

# CIDDL Research and Practice Brief 11: Simulation Technology to Bridge the Gap from College to Classroom



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## PUBLISHED

February 17, 2022



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### Suggested Citation:

Patterson, M.S. & the CIDDL Team. (2022). Simulation technology to bridge the gap from college to classroom. The Center for Innovation, Design, and Digital Learning. <https://ciddl.org/simulation-technology-to-bridge-the-gap-from-college-to-classroom/>

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Dear stakeholder,

Thank you for engaging with the Center for Innovation, Design, and Digital Learning ([CIDDL](#)). The work that you are about to access is supported with funding from the Office of Special Education Programs at the U.S. Department of Education.

The CIDDL Center is striving to impact the use of educational technologies into preparation programs, including special education, early intervention, and related services personnel preparation and leadership personnel preparation programs that prepare professionals serving students with disabilities.

## CIDDL Research and Practice Briefs

[CIDDL Research and Practice Briefs](#) is a series of reports on research and practices regarding the innovative use of technology in special education, early childhood, related services personnel preparation and leadership personnel preparation programs as well as K-12 educational settings. For each brief, an expert or practitioner in the field is invited to discuss their research and practices. In addition, experts and practitioners will share their insights into opportunities and challenges about applying their research and practices to professional preparation programs.

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# Topic: Simulation Technology to Bridge the Gap from College to Classroom

## The problem highlighted in this brief

The lack of experienced teachers leads to a vicious cycle for students with disabilities. Research shows students of experienced teachers demonstrate higher levels of achievement compared to students with novice teachers, specifically those who have taught three years or less. Yet, up to 30% of new teachers leave education within the first years of teaching. Research indicates new teachers experience a drop in self-efficacy once transitioning to the classroom. This drop factors into the high rate of attrition and results in an ever-increasing number of teachers who are unprepared to meet the needs of our students.

## Why does this matter to teacher preparation?

As of 2021, over 95% of our nation's school districts currently experience a shortage of special education teachers. Teacher educators need a way to prepare preservice teachers that addresses their self-efficacy and supports them to persist in the classroom. In this brief, CIDDL invites [Dr. Lisa Dieker](#) to share how technological simulation and biometrics provide an opportunity for preservice teachers to build their skills in an authentic and low-risk environment.

## Guest Expert: Dr. Lisa Dieker

[Dr. Lisa Dieker](#) is a Pegasus Professor and Lockheed Martin Eminent Scholar Chair at the [University of Central Florida in the College of](#)

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[Community, Innovation and Education](#) specializing in Exceptional Student Education. She is the co-director of the [Center for Research in Education Simulation Technology](#) (CREST).

Her primary area of research focuses on collaboration between general and special education teachers with a specific interest in unique opportunities that exist for students with disabilities in STEM areas in urban and rural settings. She has a passion for how technology and simulators can be used to impact teacher preparation and student learning.

## What Will You Learn from This Brief?

The brief begins with context on the background of simulation as a learning tool, including an ethical discussion on risks inherent to pre-service teachers practicing on students. Dr. Dieker makes the connection between education and other “life or death” fields, asking the question, “Why do we practice on students?” The brief continues, providing the characteristics of simulation in the field of education, its role in a learning cycle, and examples of its use. Dr. Dieker shares a combination of technologies, including simulation and biometrics, to help pre-service teachers develop their skills and self-efficacy. Dr. Dieker suggests options for teacher educators to begin with simulations in their own programs and highlights the importance of collaboration outside of education.

## Practice and Research Context

### Not a new tool

Simulation training dates back over one hundred years when it was first used to train pilots. Since then, both the military and industry

train their organizations using simulators. Public safety organizations use simulators to train first responders, such as firefighters and police officers. Airlines including Delta and JetBlue own their own simulators to train pilots and flight crew. The medical field utilizes simulators to train medical staff on diagnosis, surgical intervention, and counseling. Simulators ensure safety; they prevent loss of both equipment and lives, providing the learner an opportunity to practice without risk or fear of an error that puts another in harm.

### **Simulation in education**

Simulations can be done face-to-face or virtually. In a technological simulation, a teacher engages with a simulated classroom on a screen. The simulation is conducted live, with the



teacher's movement and speech monitored by camera by the simulation facilitator, known as an interactor. Meanwhile, the interactor responds to the teacher by controlling the movements and responses of the student avatars, each having their own name and personality. These technological simulations prevent risks to real students by having adults portray students in a virtual classroom environment (Dieker et al., 2017).

### **Simulation benefits**

Mikeska et al. (2021) found technological simulations for education provide similar benefits to those in industry, allowing pre-service teachers the opportunity to try a range of instructional strategies in a safe setting that minimizes risk for both the educator and students. Lamb and Etopio (2020) describe this as “soft failure,” in which any

failure does not last, but instead presents an opportunity for pre-service teachers to become more efficient.

Additionally, teachers can gain experience working with a diverse range of students who may not be present in an internship or practicum experience. Simulations provide pre-service teachers with repeated practice, allowing them to reach criteria for a specific skill before applying it in a real classroom. Simulations provide a learning environment in which a pre-service teacher can pause and regroup if needed or move to increasingly complex classrooms as they grow their skills (Dalinger et al., 2020). Beginning pre-service teachers may focus on practicing one skill, while advanced pre-service teachers may graduate to more complex practice, combining skills within a lesson. Simulations support personalized learning, allowing educators to grow and move as they have success (Dalinger et al., 2020).

Gundel and Piro (2021) found the authentic nature of simulations increased self-efficacy, a potential issue resulting in inexperienced teachers leaving the classroom. Preservice teachers can engage in the simulation as part of a learning cycle of preparation, simulation practice, feedback, and reflection (Mikeska, 2021). A simulation can provide multiple opportunities for practice that may not occur naturally during an internship. This supports research that preservice teachers who have practiced with feedback are two times more likely to continue in education (Kini & Podolsky, 2016).

The following are key insights shared by Dr. Dieker on this research. The interview focused on five questions around simulation and other innovative technologies in teacher preparation as well as recommendations for teacher educators to incorporate these ideas.

## Key Insights

Q1: *What are the issues that you are trying to address through your research and work with CREST?*

Dr. Dieker: "...how do we harness any technology- AI, biometrics, facial tracking, heart rates, whatever might be out there to do two things- help *better prepare new teachers* and help teachers better understand how kids with disabilities, kids who are struggling learners, kids in STEM, are doing in their classroom.

Student teaching and internship placements may not provide the depth of experience to build pre-service teacher self-efficacy. A classroom may only provide limited opportunities to practice specific skills, such as supporting a student in crisis. Furthermore, any mistakes that the pre-service teacher makes in their internship may have negative impact on the student. The classroom may not provide the pre-service teacher the opportunity to work with a diverse group of students, resulting in the pre-service teaching leaving a placement without essential experiences and feeling unprepared. Teachers who lack self-efficacy are at risk of leaving the education profession.

Q2: *How is CREST going to address those issues?*

Dr. Dieker: "...lots of people are doing work in simulation and training, but often it's in flight, it's in military, and I actually see, you know, ***teaching as a life and death situation for kids*** especially kids of poverty, kids with disabilities."

Simulations provide opportunities to address issues faced in teacher preparation. Simulations allow pre-service teachers the opportunity to engage in responsive interaction with their students by practicing

specific skills in a continuum of increasing complexity, without the risk of harm to the student. Adding biometrics provides data to the pre-service teacher on their performance.

Q3: *How would a teacher preparation program fit simulation and biometrics in their current practice?*

Dr. Dieker: “So, I would encourage maybe one purchase of (smartwatch) in the college and have a couple teachers wear them (for) student teaching, have a couple teachers do some facial tracking, have a couple step into a simulator, if you can do a shared experience with them, and have people watch that. So, maybe you can only do one hour of simulation time but ... 30 teachers watch it and talk about it.”

Teacher preparation programs can look to specific skills that pre-service teachers need for success. Donehower et al. (2020) identified teacher behaviors that aligned with simulation opportunities including questioning techniques, providing feedback, and behavior intervention. Pre-service teachers have used simulation to build their practice in math and science (Dieker et al., 2019). Additionally, simulations have proven effective to teach parental communication and instructional skills as well as teachers of students with autism (Thompson et al., 2019). Lopez Estrada (2021) used simulation during COVID when face-to-face internships were not an option.

Dr. Dieker: “...we never want to *make* our teacher candidates wear these devices. I think we want to give them options...I think we want *this kind of data*, but we want it to be *driven by the human desire*.”

-I want to know when I'm stressed if I'm a teacher of kids with behavior disorders,  
-I want to know when I'm only staring at the one kid who will talk to me, and I don't notice the rest of the class and they're all doing things that are going to cause me problems because *I'm a new teacher and I don't know.*”

Combined with other technologies, such as biometrics, heart monitoring through galvanic skin response, and eye tracking, pre-service educators can develop a grasp of how their neurophysiological state affects their performance (Lamb & Etopio, 2020).

Q4: *Where do you think the research is headed regarding simulation and related technology?*

Dr. Dieker: “There are three areas... *AI* is one, *nano technology* is one, and...*biotech*-three ways we're behind in the rest of the world. That's a good sign in the teacher-ed space... if we're going to be innovative in our work, because we're trying to catch up... there will be funding aligned with that.”

Artificial intelligence (AI) refers to the use of computers to perform tasks that would generally human intelligence. While many may first think of voice assistants, such as Alexa or Siri, AI goes beyond to options to personalize learning for students. For example, AI has been increasingly used in medical education to assist with surgical practices and assess these practices in virtual reality simulation (Winkler-Schwartz et al., 2019). To leverage these technological advancements, more research is needed to create more simulations

that utilize AI and evaluate their effectiveness on pre-service teachers' skills.

Q5: *What else should teacher preparation programs consider moving forward?*

Dr. Dieker: “Hang out with people from other disciplines that already know it. ***I’m not innovative because I’m smart; I’m innovative because I’m collaborative...*** I hang out with people that understand coding and back channels and biometrics and eye tracking.”

Dr. Dieker: “...if we're really going to move forward and change the world for teacher-ed, ***we've got to become trans-disciplinary.*** And one of my friends once said, it's like an apple pie. You can no longer pick it apart, but it sure tastes good when it's all together.”

Teacher educators may look to their university computer science, learning science, medical, and theatre programs for collaborators to bring simulation, biometrics, and other innovative practices to their teacher preparation programs.

## Resources

In the interview, Dr. Dieker provided resources and technology tools for teacher preparation programs starting with simulation and biometrics.

### [Mursion](#)

A mixed-reality simulation (MRS) software that provides a platform that blends artificial intelligence and live human interaction

### [VivoSmart Smartwatch](#)

This device monitors heart rate at the wrist and includes helpful tools such as stress tracking, a relaxation breathing timer and VO2 max readings.

### [AffDexMe](#)

This app analyzes and responds to facial expressions of emotion in real time using the built-in camera on your device. Demos available on iOS and Android.

## Link to Video

This Research and Practice Brief can be viewed on video online at <https://tinyurl.com/CIDDLBrief11Video>

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## Transcription of Interview

Transcription of the interview can be found at <https://tinyurl.com/CIDDLBrief11Transcript>

## For More Information

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