

# Understanding and Embracing the Complexities of Multicultural ICT Classrooms

Peter Denny

MS Maharaj

# Research Objectives

- Understanding the impact on student **cognitive test performance** of **teacher student congruence** (in respect of race, gender and home language specifically) in information systems and technology education;
- Understanding variations in student perceptions of **collective self-efficacy** (in respect of teacher capability specifically), and how these variations relate to culture-based differences in the impact of teacher student congruence on learning outcomes.

# Research Questions

- **Research question 1 (RQ1):**

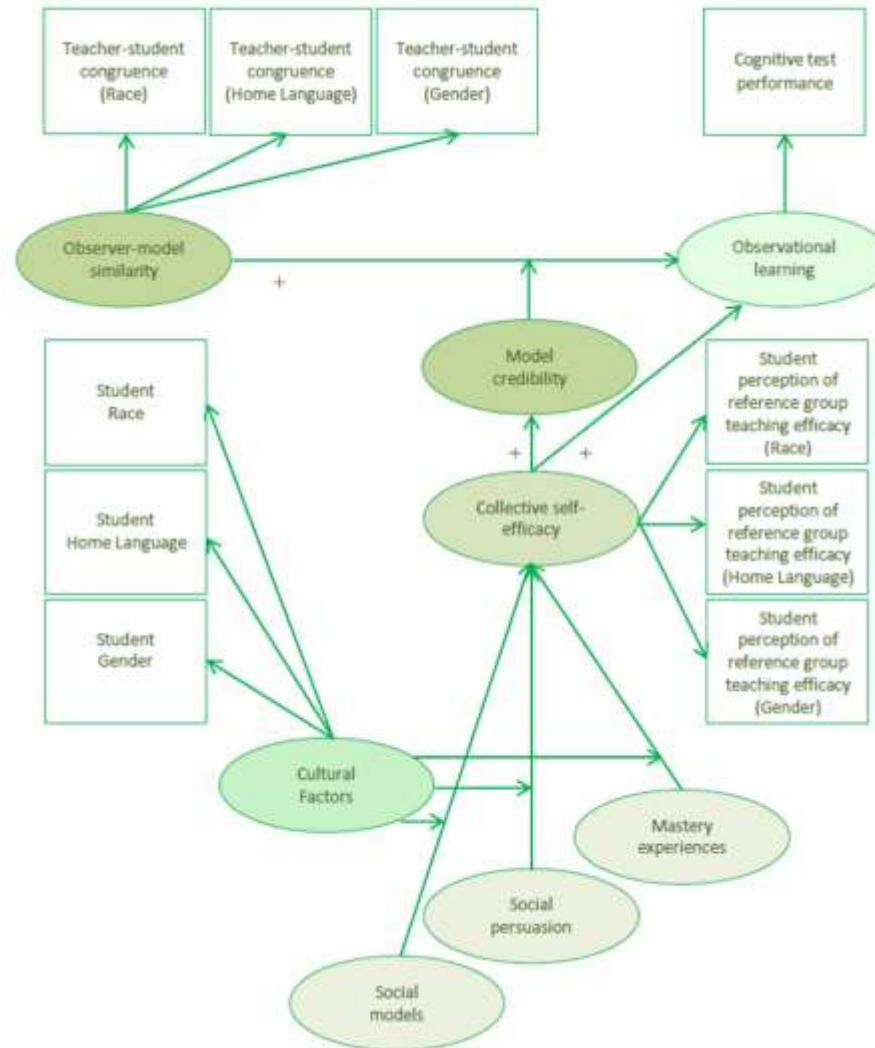
“Does matching teacher and student in respect of cultural factors impact student cognitive test performance in information systems and technology education?”
- **Research question 2 (RQ2):**

“How does culture-based variation in student perceptions of collective self-efficacy (in respect of teacher capability) relate to the impact of teacher student congruence on student cognitive test performance in information systems and technology education?”

# Theoretical Framework

- Social Cognitive Theory (Bandura)
  - Observational learning
  - Observer-model similarity
  - Model credibility
  - Collective self-efficacy

# Research Model



# Research Design

	Cohort one (Institution 1)				Cohort two (Institution 2)			
	N	%	M	SD	N	%	M	SD
<b>Total Students</b>	4825	100.00			1278	100.00		
<b>Age</b>	4825	100.00	19.71	2.77	1278	100.00	20.60	5.21
<b>Race</b>								
<i>Black</i>	2537	52.66			1003	78.48		
<i>White</i>	175	3.63			154	12.05		
<i>Indian</i>	2021	41.95			83	6.50		
<i>Coloured</i>	85	1.76			35	2.74		
<i>Other</i>	7	0.10			3	0.23		
<b>Home Language</b>					81	6.34		
<i>English</i>	2376	49.24			476	37.25		
<i>Afrikaans</i>	13	0.27			81	6.34		
<i>Zulu</i>	2011	41.68			86	6.73		
<i>Other African:</i>	425	8.81			635	49.69		
-Xhosa	158	3.27			30	2.35		
-Swazi	53	1.10			26	2.03		
-Ndebele	14	0.29			13	1.02		
-Southern Sotho	27	0.56			40	3.13		
-Northern Sotho	12	0.25			202	15.81		
-Tsonga	12	0.25			24	1.88		
-Tswana	9	0.19			198	15.49		
-Venda	11	0.23			40	3.13		
-Other	129	2.67			62	4.85		
<b>Gender</b>								
<i>Male</i>	2396	49.66			671	52.50		
<i>Female</i>	2429	50.34			607	47.50		

# Research Design

	Cohort one (Institution 1)				Cohort two (Institution 2)			
	N	%	M	SD	N	%	M	SD
<b>Total Teachers</b>	20	100.00			56	100.00		
<b>Race</b>								
<i>Black</i>	2	10.00			15	26.79		
<i>White</i>	5	25.00			31	55.36		
<i>Indian</i>	12	60.00			10	17.86		
<i>Coloured</i>	1	5.00			0	0.00		
<i>Other</i>	0	0.00			0	0.00		
<b>Home Language</b>								
<i>English</i>	18	90.00			31	55.36		
<i>Afrikaans</i>	0	0.00			12	21.43		
<i>Zulu</i>	0	0.00			2	3.57		
<i>Other African:</i>	2	10.00			11	19.64		
<i>-Xhosa</i>	1	5.00			0	0.00		
<i>-Swazi</i>	0	0.00			0	0.00		
<i>-Ndebele</i>	0	0.00			2	3.57		
<i>-Southern Sotho</i>	0	0.00			0	0.00		
<i>-Northern Sotho</i>	0	0.00			2	3.57		
<i>-Tsonga</i>	0	0.00			0	0.00		
<i>-Tswana</i>	0	0.00			0	0.00		
<i>-Venda</i>	0	0.00			0	0.00		
<i>-Other</i>	1	5.00			7	12.50		
<b>Gender</b>								
<i>Male</i>	14	70.00			30	53.57		
<i>Female</i>	6	30.00			26	46.43		

# Research Design

	Cohort one	Cohort two
<b>Institution</b>	1	2
<b>Institution type</b>	Public Tertiary	Private Tertiary
<b>Students</b> (Participants in match/mismatch study)	4825	1278
<b>Teachers</b> (Participants in match/mismatch study)	20	56
<b>Student respondents to S-CTSE survey</b>	737	636
<b>Teacher respondents to T-CTSE survey</b>	15	37
<b>Different Modules/ Courses</b>	48	118
<b>Test scores</b> (Unique student test scores in dataset)	12013	6358

## Measures and instruments

### Match/mismatch effect

*Dependent variable*

*Independent variable*

*Data source/instrument*

### Collective teaching self-efficacy (CTSE)

*Dependent variable*

*Independent variable*

*Data source/instrument*

### Statistical methods and models

#### Student test scores

- Raw test score
- Raw test score converted to z-score (deviation of student score from class mean, divided by standard deviation)
- Raw test score converted to simple deviation of student score from class mean

#### Teacher student match mismatch (Race, Home Language, Gender)

#### Student records (class marks)

- Raw test score
- Raw test score converted to z-score (deviation of student score from class mean, divided by standard deviation)
- Raw test score converted to simple deviation of student score from class mean
- Match → Student test score effect (CTSE as a moderating variable)
- Student CTSE
- Teacher CTSE
- CTSE sub-factors:
  - Subject Expertise
  - Classroom Management
  - Instructional Strategies
  - Student Engagement
- S-CTSE survey
- Generalized Estimating Equations (GEE)



# Results and Data Analysis

Race	Home Language	Gender	N	Rank	
Mismatch	Mismatch	Mismatch	3842	25	
		Match	4201	27	
		Total	8043	26	
	Match	Mismatch	Mismatch	1181	10
			Match	1346	7
			Total	2527	8
		Total	Mismatch	5023	20
			Match	5547	18
			Total	10570	19
	Match	Mismatch	Mismatch	1547	16
Match			2505	21	
Total			4052	17	
Match		Mismatch	Mismatch	1633	3
			Match	2075	1
			Total	3708	2
		Total	Mismatch	3180	9
			Match	4580	12
			Total	7760	11
Total		Mismatch	Mismatch	5389	22
	Match		6706	24	
	Total		12095	23	
	Match	Mismatch	Mismatch	2814	6
			Match	3421	4
			Total	6235	5
		Total	Mismatch	8203	13
			Match	10127	15
			Total	18330	14

# Results and Data Analysis

Parameter Estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	-.108	.1059	-.315	.100	1.039	1	.308
Race Match	.072	.0416	-.010	.153	2.981	1	.084
Race Mismatch	0 <sup>a</sup>	.	.	.	.	.	.
StCTSER	.049	.0188	.012	.086	6.672	1	.010**
TCTSER	.006	.0159	-.025	.037	.151	1	.697 <sup>ns</sup>
(Scale)	.829						

Dependent Variable: Student Test Score (z-Score)

Model: (Intercept), TeacherStudentMatchRace, StCTSER, TCTSER

a. Set to zero because this parameter is redundant.

ns = not significant at  $p < .05$ , \* = significant at  $p < .05$ , \*\* = significant at  $p < .01$ , \*\*\* = significant at  $p < .001$

# Results and Data Analysis

Parameter Estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	-.045	.1034	-.248	.158	.190	1	.663
Home Language Match	.199	.0427	.115	.282	21.610	1	.000
Home Language Mismatch	0 <sup>a</sup>	.	.	.	.	.	.
StCTSEHL	.054	.0196	.015	.092	7.558	1	.006**
TCTSEHL	-.024	.0159	-.055	.007	2.318	1	.128 <sup>ns</sup>
(Scale)	.822						

Dependent Variable: Student Test Score (z-Score)

Model: (Intercept), TeacherStudentMatchHoeLanguage, StCTSEHL, TCTSEHL

a. Set to zero because this parameter is redundant.

ns = not significant at  $p < .05$ , \* = significant at  $p < .05$ , \*\* = significant at  $p < .01$ , \*\*\* = significant at  $p < .001$

# Results and Data Analysis

Parameter Estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	.022	.1018	-.177	.222	.048	1	.827
Gender Match	-.007	.0377	-.081	.066	.038	1	.845
Gender Mismatch	0 <sup>a</sup>	.	.	.	.	.	.
StCTSEG	.045	.0180	.010	.080	6.302	1	.012*
TCTSEG	-.016	.0158	-.047	.015	1.029	1	.310 <sup>ns</sup>
(Scale)	.830						

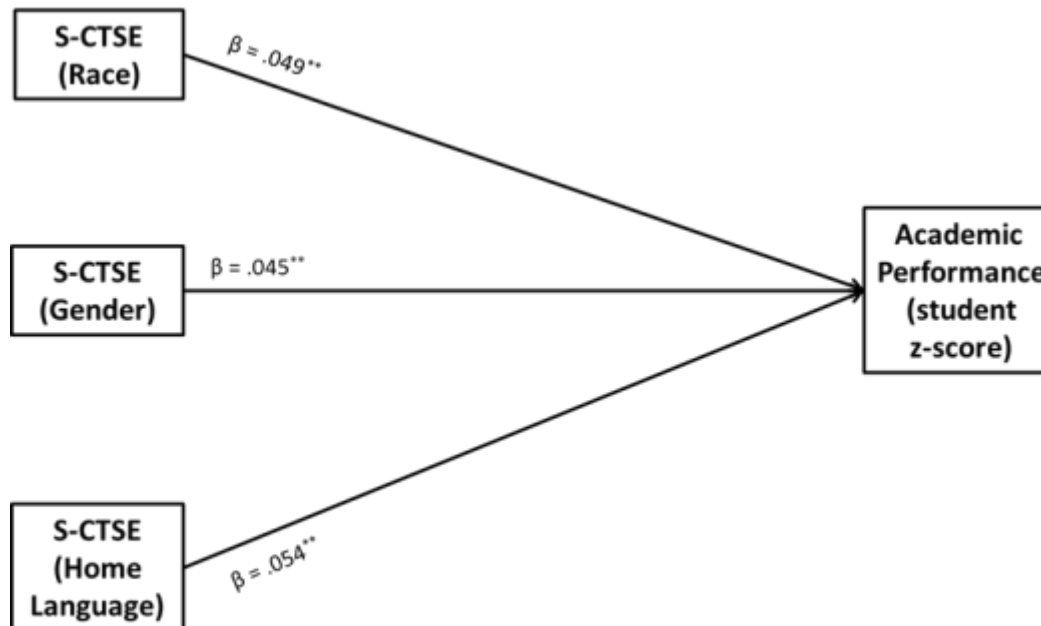
Dependent Variable: Student Test Score (z-Score)

Model: (Intercept), TeacherStudentMatchGender, StCTSEG, TCTSEG

a. Set to zero because this parameter is redundant.

ns = not significant at p=.05, \* = significant at p<.05, \*\* = significant at p<,.01, \*\*\* p = significant at p<.001

# Results and Data Analysis



**Notes:**

-Combined Institutions

-All paths are standardised betas.

\*\*\* =  $p < .001$ , \*\* =  $p < .01$ , \* =  $p < .05$ , ns = not significant ( $p > .05$ )

# Findings

1. Matching teacher and student in terms of race, home language and gender significantly improves student cognitive test performance in information systems and technology education and training.
2. There is a positive relationship between indexes of match (for race, home language and gender) and test score results.

# Findings

3. Student perceptions of collective teaching self-efficacy vary among race, home language and gender groupings and appear to relate to culture-based differences in the impact of teacher student congruence on information systems and technology related learning outcomes.
4. Students' collective teaching self-efficacy (for race, home language and gender) is significantly positively related to academic performance.

# Contribution to Body of Knowledge

- Adaptation of collective teacher self-efficacy construct for race, home language and gender reference groups (CTSE)
- Formulation of a research model to test the direct effect of student perceptions of teacher collective efficacy on academic performance
- Formulation of a research model to test the moderating effect of both student and teacher collective teaching self-efficacy (S-CTSE) on the teacher student match -> academic performance effect
- Formulation of a model to test the teacher student indexes of match -> academic performance effect



# Conclusion

“Maximum returns on South Africa’s significant investments in education will only be fully realised when both students and teachers can break the psychological shackles of culture-based collective self-doubt.”

## Teacher education strategies...

- ...must be responsive to the complexities and diversity of South Africa’s ICT student population

- ...acknowledge that ‘one response’ does not ‘fit all’.

# Thank you!

- Questions & Floor Discussion