

# Ameliorating the Special Education Teacher Crisis: Systems Thinking and Innovative Approaches

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## ABSTRACT

Chronic and pervasive special education teacher (SET) shortages have interfered with state, district, and school efforts to recruit and retain effective teachers for students with disabilities. Unfortunately, these shortages have worsened post-pandemic due to early retirements, low unemployment rates, and career changes. The purpose of this article is to provide a systems thinking (ST) framework to help stakeholders consider the complex and interacting systems in which these shortages occur (i.e., teacher preparation, district and schools, society). We consider specific elements within these systems, their interconnections, with a focus on identifying steps and ideas stakeholders can use to understand contributors to the shortage crisis, while providing strategies and innovative ideas for greater sustainability. We also offer real examples of ST solutions used within teacher education programs, schools, and other professions. To further bolster ST, we conclude with examples of innovations outside of education with ideas to bridge these concepts into potential pathways to address SET shortages.

## KEYWORDS

**Special education, systems-thinking, teacher shortages**

**S**ystems thinking (ST) broadly defined is a “a set of synergistic analytic skills used to improve the capability of identifying and understanding systems, predicting their behaviors, and devising modifications to them in order to produce desired effects” (Arnold & Wade, 2015, p. 675). Systems thinking has been used to better understand, effectively influence, and yield improved outcomes, within and across various systems, including but not limited to school systems (see Meadows, 2008; Stroh, 2015). For instance, professionals in related human service fields, such as public health and social work, also have experienced workforce crises.

When using ST to address a longstanding problem, such as the special education teacher (SET) workforce crisis, stakeholders need to intentionally “shift” how they both view and approach the problem (Meadows, 2008; Stroh, 2015). These “shifts” in perspectives allow stakeholders to understand both the short- and long-term impacts of the problem and to identify new approaches to solve the problem (Meadows, 2008; Stroh, 2015). Creating shifts among stakeholders begins with developing a clear understanding of the “big picture” (i.e., the SET crisis), while increasing awareness of and fostering shared responsibility for addressing the challenges (Stroh, 2015). Stakeholders who overlook the importance of shifting their views, responsibilities, and approaches often inadvertently replicate (or intensify) the problem (Meadows, 2008; Stroh, 2015).

In this paper, we describe the application of Stroh’s (2015) ST approach at the SET preparation level and the district and school levels to describe how we might approach and respond effectively to the longstanding shortage. We also describe the action steps, and four stage process stakeholders can use to carry out ST based on their unique SET workforce needs. To further support implementation, we offer a snapshot of how university faculty members used the four stages to launch a

program aimed at increasing the SET supply. Finally, we describe innovative approaches used outside of education that can also be used to strengthen ST.

## **SYSTEMS THINKING IN ACTION: ANALYSIS OF SPECIAL EDUCATION TEACHER EDUCATION PROGRAMS**

We used Stroh's (2015) four-stage ST process (i.e., establish readiness for change, face existing realities, commit to change, and bridge the gap between the undesired and desired outcome[s]) as the overarching framework for analyzing SET programs' role in the SET workforce crisis. When considering the content in Table 1 (moving from left to right) many of the past and present workforce solutions have been or are currently supported by the U.S. Department of Education Office of Special Education Programs (OSEP) 84.325 K and D funded projects as well as through IDEA flow through funds. The solutions to bridge the gap identified in Table 1 (i.e., modifications, alternatives) might be considered as a basis for future funding efforts to improve the availability of effective SETs. Moreover, stakeholders could add additional or alternative solutions to current practices or in place of existing solutions. Although these are clearly not exhaustive, the content included in Table 1 serves, in part, not only to synthesize and illustrate ST ideas, but also as the basis for stakeholder discussions about what needs to change and why.

### **Systems Thinking in Action: Analysis of School Districts**

The approach and content delineated in Table 2 also emerged from Stroh's (2015) four-stage ST process for analyzing both districts' and schools' roles in the SET workforce crisis. Although

we replicated the ST process, used in Table 1, the content included in Table 2 differs. Specifically, the content pertains to district and school related SET preparation, recruitment, and retention.

### **Systems Thinking in Action: SET Programs and School Districts**

Using known system issues to analyze two parts separately (see Tables 1 and 2) reflects important aspects of ST. When stakeholders carry out Stroh's (2015) four-stage process in isolation, the results typically reflect short term solutions. Although short term solutions may be vital in responding quickly to a crisis, they often backfire over time (Meadows, 2008; Stroh, 2015). By contrast, longer term solutions are generated when diverse system(s) stakeholders convene and intentionally use the ST processes and tools to identify root causes, assume shared responsibility, commit to change, and carry out modifications or interventions. When applying a longer term, ST approach (Stroh, 2015), SET educators and district personnel convene with other key stakeholders. Together, these diverse stakeholders use ST processes, such as Stroh's (2015) action steps and stages, to gain new insights into the crisis achieving longer, rather than shorter term solutions.

## **SYSTEMS THINKING ACTION STEPS AND STAGES FOR GENERATING SOLUTIONS**

In this section, we describe ST action steps and stages (see Stroh, 2015) stakeholders can use to analyze, innovate, and improve results based on their unique SET workforce needs. These action steps and related stages have the potential to offer stakeholders not only greater understanding of the complexities in the SET workforce crisis but also how to intervene effectively.

### **Action Step 1: Understand the "Big Picture"**

To understand the "big picture" (Stroh, 2015), stakeholders should use current specific SET workforce data related to their program(s) or district(s). For example, if SET faculty from several geographically connected universities are working to address the SET crisis, they should join with districts in their region to collect and analyze personnel data—allowing them to understand the nature of shortages in their area. As they examine data, stakeholders may find a surplus of certified SETs, who either separated prematurely from the workforce, or never entered it. Rather than solely recruit a new supply of SETs, these stakeholders should make efforts to understand this reserve pool and consider incentives to hire them for full or part-time work.

### **Action Step 2: Increase Awareness of and Foster Shared Responsibility for the Crisis**

One of the tenants of ST centers on optimizing the relationships between the parts of the system(s) (Meadows, 2008; Stroh, 2015). Neither SET university nor district personnel are solely responsible for the workforce crisis, so neither can solve the crisis alone. Through this partnership approach, diverse stakeholders can cooperate, rather than compete, to achieve better short and long-term results. Drawing on Action Step 1, diverse stakeholders can combine their recruitment efforts by jointly identifying and targeting workforce surplus supply.

### **Action Step 3: Take a Deeper Dive to Influence the Whole System**

Although the first two steps matter, they are insufficient to change the entire system and yield better results (Stroh, 2015). According to Stroh (2015), when

**TABLE 1:** Systems Thinking Analysis of SET Education Programs

<b>STAGE 1</b> <i>Establish readiness for change</i>	<b>STAGE 2</b> <i>Face existing realities</i>	<b>STAGE 3</b> <i>Commit to change</i>	<b>STAGE 4</b> <i>Bridge gap for better outcomes</i>
System Issue	Past /Present Solutions	Barriers that May Limit Success	Possible Solutions to Consider
Decreases in Federal SET personnel development funds	Recruit and support SET preparation with state funds (Espinoza et al., 2018)  Continue educating policy makers about the importance of fully funding IDEA.	May have reduced state funds due to pandemic related or other costs	Apply to alternative funding sources (e.g., private foundations, corporate sponsorships)  Offer service scholarships, loan forgiveness (Espinoza et al., 2018)
Declines in SET enrollment in preparation programs	Recruit teachers from other disciplines in higher education  Recruit targeted groups with paid internships (Owings et al., 2011)	Insufficient numbers of individuals interested in becoming SETs in U.S.	Consider international direct hires (Heubeck, 2022)  Develop agreements for free community college credits/degrees.
Time for traditional SET preparation	Offering Alternative Certification options (Aragon, 2016; Robertson & Singleton, 2010)	Alternatively prepared teachers more likely to leave (Redding & Smith, 2016)	Provide more intensive induction and mentoring support for underqualified SETs
Specific SET shortage areas	Offering cohort programs to fill targeted areas (Haines et al., 2017)  Recruit paraprofessionals, substitute teachers, or high school students in grow your own program (Sutcher et al., 2016; Swanson, 2011)	Insufficient numbers of individuals interested in becoming SETs	Determine specific numbers of teachers needed to teach students in specific exceptionalities.  Identify adults from foster care system as they have college support and understand diversity of issues (Steele, 2018).  Consider online games for recruitment; used in STEM to recruit students (Boyington, 2018)
Inadequate clinical experience	Enhance clinical experiences by determining the scope, selecting priority activities, identifying products/outcomes, assessing outcomes, and providing ongoing feedback (Nagro & deBettencourt, 2017)	Limited access to clinical sites and/or inadequate supply of supervisors, mentors, coaches	Use technology to increase supervision, mentoring, and coaching, during coursework and clinical experiences (Dieker et al., 2014; Horn & Rock, 2022)

**TABLE 2:** Systems Thinking Analysis for School District Personnel

<b>STAGE 1</b> <i>Establish readiness for change</i>	<b>STAGE 2</b> <i>Face existing realities</i>	<b>STAGE 3</b> <i>Commit to change</i>	<b>STAGE 4</b> <i>Bridge gap and yield better outcomes</i>
System Issue	Past/Present Solution	Barriers Limiting Success	Alternatives to Consider
Inadequate salary	Provide financial incentives through targeted or forgivable loans (Feng & Sass, 2018; Sutcher et al., 2016)	Limited fiscal resources at district, state, and/or national levels.	Apply for grants to increase SET salary, signing bonuses, and/or offer additional compensation for other roles (Espinoza et al., 2018).  Consider pay for teachers higher than administrative positions (see Schumann, 2018).  Using artificial intelligence to automate some of the routine tasks to reduce the overall SET workload
Low status	Business as usual (i.e., doing nothing to elevate the status of SETs).	Low SET status remains unchanged.	Engaging in marketing through those in the profession who are viewed as “positive” ambassadors.  Partnering with public television station to create a Teaching Network Channel (like the Food Channel (Terenizo, 2015).
Inadequate preparation	Fostering partnership programs between universities and schools (Aragon, 2016; Brownell & Sindelar, 2016)  Providing residency models (Guha et al. 2017)	Partnerships are often fraught with conflict Residency models may provide SET candidates with insufficient preparation	Increasing technology enabled opportunities for practice-based SET professional development (e.g., TeachLivE [Dieker et al., 2014], Real-time, In Ear Coaching [Rock et al., 2014], Video Coaching [Coogle et al., 2017])
Poor working conditions	Producing SET survival books and guides and “stress busting” strategies (Martin & Hauth, 2015).	May result in victim blaming and limit improvement in working conditions.	Partnering with district and national teacher unions to advocate for improved conditions. Providing leadership development about supporting SETs and improving working conditions (Billingsley et al., 2020).  Employing teams of professionals to create support networks (Wyte-Lake et al., 2013). Using Glassdoor. com to improve working situation (Rock & Billingsley, 2015).
Lack of supportive leadership preparation	Providing principals/leaders with preparation about disability, special education, and supporting SETs.	Lack of preparation in general and tends to focus on legal aspects of special education	Facilitate collective responsibility for students with disabilities across the school (Billingsley et al., 2020).

diverse stakeholders take deeper dives into the system(s), they do so to identify and understand the parts of the system, the connections between the parts, how the system has functioned and is currently functioning, allowing them to identify modifications that might yield better results. Thus, diverse stakeholders ST efforts can be guided by using Stroh's (2015) four-stage framework.

### **Stage 1**

Building the foundation for change begins when diverse stakeholders convene and acknowledge the SET workforce related issues each faces as well as what they want to change. However, cultivating collective readiness for change involves preparing stakeholders to use ST processes while engaging in difficult conversations.

### **Stage 2**

Facing existing realities requires understanding and acceptance of the problem (Stroh, 2015). For example, SETs and district personnel may recognize that under-preparing SETs is a problem that contributes to their departure from the workforce and adversely impacts educational outcomes for students with disabilities. This insight may lead the stakeholders to realize that when attempting to recruit individuals from the SET reserve pool, they need to consider how to address this underlying (and known) issue (e.g., under or outdated preparation). Also, the stakeholders might need to acknowledge they harbor different views about what SET knowledge, skills, and dispositions SETs need. This understanding and acceptance leads stakeholders to Stage 3.

### **Stage 3**

Committing to change involves making an explicit choice (Stroh, 2015). After SET faculty and district personnel have established readiness and identified

the current realities, they continue moving forward by committing to change. At this stage, the realization of what needs to change to achieve key outcomes occurs when stakeholders acknowledge the costs of the status quo, the costs and benefits associated with changing and not changing, and the solutions and trade-offs needed for both. This stage is often considered a crucial turning point. For example, when SET faculty and district personnel realize their separate attempts, producing short-term results only allow them to cope with the SET workforce crisis, rather than ending it; they may be more likely to commit to a collective approach to change.

### **Stage 4**

Bridging the gap between the undesired and desired outcome(s) takes place when diverse stakeholders move from understanding and affirming to acting (Stroh, 2015). When applied to the SET workforce crisis, stakeholders not only engage in joint recruitment efforts, which target individuals in the workforce pool, but also address the problem of under-preparation through collaborative approaches that offer low-cost certificate/licensure options, employment incentives (increased remuneration), improved working conditions, innovative approaches (e.g., job sharing), and opportunities for SET leadership. Stakeholders also engage in continuous ST improvement by jointly monitoring and adjusting their approaches regularly (e.g., quarterly, rather than annually).

## **SPECIAL EDUCATION TEACHER PREPARATION: SYSTEMS THINKING IN THE REAL WORLD**

In this example, we describe how faculty at the University of Central Florida relaunched a previously discontinued SET preparation program using the four-

stage ST process.

**Stage 1.** Establishing a readiness for change was a foregone conclusion this university faced with a decision of whether to completely discontinue its undergraduate teacher preparation program in 2016, or to focus on resurrecting it. Under-enrollment and lack of faculty led the program faculty to temporarily suspend the program years earlier, and by 2016 the final student graduated. Local school districts were in a crisis with unfilled special education positions, so in response to local need the faculty members committed to focusing on relaunching the program in 2017, with a change-model approach in mind in partnership with several Central Florida local school districts.

Using a popular change model from the field of business, the program coordinator and doctoral students used principles from Kotter's 8 step change model as the framework (Hines et al., 2022). The first step of the model, establishing a sense of urgency, is an obvious need in special education as SET positions are left unfilled by qualified teachers. Communicating this urgency to the College and university provided a way to promote change to existing systems as quickly as possible and cleared the path to building a more accessible and attractive undergraduate program which was key to this successful relaunch.

**Stage 2.** The "existing realities" to navigate in attempting to implement change began with a close examination of how and why the program was structured in its original form, state requirements impacting program design, and existing college and program area policies that hindered recruitment and retention of students. Some realities hindering recruitment were quickly identified: (a) course scheduling hindered working in schools and taking classes, (b) internship requirements created an economic inequity as some students could not afford

to quit working to fulfill the 40-hour per week requirements, (c) program admission requirements created a bottleneck and frustration for students, and (d) an increasingly online experience threatened the development of collaboration skills critical for teachers.

Given that new SETs with substantial field experiences are significantly more likely to stay (Connelly & Graham, 2009), enhancing these experiences became a cornerstone of the program relaunch. A teaching residency was created with partnering school districts to address the issue of teachers leaving the field due to feeling underprepared for the challenges they experience in the classroom (Headden, 2014). The program allowed students to find (or keep) positions as assistants in special education classrooms to complete two semesters of internship. Rather than creating a “paid internship”, the model allows for internships to be layered over the job. Students fulfilled the job requirements of the school’s position and completed coursework online or in seminars after work hours. Doctoral scholars were prepared and used a coaching model to support undergraduate students during these internships through weekly online discussions and goal-setting sessions. Changing the practice of clinical experiences and determining modifications that might yield better results was no small task. Gaining “buy-in” from colleagues willing to consider new paths forward was critical to the momentum for change.

**Stage 3.** Committing to change involved not only commitment from university stakeholders but also community partners. Understanding that School-University partnerships allowed districts to play a direct and productive role in preparing their teachers while allowing them to fill vacancies with teachers who were better prepared, more diverse, and more likely to stay

(Guha et al., 2017); thus, the program was committed to strengthening these partnerships. In one large district, for example, a long-standing MOU was changed to include language supporting the completion of university internships while on-the-job as paraprofessionals and teaching assistants. Other local districts followed suit and examined their MOUs with the university to find places to support students interested in the profession.

Another area of examination and change included program admission requirements. At the time the program was relaunched, test requirements were a barrier for students to enter the major. A system was put in place to allow provisional admission and support for test preparation so students could begin coursework rather than facing unnecessary delays. While investigating the need for program changes it was also determined that not all students interested in working with students with disabilities wanted to work in traditional classrooms. A separate track, a partnership with communication disorders, was created for students to work in other settings (Hines et al., 2023).

**Stage 4.** Bridging the gap between the undesired and desired outcome(s) is occurring at the time of this article is being written. The number of teachers in the program and entering the districts continues to grow but an unintended outcome is that more students are enrolling in the special education major, but not seeking to complete the teaching licensure requirements. Thus, some of the ST that needs to continue lies beyond the teacher preparation program and even the districts involved. The next level of ST that needs to occur involves a need for national, state, and local messaging about the state of teaching and the work conditions for the SET workforce to further impact both the undesired and desired outcomes of this project.

## EXPLORING INNOVATIVE WORKFORCE SOLUTIONS TO STRENGTHEN SYSTEMS THINKING

In this section, we provide short summaries of ideas from other fields to offer additional examples of solution-centered, innovative workforce approaches aimed at reducing shortages. The ideas are presented with notations of how they might be employed or have been employed in universities and/or districts. Although these ideas are not yet research-based approaches to SET workforce recruitment, preparation, and retention, they are worth considering and evaluating throughout Stroh’s (2015) recommended four-stage ST process.

### Supporting Mental Health

Companies such as, LinkedIn, Starbucks, Bumble, and Mozilla provide employees with mental health days (paid or unpaid) to focus on their well-being. The purpose of mental health days is to support employee’s productivity and retention by encouraging self-care. LinkedIn found success in providing all employees with one paid week off to enhance mental health and to cope with burnout. Fidelity Investments took a different, preventative approach and extended the time off for holidays by three days. SET preparation program faculty and school district personnel could consider similar health and wellness approaches by offering mental health days (proactively and reactively) that support workforce preparation and retention.

Nurses deal with high levels of loss of life in their work, thus “Death Cafés” have been used as a form of debriefing (Bateman et al., 2020). These cafes used internationally, guide informal discussion on topics of death, loss, secondary trauma, and illness. Healthcare workers, particularly within the ICU reflect on distressing events and develop a sense of

community and support among coworkers to prevent burnout. Similar types of stress cafés could be created to help pre- and in-service SETs talk virtually about challenges with others (e.g., behavior).

In a systematic review, Tolksdorf et al. (2022) found combat fatigue in Intensive Care Units was reduced when employees' work settings promoted higher levels of autonomy, decreased job overload, ensured employee safety, reduced exposure to violence, and decreased working hours. SET preparation program faculty and school district personnel could consider similar approaches for reducing SET fatigue. Some have attempted to do so by providing longer breaks, mindfulness kits, emotional support and breaks after a crisis, or by offering incentives, such as onsite daycare, free car washes, massages, therapy dogs, or even pet daycare. However, little is known about the extent to which these approaches are used and whether they have been studied systematically. We suggest funding to consider interventions that improve working conditions and supports to address SET teacher preparation, retention, and recruitment. Like the "What Works Clearing House," a national database could support the development of a knowledge base and the identification of approaches that could be used within an ST approach.

### **Matching Needs to Shortages**

The vocational rehabilitation (VR) system also faced shortages of qualified rehabilitation professionals (Smith et al., 2020). To address this need, one university implemented a five-year training program with the goal of increasing the skills of VR counselors to effectively meet the needs of persons with disabilities. Unique features of this program included customized employment strategies such as personalizing the employment relationship between job seekers and employers by matching

interests or talents. Additionally, the university offered a scholarship opportunity with a service payback requirement which received a high level of successful placement within the field. Smith and colleagues (2020) found that financial incentives, mentorship, networking, and professional learning opportunities paired with careful selection of scholars whose career interests matched the intent of the program led to an increase in the number of students pursuing a master's degree in vocational rehabilitation. This same type of model often is aligned with Office of Special Education Programs 84.325K grants, but how this might be sustained in partnership with district, state, and federal resources is a pathway for SET educators to consider.

### **Global Application**

Outside of education, countries worldwide are taking novel steps to address worker shortages. In Germany, companies facing labor shortages tend to respond with more training for low-skilled workers (Wotschack, 2020). The practice of using 'voice', or incorporating employee training interests or preferences, was found to increase participation in these trainings particularly when organizations have formalized HR practices and structures supporting employee representation (Wotschack, 2020). Meanwhile, in the face of IT shortages, cyber security, and other technology-related fields, the European Union (EU) recommends enterprises to ensure their current technology professionals remain up to date on skills and acquire proper or new certifications to meet the demands of the evolving field (van der Linden et al., 2019). Additionally, the EU recommended embedding industry expertise in courses and having businesses offer certifications or collaborate with others on the development of courses or certifications (van der Linden et al., 2019).

How might a similar approach in teacher preparation, through associations like the Council for Exceptional Children, with the Teacher Education Division combined with the Division of International Special Education (and other professional organizations), be used to strengthen ST and address SET recruitment, preparation, and retention shortages globally?

## **SPOTLIGHT ON SYSTEMS THINKING FOR BOLSTERING RECRUITMENT AND ELEVATING PROFESSIONAL STATUS**

SET faculty and school district personnel also may use the ideas offered below as a basis for how ST might be employed to bolster recruitment and elevate professional status. These ideas are intended to be generative and are worth considering and evaluating throughout Stroh's (2015) recommended four-stage ST process.

- Realign and clarify workforce, including rehiring, retooling, recycling, and continued use of those who could or will retire. Finding short-term ways to keep retirees as reading or mathematics coaches or as first year mentors for even one day a week was a successful approach by one large urban district.

- Offer scholarships, in addition to or instead of TEACH grants, to recruit for high-need schools. Universities have coordinated scholarships across organizations into a single database to recruit teachers at the university aligned with getting the district leaders to provide "paid" student teaching internships while others have harnessed foundation and Title 1 funding to provide richer financial support for teachers (Dieker et al., 2021; Scott et al., 2006).

- Employ teams of professionals to create support networks (Wyte-Lake et al., 2013). One university hired clusters of faculty members to address targeted areas of needs instead of the traditional

approach of hiring in a department one at a time.

- Identify “positive” ambassadors to shift workforce recruitment and retention. One district had celebrities talk about their favorite teachers while another had weekly promotions from diverse teachers sharing positive experiences. The current narrative in SET cannot change without directing a new narrative.

- Increase economic support. Some districts are offering signing bonuses for schools with extreme and persistent shortages. A master’s cohort in these same sites are using Title I, scholarship, and endowment funds to ensure SETs move up the pay scale, with efforts to create a strong cohort of leaders in these schools. From the over 100 teacher leaders funded to date, over 75 remained in the same schools and placements 5 years later (Dieker et al., 2021). Offer apprenticeships and ensure the new employees have the most enticing jobs (Kolding et al., 2018), or encourage paid internships. In the previous real world example illustrating Stroh’s recommended four stage ST approach in SET preparation, the ST team led by Hines and colleagues (2022) at the large urban university increased undergraduate enrollment from 0 to 100 in a year.

## CONCLUSIONS

Special education teacher shortages continue to be chronic and pervasive, interfering with the provision of a free and appropriate education to students with disabilities (National Academies of Sciences, Engineering, and Medicine, 2020). We realize fully this longstanding problem will not be remedied quickly. However, we believe the collective power of key stakeholders in special education, policy, leadership, and practice can come together in unprecedented ways to no longer talk about shortages but to turn work towards producing timely, innova-

tive workforce research and solutions. Toward this end, we encourage stakeholders to explore what a ST framework offers and how it might inform a new research agenda centered on interventions to improve teacher recruitment, preparation, retention, and effectiveness. The special education workforce and the students with disabilities and families they serve deserve no less.

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*Marcia L. Rock, Ph.D. is a Professor in the Department of Specialized Education Services and Graduate Studies Director as well as Ph.D. Program Director, at the University of North Carolina Greensboro. Dr. Rock's research interests include pre- and in-service teacher development, technology enabled coaching, workforce systems thinking and change, research practice partnerships, inclusive and special education, behavioral, social, emotional support and learning.*

### **Lisa Dieker, Ph.D.**

*Lisa Dieker, Ph.D. is a Pegasus Professor and Lockheed Martin Eminent Scholars in the College of Community Innovation and Education at University of Central Florida (UCF). She serves as the Director of the UCF/Lockheed Martin Mathematics and Science Academy, Program Coordinator for the Ph.D. program in special education, and Co-Director of the UCF Center for Research in Education Simulation Technology (CREST). Her research focuses on harnessing the power of teachers working across disciplines in inclusive settings in teacher education, special education, and simulation.*

### **Rebecca Hines, Ph.D.**

*Rebecca Hines, Ph.D. is an Associate Professor at the University of Central Florida and is the Principal Investigator on two Office of Special Education personnel preparation grants and is a Co-PI on a Stepping Up with Technology grant, RAISE: Robots and Artificial Intelligence to Improve Social Skills for Elementary Students. She currently oversees the undergraduate exceptional student education program in the College of Community Innovation and Education at UCF, and created the new Exceptional Student Education Learning and Language track to provide more opportunities for students interested in working with students with disabilities. Her research interests include working with students with emotional/behavioral disorders, inclusion, and technology integration.*

### **Bonnie Billingsley, Ph.D.**

*Bonnie Billingsley, Ph.D. is a professor at Virginia Tech and a faculty member in the School of Education in Blacksburg, Virginia. She is a former special education teacher and administrator and has taught in leadership and teacher education programs at the graduate level. She has authored numerous articles, chapters, as well as books on topics related to teacher induction, retention, working conditions, and principal leadership for inclusive schools. She has collaborated about special education leadership and teacher development with numerous universities, State Departments of Education, and research centers over the past 30 years.*

### **Timara Davis, Ph.D.**

*Timara Davis, Ph.D. is a Researcher at the American Institutes for Research (AIR). Davis is an experienced educator teaching at the elementary level and in higher education. Her research interests include teacher preparation and professional development for general education teachers in inclusive settings and the retention of teachers, with a particular focus on high needs populations.*

### **Sacha Cartagena, Ph.D.**

*Sacha Cartagena, Ph.D. is a Researcher in the Learning Supports program at the American Institutes for Research (AIR). Dr. Cartagena provides state and local education agencies with professional development, coaching, micro-credential development, and research services on topics related to high-quality, inclusive educational programming and meeting intensive, individualized learning needs, especially for students with disabilities. Additionally, Dr. Cartagena serves as the learning management system (LMS) coordinator for the PROGRESS Center, a national center funded by the Office of Special Education and Programs (OSEP) of the U.S. Department of Education. Currently, Dr. Cartagena serves on the Board of Directors for the Council for Exceptional Children.*

### **Amanda Lannan, Ph.D.**

*Amanda Lannan, Ph.D. Dr. Amanda Lannan is an assistant professor in the visually impaired, teacher preparation program at the University of Kentucky. She has extensive experience as a teacher of the visually impaired, special educator, and general education teacher. Dr. Lannan's research is focused on increasing equitable access to high quality mathematics instruction for students with disabilities. She specializes in the use of assistive technology and tactile learning to teach STEM content to students with visual impairments. She is a strong advocate for equal access with hope of increasing expectations and improving accessibility for individuals with disabilities.*

### **Annette Romualdo, Ph.D.**

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