

## **Using Digital Simulation to Address Implicit Bias in Teaching**

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**Abstract:** Bias reduction in teaching practices is a key foundation for enabling future leaders of society to achieve their highest innate and positively nurtured potential. The COVID-19 Pandemic has highlighted disparities in learning and emphasized the importance of socio-emotional stability for the long-term well-being of students and teachers. This paper presents a tool for educators that is scalable for developing equitable, culturally responsive teaching practices through implementation in a simulated teaching environment that is adaptive, interactive and augmented. Research questions to be studied during a three-year project recently funded by the U.S. National Science Foundation are described and baseline statistics gathered from pretest surveys among the first year teacher participants are presented.

**Keywords:** simulated teaching, equity, implicit bias, culturally relevant teaching

### **Introduction**

Classrooms are becoming more diverse as they reflect the society in which we live. Gender, ethnicity, socioeconomic status, and English language learning status have been linked to differences in teacher perceptions of students for whom educators may hold implicit negative attitudes and stereotypes (McGinnis, 2017). To address the diversity of differences, educators need to actively recognize and counter patterns of bias in their teaching practices as well as classroom environments (Chen, Nimmo, & Fraser, 2009). This paper will address a simulated teaching tool that includes equity related modules as well as an equity index to allow educators to recognize, reflect and remediate possible teaching practices that may contain implicit biases. Research data to compare self-report to simulation records are being collected to allow a comparison of perception to reality.

### **Literature Review**

Implicit bias is described as the attitudes or stereotypes that affect our understanding, actions and decisions in an unconscious manner (McGinnis, 2017; Staats, 2015-16). Most neuroscientists agree that the majority of our cognitive processing occurs unconsciously (Soon, Brass, Heinze, & Haynes, 2008). Because implicit associations are unconscious, implicit biases do not necessarily align with our explicit beliefs and stated intentions (Staats, 2015-16). While we may not be aware these biases exist, they can have a significant impact on decision making. Some situations in which we are likely to rely on our subconscious for decision making involve ambiguous or incomplete information, the presence of time constraints in addition to fatigue or an overloaded mind (Bertrand, Chugh, & Mulainathan, 2005). Given that teachers are often in these situations during the school day, it is not difficult to imagine that implicit biases may be contributing to their decisions (Staats, 2015-16) regarding how they interact with students along lines of gender, socio-economic status, ethnicity, and English language proficiency.

Danielson (1996) surmised that a typical teacher makes up to 3,000 important decisions during a day of instruction, many of which have varying impacts on different types of learners in the classroom. It is imperative that educators provide a culturally responsive environment for all students to be confident in their learning (Derman-Sparks & Ramsey, 2000). Being a culturally responsive educator first requires recognition of existing or potential bias, a metacognitive skill of teaching. Cultural responsiveness requires looking beyond teachers' own beliefs, cultures, perspectives and practices to being able to understand where bias may exist and how it can be overcome. Specifically, how can the personal attributes of a teacher be recognized, assessed and related back to teaching practices in an unobtrusive environment where underlying biases can be identified, acknowledged and remediated?

Many research studies have found that a teacher's sense of self-efficacy is one of the variables highly related to student achievement (Medgley, Feldlaufer, & Eccles, 1989; Tucker et al., 2005) while others specifically noted the impact on Black students (Tucker et al., 2002). One way that teachers can develop their self-efficacy is by understanding the needs of learners in the classroom with strategies to teach them. "Teachers who believe that student learning can be influenced by effective teaching despite home and peer influence and who have confidence in their ability to teach, persist longer in their teaching efforts, provide greater academic focus in the classroom, give

different types of feedback, and ultimately improve student performance” (Tucker et al., 2005, p. 29). Soodak and Podell (1994) also found a relationship between teacher self-efficacy and their beliefs about and actions toward difficult to teach students. Teachers with high self-efficacy are more likely to believe their teaching could impact student learning while teachers with low self-efficacy are more likely to look for solutions outside the classrooms (Soodak & Podell, 1994). In a study of teacher efficacy, researchers found that teacher self-efficacy for working with students of diverse backgrounds can be significantly increased by targeted training (Tucker et al., 2005). Teachers with a strong sense of efficacy believe student learning outcomes are within their control and are based on teacher behavior rather than outside influences. Researchers have identified connections between teachers’ sense of efficacy, culturally responsive pedagogy (Callaway, 2016), and student achievement (Oyerinde, 2008; Tucker et al., 2005).

Research on teacher efficacy and its relationship with culturally relevant teaching (CRT) illustrates a need to address teacher self-efficacy with respect to working with children from diverse backgrounds (APA, 2012; Oyerinde, 2008; Tucker et al., 2005). Efforts to increase teacher efficacy are vital in increasing the low academic achievement among culturally diverse students (Callaway, 2016; Tucker et al., 2005). Highly efficacious teachers have more persistence when helping struggling students, and they create lessons designed to engage their students (Bandura, 1997; Kitsantas, 2012; Protheroe, 2008).

### **Simulated Teaching Environment**

One way to identify evidence of implicit biases in teaching involves the use of a simulated teaching environment. SimSchool is a dynamic, online simulated program that allows preservice and inservice teachers the opportunity to practice teaching. SimSchool was designed to provide future and current teachers with a safe environment for experimenting and practicing techniques, especially methods of addressing different learning styles, and wide variations in academic and behavioral performance of students. Simulated teaching environments are one key innovation that provide teachers and teacher trainees many learning trials with simulated students, thereby increasing teacher confidence and competence with a diverse classroom. SimSchool supports instructional decision-making in order to foster supportive conversations with practitioners and build skills for culturally responsive teaching.

The expanded and updated simSchool 2.0 provides a wide variety of options to be used across the teacher education curriculum (Figure 1). Included in the options are the ability to create modules that focus on teacher improvement in areas such as multicultural awareness, differentiated instruction, literacy and classroom management. Research on the use of simSchool has shown improved student understanding in important teaching skills (Christensen, Knezek, Tyler-Wood, & Gibson, 2011; Collum, Christensen, Delicath, & Johnson, 2019). Educator bias is a recently confirmed area in which simulated teaching activities can improve educator preparations (Collum, Christensen, Delicath, & Knezek, 2020).

SimSchool promotes pedagogical expertise by re-creating the complexities of classroom decisions through mathematical representations of how people learn and what teachers do when teaching. From its inception, simSchool’s underlying artificial intelligence model was envisioned to include research-based psychological, sensory and cognitive domains similar to Bloom’s Taxonomy of Educational Objectives (Bloom, Mesia, & Krathwohl, 1964). The Five-Factor Model of psychology (McCrae & Costa, 1996) served as the foundation of the student personality spectrum. This model includes the characteristics of extroversion, agreeableness, persistence, emotional stability, and intellectual openness. A simplified sensory model component with auditory, visual and kinesthetic perceptual preferences comprises the physical domain. Together the physical, emotional and academic factors were demonstrated to represent salient elements of classroom teaching and learning (Christensen et al., 2011; Gibson, 2007).

### **Research Questions**

Self-report as well as simulation activity data are being collected from participants in a project focused mitigating implicit biases in the classroom. The simulation activity data will include decisions, outcomes and improvements during modules based on feedback between teaching experiences. Included in the simulation data will be an equity index based on gender and ethnicity. It is expected that when participants receive feedback on equitable practices, their subsequent teaching experiences in the simulator will show a higher equity index. The project activities are focused on answering the following research questions:

- To what extent can teaching in a simulated environment produce detectable (measurable) evidence of educator bias with respect to gender and ethnicity?

- To what extent can algorithm-based identification of – and promoted reflection on – educator biases be decreased by required session reflection debriefing?
- To what extent are levels of implicit bias related to pedagogical approach, teacher self-efficacy, locus of control and cultural awareness?

Pretest (baseline) data gathered from year 1 teachers during the first phase of the three year project are presented in this paper. The focus is on teacher self-reported survey data related to teacher efficacy, culturally relevant teaching and implicit bias.

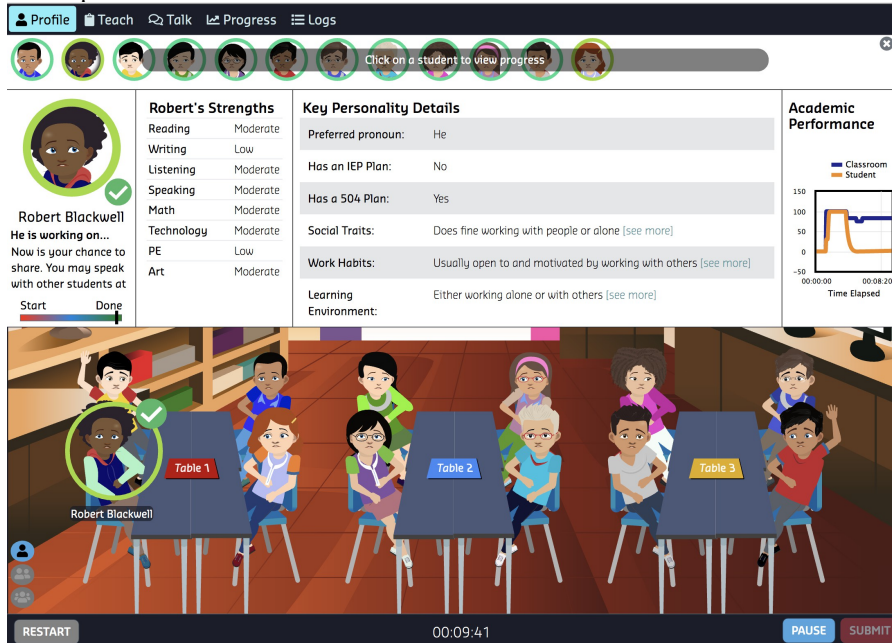


Figure 1. SimSchool classroom highlighting student profiles.

## Methods

This three-year study will involve educators completing modules in the simulated teaching environment as well as completing self-report surveys related to teacher self-efficacy, teacher locus of control, and cultural awareness. Figure 2 includes a sample of the hundreds of modules in which educators can choose. Future and current teachers will be encouraged to interact with this cognitive model over several sessions spanning several weeks, with micro-teaching interactions lasting from 10 to 30 minutes. Future and current teachers will attempt to negotiate the simulated classroom environment while adapting their teaching to the diversity of students they encounter.

= 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	StudySkills Intervention	Teach a high school class where all students have IEPs 4 • 60 min	x	2 HRS

Figure 2. Sample modules available in simSchool.

## Instruments

User data from the simSchool program will include information for each session from each of the modules that will be used to inform development. In addition, teacher survey measures focused on self-efficacy, culturally responsive teaching, and self-awareness of bias will be collected pre-post. Each of the surveys is rated on a 6-point Likert scale. The surveys include:

1. The *Teachers' Sense of Efficacy Scale* (TSES) short form (Tschannen-Moran & Hoy, 2001) will be used to measure self-efficacy related to three subscales: instructional strategies, classroom management, and student engagement. The survey has been used in multiple studies and shown to have validity and reliability as described in Tschannen-Moran et al. (2001).
2. The *Culturally Responsive Self-Efficacy Survey* (Siwatu, 2007) will be used to determine the level of competency in the skills and knowledge needed to engage in culturally responsive teaching that includes curriculum, assessment, classroom management and cultural enrichment.
3. Three scales from the *Educator Bias Inventory* (Collum et al., 2020) will be included. These scales (*Self-Awareness*, *Pedagogical environment*, and *Relationships with families and community*) will be used to cross validate with the simSchool bias index derived by the simSchool system. This survey was recently used with simSchool research and is based on Chen, Nimmo, & Fraser (2009).
4. Two scales that were used with a simulated environment were also included and are designed to measure individual pair of educator mindsets (Equality vs. Equity; and Avoidant vs. Aware). These surveys were developed by Littenberg-Tobias, Borneman, & Reich (2021) to measure equity-promoting behaviors in digital teaching simulations.
5. Locus of control was adapted from prior studies (Christensen et al., 2011) related to simSchool and used to measure the sense of control educators feel in changing their classroom environment or reaching difficult students.

Examples of the graphic feedback are shown in Figure 3. In addition, educators are provided with a report card style document that allows them to see their progress after each session. Participants are also required to include their reflections on specific activities after completing the modules.

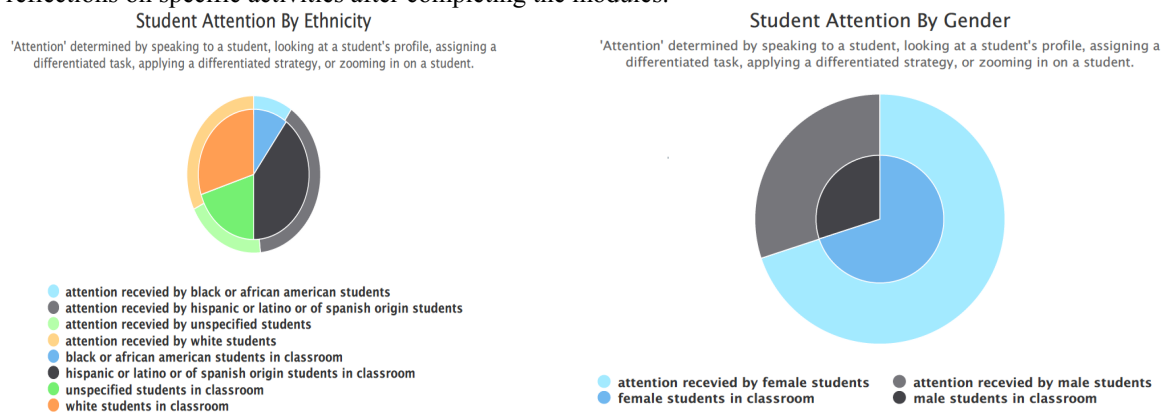


Figure 3. Graphic feedback following teaching experience in simSchool.

## Results

Pretest data from the surveys were collected during the spring of 2022. Preliminary findings from 16 teachers who completed pretest surveys as of the deadline for completing this paper are included in this analysis. Descriptive statistics as well as correlational analyses were conducted on the data. The descriptives for each of the measures are shown in Table 1. It is noteworthy that the measure related to relationships with families and community is lower within the Educator Bias Inventory than the other measures of self-awareness and pedagogical environment. The two measures with the pair of mindsets as choices (Equality/Equity and Avoidant/Aware) are interpreted by lower

scores as being closer to the word on the left side of the word pair. For example, the Equality/Equity mean is 2.59 which is closer to Equality than Equity, while the Avoidant/Aware mean is 4.56 and closer to Aware than Avoidant. Locus of control has a mean of 2.60 for this group of participants indicating a higher locus of control. The single item, “I reflect on how my own identity influences my interactions with students” is used as a marker to compare to the simulated data once it is available. Once the posttest data are completed, pre-post analysis will be conducted to determine the impact of teaching in a simulated environment that includes feedback and reflection related to equity.

Table 1. Descriptives for Measures for the simEquity Project

	N	Mean	Std. Dev.
Efficacy for Instructional Strategies	16	5.12	.44
Efficacy for Classroom Management	16	4.91	.58
Efficacy for Student Engagement	16	4.91	.60
Culturally Responsive Teaching Self-Efficacy Survey	15	5.05	.48
Educator Bias Inventory: Self awareness	15	5.37	.39
Educator Bias Inventory: Pedagogical environment	15	5.21	.43
Educator Bias Inventory: Relationship with families and community	15	4.64	.86
Equality/Equity	15	2.59	.82
Avoidant/Aware	15	4.56	.67
Locus of Control	15	2.60	.90
I reflect on how my own identity influences my interactions with students.	15	4.93	.96

### Relationships of Survey Items with Years of Teaching Experience

There was a significant correlation between years of teaching experience and two of the survey items. “The colors black and brown are equally valued as colors in my classroom” was significantly ( $p < .05$ ,  $r = .605$ ) to years of teaching experience with the higher value being related to more years of teaching experience. However, “If parents would do more for their children, I could do more” was negatively correlated ( $p < .05$ ,  $r = -.650$ ) with years of teaching experience meaning the less experience teachers had, the more they put more emphasis on what parents did for the students (locus of control).

### Relationships of Survey Items and Grade Level Taught

There were six items that were significantly correlated with grade level taught with grade level taught ranging from 4 to 8. One of the items had a positive correlation while the other five had a negative correlation.

Table 2. Significant Correlations Related to Grade Level

Survey Item	r	p
I feel confident I could use a variety of assessment strategies.	.593	.05
I feel confident I could provide appropriate challenges for very capable students.	-.515	.05
I feel confident I could assist families in helping their children do well in school.	-.512	.05
I feel confident I could help students value learning.	-.622	.05
I believe all children can succeed.	-.549	.05
Teachers should talk with their colleagues about how race affects students’ experiences in schools.	-.700	.01

### Implications for Practice

During the COVID-19 pandemic, many teacher education programs found it necessary to adapt their clinical experiences. Many programs adopted simSchool to allow their candidates the opportunity to experience clinical teaching in diverse classrooms when they were not allowed to go into real classrooms. Pre-service students were given then opportunity to experience more diverse environments than they would have in their normal in-person clinical experiences.

SimSchool is currently used as a practicing teaching platform in 10% of the largest urban K-12 districts in the U.S., 20% of the US educator preparation programs, and seven countries with a total of 200,000 users. Given the impact of COVID-19 on preservice and inservice programs, simSchool is likely to continue to expand to meet the demands of teacher development programs, with scalability facilitated by ease of access from any location with a computing device, web browser and Internet connection. The recognized importance of socio-emotional stability for the long-term well-being of current teachers and future productive citizens of our society has spotlighted the urgency

of research on programs such as simSchool with its focus on mitigation of implicit bias. Innovative solutions offer the prospect of finding a timely contribution to a significant problem in our nation.

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