

USING SIMULATION TO ADDRESS BIAS IN TEACHING PRACTICES



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BACKGROUND

- Baidee (2012) identified four advantages to simulation based learning
 - Classroom decision-making
 - Practice through repeating, receiving feedback and advice
 - Self-efficacy in classroom teaching
 - Collaborations and social interactions
- Simulations allow educators to act within virtual environments, immediately applying theory to realistic, yet controlled, settings (Fischler, 2006)

SIMEQUITY PROJECT: PURPOSE

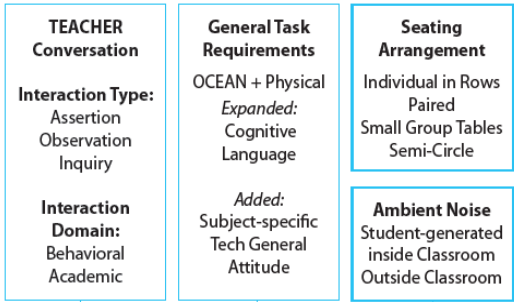
- Implicit bias impacts teaching and learning.
- A typical teacher makes up to 3,000 important decisions during a day of instruction (Danielson, 1996).
- Being a culturally responsive educator first requires recognition of existing or potential bias, a metacognitive skill of teaching.
- Digital simulations in education can support teaching and learning.
- **The simEquity project, using simSchool, focuses on helping educators recognize, reflect and reduce implicit bias that may exist.**

ABOUT SIMSCHOOL



SIMSCHOOL

- A dynamic, online classroom simulation program that allows preservice and inservice teachers the opportunity to practice teaching
- Promotes pedagogical expertise by re-creating the complexities of classroom decisions through mathematical representations of how people learn and what teachers do when teaching.
- Computational Model (COVE)
 - **C**ognitive science models
 - **O**CEAN model of psychology (Big 5 personality: extroversion, agreeableness, persistence, emotional stability and intellectual openness)
 - **V**iseral layer of Visual-Auditory-Kinesthetic perception
 - **E**nvironment (social and physical expectations) for learning



Internal Influences

Character Profile

STATE Characteristics

Cognitive:
 General Ability
 General Language Capacity + Expanded Language + Subject-Specific

Emotional:
 OCEAN + Attitude + Social Proximity Impact

TRAIT Physical Characteristics:
 VAK + Motor Skills + General Health



Data Generated


Visual Indicators <i>Expanded:</i> Facial Expressions Body Positions incl. Stimming Hand raised when cognitive and/or emotional threshold hit	Audio Indicators General Ambient Noise <i>Distraction Indicator:</i> Student Chatter + Ambient Increase influenced by average class distraction level
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Data Visible During Play

Student Dashboard Rate of Learning Zone of Proximal Development Modified OCEAN Attitude Social Impact w/ Student Influencers Change Log influenced by emotional and cognitive threshold	Class Dashboard <i>Average:</i> Rate of Learning Task Differentiation Performance Emotional Distraction Conversation Type Attitude toward Subject
	Lesson Plan Dashboard for: Task Descriptions Tasks used in Order Visual indicator of +/- average impact




Learning Characteristics in simSchool

Catalog of Modules for Various Topics and Grade Levels

 = Grade Level of Students

 = Contains Additional Resources

 = Estimated Time to Complete

	Module Name	Description		
K-5	Mastering Inclusionary Practices Elementary	Practices Explore classroom management and accommodations	x	1.5 HRS
K-5	Strategies, Accommodations, and Learning Tools	Working with a Variety of Student Learning Devices	x	2 HRS
9-12	Differentiated Instruction Secondary	Practice teaching students who learn best through different modalities	x	2 HRS
9-12	Differentiated Instruction Secondary	Practice teaching students who learn best through different modalities	x	2 HRS
9-12	Exceptionalities and Student Success, Part 3	Experience instructing students with challenges in math processing	x	1.5 HRS
9-12	Exceptionalities and Student Success, Part 5	Experience instructing students on the Spectrum	x	1.5 HRS
9-12	Mastering Inclusionary Practices Secondary	Explore classroom management and accommodations	x	1.5 HRS
9-12	Study Skills Intervention	Teach a high school class where all students have IEPs 4 • 60 min	x	2 HRS

Overview & Instructions

Reflection Questions

Resources

Teaching Sims ▾

✔ Class 1: Class 1

⊖ Class 2: Class 2

⊖ Class 3: Class 3







⊖ Class 4: Class 4

⊖ Class 5: Class 5

Observations

Teaching Sims

Instructions: You must review your observation report for each class taught for the next class to unlock. You must also review your report for each class before you can answer reflection questions if they are present.

✔ Class 1 Class 1 Class 1  Review simClass 	Class 2 Class 2 Class 2  Start Teaching!	Class 3 Class 3 Class 3  LOCKED	Class 4 Class 4 Class 4  LOCKED	Class 5 Class 5 Class 5  LOCKED
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Robert Blackwell
 He is working on...
 Now is your chance to share. You may speak with other students at

Start Done

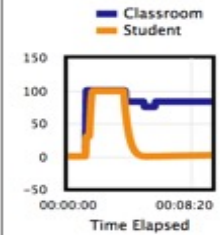
Robert's Strengths

Reading	Moderate
Writing	Low
Listening	Moderate
Speaking	Moderate
Math	Moderate
Technology	Moderate
PE	Low
Art	Moderate

Key Personality Details

Preferred pronoun:	He
Has an IEP Plan:	No
Has a 504 Plan:	Yes
Social Traits:	Does fine working with people or alone [see more]
Work Habits:	Usually open to and motivated by working with others [see more]
Learning Environment:	Either working alone or with others [see more]

Academic Performance



Robert Blackwell

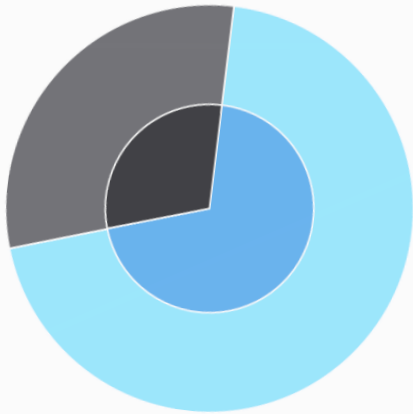
Table 1 Table 2 Table 3

RESTART 00:09:41 PAUSE SUBMIT

Graphic Feedback

Student Attention By Gender

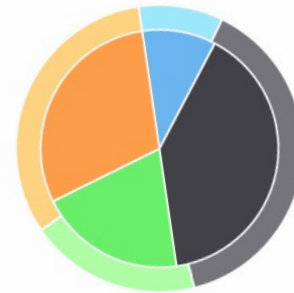
'Attention' determined by speaking to a student, looking at a student's profile, assigning a differentiated task, applying a differentiated strategy, or zooming in on a student.



- attention received by female students
- female students in classroom
- attention received by male students
- male students in classroom

Student Attention By Ethnicity

'Attention' determined by speaking to a student, looking at a student's profile, assigning a differentiated task, applying a differentiated strategy, or zooming in on a student.



- attention received by black or african american students
- attention received by hispanic or latino or of spanish origin students
- attention received by unspecified students
- black or african american students in classroom
- hispanic or latino or of spanish origin students in classroom
- unspecified students in classroom
- white students in classroom

SIMSCHOOL FEEDBACK

Class 1: Class 1

Description	Recommended Practice	N/A	Needs Attention	Satisfactory	Good
Regularly assesses individual and group performance.	Checks the class progress tab at a regular interval.			✓	
Uses information of differing student strengths and needs to further each learner's development.	Clicks on each student's profile and views their traits or progress at least once throughout the simulation.			✓	
Designs, adapts, and delivers instructions to address each student's diverse learning strengths and needs and creates opportunities for students to demonstrate their learning in different ways.	User uses a variety of tasks during the simulation.				✓

Description	Recommended Practice	N/A	Needs Attention	Satisfactory	Good
Makes appropriate and provisions for students with learning needs.	Assigns tasks in a way that maximizes students' performance (academic and behavioral).				
Chooses appropriate when students with needs are present.				✓	
Chooses appropriate 'break', before a new task.					✓
Changes task or makes a commitment when students become distressed.				✓	
					✓

RESEARCH FOCUS

- Part One (included in this paper and presentation)
- Participants rated simStudents after one simulation run predicting each student's success for the lesson plan based on:
 - Name only
 - Avatar only
- Part Two (preliminary results)
 - Participants rating AFTER the last of five simulations on the same variables
 - Participant rating of **same profile** but with different skin color and different names

Addison Blackwell

Very Unlikely Somewhat Unlikely Neutral Somewhat Likely Very Likely



Methodology: Data Collection

- Teacher Surveys
 - The *Teachers' Sense of Efficacy Scale (TSES)* short form (Tschannen-Moran & Hoy, 2001)
 - The *Culturally Responsive Self-Efficacy Survey* (Siwatu, 2007)
 - *Educator Bias Inventory* (Collum et al., 2020) (*Self-Awareness, Pedagogical environment, and Relationships with families and community*)
- Simulation-Generated Data
 - Academic Index
 - Emotional Index
 - Equality/Equity Index
 - Survey rating predicting success – avatars/names

FRAMING EXPECTATIONS

Using the scale below, give a prediction for each student's ability to be successful with the lesson plan used.



Very Unlikely Somewhat Unlikely Neutral Somewhat Likely Very Likely



Very Unlikely Somewhat Unlikely Neutral Somewhat Likely Very Likely



Very Unlikely Somewhat Unlikely Neutral Somewhat Likely Very Likely



Very Unlikely Somewhat Unlikely Neutral Somewhat Likely Very Likely

Next

Using the scale below, give a prediction for each student's ability to be successful with the lesson plan used.

Mason Aller

Very Unlikely Somewhat Unlikely Neutral Somewhat Likely Very Likely

Parker Beyer

Very Unlikely Somewhat Unlikely Neutral Somewhat Likely Very Likely

Addison Blackwell

Very Unlikely Somewhat Unlikely Neutral Somewhat Likely Very Likely

Reagan Boyce

Very Unlikely Somewhat Unlikely Neutral Somewhat Likely Very Likely

Next

RATINGS FOR AVATARS AND NAMES

Who, Me? A Scientist

Base Profile	Gender	Ethnicity	IEP	ELL	Avatar Rating	Ave. Raing for Pair	Name Rating	Ave. Raing for Pair
Ashley Dodd	F	white	N	N	3		4	
Cameron Fields	M	white	N	N	3	3.0	3	3.5
Victoria Kramer	F	white	N	Y	3		2	
Trenton Knox	M	white	N	Y	3	3.0	3	2.5
Zoey Chambers	F	white	N	N	3		4	
Luke Albright	M	white	N	N	3	3.0	4	4.0

Clone Profile	Gender	Ethnicity	IEP	ELL	Avatar Rating	Ave. for Pair	Name Rating	Ave. for Pair
Keyona Jackson	F	Black	N	N	5		4	
Ladarius Washington	M	Black	N	N	5	5.0	5	4.5
Sophia Ruiz	F	Hispanic	N	Y	3		5	
Luis Morales	M	Hispanic	N	Y	4	3.5	4	4.5
Khadeeja Fidali	F	Asian	N	N	5		5	
Brandon Chen	M	Asian	N	N	4	4.0	5	5.0

FINDINGS FOR AVATAR RATINGS

- **18 of 23 rated ELL less likely to succeed**
- The binomial probability of 18 or more of 21 tests being lower by chance is $p < .002$ (Graphpad, 2023).
- No significant difference in “likelihood of success” ratings based on skin color of Avatars (lighter skin vs. darker skin)
- Highly significant ($p < .001$) gains across $N = 39$ teacher ratings of “how likely to succeed” from first Avatar rating (trial 1) to last Avatar rating (trial 5).

FINDINGS FOR NAME RATINGS

- **14 of 17 judged ELL less likely to succeed**
- This event would be considered very rare by chance ($p < .013$) based on a binomial test (Graphpad, 2023).

SIGNIFICANT CHANGES IN TEACHER SELF-REPORT DATA

Survey Scale	n	Pre mean	Post mean	p	Cohen's d
Culturally Responsive Self-Efficacy	39	4.94 (.58)	5.19 (.55)	.001	.44
Educator Bias: Pedagogical Environment	39	5.11 (.55)	5.28 (.50)	.002	.32
Educator Bias: Relationship with families and community	39	4.53 (.96)	4.82 (.82)	.006	.33

INDIVIDUAL ITEMS (CRSE)

I feel confident that I could...	Pre Mean	Post Mean	N	P level	Cohen's d
obtain information about my students' academic strengths.	5.08	5.36	39	.014	.411
identify ways that the school culture (e.g., values, norms, and practices) is different from my students' home culture .	4.77	5.21	39	.002	.531
implement strategies to minimize the effects of the mismatch between my students' home culture and the school culture.	4.46	4.95	39	.004	.489
assess student learning using various types of assessments.	5.03	5.36	39	.003	.503
obtain information about my students' home life.	4.69	5.13	39	.006	.464
develop a community of learners when my class consists of students from diverse backgrounds .	5.13	5.38	39	.016	.402
obtain information about my students' cultural background.	4.82	5.13	39	.038	.345
help students to develop positive relationships with their classmates.	5.00	5.23	39	.048	.327

INDIVIDUAL ITEMS - CRSE CON'T

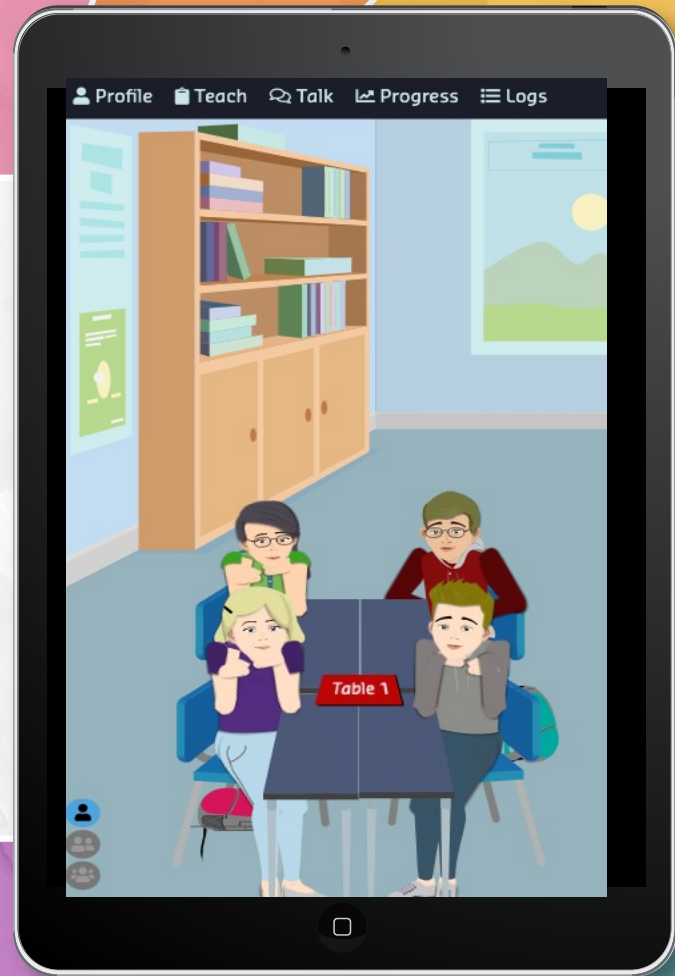
I feel confident that I could...	Pre Mean	Post Mean	N	P level	Cohen's d
revise instructional material to include a representation of different cultural groups.	4.64	4.92	39	.032	.356
identify ways that standardized tests may be biased towards culturally diverse students.	4.54	4.95	39	.006	.466
use examples that are familiar to students from diverse cultural backgrounds.	4.67	5.05	39	.014	.411
obtain information regarding my students' academic interests.	5.13	5.41	39	.026	.372
use the interests of my students to make learning meaningful for them.	5.05	5.31	39	.031	.359

IMPLICATIONS OF FINDINGS

- These analyses provide credible evidence that **simply labeling a student as ELL** resulted in bias among teachers regarding student ability to successfully complete the lesson presented in the simulator.
- Note: Actual **abilities of the simStudents were the same**
- Additional research is underway to determine **if labeling by gender also produces biases** regarding ability to successfully complete lessons.
- Next steps:
 - Triangulate simulator findings with teacher and student pre-post surveys
 - Detailed analysis of meaningful actions vs. tips provided

SIMSCHOOL Demo

<https://www.simschool.org/>



THANK YOU!

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