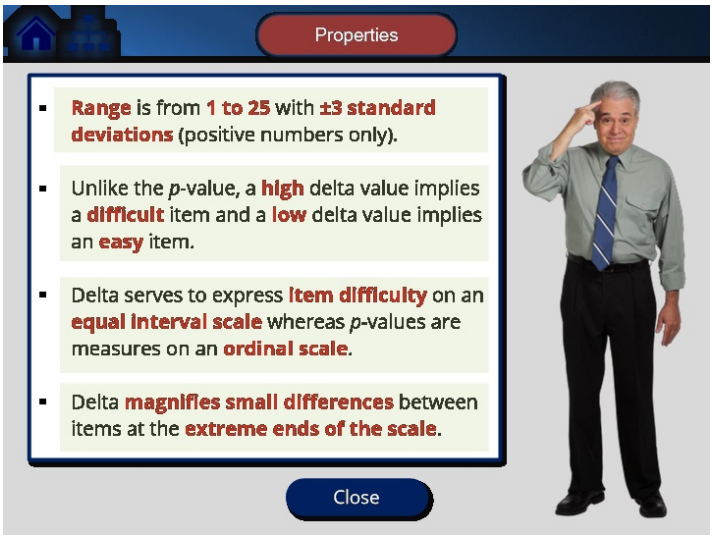
Equation (Slide Layer)



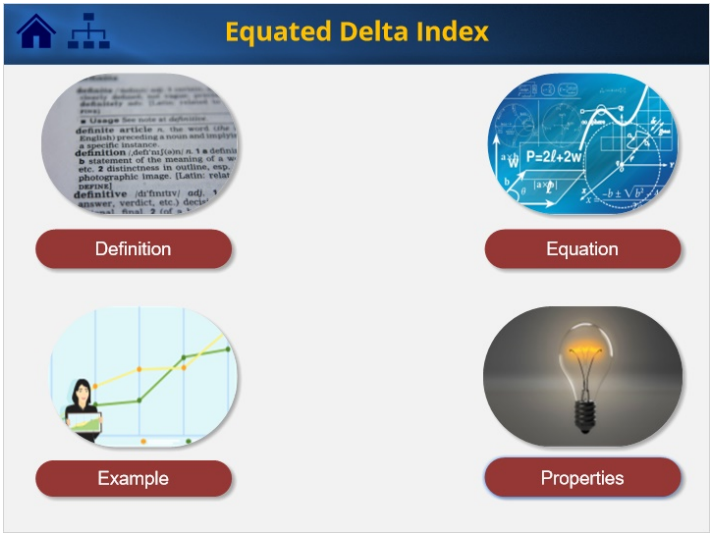
Example (Slide Layer)



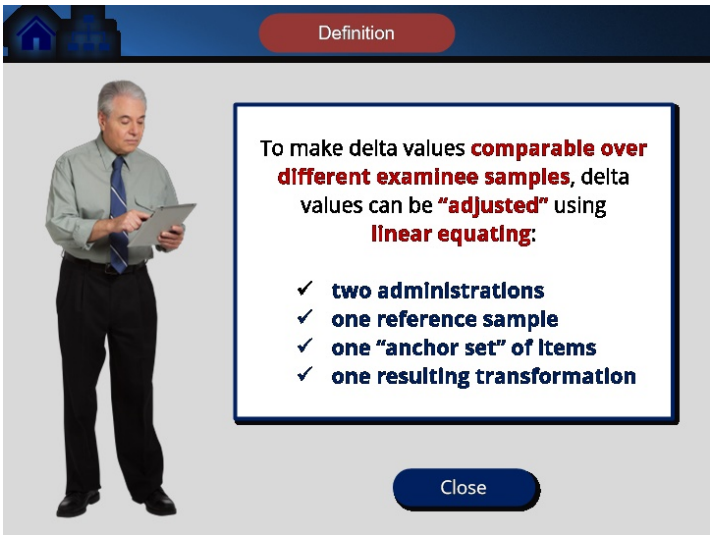
Properties (Slide Layer)



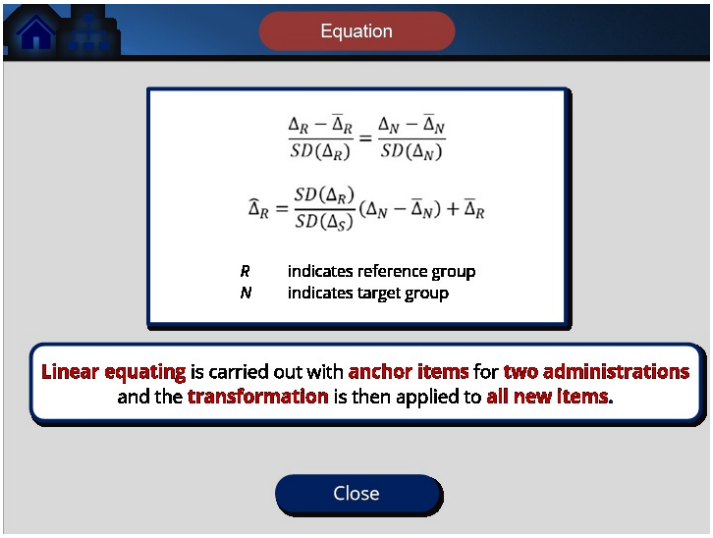
3.20 Equated Delta Index



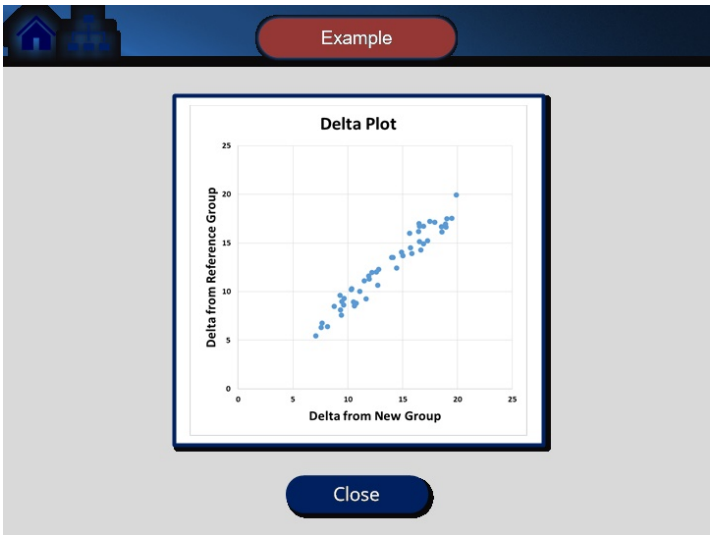
Definition (Slide Layer)



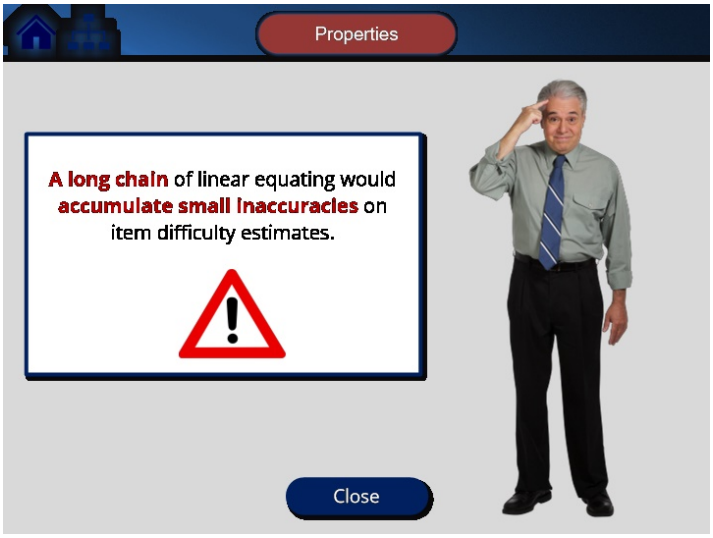
Equation (Slide Layer)



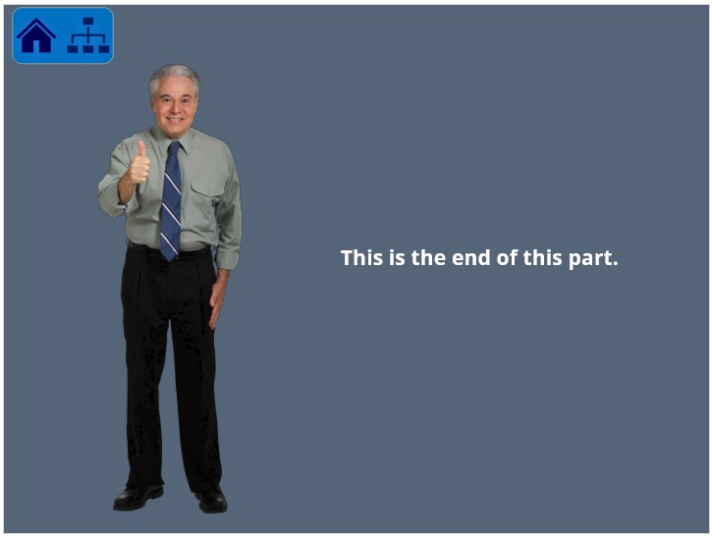
Example (Slide Layer)



Properties (Slide Layer)

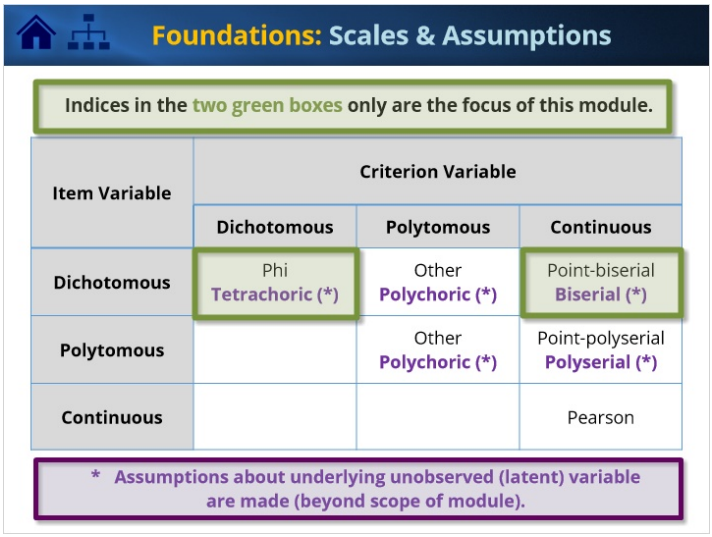


3.21 Bookend: Delta Index

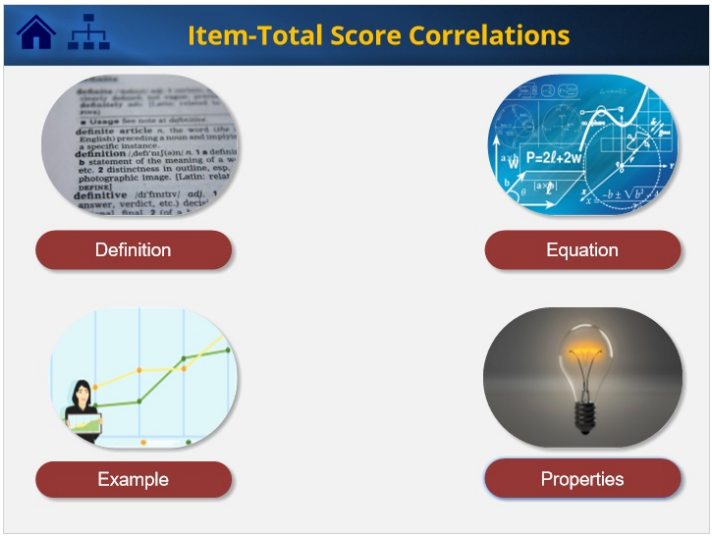


3.22 Bookmark: Item Discrimination

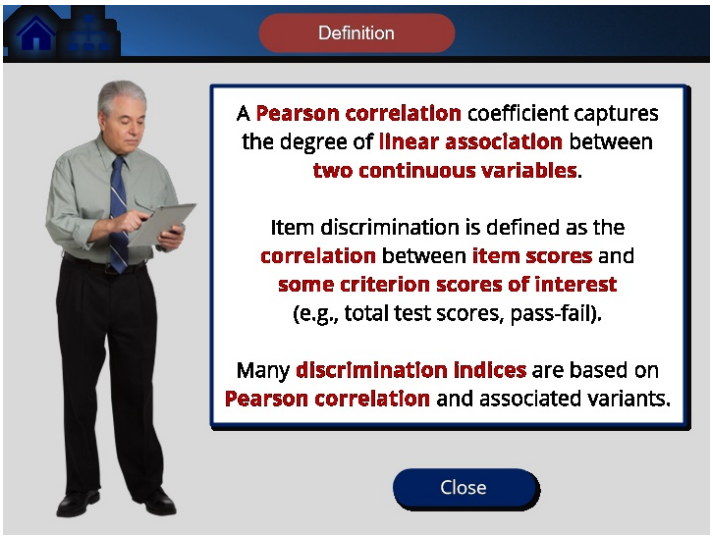
3.23 Correlation Coefficients



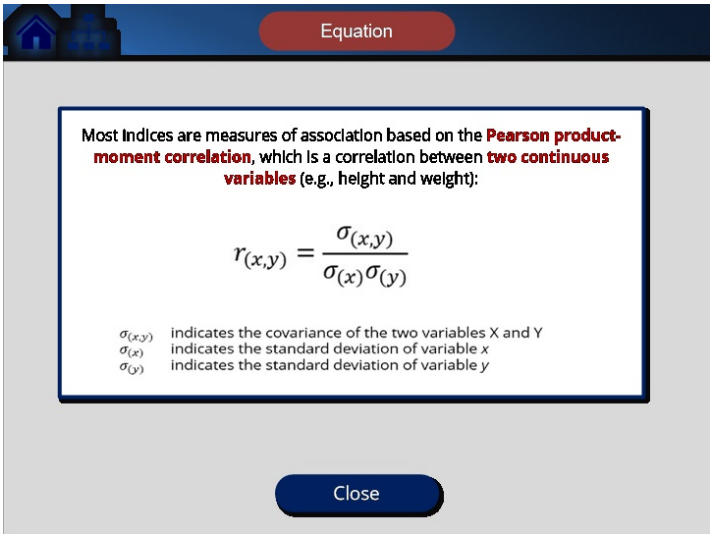
3.24 Foundations: Pearson Correlation



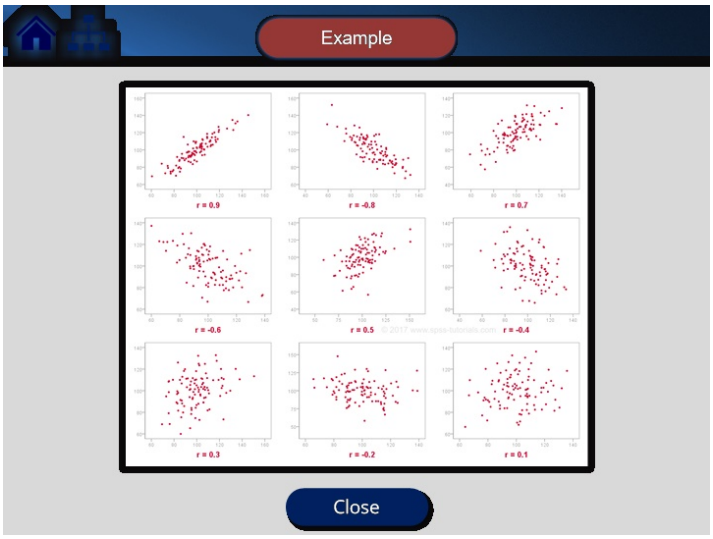
Definition (Slide Layer)



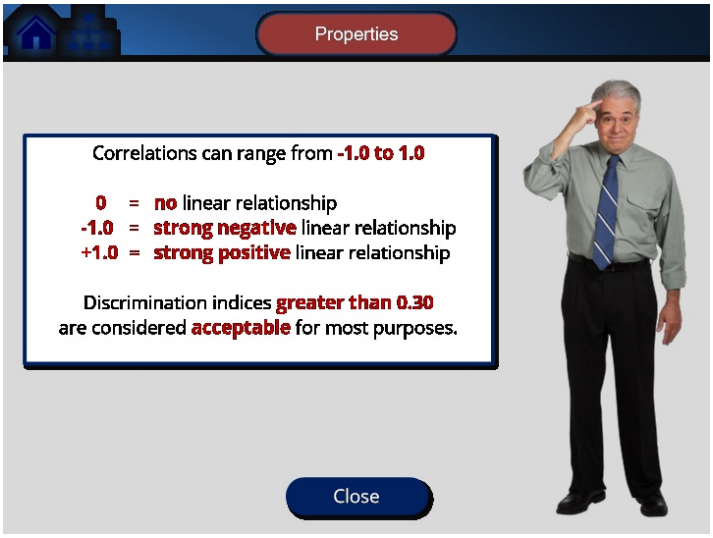
Equation (Slide Layer)



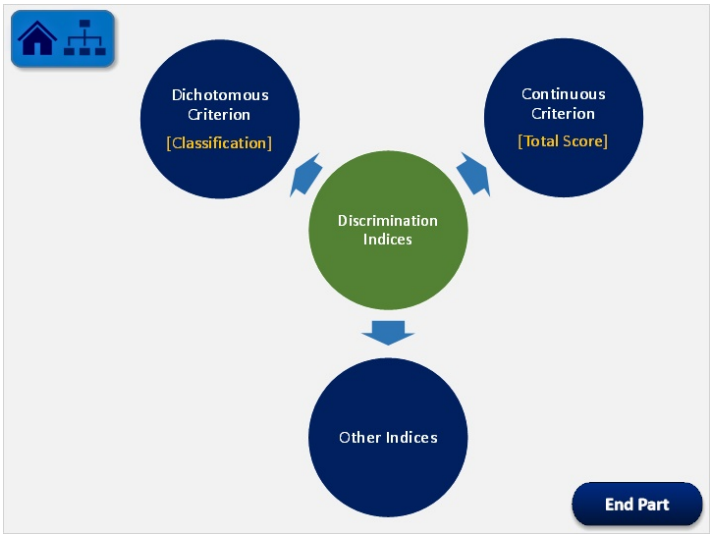
Example (Slide Layer)



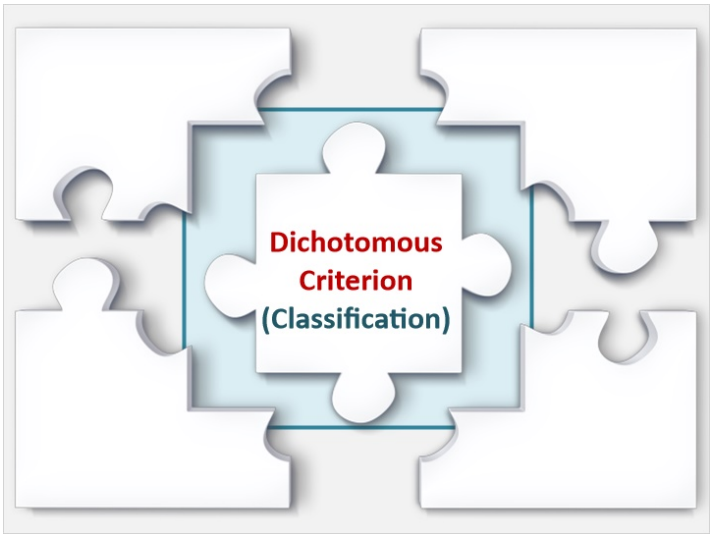
Properties (Slide Layer)



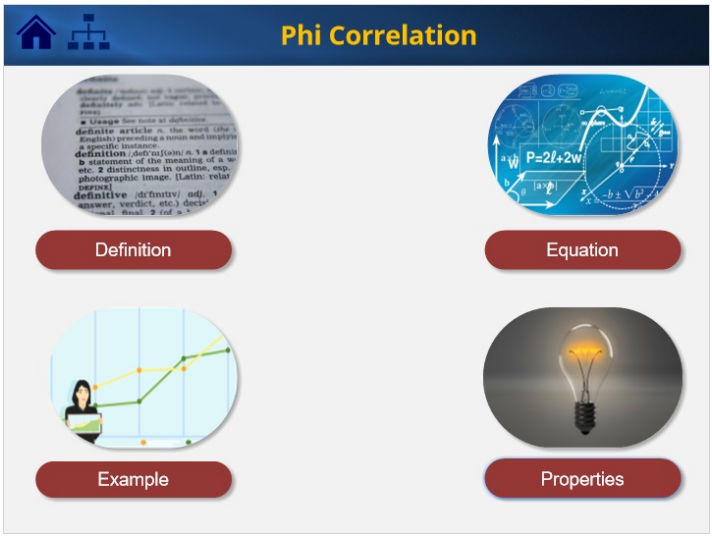
3.25 Topic Selection: Discrimination



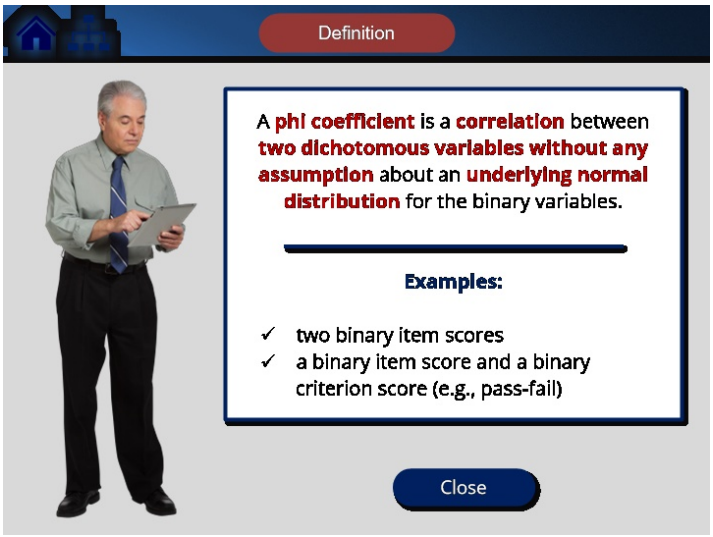
3.26 Bookmark: Dichotomous Criterion



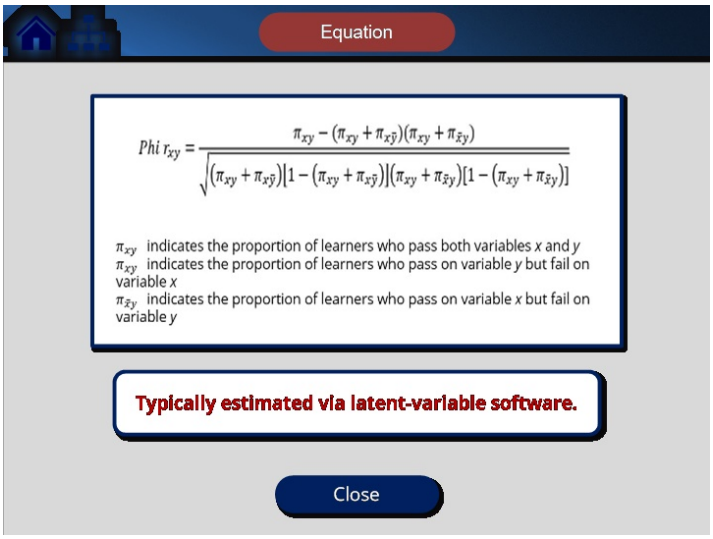
3.27 Phi Correlation



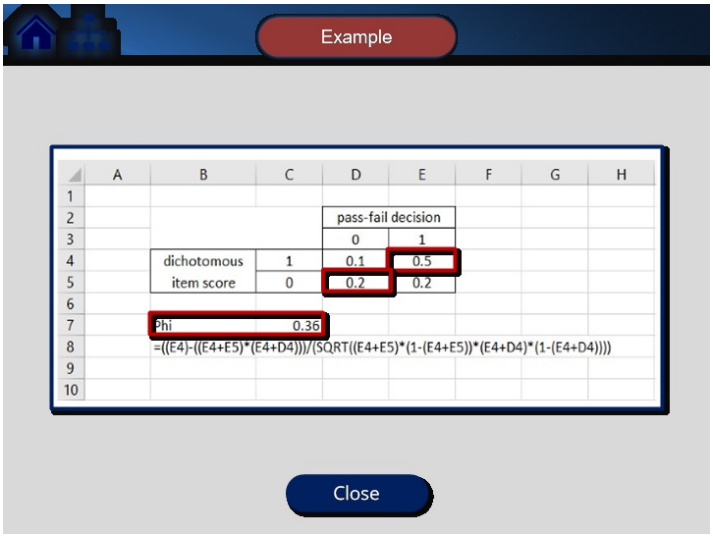
Definition (Slide Layer)



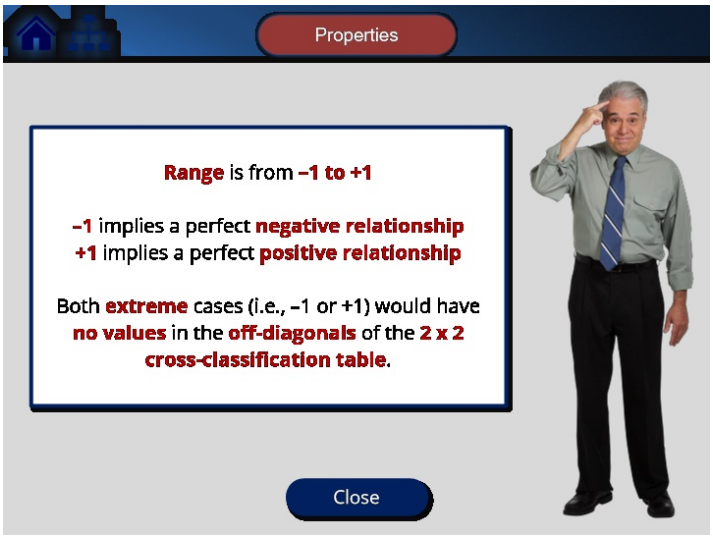
Equation (Slide Layer)



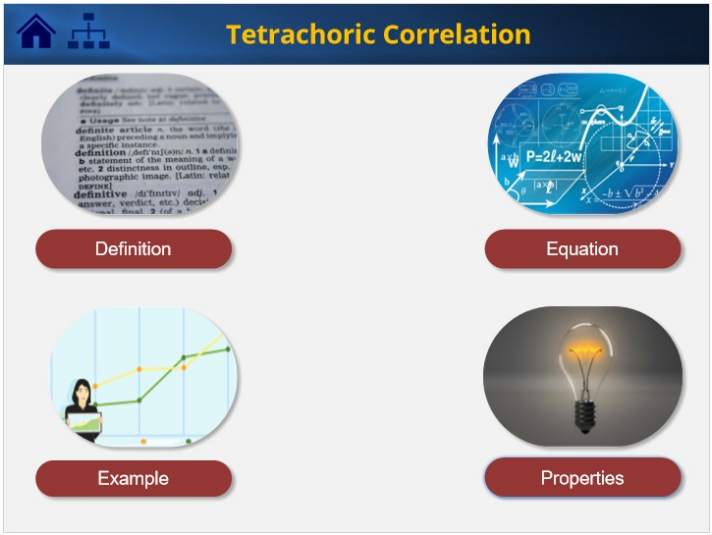
Example (Slide Layer)



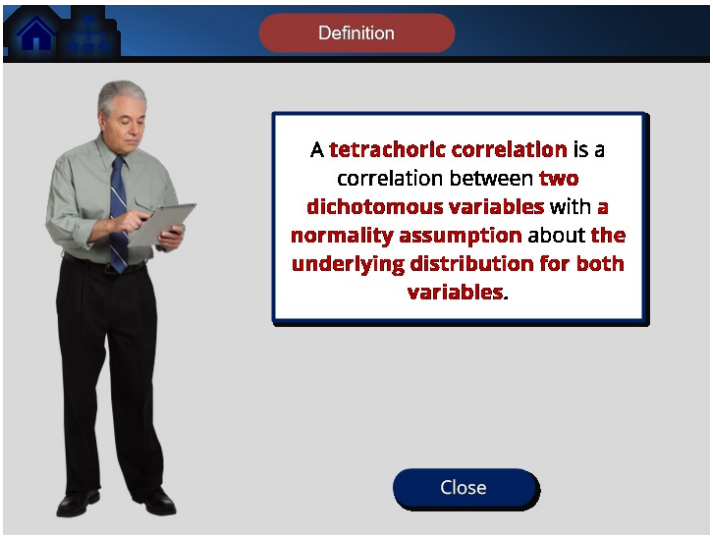
Properties (Slide Layer)



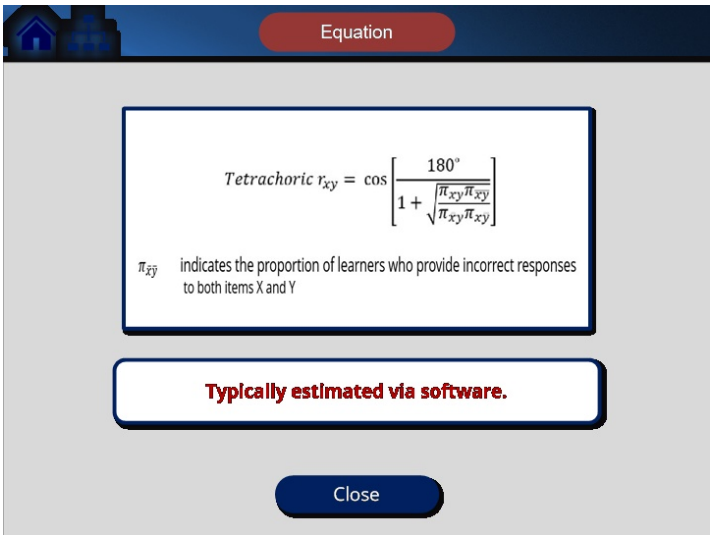
3.28 Tetrachoric Correlation



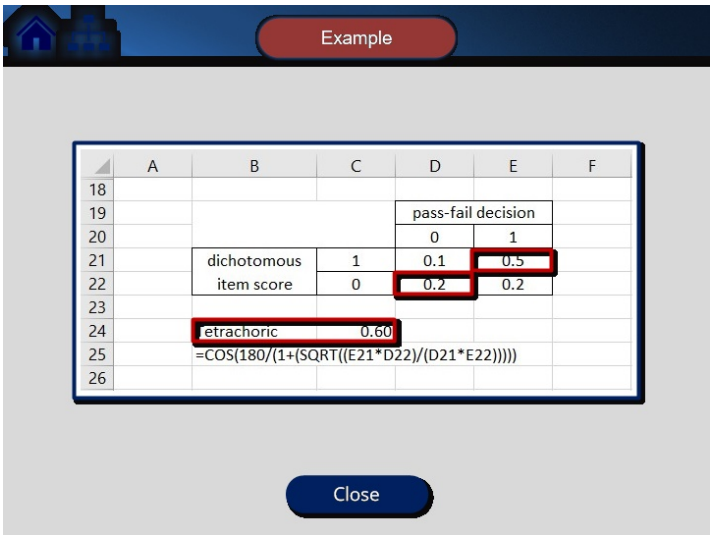
Definition (Slide Layer)



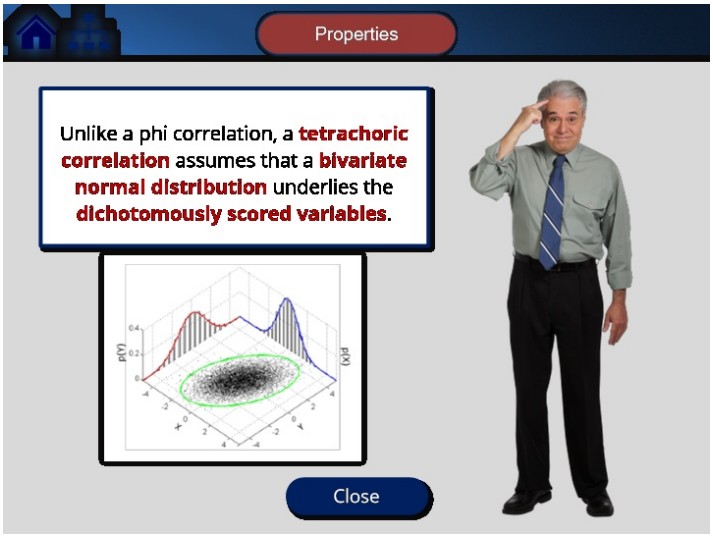
Equation (Slide Layer)



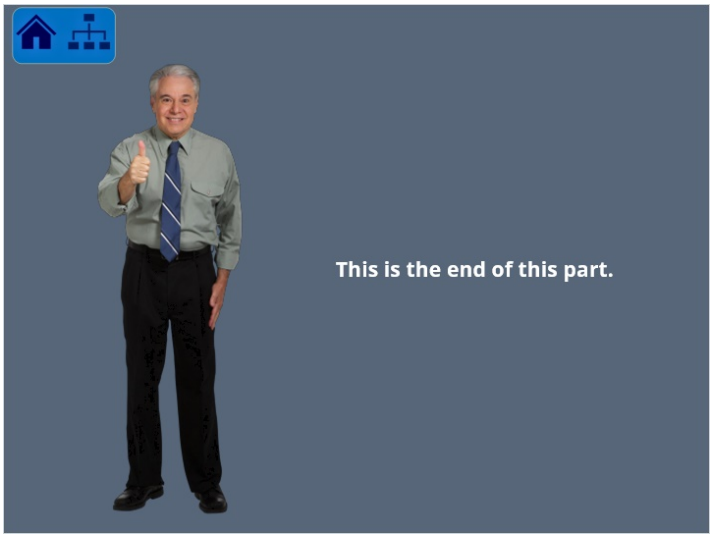
Example (Slide Layer)



Properties (Slide Layer)

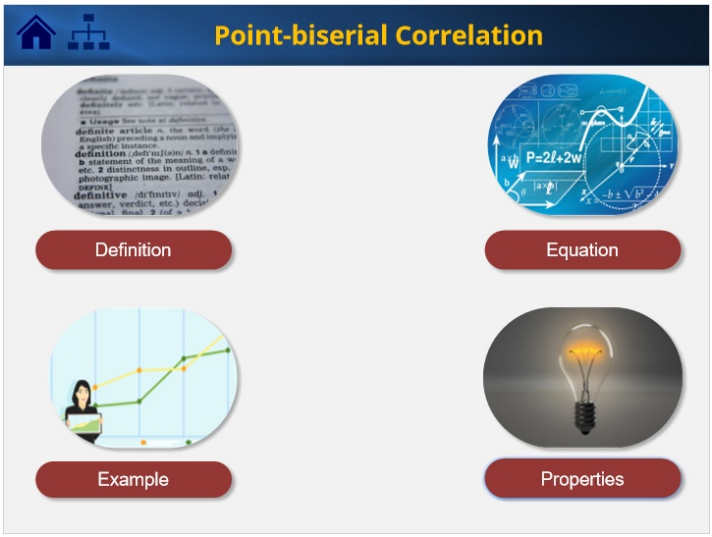


3.29 Bookend: Dichotomous Criterion

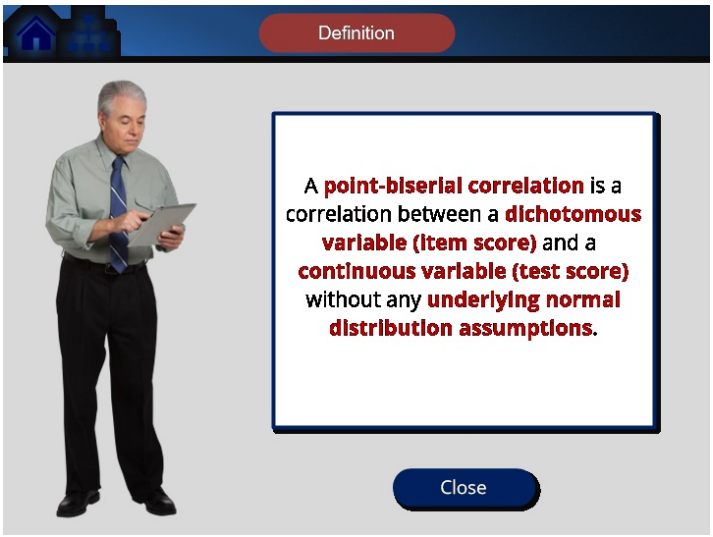


3.30 Bookmark: Continuous Criterion

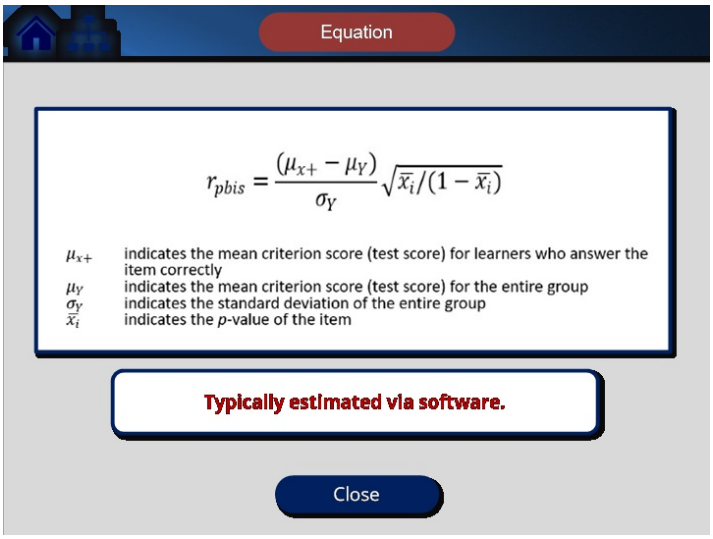
3.31 Point-biserial Correlation



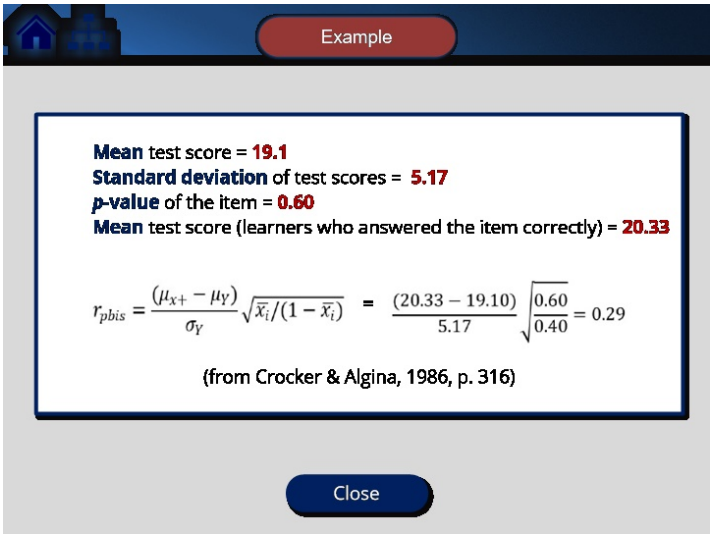
Definition (Slide Layer)



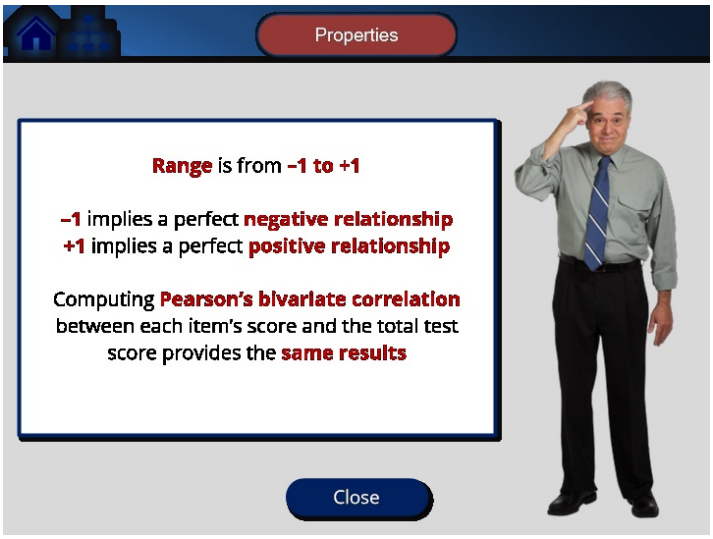
Equation (Slide Layer)



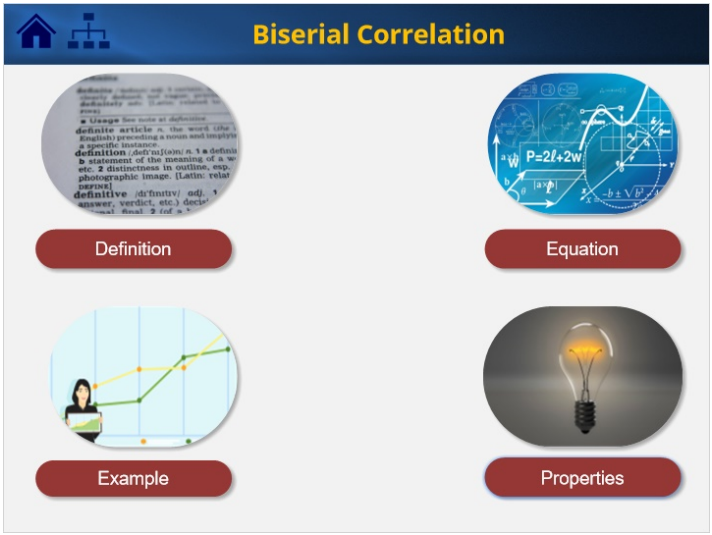
Example (Slide Layer)



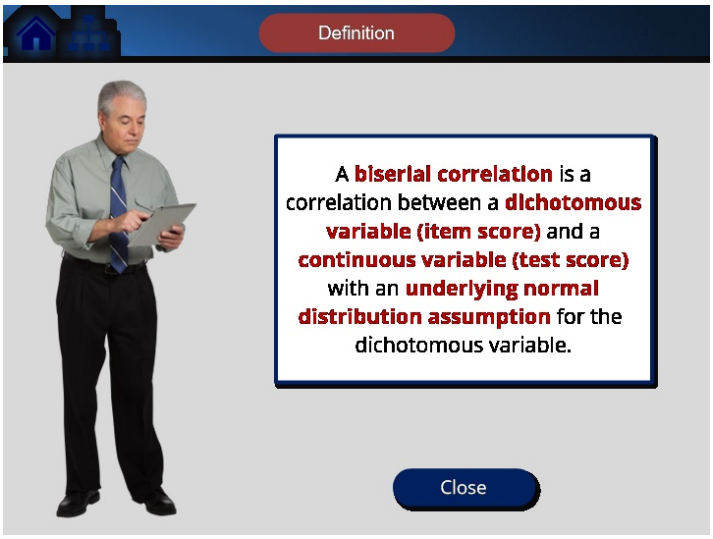
Properties (Slide Layer)



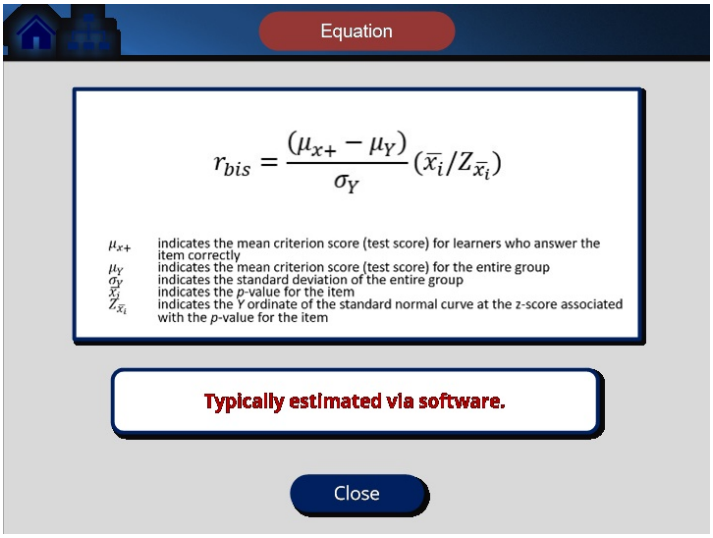
3.32 Biserial Correlation



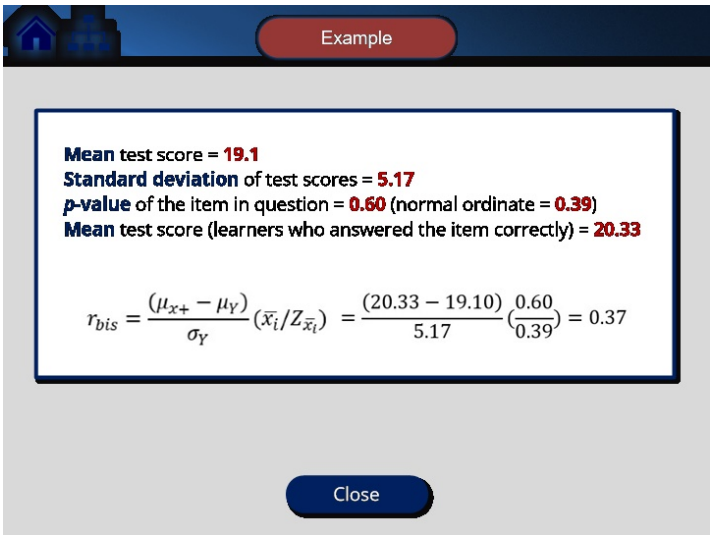
Definition (Slide Layer)



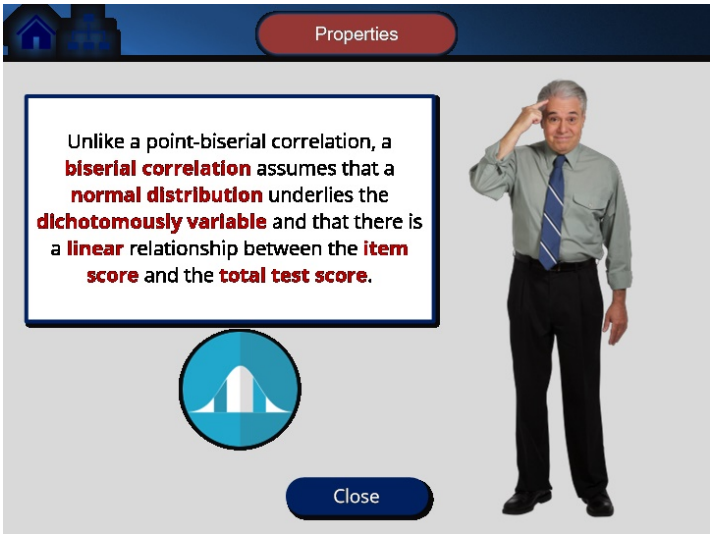
Equation (Slide Layer)



Example (Slide Layer)

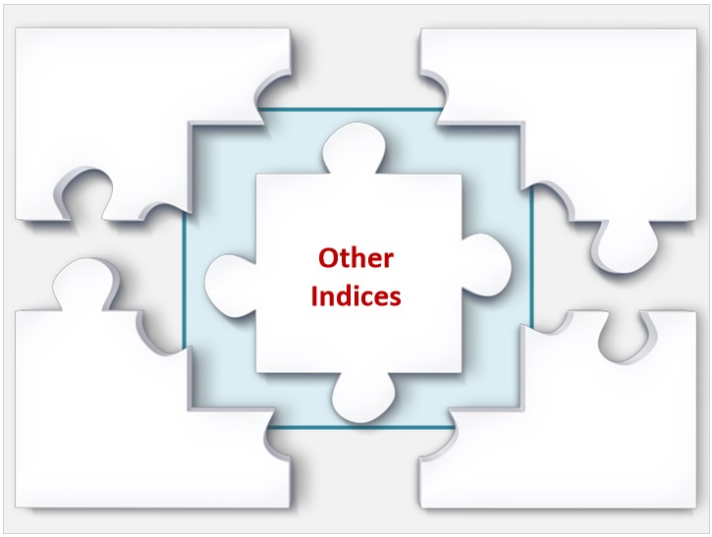


Properties (Slide Layer)

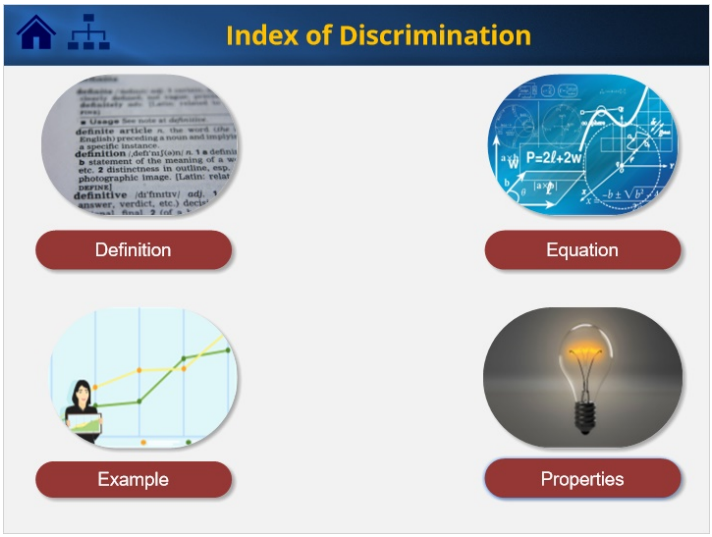


3.33 Bookend: Continuous Criterion

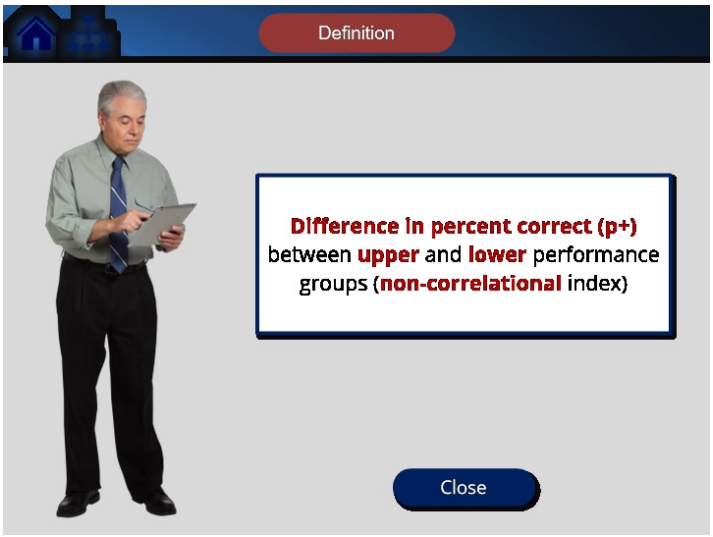
3.34 Bookmark: Other Indices



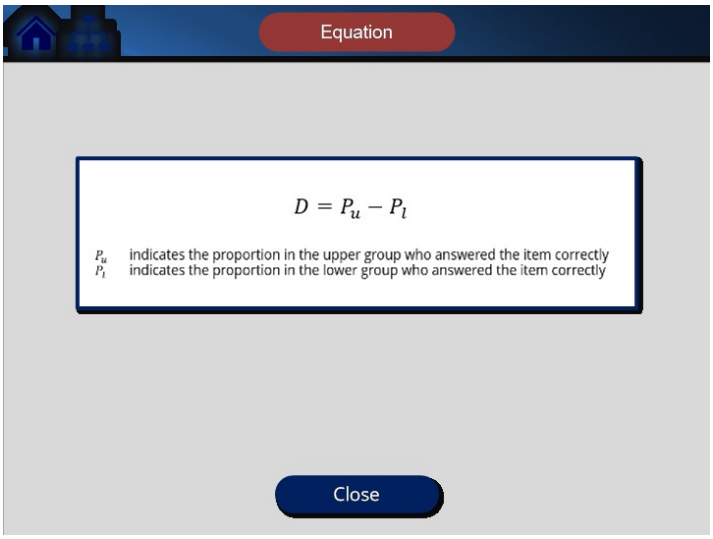
3.35 Index of Discrimination



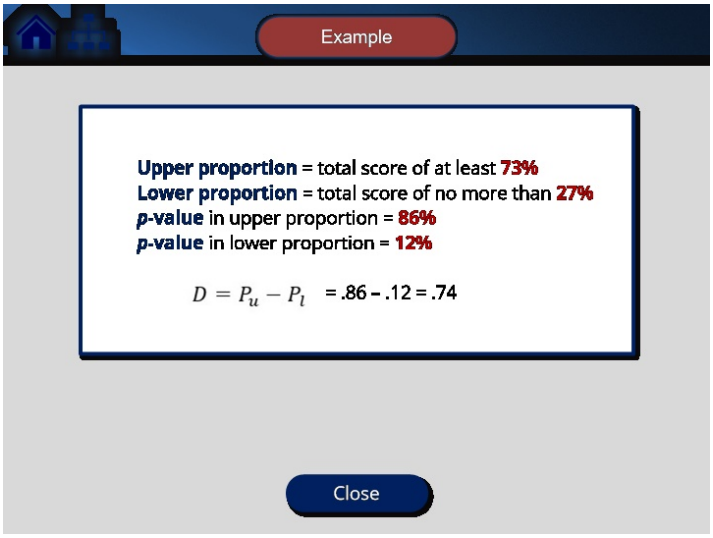
Definition (Slide Layer)



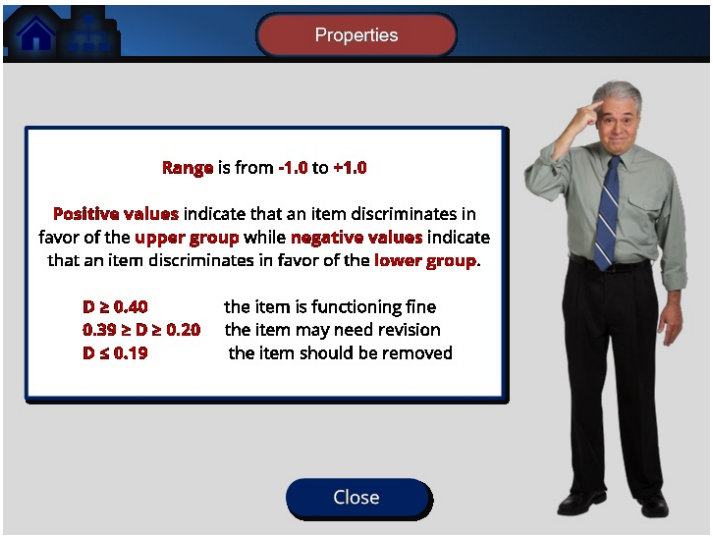
Equation (Slide Layer)



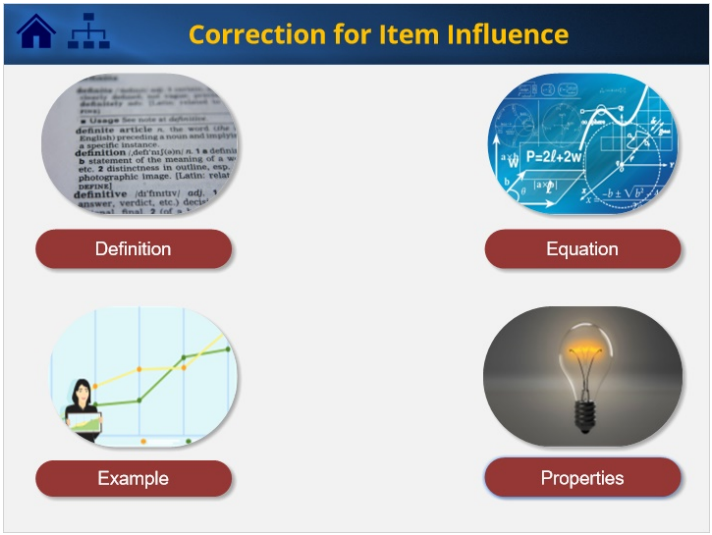
Example (Slide Layer)



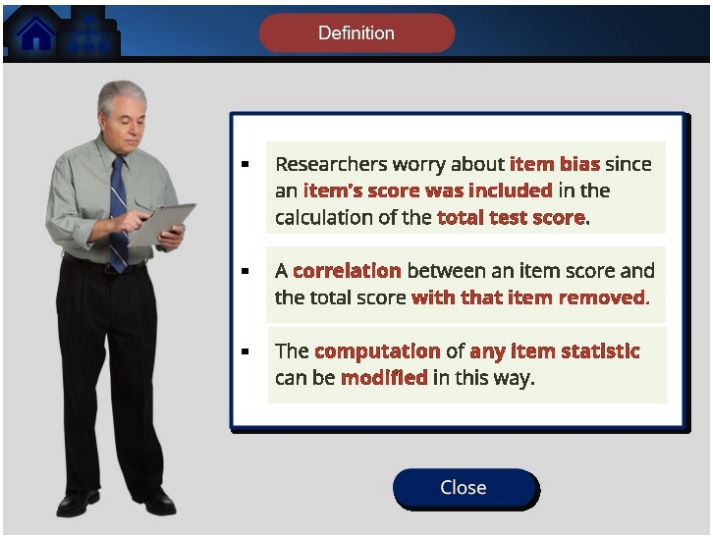
Properties (Slide Layer)



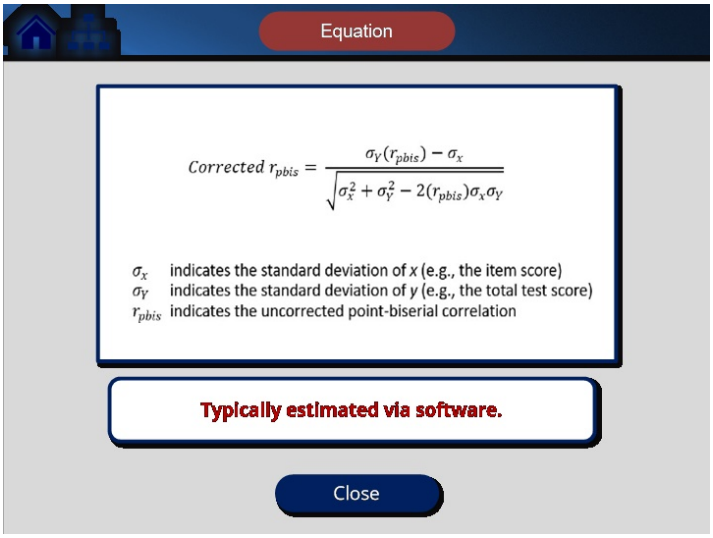
3.36 Correction for Item Influence



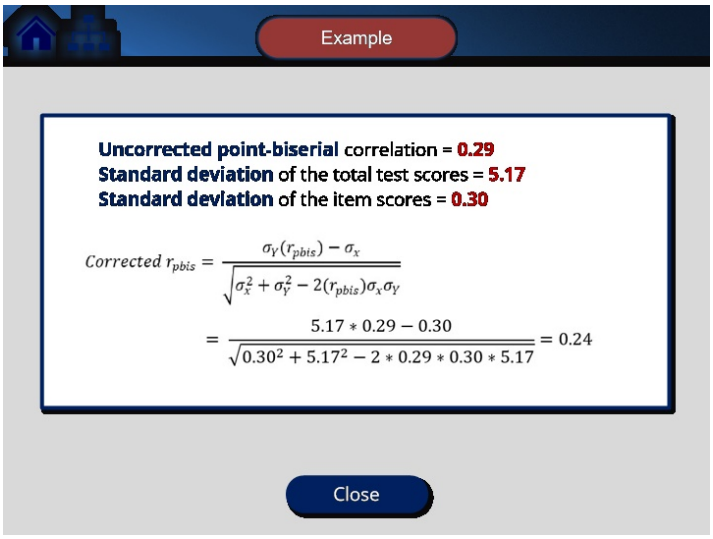
Definition (Slide Layer)



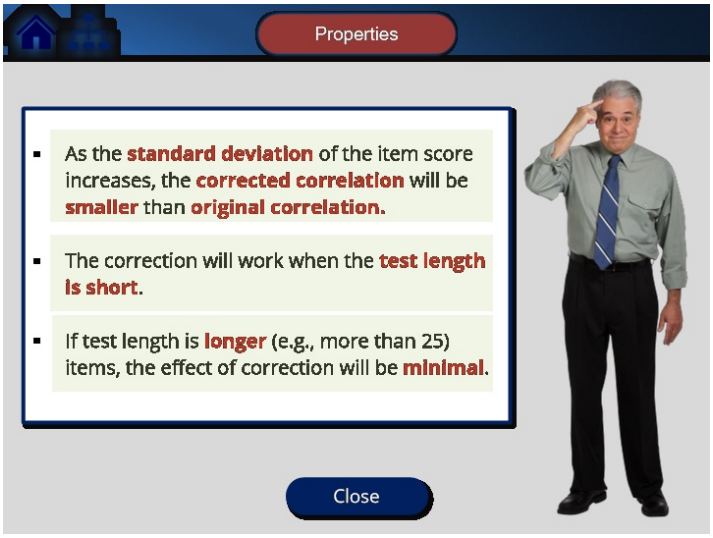
Equation (Slide Layer)



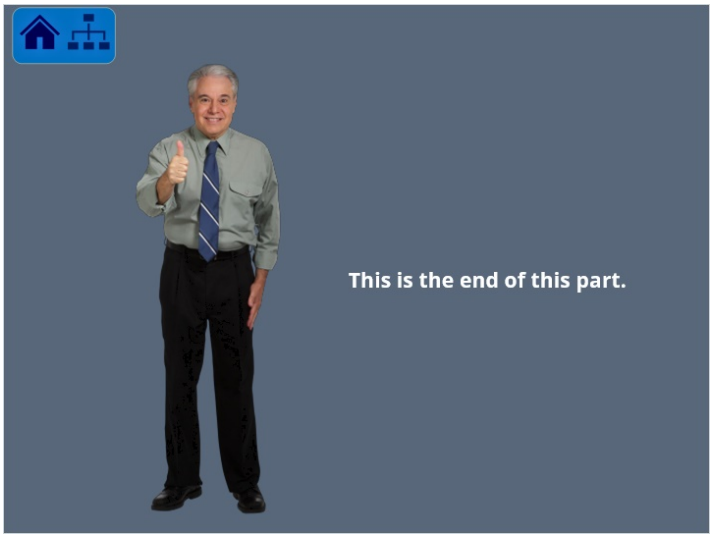
Example (Slide Layer)



Properties (Slide Layer)

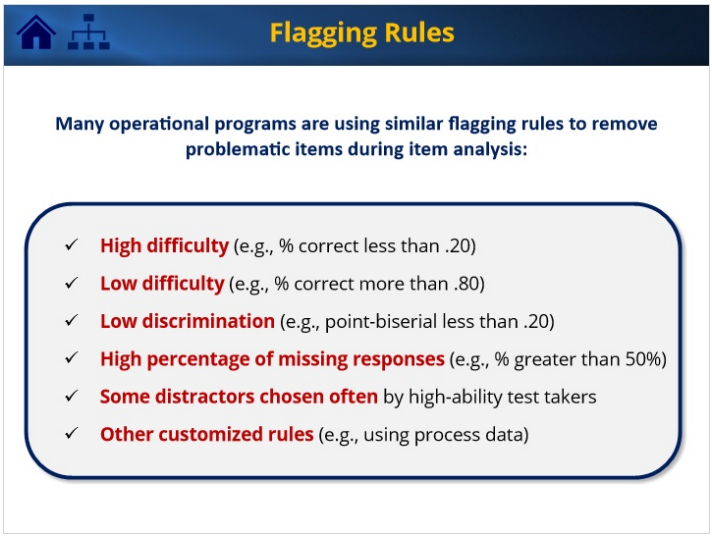


3.37 Bookend: Other Indices

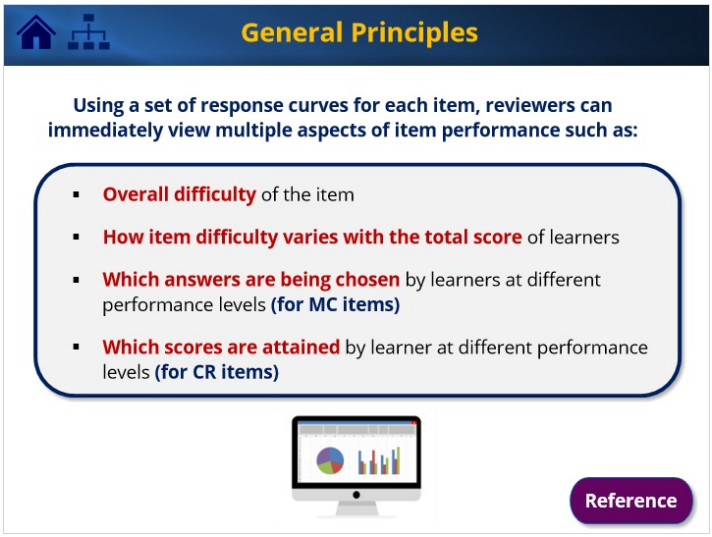


3.38 Bookmark: Flagging Rules

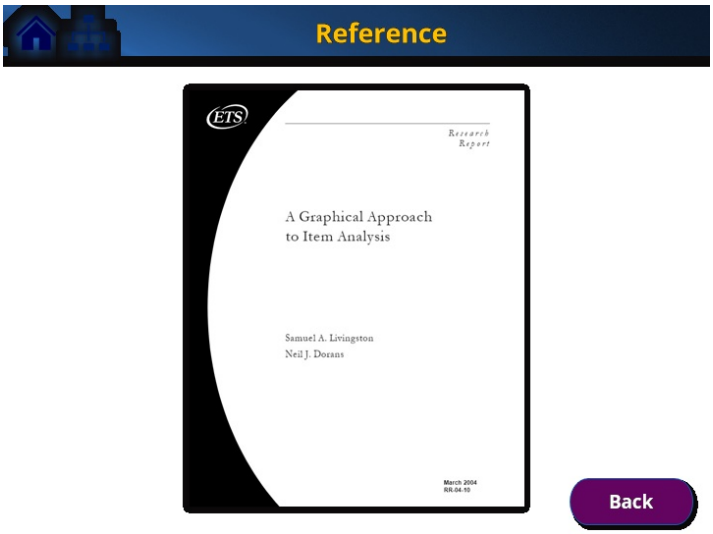
3.39 Flagging Rules from Item Analysis (1)



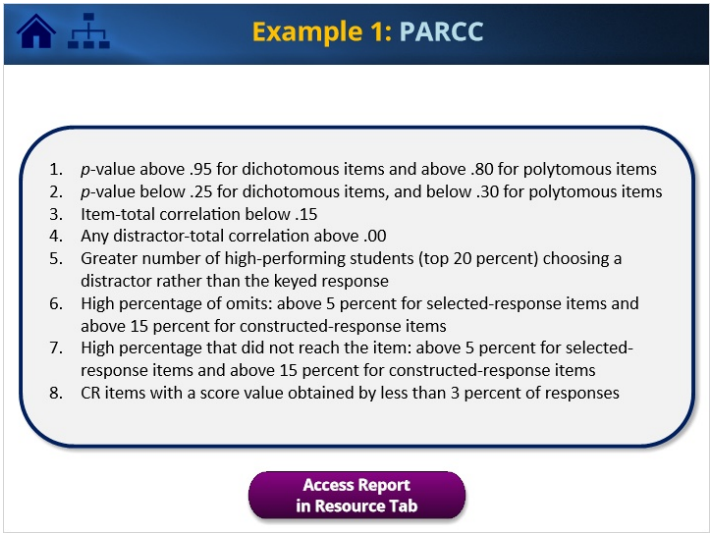
3.40 Conceptual Foundations



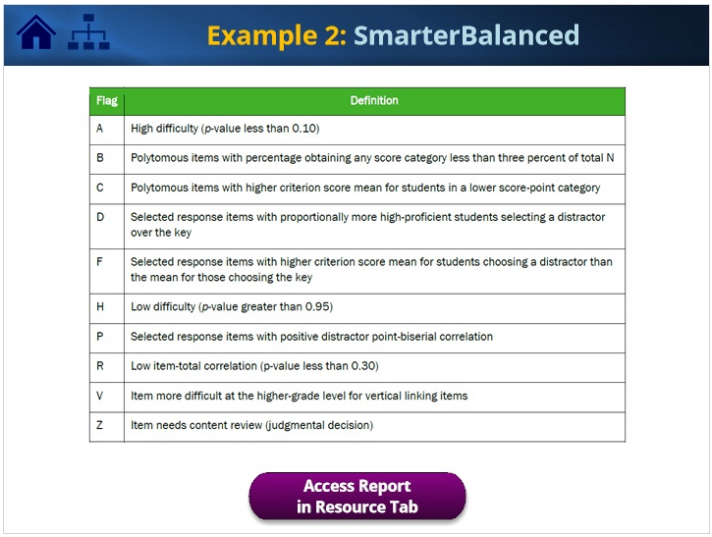
References (Slide Layer)



3.41 Example 1: PARCC



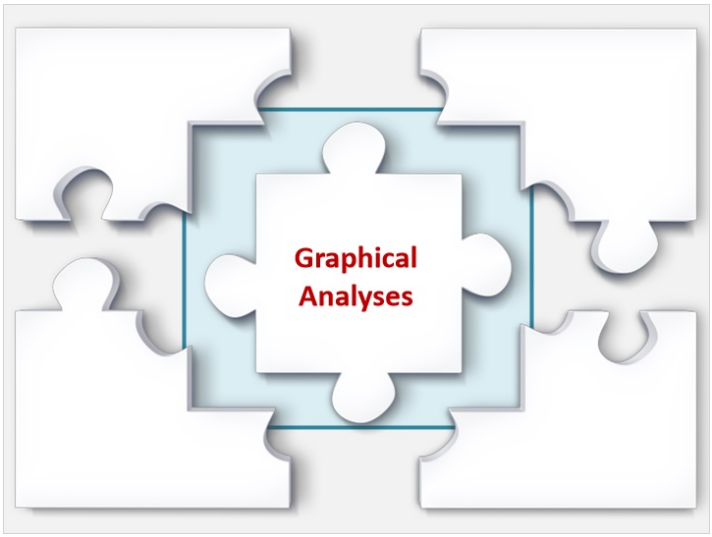
3.42 Example 2: SmarterBalanced



3.43 Bookend: Graphical Analyses

3.44 Bookmark: Distractors

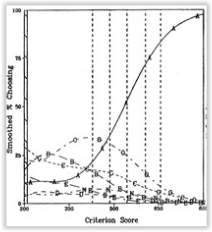
3.45 Bookmark: Graphical Analyses



3.46 Conceptual Foundations

Graphical Layout

- Each **graph** per item consists of one or more **response curves**
- The **horizontal axis** represents the score scale for the criterion
- The **vertical axis** represents the probability of a correct response
- The **response curve** shows a learner's probability of a particular response to the item as a function of the learner's total score

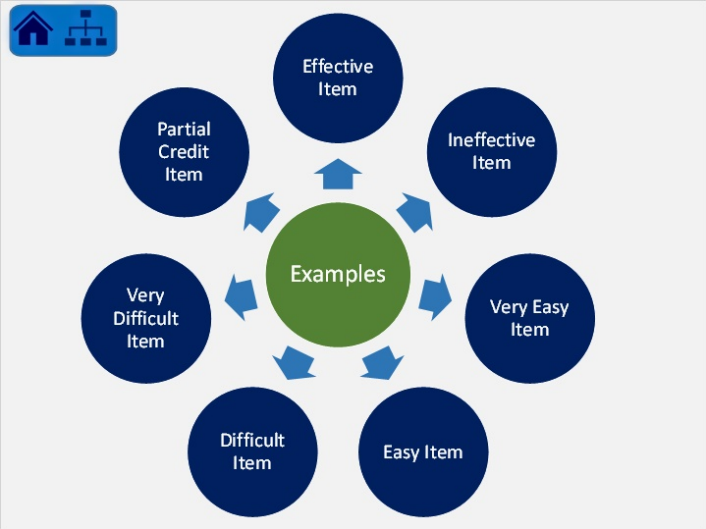


3.47 Conceptual Foundations

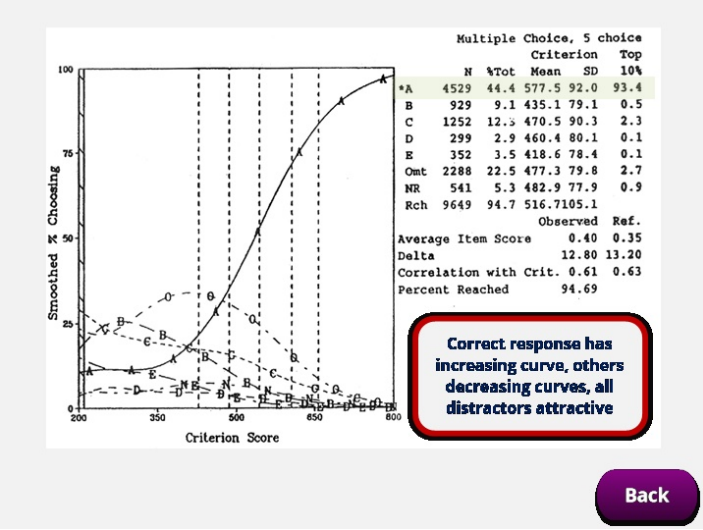
Response Curve Interpretation

- ✓ The **higher** the response curve (in any given range of the total score), the **easier** the item **(and vice versa)**
- ✓ The **more steeply** the height of the curve **increases** from left (low performers) to right (high performers), the **greater** the discriminating power of the item **(and vice versa)**

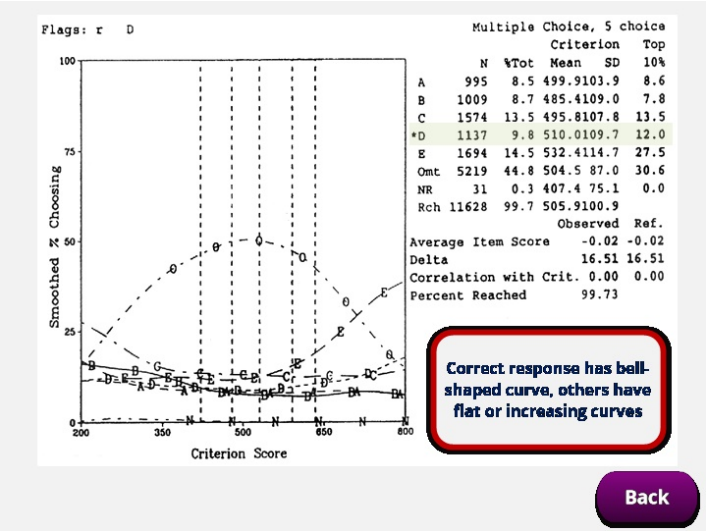
3.48 Item Selection



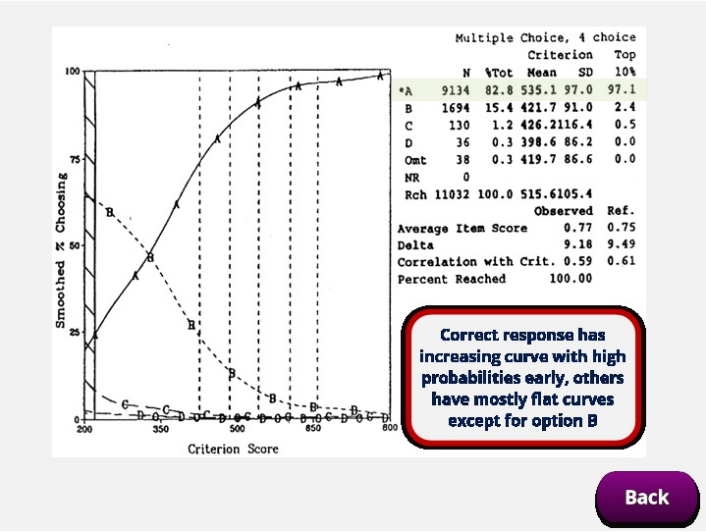
Effective Item (Slide Layer)



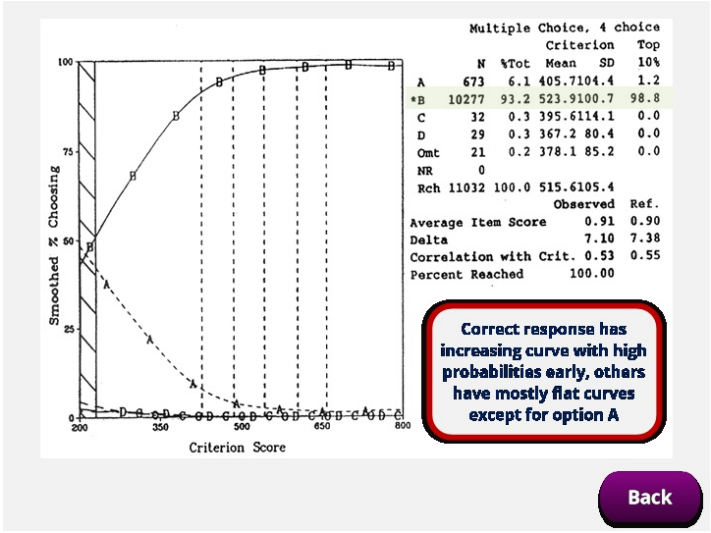
Ineffective Item (Slide Layer)



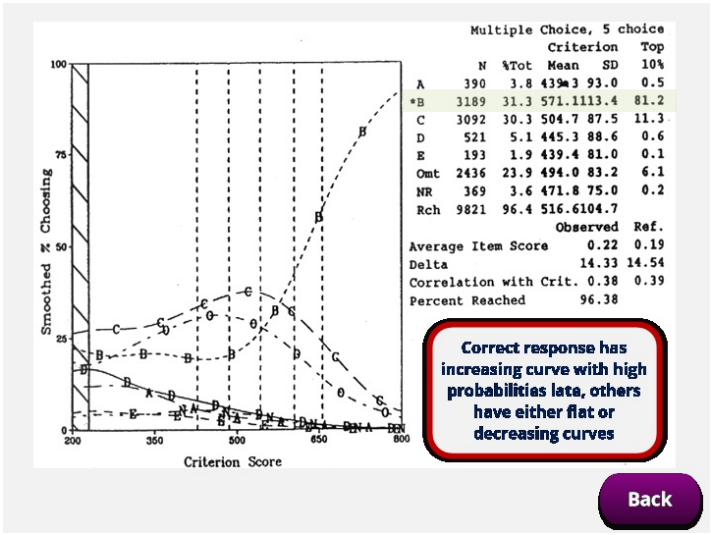
Easy Item (Slide Layer)



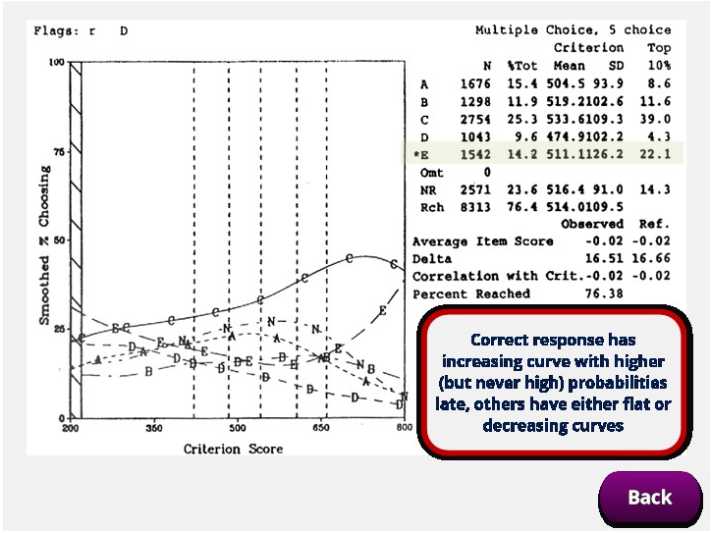
Very Easy Item (Slide Layer)



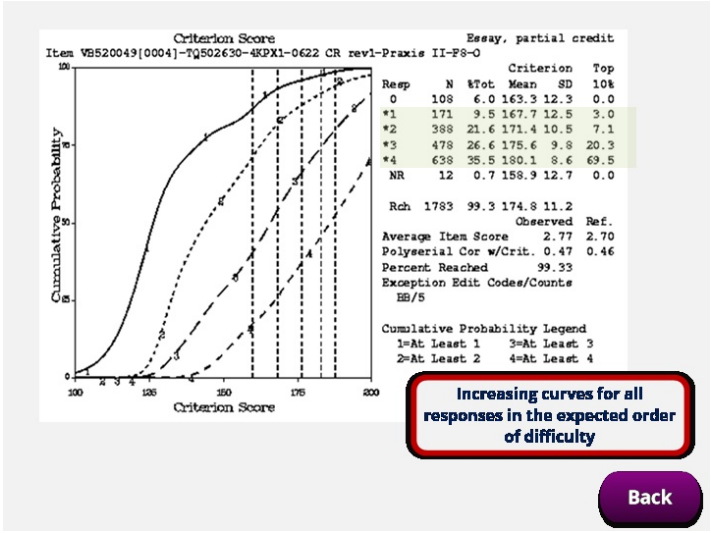
Difficult Item (Slide Layer)



Very Difficult Item (Slide Layer)

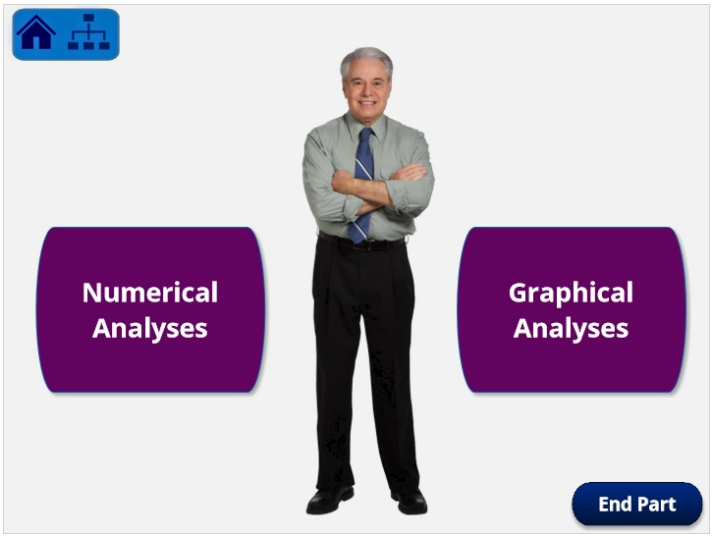


Partial Credit Item (Slide Layer)

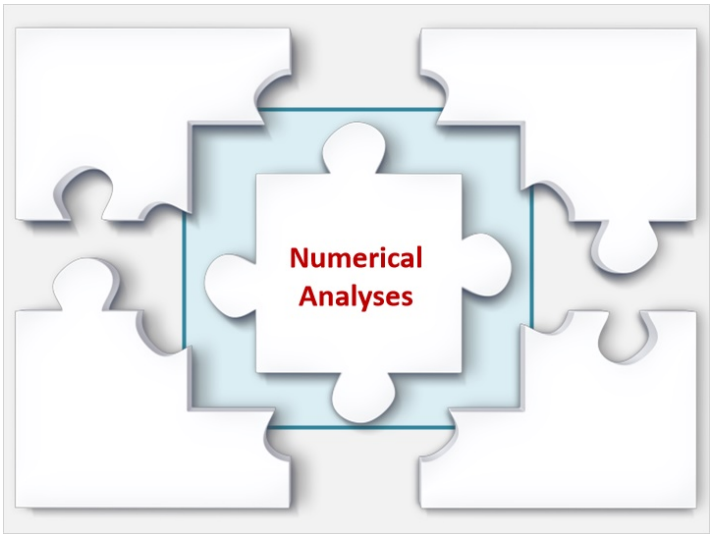


3.49 Bookend: Graphical Analyses

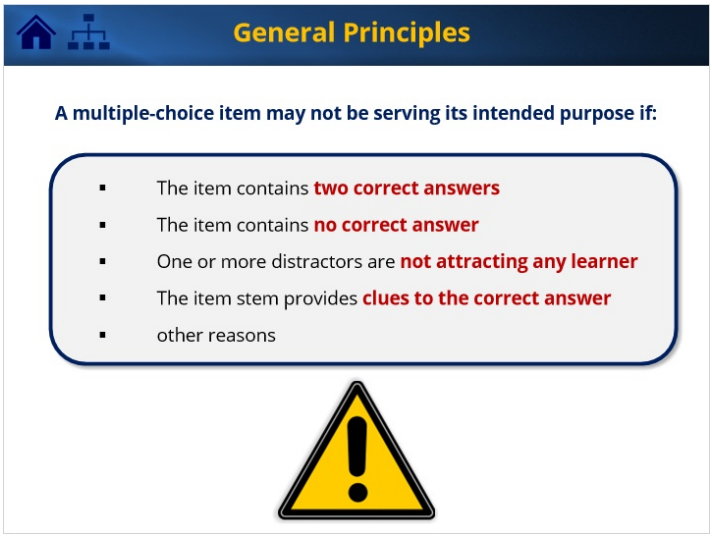
3.50 Topic Selection: Distractors



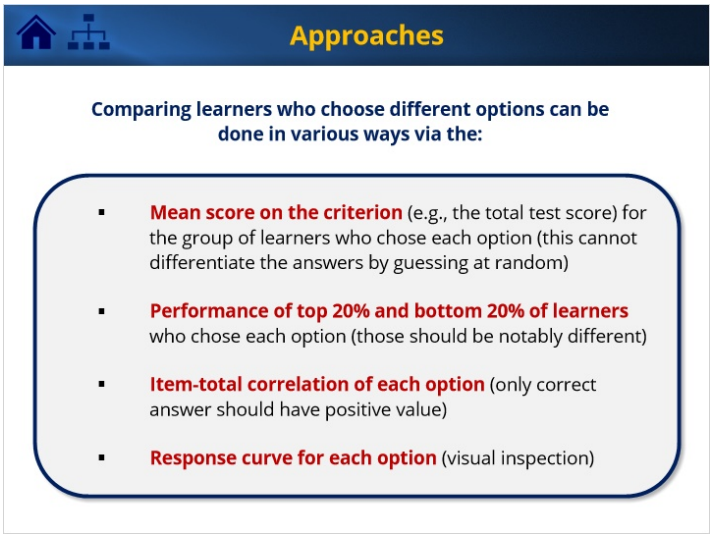
3.51 Bookmark: Numerical Analyses



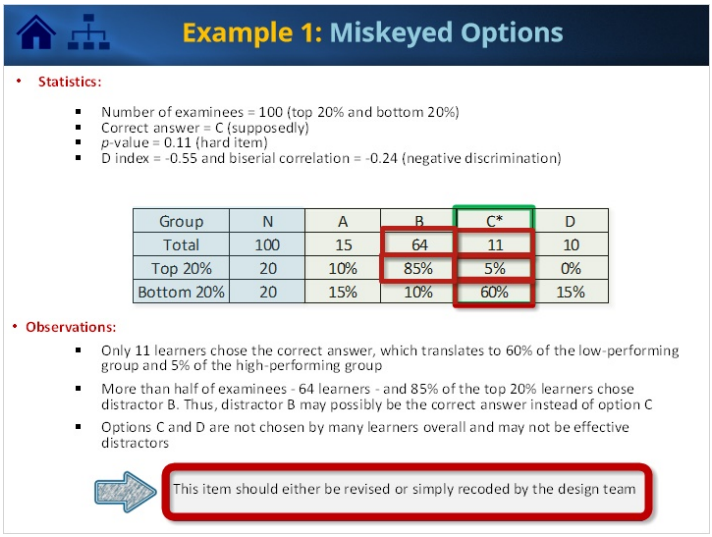
3.52 Conceptual Foundations



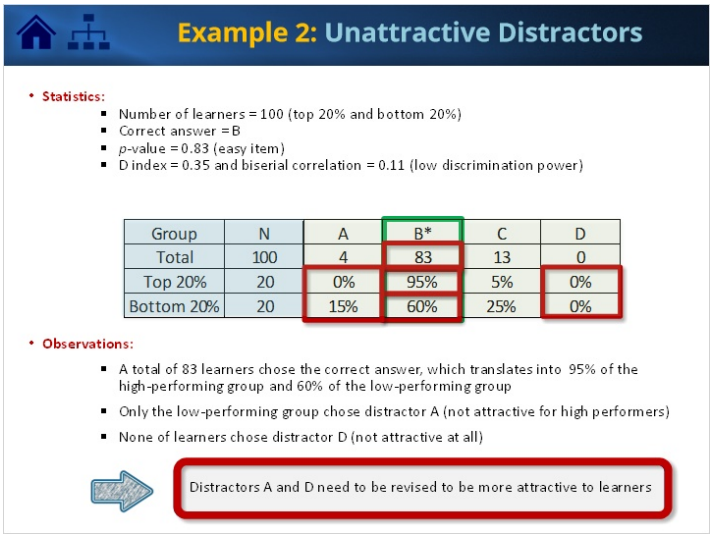
3.53 Conceptual Foundations



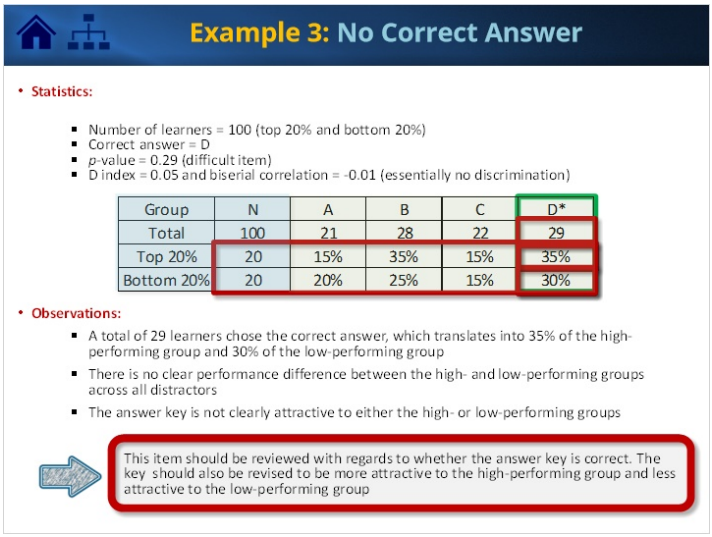
3.54 Example 1: Miskeyed Options



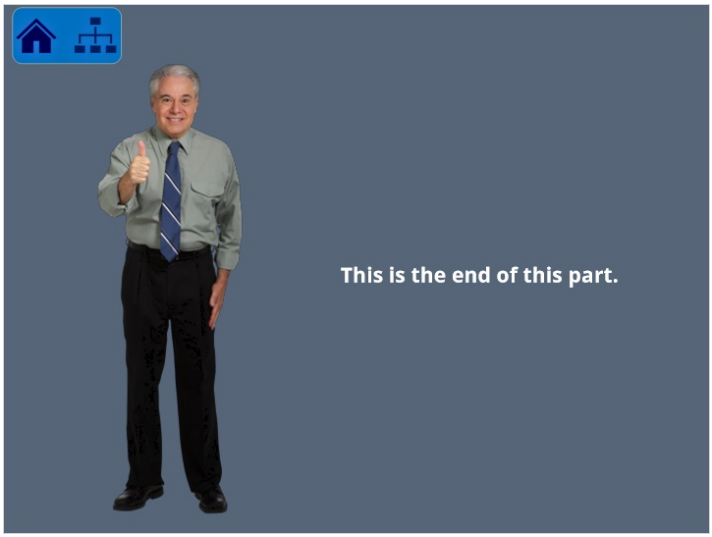
3.55 Example 2: Unattractive Distractors



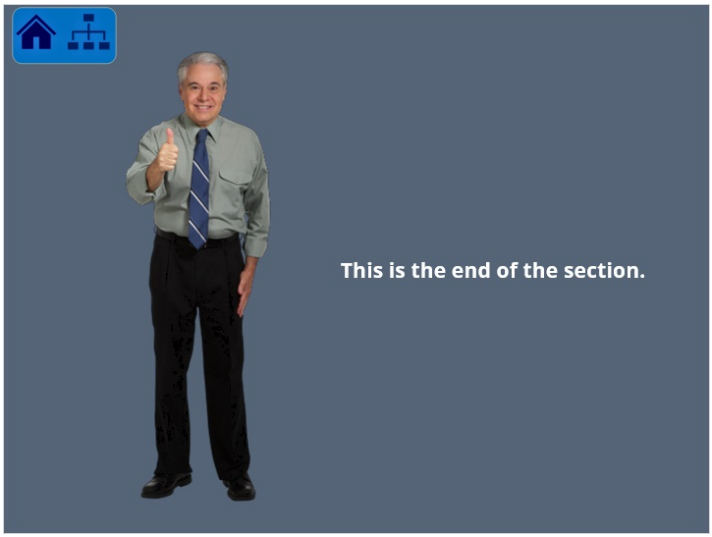
3.56 Example 3: No Correct Answer



3.57 Bookend: Numerical Analyses

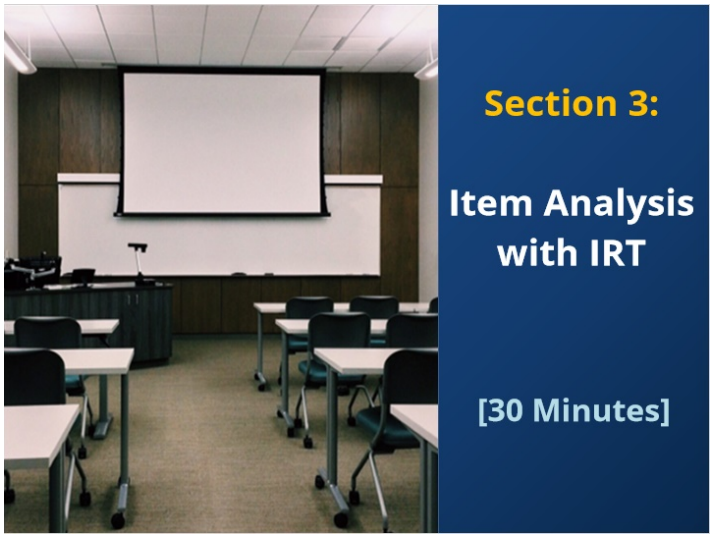


3.58 Bookend: Section 2

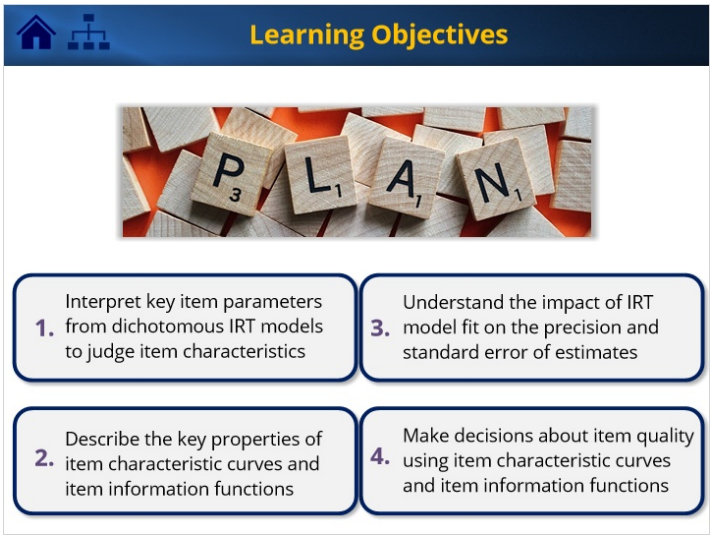


4. Section 3: Item Analysis with IRT

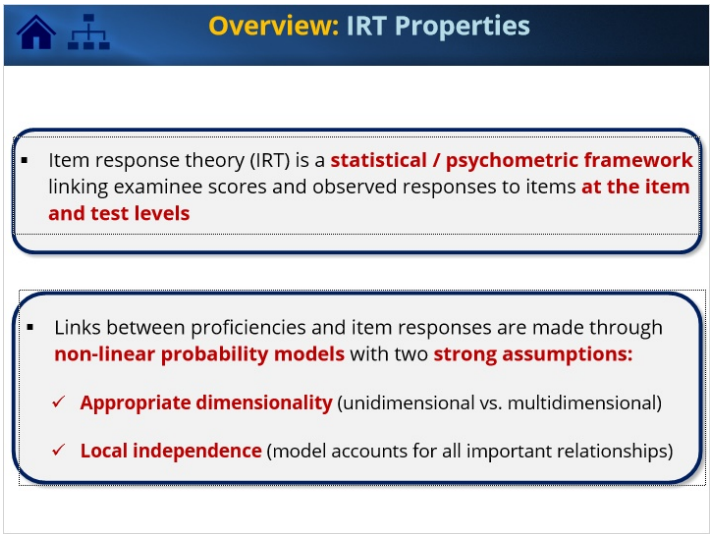
4.1 Cover: Section 3



4.2 Objectives: Section 3

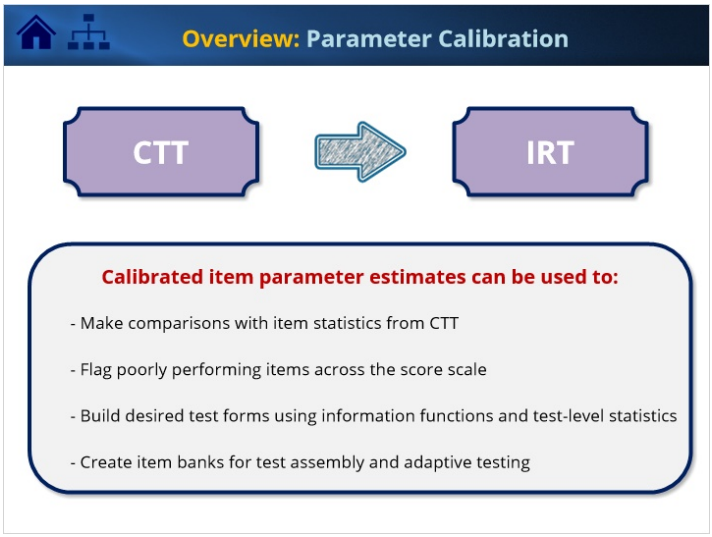


4.3 Overview (I)

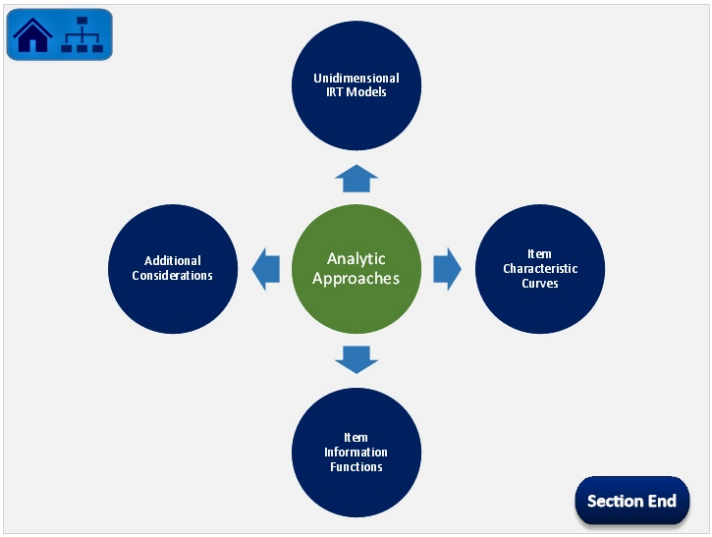


4.4 Overview (II)

4.5 Overview (III)

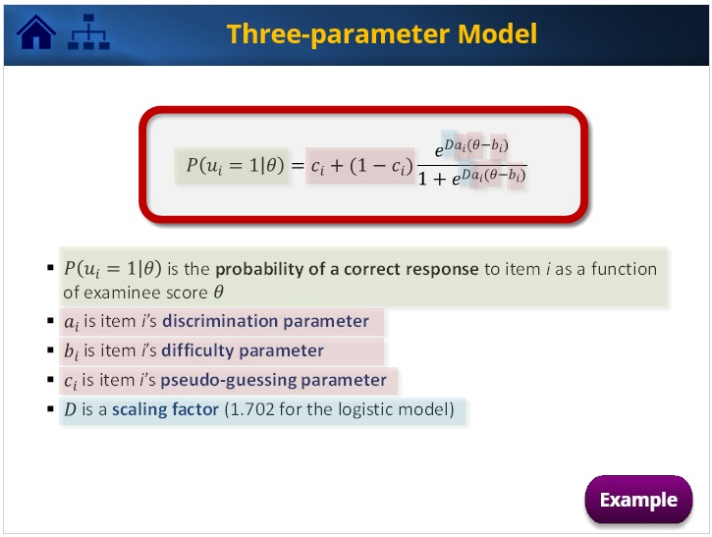


4.6 Topic Selection

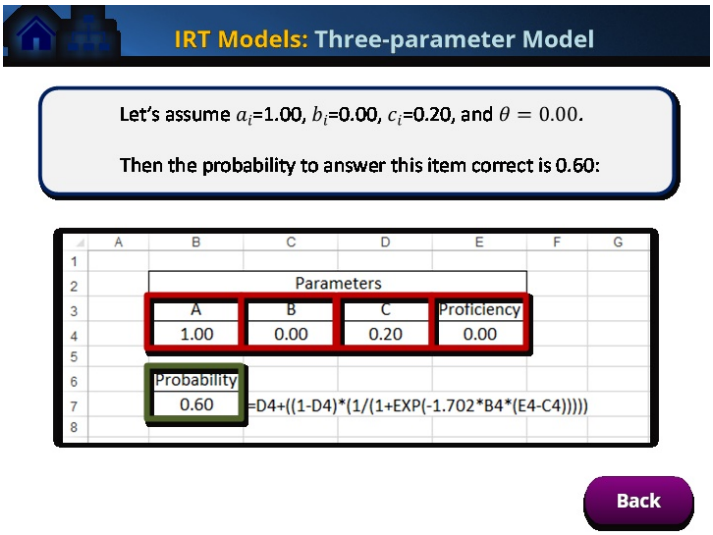


4.7 Bookmark: IRT Models

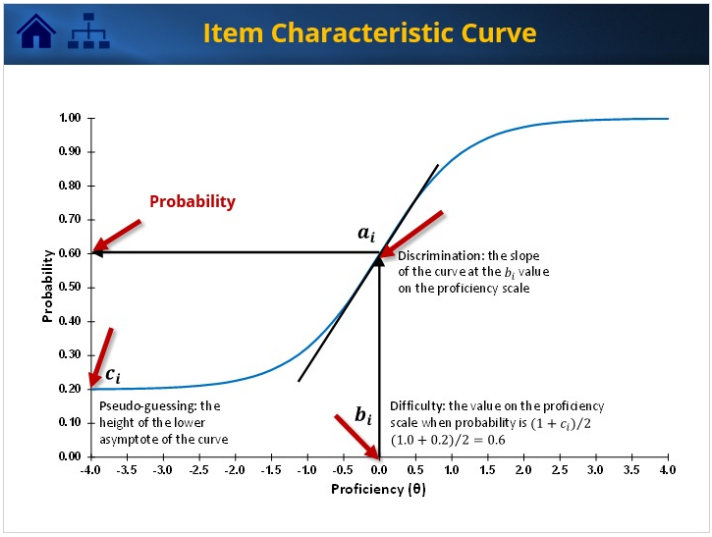
4.8 IRT Models (I)



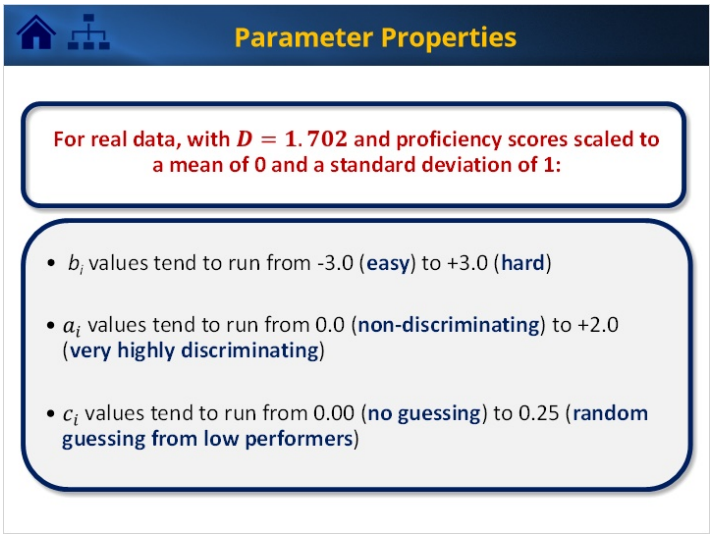
Excel Computation: 3PL (Slide Layer)



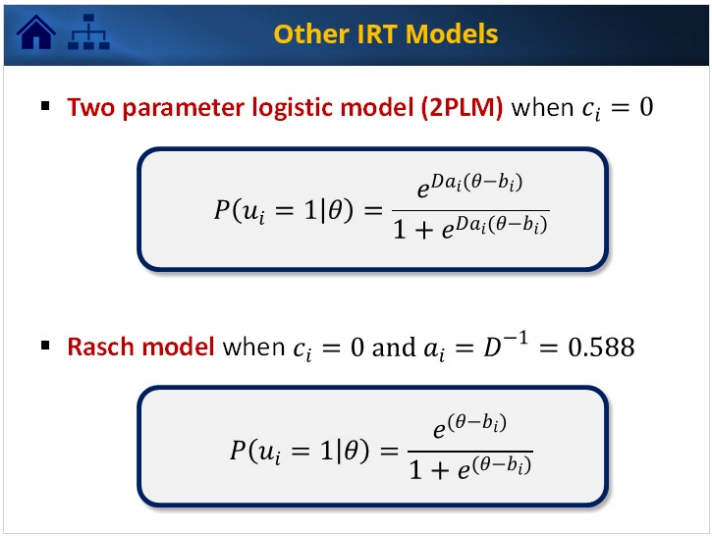
4.9 IRT Models (II)



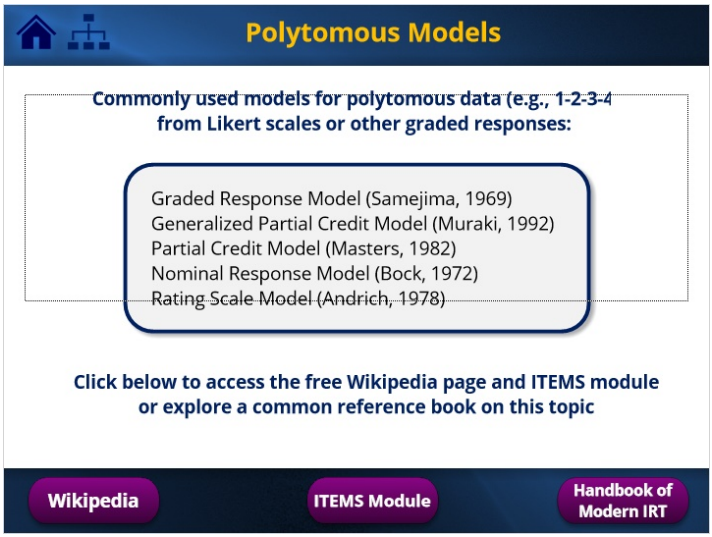
4.10 IRT Models (III)



4.11 IRT Models (IV)

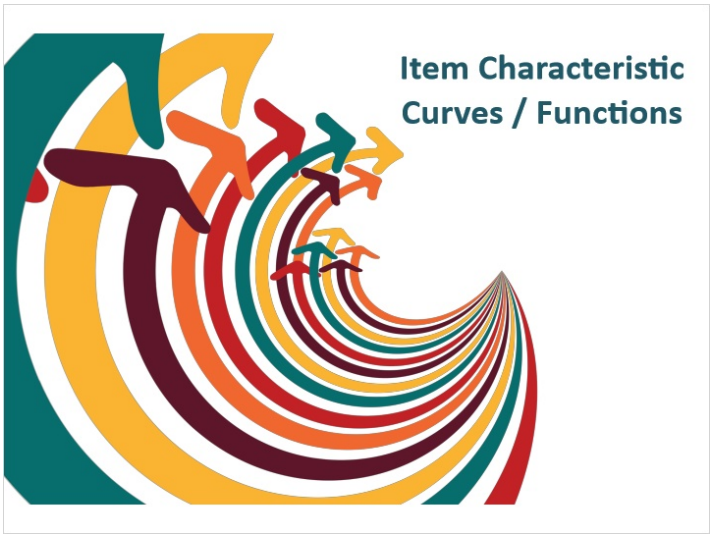


4.12 IRT Models (V)

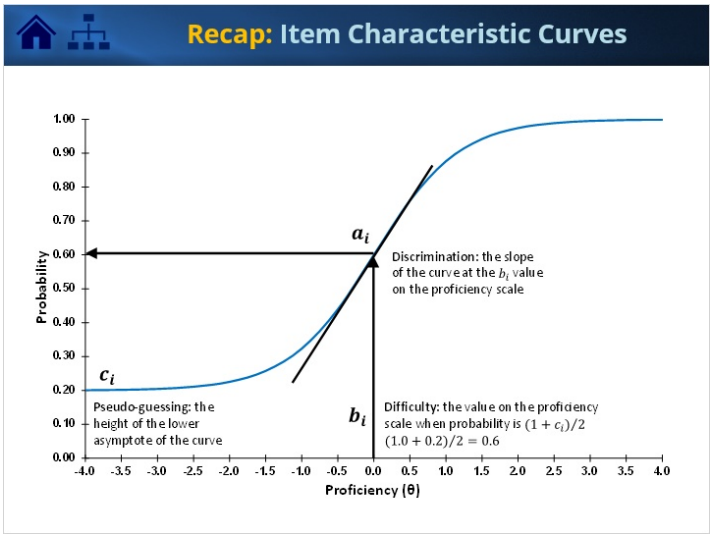


4.13 Bookend: IRT Models

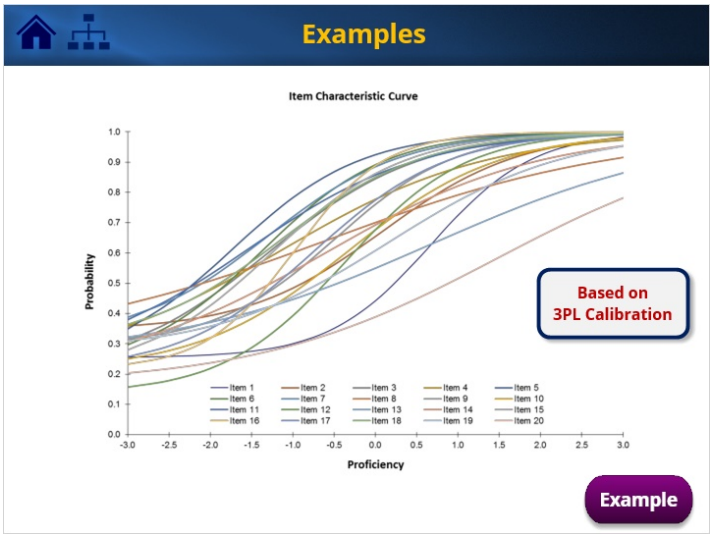
4.14 Bookmark: ICCs



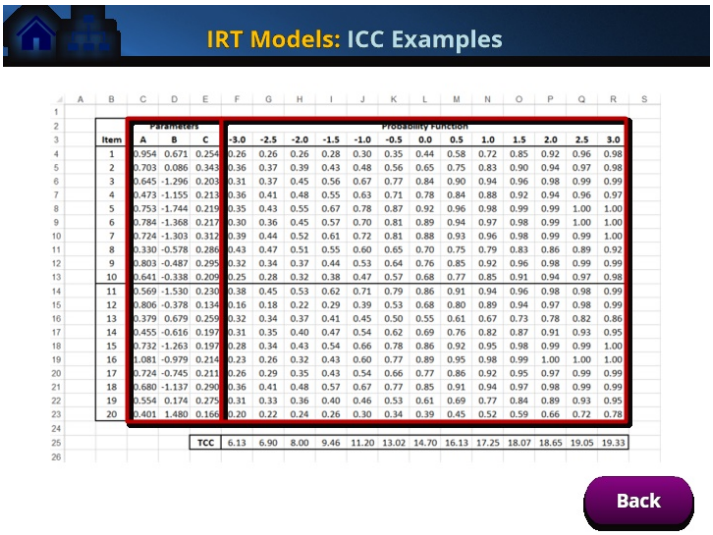
4.15 ICCs (I)



4.16 ICCs (II)

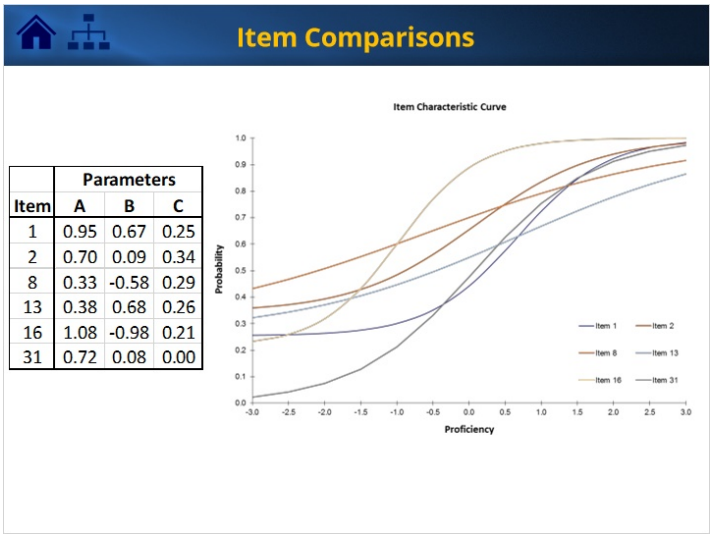


Example (Slide Layer)



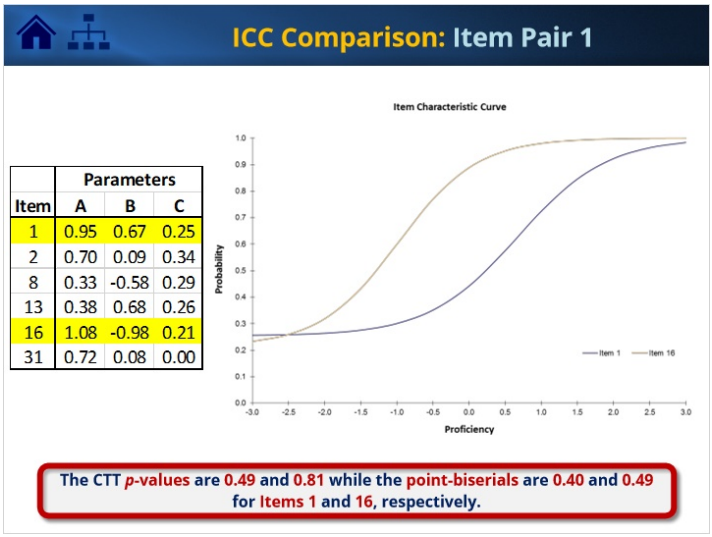
Item	Parameters A	B	C	Probability Function -3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0
1	0.954	0.671	0.254	0.26	0.26	0.26	0.28	0.30	0.35	0.44	0.58	0.72	0.85	0.92	0.96	0.98
2	0.703	0.086	0.343	0.36	0.37	0.39	0.43	0.48	0.56	0.65	0.75	0.83	0.90	0.94	0.97	0.98
3	0.645	-1.296	0.203	0.31	0.37	0.45	0.56	0.67	0.77	0.84	0.90	0.94	0.96	0.98	0.99	0.99
4	0.473	-1.155	0.213	0.36	0.41	0.48	0.55	0.63	0.71	0.78	0.84	0.88	0.92	0.94	0.96	0.97
5	0.753	-1.744	0.219	0.35	0.43	0.55	0.67	0.78	0.87	0.92	0.96	0.98	0.99	0.99	1.00	1.00
6	0.784	-1.368	0.217	0.30	0.36	0.45	0.57	0.70	0.81	0.89	0.94	0.97	0.98	0.99	1.00	1.00
7	0.724	-1.303	0.312	0.39	0.44	0.52	0.61	0.72	0.81	0.88	0.93	0.96	0.98	0.99	0.99	1.00
8	0.330	-0.578	0.286	0.43	0.47	0.51	0.55	0.60	0.65	0.70	0.75	0.79	0.83	0.86	0.89	0.92
9	0.803	-0.487	0.295	0.32	0.34	0.37	0.44	0.53	0.64	0.76	0.85	0.92	0.96	0.98	0.99	0.99
10	0.641	-0.338	0.209	0.25	0.28	0.32	0.38	0.47	0.57	0.68	0.77	0.85	0.91	0.94	0.97	0.98
11	0.569	-1.530	0.230	0.38	0.45	0.53	0.62	0.71	0.79	0.86	0.91	0.94	0.96	0.98	0.98	0.99
12	0.806	-0.378	0.134	0.16	0.18	0.22	0.29	0.39	0.53	0.68	0.80	0.89	0.94	0.97	0.98	0.99
13	0.379	0.679	0.259	0.32	0.34	0.37	0.41	0.45	0.50	0.55	0.61	0.67	0.73	0.78	0.82	0.86
14	0.455	-0.616	0.197	0.31	0.35	0.40	0.47	0.54	0.62	0.69	0.76	0.82	0.87	0.91	0.93	0.95
15	0.732	-1.263	0.197	0.28	0.34	0.43	0.54	0.66	0.78	0.86	0.92	0.95	0.98	0.99	0.99	1.00
16	1.081	-0.979	0.214	0.23	0.26	0.32	0.43	0.60	0.77	0.89	0.95	0.98	0.99	1.00	1.00	1.00
17	0.724	-0.745	0.211	0.26	0.29	0.35	0.43	0.54	0.66	0.77	0.86	0.92	0.95	0.97	0.99	0.99
18	0.680	-1.137	0.290	0.36	0.41	0.48	0.57	0.67	0.77	0.85	0.91	0.94	0.97	0.98	0.99	0.99
19	0.554	0.174	0.275	0.31	0.33	0.36	0.40	0.46	0.53	0.61	0.69	0.77	0.84	0.89	0.93	0.95
20	0.401	1.480	0.166	0.20	0.22	0.24	0.26	0.30	0.34	0.39	0.45	0.52	0.59	0.66	0.72	0.78
			TCC	6.13	6.90	8.00	9.46	11.20	13.02	14.70	16.13	17.25	18.07	18.65	19.05	19.33

4.17 ICCs (III)



Item	Parameters A	B	C
1	0.95	0.67	0.25
2	0.70	0.09	0.34
8	0.33	-0.58	0.29
13	0.38	0.68	0.26
16	1.08	-0.98	0.21
31	0.72	0.08	0.00

4.18 ICCs (IV)

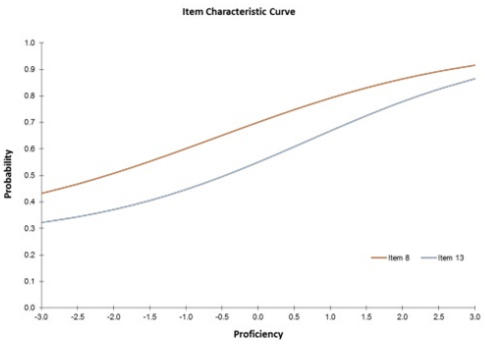


Item	Parameters A	B	C
1	0.95	0.67	0.25
2	0.70	0.09	0.34
8	0.33	-0.58	0.29
13	0.38	0.68	0.26
16	1.08	-0.98	0.21
31	0.72	0.08	0.00

4.19 ICCs (V)

ICC Comparison: Item Pair 2

	Parameters		
Item	A	B	C
1	0.95	0.67	0.25
2	0.70	0.09	0.34
8	0.33	-0.58	0.29
13	0.38	0.68	0.26
16	1.08	-0.98	0.21
31	0.72	0.08	0.00

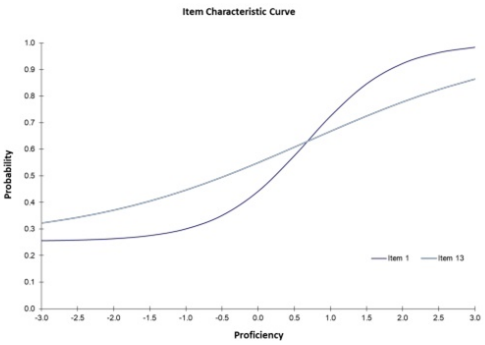


The CTT *p*-values are 0.69 and 0.54 while the point-biserials are 0.31 and 0.32 for Items 8 and 13, respectively.

4.20 ICCs (V)

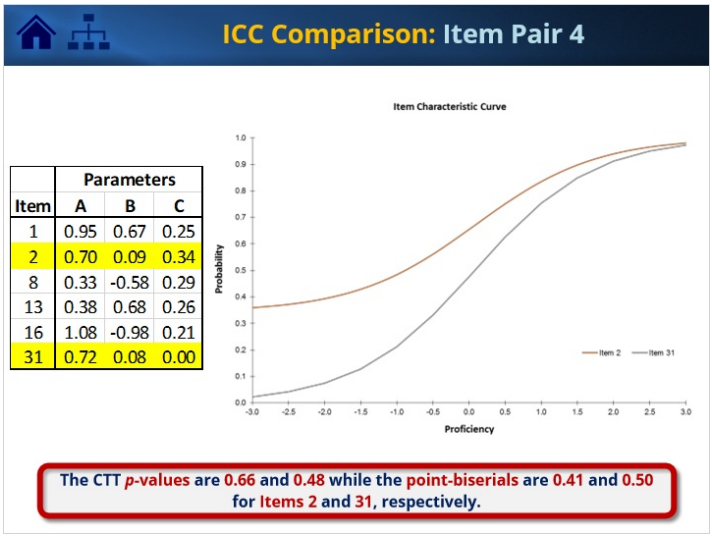
ICC Comparison: Item Pair 3

	Parameters		
Item	A	B	C
1	0.95	0.67	0.25
2	0.70	0.09	0.34
8	0.33	-0.58	0.29
13	0.38	0.68	0.26
16	1.08	-0.98	0.21
31	0.72	0.08	0.00



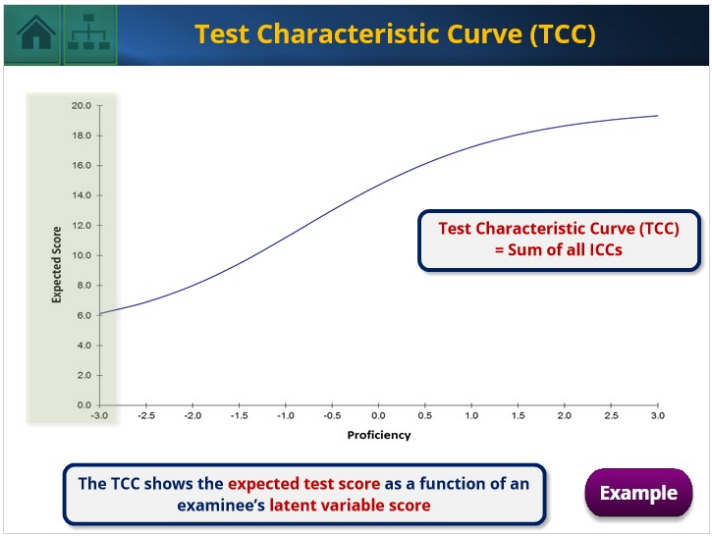
The CTT *p*-values are 0.49 and 0.54 while the point-biserials are 0.40 and 0.32 for Items 1 and 13, respectively.

4.21 ICCs (VI)

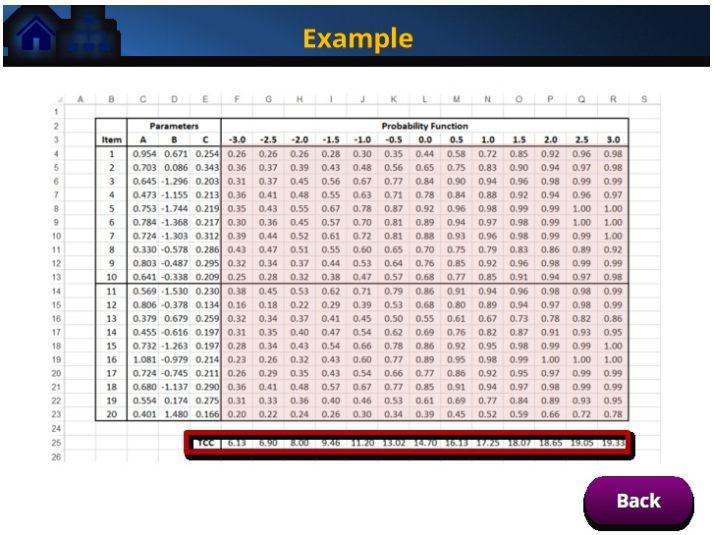


	Parameters		
Item	A	B	C
1	0.95	0.67	0.25
2	0.70	0.09	0.34
8	0.33	-0.58	0.29
13	0.38	0.68	0.26
16	1.08	-0.98	0.21
31	0.72	0.08	0.00

4.22 ICCs (VII)



Example (Slide Layer)

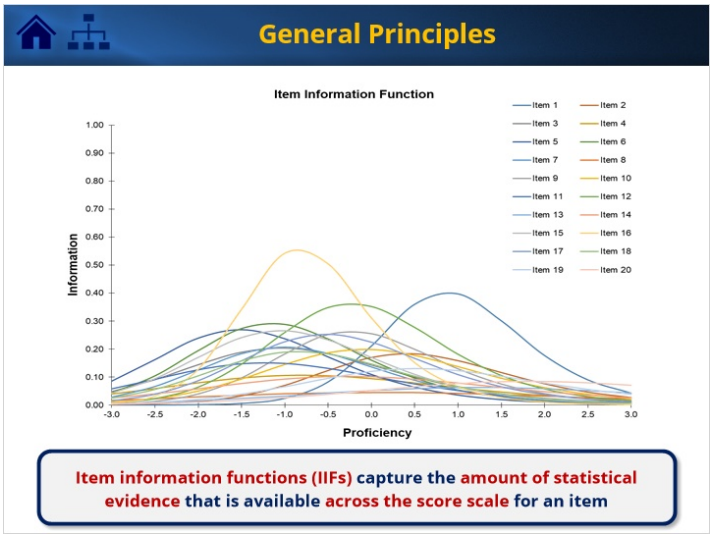


Item	Parameters A	B	C	Probability Function -3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0
1	0.954	0.671	0.254	0.26	0.26	0.26	0.28	0.30	0.35	0.44	0.58	0.72	0.85	0.92	0.96	0.98
2	0.703	0.086	0.343	0.36	0.37	0.39	0.43	0.48	0.56	0.65	0.75	0.83	0.90	0.94	0.97	0.98
3	0.645	-1.296	0.203	0.31	0.37	0.45	0.56	0.67	0.77	0.84	0.90	0.94	0.96	0.98	0.99	0.99
4	0.473	-1.155	0.213	0.36	0.41	0.48	0.55	0.63	0.71	0.78	0.84	0.88	0.92	0.94	0.96	0.97
5	0.753	-1.744	0.219	0.35	0.43	0.55	0.67	0.78	0.87	0.92	0.96	0.98	0.99	0.99	1.00	1.00
6	0.784	-1.368	0.217	0.30	0.36	0.45	0.57	0.70	0.81	0.89	0.94	0.97	0.98	0.99	1.00	1.00
7	0.724	-1.303	0.312	0.39	0.44	0.52	0.61	0.72	0.81	0.88	0.93	0.96	0.98	0.99	0.99	1.00
8	0.330	-0.578	0.286	0.43	0.47	0.51	0.55	0.60	0.65	0.70	0.75	0.79	0.83	0.86	0.89	0.92
9	0.803	-0.487	0.295	0.32	0.34	0.37	0.44	0.53	0.64	0.76	0.85	0.92	0.96	0.98	0.99	0.99
10	0.641	-0.338	0.209	0.25	0.28	0.32	0.38	0.47	0.57	0.68	0.77	0.85	0.91	0.94	0.97	0.98
11	0.569	-1.530	0.230	0.38	0.45	0.53	0.62	0.71	0.79	0.86	0.91	0.94	0.96	0.98	0.98	0.99
12	0.806	-0.378	0.134	0.16	0.18	0.22	0.29	0.39	0.53	0.68	0.80	0.89	0.94	0.97	0.98	0.99
13	0.379	0.679	0.259	0.32	0.34	0.37	0.41	0.45	0.50	0.55	0.61	0.67	0.73	0.78	0.82	0.86
14	0.455	-0.616	0.197	0.31	0.35	0.40	0.47	0.54	0.62	0.69	0.76	0.82	0.87	0.91	0.93	0.95
15	0.732	-1.263	0.197	0.28	0.34	0.43	0.54	0.66	0.78	0.86	0.92	0.95	0.98	0.99	0.99	1.00
16	1.081	-0.979	0.214	0.23	0.26	0.32	0.43	0.60	0.77	0.89	0.95	0.98	0.99	1.00	1.00	1.00
17	0.724	-0.745	0.211	0.26	0.29	0.35	0.43	0.54	0.66	0.77	0.86	0.92	0.95	0.97	0.99	0.99
18	0.680	-1.137	0.290	0.36	0.41	0.48	0.57	0.67	0.77	0.85	0.91	0.94	0.97	0.98	0.99	0.99
19	0.554	0.174	0.275	0.31	0.33	0.36	0.40	0.46	0.53	0.61	0.69	0.77	0.84	0.89	0.93	0.95
20	0.401	1.480	0.166	0.20	0.22	0.24	0.26	0.30	0.34	0.39	0.45	0.52	0.59	0.66	0.72	0.78
TCC				6.13	6.90	8.00	9.46	11.20	13.02	14.70	16.13	17.25	18.07	18.65	19.05	19.31

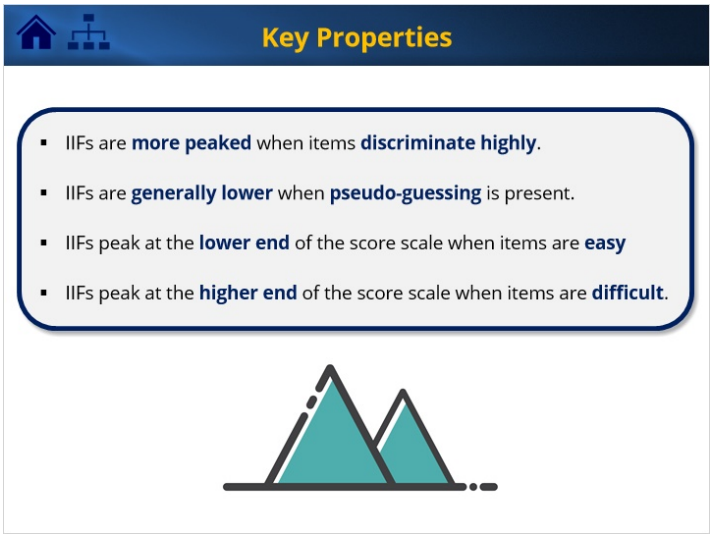
4.23 Bookend: ICCs

4.24 Bookmark: IIFs

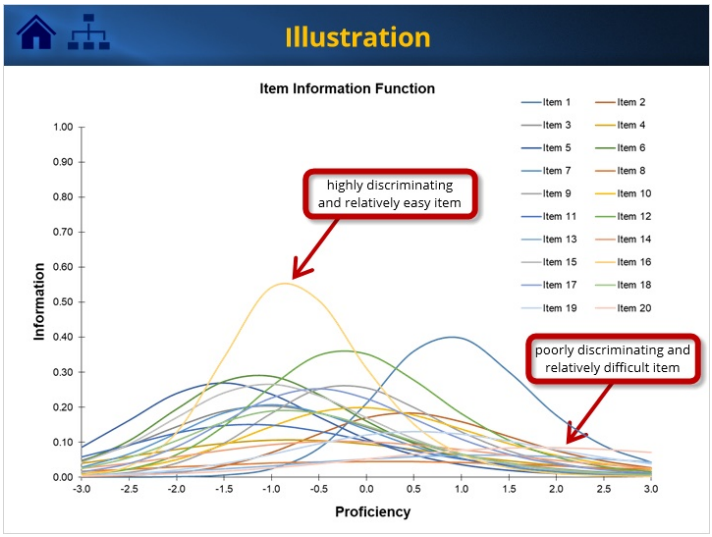
4.25 IIFs (I)



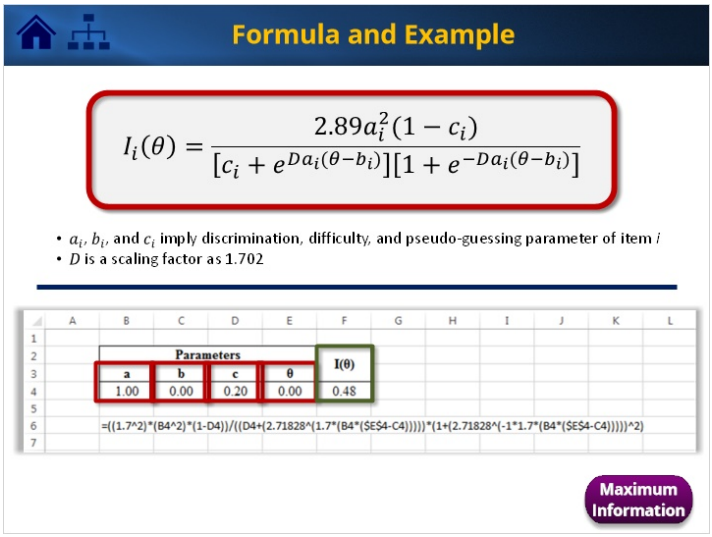
4.26 IIFs (II)



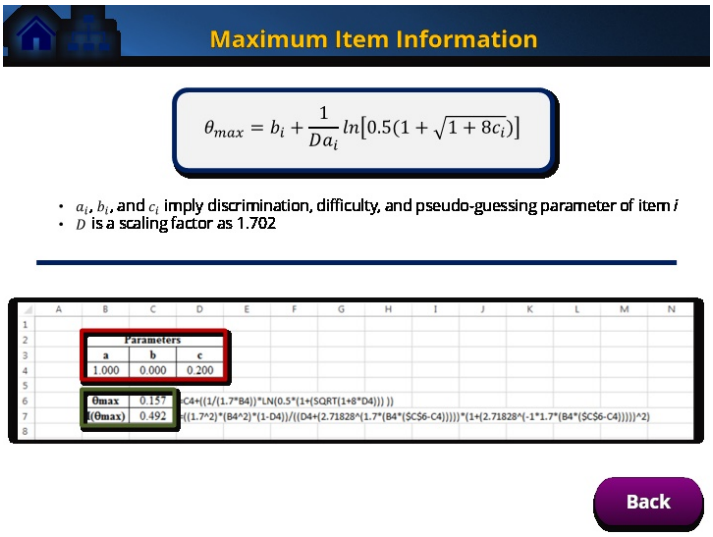
4.27 IIFs (III)



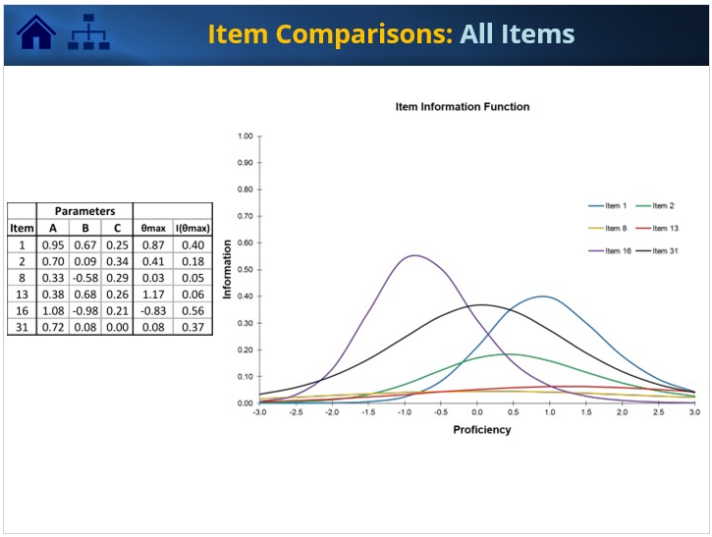
4.28 IIfs (V)



Maximum Info (Slide Layer)

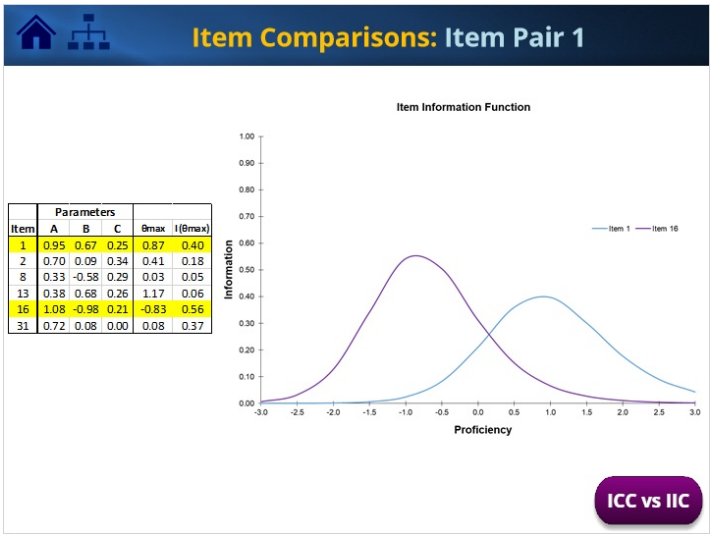


4.29 IIFs (VI)



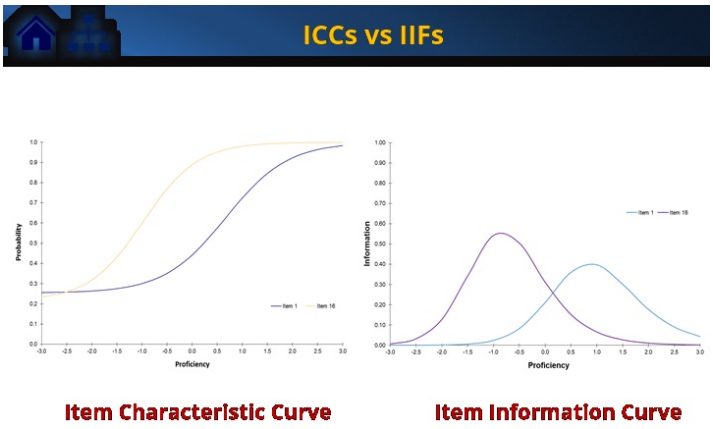
	Parameters				
Item	A	B	C	θmax	I(θmax)
1	0.95	0.67	0.25	0.87	0.40
2	0.70	0.09	0.34	0.41	0.18
8	0.33	-0.58	0.29	0.03	0.05
13	0.38	0.68	0.26	1.17	0.06
16	1.08	-0.98	0.21	-0.83	0.56
31	0.72	0.08	0.00	0.08	0.37

4.30 IIFs (VII)

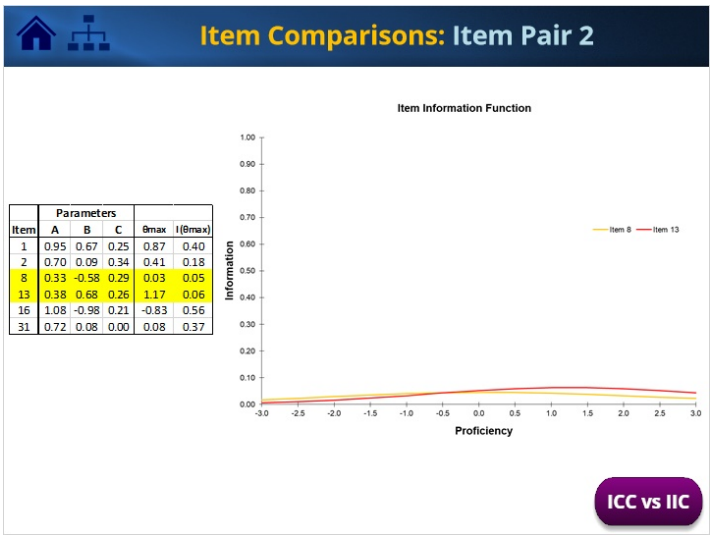


	Parameters				
Item	A	B	C	θmax	I(θmax)
1	0.95	0.67	0.25	0.87	0.40
2	0.70	0.09	0.34	0.41	0.18
8	0.33	-0.58	0.29	0.03	0.05
13	0.38	0.68	0.26	1.17	0.06
16	1.08	-0.98	0.21	-0.83	0.56
31	0.72	0.08	0.00	0.08	0.37

ICC vs IIF (Slide Layer)

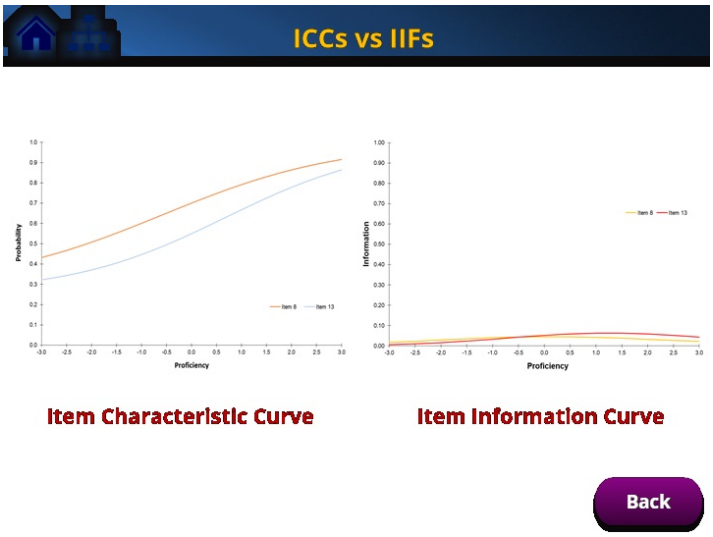


4.31 IIFs (VIII)

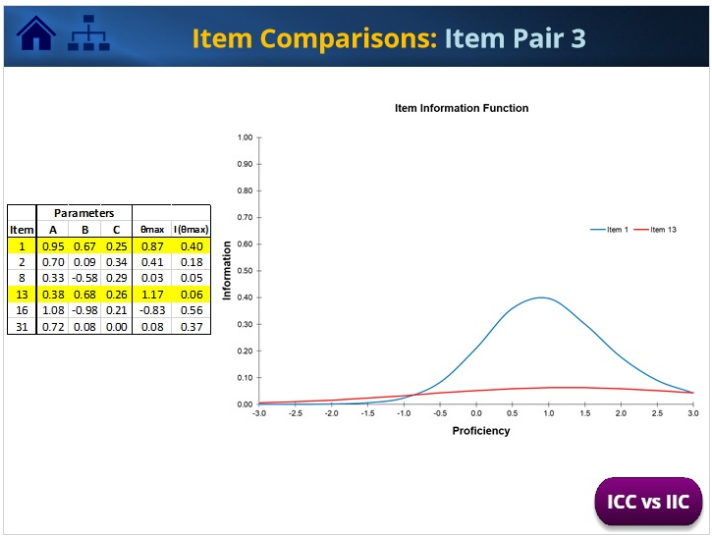


Item	Parameters A	B	C	θmax	I(θmax)
1	0.95	0.67	0.25	0.87	0.40
2	0.70	0.09	0.34	0.41	0.18
8	0.33	-0.58	0.29	0.03	0.05
13	0.38	0.68	0.26	1.17	0.06
16	1.08	-0.98	0.21	-0.83	0.56
31	0.72	0.08	0.00	0.08	0.37

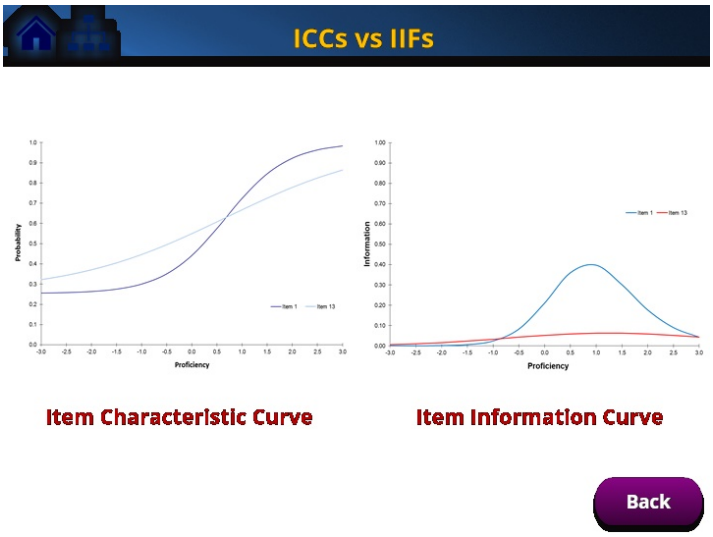
ICCs vs IIFs (Slide Layer)



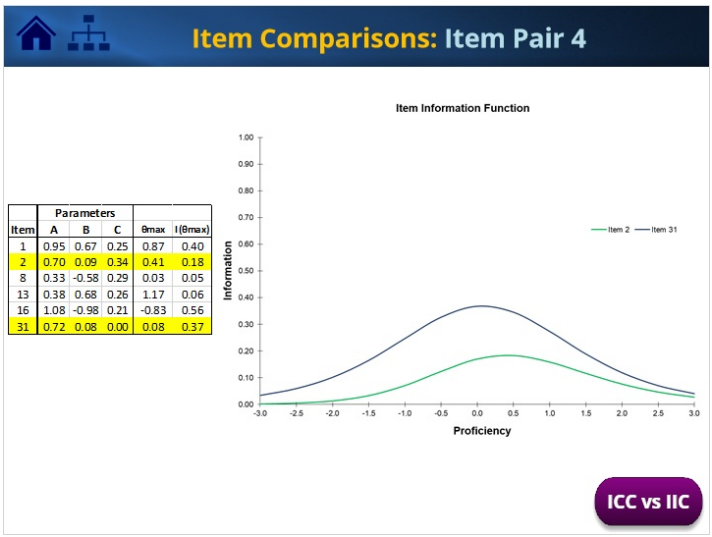
4.32 IIFs (VII)



ICC vs IIF (Slide Layer)

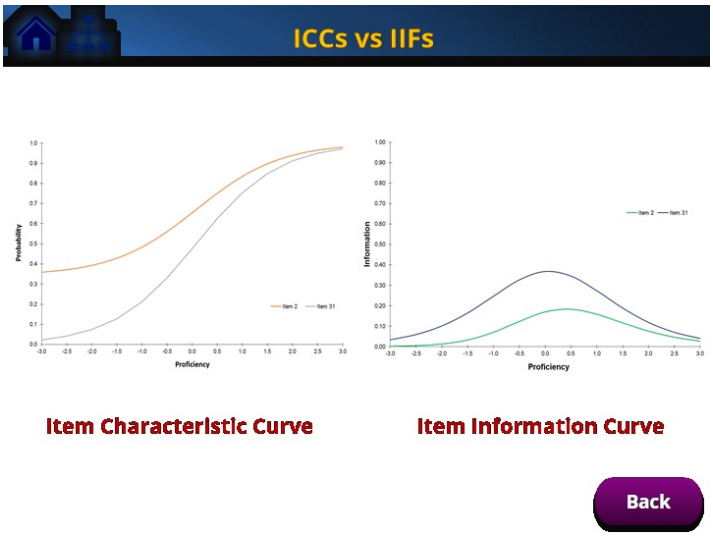


4.33 IIFs (IX)

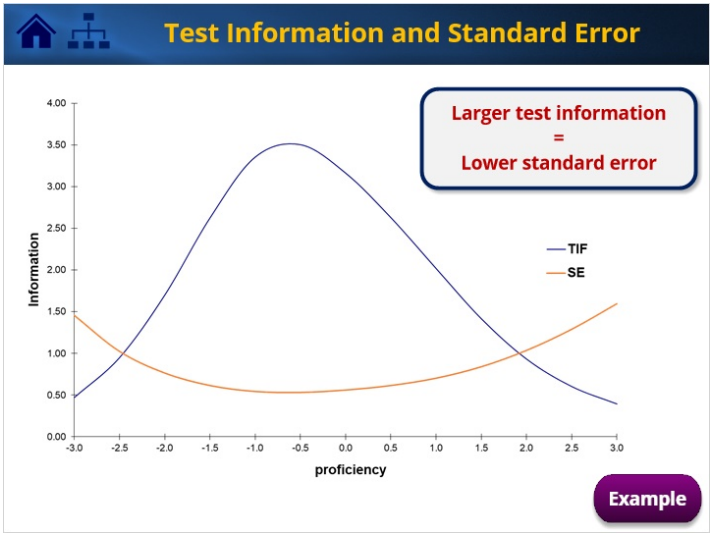


	Parameters				
Item	A	B	C	θmax	I(θmax)
1	0.95	0.67	0.25	0.87	0.40
2	0.70	0.09	0.34	0.41	0.18
8	0.33	-0.58	0.29	0.03	0.05
13	0.38	0.68	0.26	1.17	0.06
16	1.08	-0.98	0.21	-0.83	0.56
31	0.72	0.08	0.00	0.08	0.37

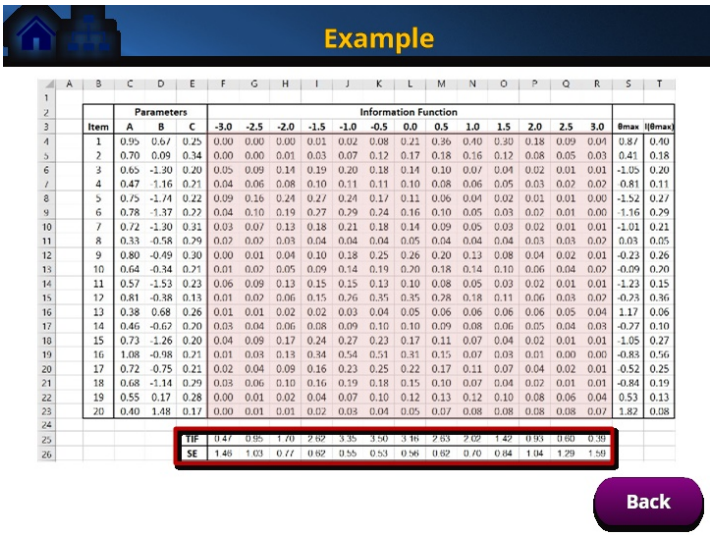
ICCs vs IIFs (Slide Layer)



4.34 IIFs (XI)

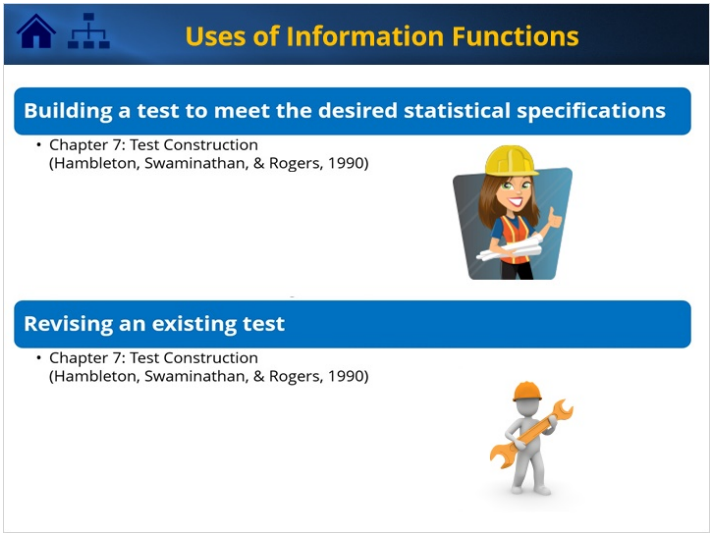


Example (Slide Layer)

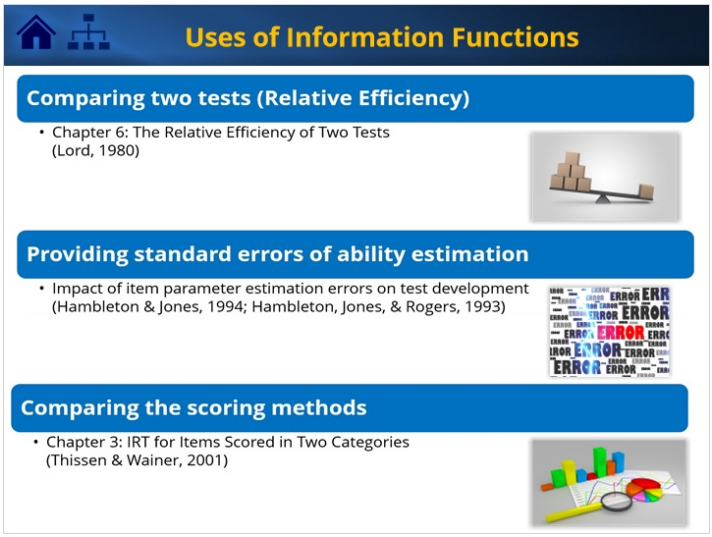


Item	Parameters A	B	C	Information Function -3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	θmax	I(θmax)
1	0.95	0.67	0.25	0.00	0.00	0.00	0.01	0.02	0.08	0.21	0.36	0.40	0.30	0.18	0.09	0.04	0.87	0.40
2	0.70	0.09	0.34	0.00	0.00	0.01	0.03	0.07	0.12	0.17	0.18	0.16	0.12	0.08	0.05	0.03	0.41	0.18
3	0.65	-1.30	0.20	0.05	0.09	0.14	0.19	0.20	0.18	0.14	0.10	0.07	0.04	0.02	0.01	0.01	-1.05	0.20
4	0.47	-1.16	0.21	0.04	0.06	0.08	0.10	0.11	0.11	0.10	0.08	0.06	0.05	0.03	0.02	0.02	-0.81	0.11
5	0.75	-1.74	0.22	0.09	0.16	0.24	0.27	0.24	0.17	0.11	0.06	0.04	0.02	0.01	0.01	0.00	-1.52	0.27
6	0.78	-1.37	0.27	0.04	0.10	0.19	0.27	0.29	0.24	0.16	0.10	0.05	0.03	0.02	0.01	0.00	-1.16	0.29
7	0.72	-1.30	0.31	0.03	0.07	0.13	0.18	0.21	0.18	0.14	0.09	0.05	0.03	0.02	0.01	0.01	-1.01	0.21
8	0.33	-0.58	0.29	0.02	0.02	0.03	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.03	0.03	0.02	0.03	0.05
9	0.80	-0.49	0.30	0.00	0.01	0.04	0.10	0.18	0.25	0.26	0.20	0.13	0.08	0.04	0.02	0.01	-0.23	0.26
10	0.64	-0.34	0.21	0.01	0.02	0.05	0.09	0.14	0.19	0.20	0.18	0.14	0.10	0.06	0.04	0.02	-0.09	0.20
11	0.57	-1.53	0.23	0.06	0.09	0.13	0.15	0.15	0.13	0.10	0.08	0.05	0.03	0.02	0.01	0.01	-1.23	0.15
12	0.81	-0.38	0.13	0.01	0.02	0.06	0.15	0.26	0.35	0.35	0.28	0.18	0.11	0.06	0.03	0.02	-0.23	0.36
13	0.38	0.68	0.26	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.06	0.06	0.06	0.06	0.05	0.04	1.17	0.06
14	0.46	-0.62	0.20	0.03	0.04	0.06	0.08	0.09	0.10	0.10	0.09	0.08	0.06	0.05	0.04	0.03	-0.27	0.10
15	0.73	-1.26	0.20	0.04	0.09	0.17	0.24	0.27	0.23	0.17	0.11	0.07	0.04	0.02	0.01	0.01	-1.05	0.27
16	1.08	-0.98	0.21	0.01	0.03	0.13	0.34	0.54	0.51	0.31	0.15	0.07	0.03	0.01	0.00	0.00	-0.83	0.56
17	0.72	-0.75	0.21	0.02	0.04	0.09	0.16	0.23	0.25	0.22	0.17	0.11	0.07	0.04	0.02	0.01	-0.52	0.25
18	0.68	-1.14	0.29	0.03	0.06	0.10	0.16	0.19	0.18	0.15	0.10	0.07	0.04	0.02	0.01	0.01	-0.84	0.19
19	0.55	0.17	0.28	0.00	0.01	0.02	0.04	0.07	0.10	0.12	0.13	0.12	0.10	0.08	0.06	0.04	0.53	0.13
20	0.40	1.48	0.17	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.07	0.08	0.08	0.08	0.08	0.07	1.82	0.08
TIF				0.47	0.95	1.70	2.82	3.35	3.50	3.16	2.83	2.09	1.42	0.93	0.60	0.39		
SE				1.46	1.03	0.77	0.62	0.55	0.53	0.56	0.62	0.70	0.84	1.04	1.29	1.59		

4.35 IIFs (XII)



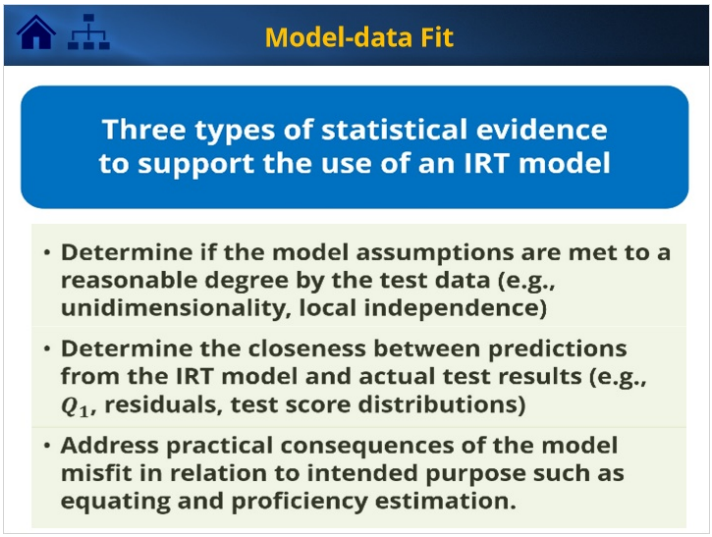
4.36 IIFs (XII)



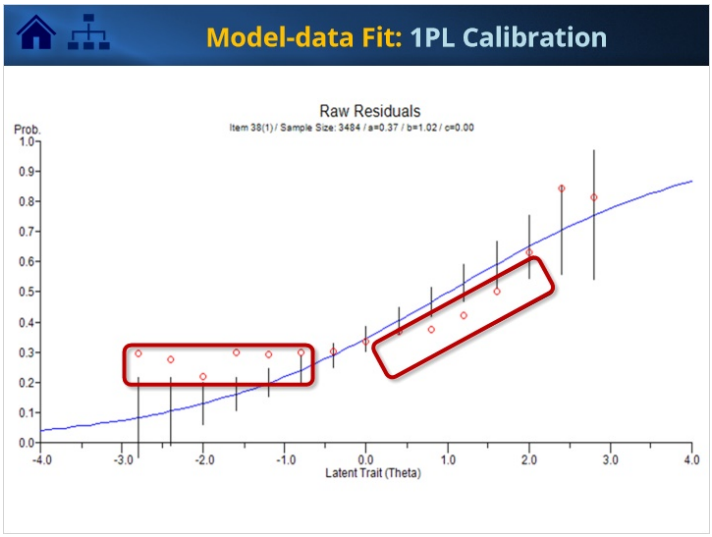
4.37 Bookend: IIFs

4.38 Bookmark: Considerations

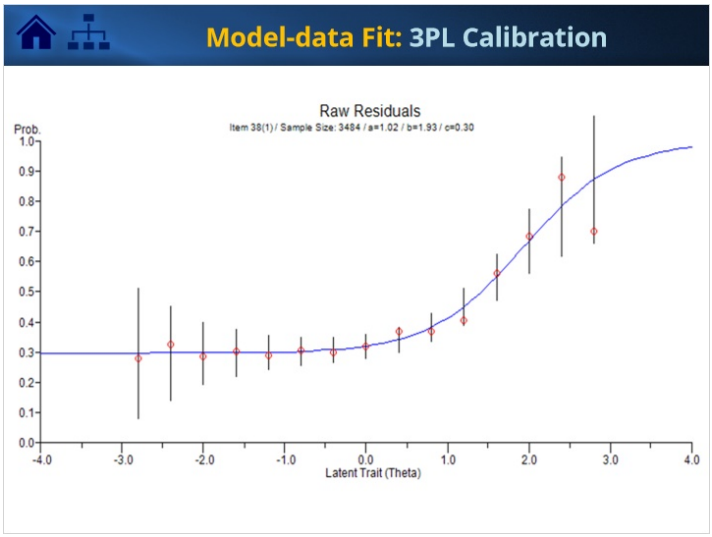
4.39 Considerations (I)



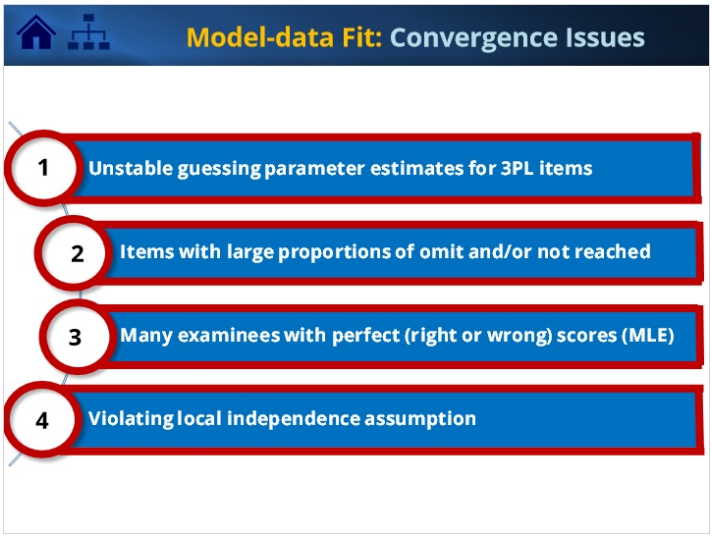
4.40 Considerations (II)



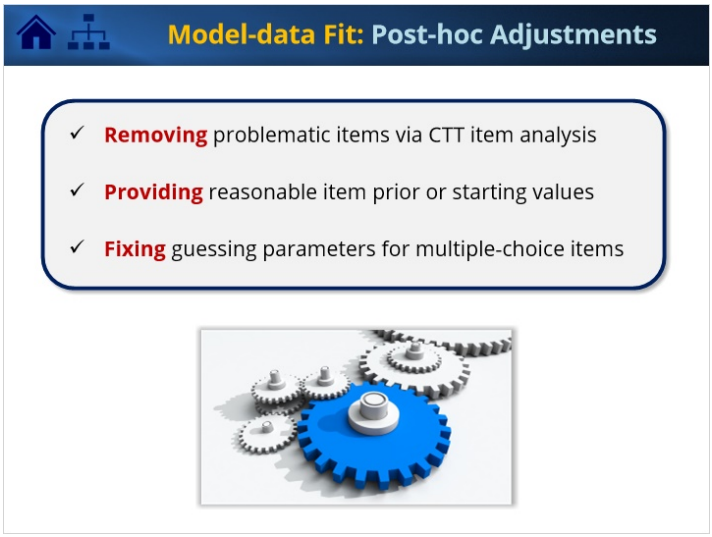
4.41 Considerations (III)



4.42 Considerations (IV)



4.43 Considerations (V)



4.44 Bookend: Considerations

4.45 Module Cover (END)