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Exploring Preservice Teachers' Affective Response to Disruptive Student Behavior in an Immersive Simulation Classroom

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EXPLORING PRESERVICE TEACHERS' AFFECTIVE RESPONSE TO DISRUPTIVE STUDENT BEHAVIOR IN AN IMMERSIVE SIMULATION CLASSROOM

by

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ABSTRACT

This mixed methods study investigated changes in preservice teachers' affective response to disruptive student behavior within the TeachLivE™, immersive simulation classroom. Preservice teachers completed two simulation teaching sessions, during which they were exposed to five different disruptive student behavior events in each. All teaching sessions were recorded and post-processed using iMotions Affectiva Affdex software to collect data on preservice teachers' emotion expression and valence during their teaching experiences. At the end of each teaching session, participants completed a self-report survey on their level of stress. Simulated teaching sessions were followed-up with video stimulated recall sessions where participants reflected on their feelings during the simulation. The goal of this research was to examine changes in preservice teachers' affective response to stress, with repeated exposure to disruptive student behavior, to determine if it had a "desensitization" effect, potentially increasing emotional regulation ability and decreasing negative emotional responses.

Descriptive statistics were used to examine differences in emotional valence by disruptive student events and teaching sessions. Paired samples t-tests were conducted to examine if mean differences existed in self-reported stress within and between teaching sessions. Additional qualitative analysis of video stimulated recall sessions was conducted using thematic analysis. Analysis revealed minimal difference in preservice teachers' positive or negative emotional valence in response to disruptive student behavior events within and between teaching sessions. There was a statistically significant change in self-reported stress from the first simulated teaching session to the second. Analysis of video stimulated recall reflections revealed themes of cognitive dissonance, behavior-induced stress, and difficulty with virtual behavior management.

This is dedicated to my daughters, Nadia and Ellie, for your unconditional love, encouraging words, understanding, and walks on the beach when I needed them most. I love you and thank you for always being supportive of me on this journey. You are my rocks! <3

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AACTE: American Association of Colleges of Teacher Education

ANOVA: Analysis of Variance

AR: Affective Response

ASD: Autism Spectrum Disorder

AU: Action Units

CD: Cognitive Dissonance

DV: Dependent Variable

EASI: Emotions as Social Information

EE: Emotional Exhaustion

EPP: Educator Preparation Program

ER: Emotion Regulation

IRB: Institutional Review Board

IV: Independent Variable

PDK: Phi Delta Kappan

SIT: Stress Inoculation Training

TLE: TeachLivE™

UCF: University of Central Florida

VSR: Video Stimulated Recall

CHAPTER ONE: INTRODUCTION

Statement of the Problem

Teaching is characterized by high levels of stress and exhaustion compared to other professions (Carlyle & Woods, 2002; Chang, 2013; Maslach et al., 2001), and teacher turnover costs the United States over $8 billion dollars annually. Teacher replacement costs range from $9,000 in rural districts to more than $20,000 in urban districts, negatively impacting school stability, class sizes, course offerings, student learning, and the labor market (Carver-Thomas & Darling-Hammond, 2017). The Learning Policy Institute (2017) reported six of ten new teachers hired are replacing those who left the classroom before retirement. Similarly, the American Association of Colleges of Teacher Education (AACTE, 2018) reported almost half of college graduates who become teachers leave the profession within a few years. The U.S. Department of Education, National Center on Education Statistics reported, of the 3,377,900 public school teachers who were teaching during the 2011-12 school year, 8% moved to a different school, and 8% left the profession (Goldring et al., 2014). This equates to an approximately 16% turnover rate due to teachers changing schools or completely leaving the profession. Overall, approximately 90% of the nationwide annual demand for teachers is created when teachers leave the profession (Carver-Thomas & Darling-Hammond, 2017).

One key variable driving turnover is teacher burnout (Rumschlag, 2017). Burnout can be described as emotional exhaustion, depersonalization, and reduced feelings of personal accomplishment resulting from occupational stress (Maslach et al., 1996). In the 51st Annual PDK Poll report, *Frustration in the Schools: Teachers Speak out on Pay, Funding, and Feeling Valued* (2019), half of teachers say they have seriously considered leaving the profession in recent years, with 19% citing “stress/pressure/burnout” as the reason - only second to concerns

about pay and benefits. Stress and teacher burnout has been directly related to poor management of student discipline problems (Podolsky et al., 2017), with disruptive student behavior identified as the most frequently cited source of novice teacher stress (Chang, 2013; Dicke et al., 2015). As teachers experience increased levels of stress, their self-efficacy, motivation, and effort decreases (Yu et al., 2015), and emotional exhaustion, which is a significant predictor of teacher turnover, increases (Tsouloupas et al., 2010).

Emotions and stress are two of the psychological states that comprise affect; mood is the third (Gross, 2015). Stress is an affective psychological state defined as mental or emotional strain resulting from adverse or demanding physical, mental, or emotional circumstances (Balakrishnan et al., 2017; Gross, 2015; Pediaditis et al., 2015). Stress responses typically refer to negative affective states due to an inability to manage or resolve situational demands (Gross, 2015); emotions refer to more specific positive and negative affective states that unfold over time; moods refer to emotions sustained over a period of time (Gross, 2015). Based on Gross' Modal Model of Emotion (2015), contextually-based evaluations give rise to changes in experiential, behavioral, and physiological response systems that characterize emotion.

Based on the transactional model of stress, developed by cognitive psychologist Richard Lazarus, stress is defined as psychological strain resulting from a dynamic and bidirectional transaction between the individual and the environment that is cognitively mediated by individual appraisals of the relationship between them and the circumstances of their environment (Lazarus & Folkman, 1984; Meichenbaum, 1985; Meichenbaum, 2017; Robinson, 2018). From the transactional perspective, cognitive appraisal and emotions are key factors impacting psychological stress (Lazarus & Folkman, 1984; Lobel & Dunkel-schetter, 1990; Robinson, 2018). As such, an individual's appraisal of events, individual coping resources and

options, play a critical role in the determination and nature of stress, and their emotional reactions to stress (Meichenbaum, 1985).

Emotions are complex cognitive structures intimately linked to stress (Caryle & Woods, 2002). Emotions prepare us to make decisions and act. Scanning and appraising circumstances in our environment elicits emotions, which motivate behavior (Matsumoto et al., 2013). Emotions are an integral part of education, which until recent years, were often neglected in educational reform efforts (Hargreaves, 2000). The classroom is an emotionally rich environment where teachers and students experience myriad of emotions and engage in behaviors motivated by emotions (Taxer & Gross, 2018). The emotions teachers express in the classroom have important effects on their students. Not only must teachers have the ability to support students' emotion regulation, they must also have the ability to regulate their own emotions and emotion expression (Becker et al., 2014; Jiang et al., 2016).

Effective teachers charged with positive emotions connect better with their students (Carlyle & Woods, 2002); whereas, teachers who are experiencing negative emotions related to stress and burnout are likely to experience poor quality student interactions (Rumschlag, 2017). Becker et al. (2014) examined the strength of the relationship between teachers' emotions, their instructional behavior, and students' emotions, and found teachers' emotions were significantly related to students' emotions across content areas. Given the susceptibility to emotion contagion in the classroom, and the impact of emotions on verbal and nonverbal behaviors, teacher leaders may need to begin recognizing the importance of teachers' emotion regulation and expression and the potential to enhance or diminish student learning and behavior in the classroom.

Despite behavior reduction strategies being identified as some of the most important skills for preservice teachers to learn (Simonsen et al., 2008; Oliver & Reschly, 2010), and

teachers reporting regulating emotions in response to student misbehavior more than any other classroom situation (Taxer & Gross, 2018), new teachers report their teacher preparation programs failed to properly prepare them to manage disruptive behavior (Freeman et al., 2014; Flower et al., 2017). New approaches to teacher preparation, related to behavior management, are critical given student learning outcomes are connected to a teachers' ability to manage difficult behavior in the classroom (Gage et al., 2018) and given the effect of teachers' negative emotions related to stress on student emotions.

The National Council on Teacher Quality report (2014), *Training Our Teachers: Classroom Management*, documents the absence of cohesive instruction in classroom management strategies along with opportunities to practice techniques in teacher preparation programs. As such, it is imperative teacher preparation programs address this deficit by focusing on implementation of better instructional methods to prepare preservice teachers with the knowledge and emotional stamina to confidently and effectively address challenging classroom behaviors (Greenberg et al., 2014). One such approach to address this need, as recommended by Greenberg et al., (2014), is adoption of instruction in behavior management through simulation experiences.

A growing body of research increasingly supports the use of simulations in teacher preparation programs to effectively shape pre-service teachers' practice (Dieker et al., 2014). Simulations allow individuals to experience high stakes situations without risking the loss of money or time, and without personal risk to people (Dieker et al., 2014a). TeachLivE™ (TLE) is one such simulation environment using mixed reality to give users a sense of immersion and presence, where trained human actors, called interactors, control virtual students for an authentic and immersive experience (Dieker et al., 2014a). Previous research indicates five minutes in the

simulation classroom is equivalent to a 30-minute in-person interaction, in terms of emotional toll on a participant (Alexander, Brunyé, Sidman, & Weil, 2005; Dieker et al., 2008). Additionally, four 10-minute classroom simulator sessions improved targeted teaching behaviors in the simulator that also generalized to the classroom (Dieker et al., 2014b). As such, the use of TeachLivE™ for preservice teachers to practice managing their affective response to disruptive student behavior may decrease future susceptibility to stress and burnout while enhancing their emotional regulation skills and ability.

Purpose of the Study

The present study aimed to examine the effect of repeated exposure to stress-inducing teaching events, involving disruptive student behavior, in a simulation classroom on preservice teachers' affective response as measured by facial expression of emotions, self-report stress measures, and video stimulated recall reflections. Understanding the relationship between stress and emotion expression in preservice teachers can provide a standard for investigating emotion regulation, and the incongruence often found between teachers' feelings of stress and their emotion expression, often the result of expressive suppression of emotions. With almost half of new college graduates leaving the teaching profession within a few years (AACTE, 2018), new teachers report being underprepared in the area of behavior management (Abebe & HaileMariam, 2011), increasing susceptibility to emotional exhaustion during the first years of teaching (Voss, et al., 2017). New methods for preparing teachers for stress-inducing behavior problems not replicable in the traditional teacher preparation setting are needed.

Elliott and Eisdorfer (1982) identified four types of stressful events: (1) acute time-limited stressors, such as medical or dental procedures; (2) a sequence of stressful events as a result of a larger traumatic event such as a natural disaster, or major transitional event such as the

death of a loved one; (3) chronic intermittent stressors such as repeated exposure to competitive performance for athletes, or job performance evaluations; and (4) chronic continual stressors such as long-term illness or disabilities resulting from a traumatic event, or exposure to long-term, persistent, occupational stress, often experienced by law enforcement, nurses, and teachers (Meichenbaum, 2017).

Desensitization has been used to prepare professionals in a variety of fields. Stress Inoculation Training (SIT), for example, is an evidence-based, cognitive-behavioral intervention developed by Donald Meichenbaum at the University of Waterloo based on the transaction model of stress (Meichenbaum, 1985; Meichenbaum & Deffenbacher, 1988; Meichenbaum, 2017). Like biological inoculation, which exposes individuals to weak forms of a disease to build tolerance and prevent more severe reactions in the event of full strength exposure to the disease, SIT exposes individuals to graduated levels of potential real life psychological stressors in a controlled environment. The intent is to desensitize individuals to exposure to those stressors in real world situations, thus decreasing the probability of negative physiological and emotional reactions (Meichenbaum, D., 2017; Meichenbaum & Deffenbacher, 1988; Weller, 2013; Prachyabrued et al., 2019; Serino et al., 2014). The goal of SIT is to help individuals develop new schemas by allowing them to experience stressful cues, while interrupting and changing maladaptive stress-induced behavioral patterns (Meichenbaum, 1985; Meichenbaum, 2017).

Significance of the Study

Understanding changes in reported stress and emotion expression in preservice teachers, during repeated exposure to stressful events, in a simulated environment, has the potential to provide an innovative way to prepare preservice teachers with strong emotional regulation ability (ERA) prior to their first year teaching. This could build their competence to adaptively persist

through periods of cognitive disequilibrium and decrease their susceptibility to emotional exhaustion and burnout.

In conducting this study, the researcher attempted to: (a) reveal findings on the changes in preservice teachers' affective response to repeated exposure to stress-inducing events in a simulated classroom, with facial expression of emotions, and self-report measures of stress; (b) reveal findings on the emotional experience of preservice teachers after repeated exposure to stress-inducing events in a simulated classroom; and (c) contribute new literature on the use of desensitization principles in teacher preparation programs to train teachers for dealing with disruptive student behavior.

Operational Definitions

Affective state: Emotions; brief, intense, reactions brought to the forefront of cognizance and have significant physiological and behavioral manifestations, preparing the body for action (D'Mello & Graesser, 2012).

Burnout: A psychological syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment. These feelings can occur specifically with individuals working with other people in some capacity (Maslach et al., 2006).

Cognitive dissonance (or disequilibrium): The state that occurs when people face obstacles to goals, interruptions, contradictions, incongruities, anomalies, uncertainty, and salient contrasts (D'Mello & Graesser, 2012).

Emotions: A collection of psychological states that include subjective experience, expressive behavior (e.g., facial, bodily, verbal), and peripheral physiological responses (e.g., heart rate, respiration) (Gross & Feldman Barrett, 2011).

Emotion regulation: Efforts to influence emotions in ways we think will increase, decrease, or maintain an emotional response on the chance they will be helpful rather than harmful (Gross, 2015).

Expressive suppression: Ongoing efforts to inhibit one's emotion-expressive behavior (Gross, 2015).

Facial expression: Movements of the facial muscles supplied by the facial nerve that are attached and move facial skin, and are core indicators of underlying emotional states (iMotions, 2016).

iMotions Affectiva: Artificial emotional intelligence software that categorizes a user's emotional expression, emotional engagement, and overall valence through computer vision algorithms using identifying landmarks on the face such as corners of eyebrows or corners of mouth, and mapping facial expressions to emotions (iMotions, 2016).

Preservice teacher: A student in a teacher education program who is preparing to become a teacher, but does not yet teach independently in his or her own classroom (Hudson et al., 2019)

Stress: The psychological demand that can be defined as the problematic outcomes referred to as the cause of emotional distress, known as anxiety, depression, and psychosomatic complaints (Caryle & Woods, 2002).

Valence: the value associated with a stimulus as expressed on a continuum from attractive to aversive; one of two dimensions of emotion, with the other being arousal (American Psychological Association, 2020); a measure of how positive, negative or neutral an expression is, as coded by facial action units; overall negative valence codes being anger,

fear, sadness, disgust, and contempt and overall positive valence codes being joy/happiness. (iMotions, 2016).

Video stimulated recall: A research technique in which participants of a study view themselves on video, and share reflections on their thoughts, feelings, and actions while watching (Gazdag et al., 2019).

Theoretical Framework

Lazarus and Folkman's (1984) transactional model of stress and coping and Gross' process model of emotion regulation provide the theoretical underpinnings for this study. As seen in Figure 1, the transactional view of stress is characterized by the dynamic interaction of an individual and their environment mediated by cognitive appraisal processes that shape our experience. The transactional model of stress and coping is a system of appraisal, response, and adaptation to regulate emotions or alter circumstances causing the problem (Schmidt et al., 2010). According to this theory, a stress response occurs as a result of cognitive appraisal occurring at two levels: a primary level during which an event is perceived as a threat to personal goals, and a secondary level when an individual feels insufficient resources to overcome the stressor.

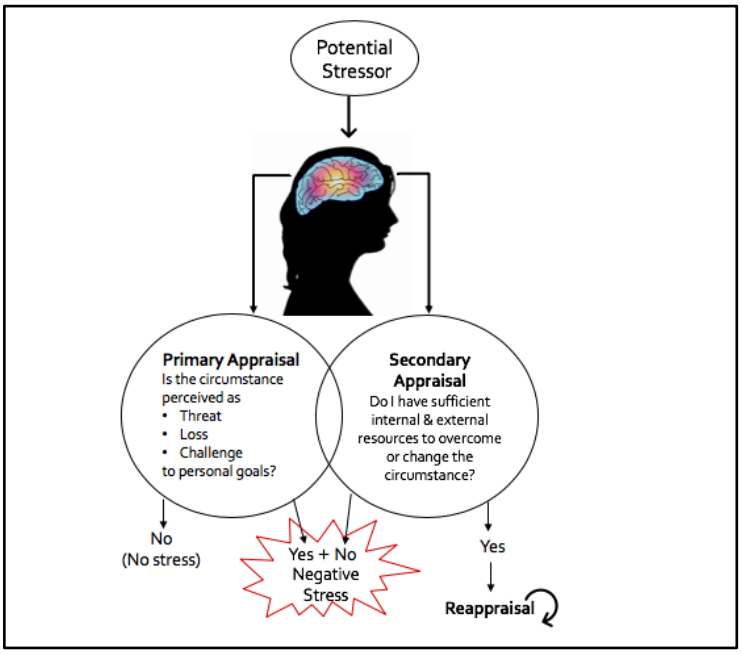

Figure 1: Transactional Model of Stress and Coping

Note. This figure was adapted from Lazarus & Folkman (1984).

Gross' process model of emotion regulation, as seen in Figure 2, is intimately aligned with the transactional model of stress and coping. Gross' process model of emotion regulation, also based on cognitive-appraisal processes, looks more deeply at the emotional regulation choices people can make at different points in the emotion-generative process (Gross, 2015). Emotion regulation occurs when a valuation occurring at the secondary level at takes on a first-level valuation system, activating action impulses (Gross, 2015). This model distinguishes five sets of emotion regulation strategies: (1) situation selection which entails taking actions to approach or avoid situations; (2) situation modification which aims to directly alter circumstances; (3) attention deployment which involves redirecting one's attention within a situation; (4) cognitive change which refers to an individual's appraisal of an internal or external situation in an effort to alter its' emotional impact; and (5) response modulation refers to directly manipulating components of the emotional response (Gross, 2015).

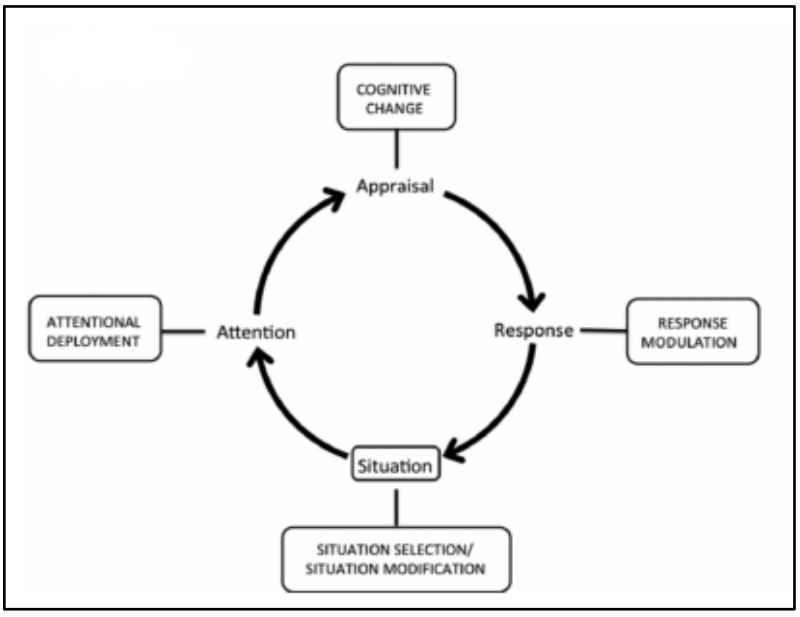

Figure 2: The Process Model of Emotion Regulation

Note. This figure (Gross, 2015) demonstrates the emotion regulation strategies at each phase of the emotion generative process.
Source: Gross, J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry,* 26, 1-26.

CHAPTER TWO:
LITERATURE REVIEW

Introduction

Teaching is a stressful profession characterized by elevated levels of emotional exhaustion and burnout (Chang, 2013; Fitchett et al., 2018; von der Embse et al., 2019). Stress, burnout, attrition, and an enduring negative affect have been associated with teachers' poor emotional regulation ability (Merida-Lopez et al., 2017; Montgomery & Rupp, 2005). Poor appraisal and self-regulation have been identified as two factors of emotional regulation that significantly predict burnout (Chan, 2006), and high levels of self-efficacy has been associated with effective emotion regulation strategies (Chan, 2004). As such, differences in ERA and self-efficacy may serve as contributors, increasing or decreasing a teachers' vulnerability to stress; therefore, interventions that target these constructs are needed to potentially guard teachers against the damaging effects of stress. Teacher stress results in a myriad of challenges for schools, including negative impacts on student success, absenteeism, attrition, and teacher decision-making (von der Embse et al., 2019). Despite entering the field with optimism about the nature of teaching, first-year teachers are not immune to the deleterious effects of teacher stress (Fitchett et al., 2018). Rumschlag (2017) reports 9.5% of education graduates discontinued their role as classroom teachers before they even completed their first year of teaching. Preservice teachers, who need to be equipped with the knowledge, skills, and dispositions to help them be successful in their first years of teaching (Darling-Hammond, 2003), often report leaving the field due to feeling underprepared and overwhelmed for the challenges they experience in the classroom (Headden, 2014).

Cognitive Dissonance/Disequilibrium

Preservice teachers enter teacher preparation with preconceived notions about teaching and students. This results in cognitive dissonance, and preservice teachers often feel unprepared for the realities of the classroom (Eisenhardt et al., 2012). Cognitive dissonance (CD) occurs when perception of an inconsistency in an individual's cognitions results in a psychologically aversive state (Festinger, 1957). Individuals are then motivated to alleviate this uncomfortable state. The decision-making in situations of conflicting motivations is a source of a variety of emotions, which can be positive or negative (Fontanari et al., 2012). Quick, "in-flight," decision-making is often a difficult skill to master for novice teachers who have not yet developed elaborate schema often seen in expert teachers who are constantly monitoring the classroom, appraising situations, recognizing potential problems, and making quick decisions to resolve them (Westerman, 1991; Wolff, van den Bogert et al., 2015).

In a nine-year longitudinal study investigating changes in teachers' beliefs over their teacher preparation program through in-service teaching, Wall (2018) found dissonant learning experiences promote transformative learning, development of teacher identity, and increased likelihood of perseverance in times of emotional turmoil. As such, the researcher suggests teacher preparation programs include experiences, assignments, and discourse to trigger cognitive dissonance in a supportive context. In addition to encouraging preservice teachers to question current conceptions, these experiences will also provide an opportunity for teacher educators to introduce new pedagogical methodologies, fostering deep learning (Wall, 2018).

In two studies, Cancino-Montecinos et al. (2018) investigated the relationship between emotions and attitude-change when experiencing cognitive dissonance. Based on Gross' process model of emotion regulation, researchers asked participants to appraise their emotions as positive

or negative, relative to their dissonant behavior, positing that initial appraisal of an aversive situation may result in positive emotions after reappraisal (Cancino-Montecinos et al., 2018). They found that negative emotions elicited during periods of cognitive dissonance were inversely related to attitude change, while positive emotions were positively related to attitude change, revealing important connections between emotions and attitude change and confirming the relevance of appraisal theories and emotion regulation to cognitive dissonance. Researchers argued the dissonance process is a complex cycle of cognitive reappraisals, eliciting emotions and attitude change, and as such, suggest the dissonance-reduction process itself is a form of emotion regulation.

In a qualitative examination of the impact structured field experiences had on preservice teachers' beliefs about students, and the impact of creating dissonance on their beliefs about, and future practice, of teaching; Eisenhardt et al. (2012) assigned preservice teachers with developing two case studies on students with learning and social-emotional needs different from their own. Findings revealed preservice teachers acquired knowledge and perspectives transcending previously held notions of diverse learners, and dissonance broadened their understanding of the range of students' needs and implications for learning.

When confronted with disruptive student behavior, teachers are required to make critical decisions directly impacting the welfare and safety of themselves, the disruptive student, and the other students in the classroom (Harris, n.d.). The cognitive and affective processes experienced by a teacher have the potential to hinder or enhance their ability to stay calm and diffuse a situation when disruptive behavior by students occurs. A teachers' ability to emotionally regulate during critical times of disruptive student behavior may impact his/her ability to reduce the related stress and potentially negative emotions (Gross & John, 2003). As such, teachers must

learn to monitor and quickly regulate their thoughts, feelings, and behaviors during disruptive student behavior because of the potentially harmful effects on their ability to successfully manage the student behavior and maintain safety and order in the classroom (Hargreaves, 2000).

Facial Expression of Emotion

Humans naturally experience emotions and perceive emotions in those around them (Feldman Barrett, 2012), and they have a significant effect on an individual's thoughts, decisions, and actions (Gross, 2015; Feldman Barrett, 2006). Theorists have long recognized that the study of facial expression of emotion is pertinent to exploring and understanding questions of human nature (Keltner & Ekman, 2000), and research has shown a substantial link between facial expression and markers of emotion (Cohn & De la Torre, 2015; Ekman, 1993; Ekman, 2004; Ekman & Friesen, 2003; El Kaliouby, 2005; Keltner & Ekman, 2000). Picard (1997) demonstrated that facial tracking can be used to increase our understanding of the mental state of the person whose face is being tracked. This work was extended by el Kaliouby & Robinson (2005) by developing a computational model for facial affect inference, using a real-time system, and concluded that it is more efficient to assess emotion over a 2-second window than by looking at a current frame.

Although emotions can be privately felt, they are often outwardly expressed (van Kleef, 2010). Facial expressions are an outward expression of an individual's internal affective state, as well as a social communication tool (Van Kleef, 2010). Facial expression is considered the most important nonverbal communication channel (Kortelainen et al., 2012). Van Kleef (2010) argues emotions serve social functions, have interpersonal consequences, and regulate social interaction by providing information to the people around us about our feelings, ambitions, and social goals. Individuals express emotions through facial expressions, voice, body posture, and word choice,

and emotional expressions inform the observers about an individual's appraisal of the situation (Van Kleef, 2010).

In addition to providing information about emotional state such as anger, contempt, disgust, fear, joy, sadness, or surprise, facial expressions can be used to detect stress and anxiety (Pediaditis et al., 2015; Zhang et al., 2019). Stress is a component affective state that shapes facial expressions (Mayo et al., 2018), and three facial expressions related to negative emotional stress include anger, sadness, and fear (Lerner et al., 2007; Zhang et al., 2019). Facial cues from the eyes and mouth, as well as head movements have been shown to achieve good accuracy as discriminative indicators of stress (Pediaditis et al., 2015). Facial displays of emotion provide a nonverbal objective indicator of the emotional experience of an individual by a stressor (Lerner et al., 2007).

Mehrabian (2006) defines nonverbal behavior as "actions as distinct from speech," and includes facial expressions, gestures, postures, positions, and body movements (p. 1). Consistent with Van Kleef's theory, Matsumoto et al. (2013) note nonverbal behavior is one way to communicate messages without the use of words, in the broader category of nonverbal communication. Teacher nonverbal communication - proximity, eye contact, body language, facial expression, and touching - is important in student interactions (Hansen, 2010).

Overall, nonverbal behaviors displayed in the classroom influence the perception students have of their teachers (Hansen, 2010). Research indicates between 65% and 93% of interaction between individuals, including students and teachers, is nonverbal, (Mehrabian, 2008), and emotions are associated with very specific facial expressions (Ekman, 1972). Incongruence between a teachers' verbal messages and nonverbal behaviors often results in students believing

what they see instead of what they hear, leading to communication breakdowns and increasing the likelihood of negative student behaviors (Hansen, 2010).

Facial Expression Analysis

iMotions facial analysis software has been used in a variety of fields, largely as one channel of multimodal data collection, including such things as eye tracking, galvanic skin response, and self-report measures. When researching individuals' affective state, regardless of industry, facial expression analysis was rarely found to be used unimodally. Given that human emotion is expressed in various channels, multimodal data increases accuracy. In business, facial expression analysis has been used to assess consumers' attitudes and trust with respect to advertising (Hamelin et al., 2020), including political advertising and how communication from political leaders influences voters' emotional responses (Ortigueira-Sánchez & Cárdenas-Egúsquiza, 2019); the impact of emotions on consumer taste preferences (Samant et al., 2017) and purchase behavior (Samant & Seo, 2020). Smith and Rose (2019) used iMotions to analyze the effects of emojis used in digital marketing messages on consumer emotions, and the degree to which emotion contagion had a positive effect on service provider and consumer relationships. Schulz et al. (2018) and Ausin et al. (2017) used data from facial expression analysis to examine the impact of product brand on consumer emotions. In addition to business, facial expression analysis has also been used in the health and medical fields to explore pain detection in children and adults (Xu et al., 2019; Xu & de Sa, n.d.); examine face perception in patients with Parkinson's disease (Ho et al., 2020); explore affect valuation of exercise (Brand & Ulrich, 2019); and exercise-induced feelings (Timme & Brand, 2020).

In education, iMotions facial analysis software has been used extensively as part of studies using multimodal data to examine students' affective state and engagement when

learning, often in the context of learning through Intelligent Tutoring Systems (ITSs) and Game Based Learning Environments (GBLEs) (Timme & Brand, 2020). Azevedo et al. (2016) included facial analysis when investigating the use of pedagogical agents to externally regulate learning while using the ITS MetaTutor, to examine the impact on students' complex and self-regulated learning. Mudrick et al. (2017), Taub, Mudrick et al. (2018), Taub, Azevedo et al. (2018) and Sawyer et al. (2018) also examined facial expression of undergraduate students while learning using MetaTutor. Mudrick et al. looked specifically at joy, confusion, and neutral emotion to examine the influence of the virtual human tutor agents' facial expression congruency, content relevancy, and timing on students' learning strategies, judgements, and emotional responses during learning. Taub, Mudrick et al. examined the relationship of student note taking and emotions, accuracy, and learning gains. Taub, Azevedo et al. examined how emotions and detected levels of emotions impact metacognitive accuracy during learning. Sawyer et al. investigated the role of affect and metacognition to determine the impact of emotions on confidence judgements during learning. Bradbury et al. (2017) examined the effects of autonomy on emotions and learning in the GBLE Crystal Island. Sawyer et al. (2017) also used the GBLE Crystal Island specifically to investigate affect-enhanced student models during learning. Fwa and Marshall (2018) investigated the combination of facial expression, keystrokes, mouse clicks, head posture and contextual features to detect student's frustration in an Affective Tutoring System. Also examining GBLE environments, but within the natural classroom setting, Baker et al. (2016) and Bosch et al. (2015) used facial expression analysis to examine learning-centered affect detection while 8th and 9th grade students' learned in the GBLE Physics Playground.

In addition to the aforementioned literature which focused on facial expression analysis of students', a search of the literature with the purpose of locating research focused on analyzing teachers' facial expressions of emotion was conducted. The criteria used for the analysis of literature included in the search were articles published as empirical studies in peer-reviewed journals, containing the search terms "facial expression" AND "emotion" OR "feelings" OR "affect" AND "teachers" OR "educators" OR "preservice teachers." Both qualitative and quantitative studies were included. The time frame included articles in the past five years, 2015-2020. Next, articles were hand-coded to exclude the following fields: (a) duplicates from other search terms or search engines, (b) not empirical (i.e. brief reports), (c) population studied were students/children, and (d) population studied had a medical or disability diagnosis. These criteria were chosen for the purpose of examining existing research on how facial expression of emotions has been researched with respect to teachers.

The search was conducted using the University of Central Florida's Library System. Databases included APA PsycINFO, Academic Search Premier, ERIC, Science Citation Index, Social Sciences Citation Index, IEEE Xplore Digital Library, and Science Direct. The initial search produced 52 sources (n=52). After screening, only two studies met inclusion criteria (n=2), highlighting a significant gap in the research with regard to studies using facial expression of emotions to explore the emotional experiences of teachers in the classroom.

The first article, and the one that provided the basis for a partial replication, was by Park & Ryu (2019). The researchers conducted a within subjects design exploring preservice teachers emotional experience in a simulation classroom through a series student interactions. Participants completed two teaching phases during which there were a series of three teaching interactions: no interaction, expected interaction, and unexpected interaction. Emotient software was used to

collect and analyze data on preservice teachers' attention; overall emotional engagement; overall sentiment on emotional valence; and on facial expression for emotions of anger, sadness, fear, and joy/happiness. Follow-up interviews and VSR were conducted with all participants in an effort to gain greater insight into the emotional experiences of individuals in virtual simulation environments. Participants completed all phases of the teaching simulation in one session without any pauses.

Data analysis revealed statistically significant findings in the areas of emotional engagement, positive and neutral valence scores, and the emotion of joy while all other measures did not indicate any significant changes. Specifically, emotional engagement scores of teaching phase 1 differed statistically significantly among interactions types, $F(1.88, 24.49)=4.14$, $p<.05$, $\omega 2 =0.08$, a medium effect size, but not in teaching phase 2. Mean positive valence scores differed statistically significantly among the interaction types in teaching phase 1, $F(1.76, 22.85) = 9.03$, $p < 0.01$, $\omega 2 = 0.10$, a medium-large effect size. Neutral valence differed statistically significantly among the interaction types for teaching phase 2, $F(1.81, 23.56) = 9.17$, $p < 0.01$, $\omega 2 = 0.10$, a medium-large, and joy scores in teaching phase 1 differed statistically significantly among interaction types, $F(1.71, 22.24) = 6.28$, $p < 0.01$, $\omega 2 = 0.15$, a large effect size. The emotion of joy was significantly higher during unexpected teaching events, suggesting that unexpected interactions in simulation training classrooms may lead to increased happiness when teaching (Park & Ryu, 2019).

In the second study, Chang et al. (2018) explored the nonverbal behaviors of six teachers during a video recorded self-reflection of teacher professional development. Data on facial expression as one measure of nonverbal behavior was conducted. Observers hand coded the observed behaviors of laugh, surprise, shame, defensive, and distraction. Analysis of the coded

data revealed the frequency of the observed behaviors of laughter, defensiveness, and distraction were found to differ significantly over time: laugh, $\chi 2$ (2) = 26.11, $p < .001$; defensiveness, $\chi 2$ (2) = 27.67, $p < .001$; and distraction, $\chi 2$ (2) = 12.69, $p = .002$. Surprise, shame, and defensiveness, were found to be significantly more frequent in the first semester (i.e., DVC 1-1, DVC 1-2): surprise, $\chi 2$ (3) = 20.12, $p < .001$; shame, $\chi 2$ (3) = 17.85, $p < .001$; defensiveness, $\chi 2$.

Emotions of Teacher Stress

Richard Lazarus (1999) stated that "where there is stress, there is emotion" (p. 49), and emotions tell us about how a person has appraised events in an adaptational transaction. This can be of particular importance when examining teacher stress, how student misbehavior is appraised and how corresponding emotions emerge. In a 2010 study by Tsouloupas et al. (2010), researchers used social cognitive theory as a framework to examine the relationship between teacher perceptions of student misbehavior, emotional exhaustion, and the role of teacher efficacy beliefs and emotional regulation in this relationship. Five dependent variables were included in the analysis: (1) teacher perceptions of student misbehaviors measured by questionnaire developed by the researchers, (2) perceived teacher efficacy in handling student misbehavior measure by the Perceived Self-Efficacy in Classroom Management questionnaire, (3) emotion regulation measured by a reduced version of the Emotional Regulation Questionnaire (ERQ), (4) emotional exhaustion measured by a reduced version of the emotional exhaustion subscale from the Maslach Burnout Inventory-Educators Survey (MBI-ES), and (5) teacher turnover intentions measured using Lee and Mowday's (1987) turnover intention questionnaire.

In the 2010 Tsouloupas et al. study, 610 teachers in five school districts completed a survey. Data analysis revealed teacher perceptions of student misbehavior are directly related to

emotional exhaustion. However, there was no relationship between cognitive reappraisal and expressive suppression as mediators of teacher perceptions of student misbehavior and emotional exhaustion. Though not mediators, the authors did note cognitive reappraisal and expressive suppression, emotional regulation strategies had a direct relationship to emotional exhaustion. Finally, emotional exhaustion was shown to have a significant positive relationship to teacher attrition and teacher migration, confirming emotional exhaustion as a predictor of teacher turnover. The study also confirmed the role of teacher perceptions of student misbehavior to emotional exhaustion, and that specific forms of teacher efficacy are key to explaining emotional exhaustion.

Impact of Teacher Emotion on Students

Emotion regulation within the classroom environment is multifaceted and dynamic; whether through automaticity or effortful means, teacher expression of emotions influences subsequent students' experience of their own emotions. The intimate nature of the classroom environment facilitates susceptibility to emotion reciprocity, contagion, and crossover. Based on crossover theory, Becker et al. (2014) examined the strength of the relationship between teachers' emotions, their instructional behavior, and students' emotions. More specifically, they studied how teachers' instructional behavior is related to students' emotions. Using an experience sampling technique, a convenience sample of 149 students were included in the study. Data collection was done through the use of iPod Touch devices over a period of 10 school days during four different subjects. Participants recorded their immediate emotional experiences in class, including their perceptions of their teachers' emotions and instructional behavior. Intraindividual multilevel regression analyses revealed perceived teachers' emotions and instructional behavior significantly predicted students' emotions. The same pattern was

found for perceived teachers' emotions, demonstrating teachers' emotions were significantly related to students' emotions. All interaction terms were non-significant, indicating the structural relationship between teacher and student emotions is consistent across subject domains.

In a longitudinal study with 1,643 fifth through tenth graders, and 69 teachers at 10 secondary schools in Germany, Frenzel et al. (2018) studied the reciprocal transmission of teachers' and students' emotions and the processes mediating this relationship, and proposed links between teachers' and students' enjoyment mediated by observations of each other. Statistical analysis of longitudinal data collected by the administration of three surveys over the course of a year, revealed findings consistent with those of Becker et al. (2014); there was a reciprocal emotion transmission between teachers and students specifically, with regard to perceptions of enjoyment, enthusiasm, and engagement.

An exploratory, mixed-methods study by Jiang et al. (2016) also examined perceptions of emotions. The study included four teachers and 53 students in grades seven to nine. Data was collected using an eight-item questionnaire with a 5-point Likert-scale, rating the frequency of display of teachers' emotions, and a semi-structured interview done with teachers regarding their emotional experiences and emotional regulation strategies. When compared to students' perceptions of teachers' emotions, findings revealed patterns of association between teachers' positive and negative emotions as perceived by their students. Consistent with previous research, findings revealed more teachers down-regulate negative emotions than up-regulate positive emotions. Findings also revealed reappraisal was more effective than suppression in increasing positive-emotion expression and reducing negative emotion expression.

Hosotani and Imai-Matsumura (2011) investigated the role of emotions in this endeavor by measuring emotional competence of 24, "high quality" Japanese teachers, exploring their

emotional experiences, emotion expression patterns, and use of emotion regulation strategies. Data collection and analysis was done using a semi-structured interview procedure. Teachers reported experiencing anger, sadness, fear, disgust, joy, love/affection, and surprise in the classroom. Emotions were reported as "children-elicited" or "self-elicited." 67% of teachers reported how they express emotions was decided on "case-by-case" basis, and they considered their ability to suppress or stage their emotions according to the situation as a skill. Fear and disgust were reportedly always suppressed, while anger, joy and sadness were regulated using suppression and direct staging. Direct staging was utilized to communicate approval and intentionally evoke emotion in students, while suppression was used to encourage students to listen, to be independent, and prevent students from knowing the teacher's emotion. When emotions were expressed, they were largely utilized to encourage the development of academic skills in students.

In another study in the Netherlands, Mainhard et al. (2018) investigated the extent to which the interpersonal processes of teacher agency and communion, as perceived by students, explain variability in student emotions. Participants included 1668 secondary students in the Netherlands who completed an Academic Emotions Questionnaire and Questionnaire on Teacher Interaction (QTI). Findings revealed student-perceived teacher agency had a weak to moderate positive association with enjoyment, and communion showed a strong positive association with enjoyment. Communion had a moderate negative association with anxiety. Communion, at the teacher-student, teacher-class, and teacher level, was significantly negatively related to student anxiety while agency at the teacher level was significantly positively related to student anxiety. Findings, in line with interpersonal theory, revealed statistically significant interaction between agency and communion at the teacher level, indicating some moderating effects on each other.

Within the multidimensional nature of teacher-student relationships, teacher emotion impacts student perception of academic self-efficacy and performance. Zhang and Zhang (2013) used the broaden-and-build theory and emotional response theory as the framework to study the effects of instructors' positive emotions on student engagement and critical thinking in U.S. and Chinese classrooms. Participants included 362 college students, 165 from a university in the U.S. and 197 from a university in China. Respective measures were identified as (1) positive emotions measured by positive affect subscale from the positive and negative affect schedule scale (PANAS), (2) student engagement measured by the school engagement scale, and (3) critical thinking measured by the critical thinking subscale from the motivated strategies for learning questionnaire (MSLQ). Students completed questionnaires in class. Hierarchical regression analyses revealed the effects for instructors' positive emotions on student behavioral and cognitive engagement were positive for both cultures. Additional hierarchical regression analyses revealed the effects of instructors' positive emotions on critical thinking was both positive and significant in both cultures. Students' positive emotions were mediator to instructors' positive emotions on student critical thinking. Results affirm the reciprocal effect of teacher and student emotions in the classroom and highlight the importance of positive emotions in the classroom by both instructors and students.

In a related investigatory construct, Titsworth et al. (2013) conducted two studies to investigate emotional response through predictive modeling. In the first study, authors sampled 752 students from three universities, using the emotional response theory framework, to test a hypothesized predictive model exploring how teachers' communication behaviors potentially influence students' perceptions of emotional experiences in a class; and in turn, how enjoyment, pride, and hope are possibly affected.

Five dependent variables and measures were identified for the study: (1) classroom emotions measured by Titsworth et al.'s (2013) classroom emotion scale, (2) achievement emotions measured by the Achievement Emotion Questionnaire (Pekrun et al., 2011), (3) teacher clarity measured by the Clarity Behaviors Inventory (CBI) (Titsworth et al., 2004), (4) teacher nonverbal immediacy measured by Perceived Nonverbal Immediacy Behavior Scale (PNIB) (McCroskey et al., 1996), and (5) communication competence measured by Communicator Competence Questionnaire (Monge et al., 1982). Data Analysis were obtained using Structural Equation Modeling (SEM). Tests for homogeneity of the variance/covariance matrix revealed no statistically significant differences for institutions; therefore, it was appropriate to analyze all groups in a single structural model. The direct and indirect relationships of the independent and dependent variables indicated a significant relationship between emotional support and communication competence; emotion work was significantly predicted by teacher immediacy. Emotional support was positively predictive of enjoyment, hope, and pride, and emotion work emerged as a significant predictor of enjoyment, hope, and pride.

Titsworth and colleagues (2013) conducted additional analyses, which revealed teacher immediacy, teacher clarity, and teacher communication competence have significant indirect effects on students' enjoyment, also serving as predictors of students' hope and pride. Further, teacher clarity directly predicted students' enjoyment, and teacher communication competence emerged as a direct predictor of students' enjoyment, hope, and pride. The authors concluded that the mediated effects of teacher communication behaviors on discrete emotions should be included in describing student emotional responses.

As a follow-up to their 2013 study, researchers, once again, used Emotional Response Theory (ERT) as a framework to explore whether poor teacher communication behaviors are

related to discrete negative emotions (Mazer et al., 2014). The goal was to provide a comprehensive explanation of how the quality of teacher-student interactions can potentially influence factors contributing to student engagement and academic success. Within this study, participants included 753 students (nearly identical *n* to their first study), from three large universities, who were invited to complete an electronic survey with questions about the teacher in their first class. Five dependent variables and measures were identified for the study: (1) classroom emotions measured by Titsworth et al.'s (2013) classroom emotion scale, (2) achievement emotions measured by the Achievement Emotion Questionnaire, (3) teacher clarity measured by the Clarity Behaviors Inventory (CBI), (4) teacher nonverbal immediacy measured by Perceived Nonverbal Immediacy Behavior Scale (PNIB), and (5) communication competence measured by Communicator Competence Questionnaire. Data analysis were obtained using Structural Equation Modeling (SEM). Tests for homogeneity of the variance/covariance matrix revealed no statistically significant differences for institutions; therefore, it was appropriate to analyze all groups in a single structural model. The direct and indirect relationships of the independent and dependent variables reflected a significant relationship between emotional support and communication competence indicating a teachers' nonverbal immediacy, clarity, and communication competence will positively predict students' perceptions of emotional support in a class, and will negatively predict students' perceptions of emotion work in a class. In addition, emotional support was predictive of anger, anxiety, shame, hopelessness, and boredom. Supporting and emotion work emerged as a significant predictor of anger, shame, hopelessness, and boredom.

Additional analysis reveals significant indirect effects on students' anger from nonverbal teacher immediacy, teacher clarity, and teacher communication competence (Mazer et al., 2014).

They served as indirect predictors of students' anxiety, shame, and boredom, but had significant indirect effects on students' hopelessness. Secondary analysis of direct and indirect paths from teacher communication behaviors to students' negative emotions indicates nonverbal teacher immediacy directly predicted students' anger, shame, and hopelessness, and teacher clarity directly predicted students' anger and boredom. Findings suggest teacher communication plays a vital role in student engagement because of how they influence students' emotions, and poor communication from teachers can lead to negative emotional reactions from students (Mazer et al., 2014).

Drawing on emotions as social information theory (EASI), van Doorn et al. (2014) studied the expression of anger on students' performance. Forty-five undergraduate students were given a recognition task during which they were exposed to two conditions - a happy instructor and an angry instructor. Participants rated their own affect and that of the instructor, and learning performance was measured. An ANCOVA revealed participants were more sensitive to the task when exposed to the angry rather than happy instructor. In contrast to the widely endorsed positivity paradigm, findings, for the first time, indicated instructor anger can enhance students' performance. To replicate and extend their research, the authors then exposed 90 undergraduates to similar treatment conditions with a recall task and found similar findings; an instructor's expression of anger improved learning performance. These findings challenged the widely held belief positive emotions facilitate learning more than negative emotions.

In a study guided by the conceptual framework of Dix's (1991) affective model of parenting in combination with aspects of Gross' (2002) process model of emotion regulation, Swartz and McElwain (2012) conducted observations of 24 preservice teachers during a practicum experience in a university laboratory child care setting. They examined the frequency

and variability of preservice teachers' responses to children's emotional displays, and the degree to which individual differences in preservice teachers' emotion-related regulation and cognition were associated with their observed responses to children's emotions. In addition, preservice teachers' emotion-related cognitions, specifically accepting beliefs about children's emotions and empathic perspective taking, as correlates of teachers' responses to children's emotions, were also examined. Correlation and regression analyses revealed teachers reporting greater reappraisal strategies in regulating their own emotions, teachers reporting more accepting beliefs about children's emotions, and teachers reporting higher levels of perspective-taking. They provided more supportive responses to children's negative emotions and fewer non-supportive responses to children's positive emotions. However, perspective-taking was only associated with greater support of negative emotions when teachers reported low-to-moderate levels of suppression.

TeachLive™ Simulation Classroom

TeachLivE™ is a simulation platfrom in wich individuals interact within a virtual classroom on a screen such as a computer, projector or large screen display. The TeachLivE™ simulation platform was developed in response to teacher attrition and declining teacher preparation enrollment, in an effort to provide a low-stakes environment in which to better prepare highly skilled preservice teachers prior to entering high stakes situations in the K-12 classrooms without risk to students or risking the loss of valuable resources (Dieker et al., 2008; Dieker et al., 2014a). Mistakes made by participants during rehearsals in the TeachLivE™ simulation classroom provide low-risk opportunites for real-time coaching, practice, and feedback. Individuals can participate in the TeachLivE™ simulation classroom on-site in a university lab or by connecting remotely via a personal or desktop computer (Dieker et al.,

2014a). Whether participating in a lab on campus or connecting remotely, interactors, trained in acting, improvisation, and human psychology, use a webcam to see and hear the participants, and control the human-like interpersonal behaviors and responses of the virtual students, as they might be seen in a typical classroom (Dieker et al., 2008). One interactor controls the behaviors of all of the virtual students in a small classroom during a session.

TeachLivETM has been used across a variety of scenarios and ages. The TeachLivETM environment allows educators to break down specific content, instructional strategies, and targeted skills for rehearsal to build their foundational teaching skills and overall teaching repertoire and generalize it to the classroom (Dieker et al., 2008; Dieker et al., 2014a; Dieker et al., 2014b; Dawson & Lignugaris/Kraft, 2017; Dalinger et al., 2020; Judge et al., 2013; Hayes et al., 2013). The original intention and primary use of TeachLivETM has been for training, remediation, or retraining of preservice and inservice teachers on specific teaching behaviors or skills including, but not limited to, use of evidenced-based reading comprehension strategies (Ely et al., 2018); implementation of classroom management practices (Hudson et al., 2019); use of functional analysis assessment procedures (Vaquez et al., 2017); increasing praise and response rates (Dawson & Lignugaris/Kraft, 2017; Elford et al., 2013); implementation of Discrete Trial Training (Garland et al., 2012); providing reading and assessment data to caregivers (Kelley & Wenzel, 2019); implementation of a system of prompts for teaching students with autism (Garland et al., 2016); increasing teacher-parent collaboration skills (Accardo & Xin, 2017); increasing physics pedagogy (Chini et al., 2016); improving mathematical affect (Khalil et al., 2016); and developing behavior management skills (Larson et al., 2020). Regardless of the target skill being rehearsed, training in TLE can be enhanced with real-time coaching or an After Action Review (AAR) coaching process (Hanoun & Nahavandi, 2018). During the simulation,

the participant or an expert coarch can pause the classroom at any time for additional in-the-moment coaching to address challenges, misconceptions, or error correction (Dieker et al., 2014b). Additionally, AAR immediately following the simulation experience allows for self-monitoring of behaviors and actions, and personalized goal-setting for future rehearsals (Hanoun & Nahavandi, 2018).

Overall, TeachLivETM provides a means to prepare teachers in an immersive setting with skills that might otherwise be difficult to plan and practice in a real classroom. Planning disruptive student behavior events to induce stress in an effort to desensitize preservice teachers and increase their emotional regulation ability is one such example of how the adaptive, low-risk, nature of simulation training can provide a means to train preservice teachers in a skill that would otherwise be too difficult and unethical to replicate with real students a classroom.While TeachLiveTM has traditionally been used to train or retrain preservice and inservice teachers with specific instructional strategies or behaviors through rehearsal, real time coaching and feedback or AAR, this was a novel use of the simulation classroom to expose preservice teachers to stressors of the classroom in a controlled environment without coaching or feedback in an attempt to build tolerance and potentially decrease their emotional and physiological reactions in the natural classroom setting.

Summary

Stress, emotional exhaustion, and burnout among teachers is a worrying phenomenon, particularly in special education where critical shortages of teachers already exist and high attrition rates continue to exacerbate the problem (Carlyle & Woods, 2002; Carver-Thomas & Darling-Hammond, 2017; Maslach et al., 2011; Rumschlag, 2017; Podolsky, 2017). In addition to chronic understaffing as a result of attrition, the deleterious consequences of burnout include

absenteeism, loss of financial resources for schools, reduced teacher self-efficacy, poor quality instruction, decreased academic performance for students, and impaired student-teacher relationships over time (Carver-Thomas & Darling-Hammond, 2017; Ryan et al., 2017; von der Embse et al., 2019; Yu et al., 2015). An estimated 40-50% of new teachers are leaving the teaching profession within the first few years of teaching, as a result of emotional exhaustion, the central stress component of burnout (Fitchett et al., 2018; Maslach et al., 2001; Rumschlag, 2017; Steinhardt et al., 2011). Despite well-documented reports of teacher stress, educational reform efforts have largely ignored the affective components of teaching, underplaying the emotional dimension, and the inextricable link to stress and burnout (Carlyle & Woods, 2002; Hargreaves, 1998, 2000; Maslach et al., 2001). As a result, we have stressed out teachers attempting to navigate the daily demands in a classroom environment where student perception of teacher emotions significantly predicts student emotional response and learning, or they are leaving the profession altogether. Given the intimate nature of the classroom, the documented deleterious effects of teacher stress, and the susceptibility of emotion contagion between teachers and students in the classroom, it is critical to identify interventions designed to help teachers minimize stress. Given the effectiveness of stress inoculation therapy in other fields (Gauron, 1987; Houram et al., 2011; Hourani et al., 2016, 2018; Jackson et al., 2019; Meichenbaum, 2017; Sheehy & Horan, 2004), evidence toward the validity of cyber-interventions of SIT (Serino et al., 2014), and the potential utility of harnessing the power of cognitive disequilibrium, coupled with desensitization strategies used in SIT to decrease the stress and anxiety of preservice teachers as they develop new schema and coping patterns, the researcher intends to examine the efficacy of a desensitization intervention for preservice teachers through simulation.

CHAPTER THREE:
METHODOLOGY

Introduction

The present study examines the effect of repeated exposure to disruptive student behavior events in a simulated classroom (TeachLivE™), on undergraduate preservice teachers' affective response through facial expression recognition and self-reported stress. Additional qualitative analysis of language from video-stimulated recall reflections was done to provide richer insight into the preservice teachers' emotional experience. The Institutional Review Board of the University of Central Florida granted permission for the study, which has been assigned number STUDY00001399 (Appendix A). Described in this chapter are the research design, methodology, and procedures for the study.

Problem Statement

An estimated 40-50% of new teachers are leaving the teaching profession within the first few years of teaching as a result of emotional exhaustion, the central stress component of burnout (Fitchett et al., 2018; Maslach et al., 2001; Rumschlag, 2017; Steinhardt et al., 2011). Despite teachers reporting regulating emotions in response to student misbehavior more than any other classroom situation (Taxer & Gross, 2018), new teachers report their teacher preparation programs failed to properly prepare them to manage disruptive behavior (Freeman et al., 2014; Flower et al., 2017). Although teacher stress is well-documented, educational reform efforts have largely ignored the affective components of teaching, underplaying the emotional dimension, and the inextricable link to stress and burnout (Carlyle & Woods, 2002; Hargreaves, 1998, 2000; Maslach et al., 2001). The intent of this study was to explore the use of desensitization and

cognitive dissonance on the affective stress response of preservice teachers' when exposed to disruptive student behavior during simulated teaching sessions, as measured by facial expression of emotion, self-reports, and video stimulated recall.

Research Questions

1. Does preservice teachers' emotional valence (positive, negative, neutral) differ in response to disruptive student behavior events during teaching sessions in a simulation classroom?
2. Does preservice teachers' emotional valence (positive, negative, neutral) differ between disruptive student teaching events of teaching session 1 and teaching session 2 in a simulation classroom?
3. Is there a statistically significant difference in preservice teachers' self-reported stress from teaching session 1 to teaching session 2?
4. In what ways do video stimulated recall reflections with preservice teachers contribute to a more comprehensive and nuanced understanding of their emotional experience responding to disruptive student behavior in a simulation classroom, and the relationship to their expressed emotions?

Research Design

This study employs a mixed-methods research design, combining principles in quantitative and qualitative research, to assess the changes in preservice teachers' stress in response to disruptive student behavior. Preservice teachers interacted with five disruptive student behavior events in each of two teaching sessions. iMotions Affectiva Affdex facial expression recognition software was used to code and analyze the participant's emotional

expression and emotional valence while he/she was engaged in the different events of the teaching simulation. Stress was induced as the independent variable through disruptive student behavior events, and also measured as the dependent variable using facial expression recognition, daily stress surveys conducted before and after each teaching session, Video Stimulated Recall (VSR). Additional qualitative analysis was conducted on open-ended survey questions given to participants after their participation in teaching sessions had concluded. Open-ended questions were used to explore the social validity of participants' experiences in the simulated teaching sessions.

Participants

Recruitment

This study specifically targeted undergraduate students (i.e., pre-service teachers) currently enrolled in Teacher Education programs at UCF's College of Community Innovation and Education. Participation in this study was limited to adult participants who agreed not to wear any face covering during teaching sessions, other than clear eyeglasses, since face coverings interfere with the facial recognition program's ability to detect and classify facial expressions if facial features are occluded.

Participants were recruited with distribution of a flyer (see Appendix B) via email to all undergraduates in teacher preparation programs in UCF's School of Teaching and Learning. The flyer was also posted on bulletin boards in education buildings on campus. The flyer included a QR code to a Qualtrics survey for interested participants to respond. The Qualtrics was programmed to assign a randomized ID to each responder. This ID was used throughout the remainder of the study to identify the participant. Participants were given a $20 gift card at the end of the study, for having completed all study requirements.

Forty-one undergraduate education majors initially responded to the recruitment flyer, indicating an interest in participation in the study. Twenty-three of those respondents followed through with scheduling to attend a pre-study information session scheduled on campus for March 16, 2020, which was to include a tour of the TeachLivE™ lab, review of the study protocol and procedures, and review of participant consent. Data collection was scheduled to begin in the TeachLivE™ lab on March 23, 2020. Due to campus closure as a result of COVID-19, the pre-study session and simulated teaching sessions were changed to a remote platform. Five respondents texted the researcher they would no longer be able to participate in the study, citing job loss, relocation, and family circumstances as a result of COVID-19. Five respondents did not reply to the researcher's emails or texts inviting them to participate in the study online. Thirteen participants provided consent and scheduled their TeachLivE™ sessions for the study. Two cancelled their sessions, and two withdrew from the study after their first session, leaving nine participants who completed the entire study (see Table 1).

Participants included two junior (22%) and seven senior (78%) undergraduate students, with one male (11%) and eight females (89%). Additionally, four participants (44%) were 20- to 24-years-old, one (11%) 25- to 29-years-old, two (22%) 30- to 34-years-old, and two (22%) 35-years-old or above. Seven participants (78%) were Exceptional Student Education majors, and two (22%) were Elementary Education majors. All 7 participants who were Exceptional Student Education majors had successfully completed EDG 4410, Teaching Strategies and Classroom Management and EEX 4601, Introduction to Behavior Management which are the two core classes in the School of Teacher Education (STE) that prepare preservice teachers in the areas of classroom management and behavior management. The two participants who were Elementary Education majors had completed EDG 4410, but had not completed EEX 4601. Six participants

(67%) were enrolled in Internship 1 during the study, and one participant (11%) was enrolled in Internship 2. Two participants (22%) were not enrolled in internship. Five participants (56%) worked full-time in a classroom at the time of the study, three participants (33%) worked part-time in a classroom, and one participant (11%) was not employed working in a classroom. Only students who agreed to participate in the study were included in the final data analyses and paid for their participation. Given the small sample size a decision as made to use descriptive statistics in lieu of inferential statistics.

Table 1
Participant Demographics

Participant	Gender	Race	Age Range	Major	EDG 4410	EEX 4601	Internship	Employed in Classroom
1	Female	W	35+	ExEd	Y	Y	Intern 1	FT
2	Female	W	35+	ExEd	Y	Y	Intern 1	FT
3	Female	W	20-24	ExEd	Y	Y	n/a	n/a
4	Male	B	25-29	ExEd	Y	Y	Intern 1	FT
5	Female	W	20-24	ElemEd	Y	N	Intern 1	PT
6	Female	H	20-24	ElemEd	Y	N	Intern 1	PT
7	Female	W	20-24	ExEd	Y	Y	Intern 2	FT
8	Female	B	30-34	ExEd	Y	Y	n/a	FT
9	Female	H	30-34	ExEd	Y	Y	Intern 1	FT

Note: W=white; B=black; H=Hispanic; ExEd=Exceptional Student Education; ElemEd=Elementary Education; FT=full-time; PT=part-time; Y=yes; N=no.

Role of the Researcher

The researcher in this study is a doctoral student in Exceptional Student Education in the University of Central Florida's School of Teacher Education, and a certified Exceptional Education teacher in the state of Florida who taught in the public school system for 5 years prior to entering the doctoral program, and has also previously worked as a substitute teacher and a paraprofessional in a self-contained classroom with students diagnosed with autism spectrum disorder (ASD). Additionally, the researcher served as the team lead on her school's crisis prevention and behavior intervention team while working as a teacher. Reflecting on previous

experiences working with teachers and students while intervening in disruptive student behavior events, the researcher became interested in finding ways to improve a teacher's ability to manage his/her affective response to disruptive students in an effort to prevent escalation of student behavior and teacher stress.

During her time at UCF, the researcher served as an academic advisor to seven of the nine preservice teachers who participated in the study. Although the researcher professionally knew 7 of 9 participants, there was no indication that their participation in the study was a result of selection bias due to the fact that criteria used to recruit and enroll participants in the study was not restrictive, and recruitment efforts were consistent with all potential preservice teachers in the university receiving the same number and type of correspondences during recruitment efforts. All preservice teachers who indicated an interest in the study, regardless of program, and agreed to not wear any facial coverings so that their facial expression could be recorded, were invited to participate. Prior to school closure as a result of COVID-19, an additional 12 participants who were not familiar to the researcher, were registered to participate in the study.

Setting

Due to the COVID-19 and subsequent stay-at-home orders, the study was conducted with remote access to the TLE simulation classroom via Skype. While not the originally planned procedure, TeachLivE™ is widely used in a remote format. TeachLivE™ has been used by over 10,000 preservice and inservice teachers at over 37 universities. TeachLivE™ is an avatar-mediated system consisting of five student avatars in an inclusive, virtual classroom setting. In the TLE environment, professionally trained human interactors orchestrate the behaviors of the student avatars in response to participant actions (Barmaki, 2015). Skype videoconferencing

software allows participants to access the classroom, to be viewed on the interactor's screen, and to be recorded during the session.

Procedures

Three to five days prior to beginning the study, participants (pre-service teachers) attended a 30-minute information session via Zoom conferencing software, where they watched a 5-minute video of a remote TeachLivE™ session, reviewed the research study protocol, asked questions, and were given access to a link to schedule his/her TeachLivE™ sessions if they wished to continue with participation in the study.

Sessions

The simulated experience in the TeachLivE™ lab (Figure 3) was conducted remotely via Skype. Each session consisted of five components: the preservice teacher, the interactor, teaching scenarios involving 2 minutes of baseline condition, five different disruptive student behavior events over 4 minutes, and recordings for facial expression recognition.

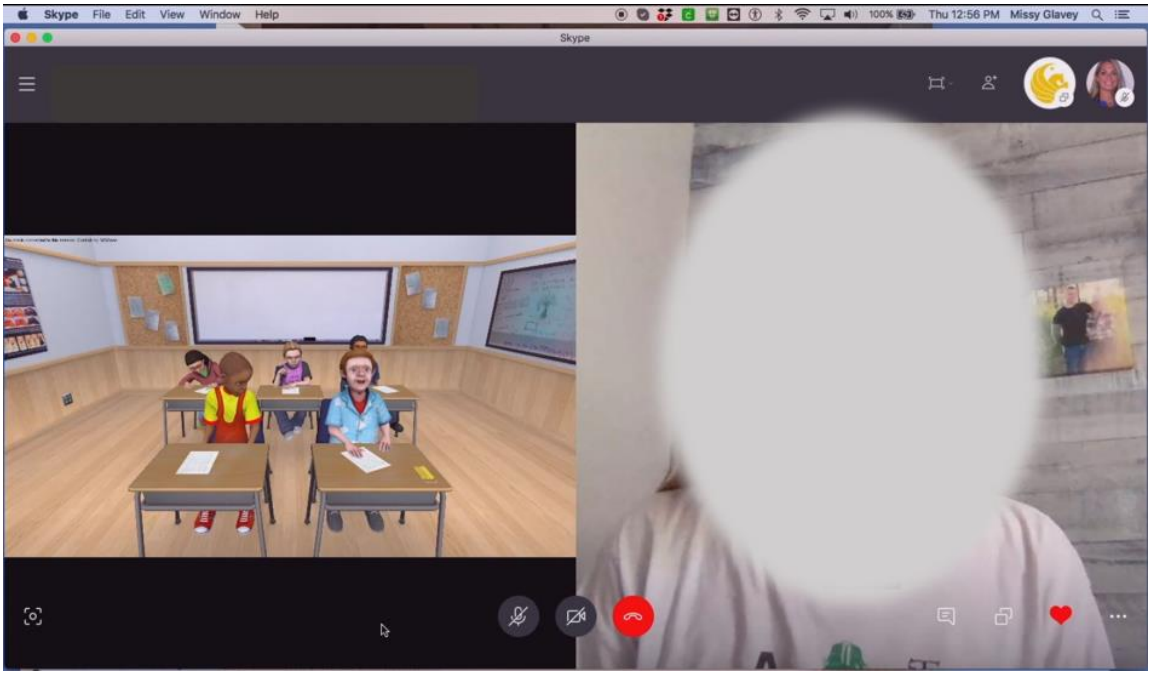

Figure 3: TeachLivE™ Session Conducted via Skype

In each simulation scenario, five avatars, or virtual students, appeared in the simulated middle school classroom. During the simulation, the interactor observed, processed, and responded to the preservice teacher trainee in real-time, through the student avatars, based on objectives outlined by the researcher. As a regular feature of TeachLivE™, each of the virtual students has a unique name and personality, and have dynamic interactions with participants, including voice narration and body movements.

The participants began each of two teaching sessions with avatars at baseline behavior - expected student behavior. Participants were exposed to two teaching sessions for six minutes, each no more than one week apart. During participants' teaching sessions in TeachLivE™, student avatars controlled by an interactor exhibited different, disruptive student behaviors in random order, as noted in Table 2. These behaviors were derived from the 2019 publication, *Breaking Bad Behavior: The Rise of Classroom Disruptions in Early Grades and How Districts are Responding* (District Leadership Forum, 2019). The researcher met with two TeachLivE™

interactors scheduled to conduct the sessions for the study prior to the day of data collection. Study procedures and descriptions of the student behaviors (see Appendix C) were reviewed and practiced two times prior to the start of the study, with a doctoral student serving as the "participant." A trial study and additional practice sessions were not possible due to time constraints from delays in securing the iMotions software, followed by closure of the campus due to COVID-19. This also removed the opportunity of the researcher to conduct a calibration process for collecting and analyzing facial expression data using iMotions Affectiva software. Calibration was not possible given the data was collected via video-conferencing software, and not conducted in a lab.

Table 2
Disruptive Student Behavior Events

Event	Description with example
1	Tantrums – questioning why and criticizing the lesson "this is so stupid… why are we learning this?"
2	Bullying - making fun of a student with a disability/name-calling "hey mutey… you gonna talk"
3	Disengagement - Cell phone use during class (student holding cell phone and texting)
4	Oppositional Defiance – Refusal "no! you can't make me do this!"
5	Verbal abuse or threat toward other students "you better stop talking or I will punch in the face!"

Preservice teachers connected via Skype to participate in their remote TLE sessions and were sent a link to Qualtrics to complete the Daily Stress Survey prior to starting the session. Once the participant completed the stress survey, she/he was admitted to the simulation classroom and given directions to say, "start classroom," when they were ready to begin. When the participant stated, "start classroom," the interactor began the teaching session, and the research assistant set the timer for 6 minutes. Sessions were recorded for post processing of facial expression using the iMotions Affectiva Affdex software.

Participants initiated the start of a session and greeted student avatars as one would in a real classroom and began teaching a Science lesson on *States of Matter* provided by the researcher (see Appendix D). The lesson plan was given to the participants at least 72 hours prior to their first scheduled training session to provide an opportunity to familiarize themselves with the lesson. After 2 minutes of baseline during which virtual students exhibited expected compliant student-teacher interactions, the virtual students began to engage in disruptive student behaviors (see Table 2) in random order. Five disruptive student behavior events took place over 4 minutes, and were exhibited by one student at a time. The total teaching session lasted for 6 minutes (2 minutes of baseline + 4 minutes of disruptive behavior events) or until the participant requested to end the session. In an effort to control for order effects, randomized partial counterbalancing of the disruptive student behaviors was conducted (see Appendix F). At the end of each session, participants were sent a link to Qualtrics to complete the post Daily Stress Survey.

Quicktime software was be used to record the video and audio of each participant (including face) during the sessions to assess their emotional states. The recordings were converted to mp4 files using iMovie software. Videos in mp4 format were post-processed using iMotions Affdex software. Affdex provided facial expression data regarding participants' fluctuations of emotion and valence during simulated teaching rehearsals.

Additional Study Procedures

As a result of limitations to the original research protocol due to campus closure because of COVID-19, the researcher requested approval of modifications to the research protocol after the data collection in TLE was complete. On April 29, 2020, IRB approved the addition of a

post-study Qualtrics Survey to participants, regarding their experience. Participants were emailed the link and asked to respond anonymously to open-ended questions.

Additionally, IRB approval was received to conduct Video Stimulated Recall (VSR) with participants via Zoom. This method was selected based on a recent study by Park & Ryu (2019) exploring preservice teachers' emotional experiences in a simulated experience similar to TeachLivE™ using facial expression recognition. Participants were contacted by email and asked to do a follow-up activity to their teaching sessions to provide in-depth understanding of their simulation experiences. Participants who agreed to participate were scheduled to meet via Zoom to watch their videos. Videos were shared through the "share screen" option in Zoom for participants to watch. Audio of their video stimulated recall was recorded for transcription and qualitative analysis. Due to the in-flight changes made during the study, participants who completed all initial components of the "phase 1" study protocol and consent, but who were not available to participate in the VSR, were still paid for their full participation in the study as stated in the original study protocol and participant consent.

Participants were asked to watch the recordings of their TeachLivE™ sessions using the following directions, which were used in the Park & Ryu (2019) study and provided by Dr. Park, for use in the present research:

- The purpose of this stimulated recall is to understand your thoughts and feelings while you were teaching in the virtual teaching simulation.
- You will watch the recorded video clips of your teaching you completed.
- While watching your recorded teaching video clips, feel free to share any of your thoughts and feelings about your experiences. I will pause the video clip to help recall context as needed.

Dependent Measures

Valence

iMotions Affectiva Facial Expression Recognition software was used to measure changes in facial expressions of emotion. Affectiva's Affdex technology scientifically measures and reports emotions and facial expressions using sophisticated computer vision and machine learning techniques. Affectiva Affdex uses a standard webcam to analyze facial expressions of subjects. Available output metrics are in the form of head orientation (yaw, pitch, roll), interocular distance, 34 facial landmarks, seven basic emotions (anger, contempt, disgust, fear, joy, sadness, or surprise), valence, engagement, attention, and 14 facial action units (see Figure 4). A composite emotional metric called valence, which gives feedback on the overall experience, is also reported. The default iMotions valence values were used for the purposes of this exploratory study with valence values from 50 to 100 indicating a positive experience, values from 50 to -50 indicating a neutral experience, and values from -50 to 0 indicating a negative experience.

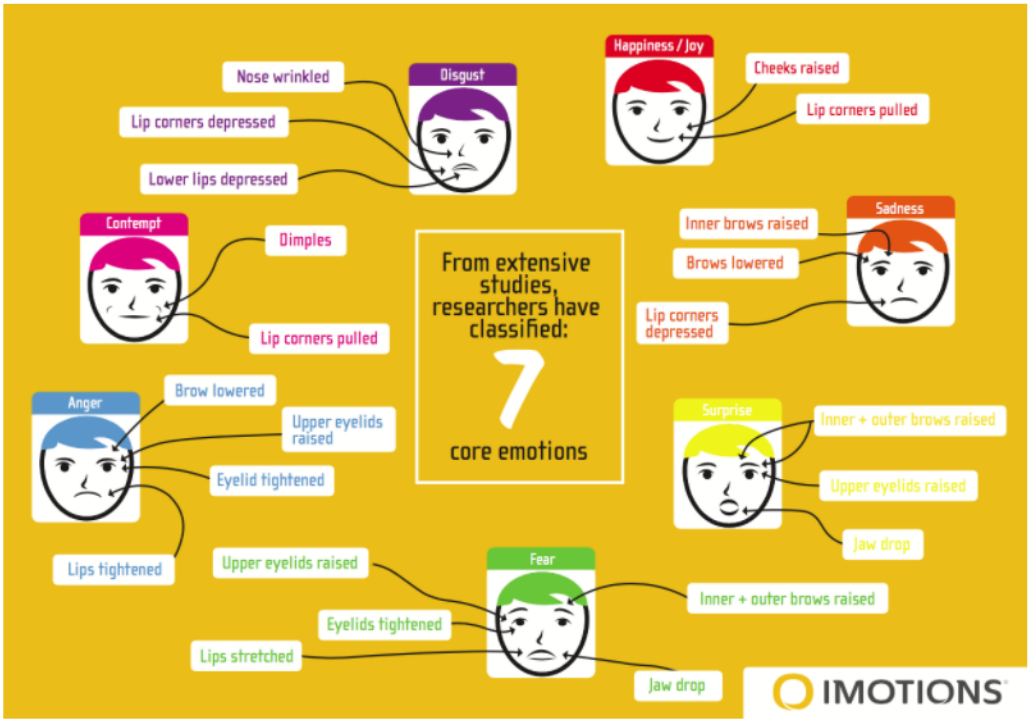

Figure 4: Seven Basic Emotions and their Facial Action Units

Note. Retrieved from iMotions. https://imotions.com/blog/emotions-matter/, 2020.

Coding by Affectiva Affdex is done using the EMFACS version of the Facial Action Coding System (Friesen & Ekman, 1984). Ekman & Friesen (1978) developed the Facial Action Coding System or FACS, based on a discrete emotions theoretical perspective, and is designed to measure specific facial muscle movements. EMFACS, is an abbreviated version of FACS which assesses only those muscle movements believed to be associated with emotional expressions. It is a measurement system that does not interpret the meaning of the expression, but allows for a construction of emotions based on the combination of facial action units measured (iMotions, 2016). The system was tested on an independent set of 10,000 images to verify the generalizability of algorithms. EMFACS' empirical grounding is suggested in the concurrent validation studies with FACS, which indicate high correlations (>.8) of EMFACS and FACS (Kring & Sloan, 2007). Additional psychometric properties are proprietary to iMotions.

Daily Stress Survey

Teachers were asked to indicate daily stress levels using a rating scale of 1-4, with one being not stressed and a four being very stressed, immediately before and after each simulated teaching session. The Daily Stress Survey is an informal tool that has not been used or evaluated extensively, therefore reliability and validity of the measure has not been established.

Video Stimulated Recall

A video stimulated recall was conducted with each of the participants in the period 1 month after the final simulated teaching session. VSR is a tool often used by researchers to capture and study teacher cognition (Gazdag et al., 2019). VSR methodology involves teachers being interviewed, and or being asked to offer their reflection, as they watch video-recorded segments of their own teaching (Gazdag et al., 2019). VSR is used to gain insight into the unspoken thinking and decision-making processes teachers engage in while teaching. VSR is not a coaching session. Importance should be given to the teachers' agency and expertise as they provide reflection on their experience (Kim & Silver, 2016).

For the purposes of the current research, each participant was asked for his/her reflections while watching recorded video clips, with the researcher, via Zoom video conferencing software. Instructions for VSR were obtained from Dr. Sanghoon Park (personal communication, March 2020). His study was conducted in South Korea; thus, all directions were in Korean. Dr. Park translated the directions he used for his study to English, and sent them to the researcher in an email so his procedure could be replicated. The directions used for VSR were:

1. The purpose of this stimulated recall is to understand your thoughts and feelings while you were teaching in the virtual teaching simulation.
2. You will watch the recorded video clip of your teaching practice you completed.

3. While watching your recorded teaching video clips, feel free to share any of your thoughts and feelings about your experiences. I will pause the video clip to help you recall context.

Social Validity Measure

Social validity refers to the extent to which a target population (e.g., preservice teachers) judges the given intervention, goals, practices, and procedures as socially acceptable (Wolf, 1978). Social validity data were collected through an informal Qualtrics survey given at the conclusion of the first phase of the study (see Appendix F). Questions for the survey were adpated from Park & Ryu (2019), and included six, open-ended questions about the perception, authenticity, and value of the virtual teaching experience. Participants were emailed a link to the survey. Responses were recorded anonymously to encourage honesty and accuracy. Psychometric properties of the survey borrowed from the Park & Ryu study (2019) to measure social validity were not available to the researcher.

Data Analysis Plan

To examine research question 1, descriptives statistics of the mean percent of time facial expression of emotions were present was conducted to assess if differences existed in preservice teachers' emotional valence (positive, negative, neutral) by disruptive student teaching events.

To examine research question 2, descriptives statistics of facial expression of emotions were conducted to assess if differences existed in preservice teachers' emotional valence (positive, negative, neutral) between teaching session 1 events and teaching session 2 events.

To examine research question 3, a paired samples t-test was conducted to examine if mean difference exist between preservice teachers' self-reported stress post session 1 and session 2.

To examine research question 4, the data gathered from the VSR reflections were analyzed using thematic analysis, allowing the researcher to organize, describe, and interpret themes within the data (Braun & Clarke, 2006). VSR reflections were transcribed and imported into NVivo software for coding and analysis. The researcher used inductive thematic analysis (Boyatzis, 1998), identifying themes that emerged from coding of the preservice teachers' language during their VSR sessions.

Trustworthiness/Validity

Creswell (2013) suggests using two methods to determine the validity of a qualitative research study. For this study, the researcher used triangulation, and peer review of the video stimulated recall data that was gathered. Triangulation was conducted through the use of multiple data sources to add credibility to the research, developing a more comprehensive understanding of the phenomena (Creswell, 2013). Data sources included descriptive statistics on participants' facial expression of emotions extracted from participants' post-processed video recordings using iMotions Affectiva Affdex software, self-reported stress levels collected by survey, and video stimulated recall reflections.

Additionally, the researcher allowed for an external review of the process by using a peer reviewer as a research associate (Creswell, 2103). Peer review was conducted to add trustworthiness and reliability of coded themes that emerged through participants' transcribed reflections from video stimulated recall sessions. Additionally, text analysis using NVivo

software was also conducted on participants' VSR reflections to look for patterns in their language and cross check manually coded themes to increase trustworthiness.

CHAPTER FOUR: RESULTS

Introduction

The study was conducted over late March and April 2020. It should be noted that this was the time period during which the 2020 Novel Coronavirus (COVID-19) outbreak initiated a statewide quarantine, resulting in suspension of all non-essential campus activities, and transitioning students to remote instruction through the summer semesters. As such, all graduate students conducting research for their thesis/dissertation were provided guidance from the Office for Research of the College of Graduate Studies at UCF, permitting adjustments to study protocols so that research activities could continue remotely, when possible. In consultation with the researcher's faculty advisor, the researcher revised the study protocol emergently, noting revisions implemented due to the COVID-19 emergency. Revisions were submitted to IRB as soon as possible, including changing from face-to-face bimodal data collection in the TeachLivE™ lab to a mixed-methods study, using remote data collection via the video-conferencing software Skype.

Additional changes made to the study followed a personal communication with Dr. Sanghoon Park, Associate Professor at the University of South Florida, in which the researcher requested a copy of the interview questions included in his study, "Exploring Preservice Teachers' Emotional Experiences in an Immersive Virtual Teaching Simulation through Facial Expression Recognition," in the *International Journal of Human-Computer Interaction* in 2019. Dr. Park shared six interview questions, translated from Korean, that were used in his research and recommended the researcher also include Video Stimulated Recall, as he thought it would be a valuable method to gather additional data about the emotional experiences of participants in the current study (S. Park, personal communication, March 23, 2020).

A total of nine preservice teachers participated in the study to its completion. The preservice teachers took part in pre- and post-surveys on feelings of stress per teaching session, and matched pairs t-tests were run to determine statistical significance of the differences in post-survey scores from teaching simulation session 1 to teaching simulation session 2. Additionally, descriptive statistics of emotion expression and emotional valence were collected throughout each teaching session by iMotions Affectiva Affdex software. Descriptive statistics were examined to determine whether there was a difference in the mean percent of time of preservice teachers' emotional valence (positive, negative, neutral), and emotion expression (anger, sadness, disgust, fear, contempt, joy, and surprise) by events in teaching session 1 and teaching session 2. Descriptive statistics were also analyzed to determine the mean difference in percent of time of emotion expression and emotional valence for the events in teaching session 1 to the events in teaching session 2.

Additionally, results of individual video stimulated recall (VSR) sessions with preservice teachers were analyzed. The sessions were transcribed and coded using inductive thematic analysis. A peer reviewer was also used to code and analyze the data, to ensure inter-rater agreement, and NVivo software was used to identify patterns in language and crosscheck manual coding.

The research questions addressed in the study were:

1 Does preservice teachers' emotional valence (positive, negative, neutral) differ in response to disruptive student behavior events during teaching sessions in a simulation classroom?

2 Does preservice teachers' emotional valence (positive, negative, neutral) differ between disruptive student teaching events of teaching session 1 and teaching session 2 in a simulation classroom?

3 Is there a statistically significant difference in preservice teachers' self-reported stress from teaching session 1 to teaching session 2?

4 In what ways do video stimulated recall reflections with preservice teachers contribute to a more comprehensive and nuanced understanding of their emotional experience, responding to disruptive student behavior in a simulation classroom, and the relationship to their expressed emotions?

Data Analysis

In this section, descriptive statistics obtained from the iMotions Affectiva Affdex software were used to discuss the participants' emotional experiences in each teaching session. For each teaching session, the participants' affective response to stress-inducing events was analyzed in the categories of emotional valence and discrete emotion expression. Each teaching session included five, disruptive student behavior events intended to induce stress. The emotional valence category contained positive, negative, and neutral emotional responses. The emotion expression category contained seven emotions: anger, joy, sadness, fear, surprise, disgust, and contempt. Descriptive statistics for each of the emotion expressions and valence broken down by teaching session and event are included.

Additionally, in this section, the daily stress survey results will be discussed, using results of a matched pairs t-test run to determine if there was a statistically significant mean difference in pre-test and post-test scores of each simulation session. A matched pairs t-test was also run to determine if there was statistically significant mean difference between post scores of of session

1 and session 2. The paired-samples t-test is an appropriate analysis to determine whether the mean difference between paired observations is statistically significantly different from zero. A significant positive mean would suggest an increase in stress whereas a significant negative mean would suggest a decrease in stress (Laerd Statistics, n. d.).

Research Question 1

In order to answer RQ1, descriptive statistics were obtained using IBM SPSS Statistics for Windows, Version 25.0 statistical software to analyze the data extracted from iMotions Affectiva Affdex software. The descriptive data shown in Table 3 and Table 4 represents the mean score and standard deviation of the percent of time the emotional valence was present in response to each event during teaching sessions.

Table 3
Mean Scores of Emotional Valence for Teaching Session 1

		Teaching Session 1				
		Type of Event				
Outcome Variable	Measures	Cellphone (n = 8)	Criticize Lesson (n = 8)	Name Call (n = 8)	Refusal (n = 8)	Verbal Threat (n = 8)
Emotional Valence	Positive	7.5 (12.7)[a]	7.2 (6.4)	8.5 (10.8)	3.6 (6.4)	4.1 (5.8)
	Negative	5.7 (6.3)	2.6 (2.1)	3.5 (4.9)	5.9 (6.7)	11.7 (18.1)
	Neutral	86.8 (13.7)	90.3 (7.2)	88.0 (9.4)	90.6 (8.7)	84.2 (16.0)

[a]Each score represents the mean score of the percent time of emotional valence presence in response to each interaction type, with the standard deviation in parentheses.

Table 4
Mean Scores of Emotional Valence for Teaching Session 2

		Teaching Session 2				
		Type of Event				
Outcome Variable	Measures	Cellphone (n = 8)	Criticize Lesson (n = 8)	Name Call (n = 8)	Refusal (n = 8)	Verbal Threat (n = 8)
Emotional Valence	Positive	6.6 (9.1)[a]	4.1 (8.0)	4.4 (7.6)	5.4 (9.0)	11.9 (15.6)
	Negative	7.8 (7.3)	8.9 (6.6)	12.5 (14.7)	7.3 (7.8)	3.4 (3.8)
	Neutral	85.6 (9.8)	87.0 (7.5)	83.1 (13.4)	87.2 (10.0)	84.7 (13.3)

[a]Each score represents the mean score of the percent time of emotional valence presence in response to each interaction type, with the standard deviation in parentheses.

As revealed in Tables 3 and 4, participants exhibited neutral valence more than 80% of the time for disruptive student behavior events in both simulated teaching sessions indicating the

majority of the time positive and negative emotions were not detected in participants as measured by the numerical thresholds set for the study - positive valence between 50 and 100, and negative valence between -50 and -100 in both teaching sessions. During the majority of the time in both teaching sessions, emotion scores fell between 50 and -50 coding them as neutral. During teaching session 1, differences of less than 1% were observed in positive valence between the cell phone, criticize lesson, and name calling events. Positive valence was highest during the name calling event (M=8.5, SD=10.8) and lowest in response to the refusal event (M=3.6, SD=6.4). During the second teaching session, differences of less than 1.5% were observed in positive valence between the cell phone, criticize lesson, name calling, and refusal events. Positive valence was highest during the verbal threat of violence event of teaching session 2 (M=11.9, SD 15.6) and lowest during the criticize lesson interaction (M=4.1, SD=8.0).

During teaching session 1, the largest difference in negative valence was detected between the verbal threat event (M=11.7, SD=18.1) and the criticize lesson event (M=2.6, SD=2.1). During the second teaching session, the largest difference in negative valence was detected between the name calling event (M=12.5, SD=14.7) and the verbal threat of violence event (M=3.4, SD=3.8).

Additional descriptive statistics were obtained on specific emotion data collected during the teaching sessions. As seen in Table 5 and Table 6, sadness and fear were the least present emotions throughout the study, being detected in only two out of ten events, and 0% of the time for events during teaching session 1. During teaching session 2, sadness was detected during criticize lesson (M = 0.2, SD = 0.4), and name-calling (M = 0.2, SD = 0.6). Fear was detected during teaching session 2 for cell phone (M = 0.8, SD = 2.1) and criticize lesson (M = 0.8, SD = 2.1). The emotion of anger was detected in only 50% of events throughout the study. Anger was

present (M = 0.2, SD = 0.7) during the criticize lesson event of teaching session 1. During teaching session 2, anger was present for cell phone (M = 0.7, SD = 1.9), criticize lesson (M= 0.2, SD = 0.4), name-calling (M = 3.5, SD = 6.4), and verbal threat (M = 0.6, SD = 1.2). Overall, anger, sadness, disgust, and fear were detected for negligible amounts of time during teaching session 1. During teaching session 2 anger was elicited in response to the cell phone (M=0.7, SD=1.9), name calling (M=3.5, SD=6.4), and verbal threat events (M=0.6, SD=1.2). Sadness and fear were detected less than 1% of the time in response to teaching events during teaching session 2. Fear was present in response to the cell phone (M=0.8, SD=2.1) and criticize lesson (M=0.8, SD=2.1) events, and sadness was present for the criticize lesson (M=0.2, SD=0.4), and name calling (M=0.2, SD=0.4) events. Disgust was expressed during all events of teaching session 2 ranging from a mean of 3% of the time in response to the cell phone event to a mean of 0.4% of the time for the verbal threat of violence event.

During all disruptive teaching events for both simulated teaching sessions, surprise was the emotion detected most, and joy was the second most detected emotion. The refusal event of teaching session 2 elicited the most surprise (M=20.3, SD=22.1) followed by the cell phone event of teaching session 1 (M=19.0, SD=22.7). Overall surprise was detected over 10% of the time for cell phone events of both teaching sessions; over 16% of the time for criticize lesson events and verbal threat events of both teaching sessions. Surprise was lowest during the name calling events of teaching session 2 (M=5.3, SD=11.5).

The emotion of joy was detected in the greatest amounts for the name calling event (M=10.5, SD=10.5) and verbal threat (M=10.6, SD=14.7) events of teaching session 1. Joy was detected in the least amounts for the refusal event of teaching session 1 (M=3.7, SD=6.2) and the

verbal threat event of teaching session 2 (M=3.7, SD=8.1). Joy was present for all other teaching events in both sessions in mean percentages of time between 7% and 9%.

Table 5
Mean Score of Basic Emotions for Teaching Session 1 (standard deviation)

		Teaching Session 1				
		Type of Event				
Outcome Variable	Measures	Cellphone (*n* = 8)	Criticize Lesson (*n* = 8)	Name Call (*n* = 8)	Refusal (*n* = 8)	Verbal Threat (*n* = 8)
Basic Emotions	Anger	0.0 (0.0)[a]	0.2 (0.7)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
	Sadness	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
	Disgust	0.9 (2.4)	1.0 (2.2)	0.7 (2.0)	1.3 (2.3)	1.0 (2.0)
	Joy	7.5 (13.2)	7.5 (8.0)	10.5 (10.5)	3.7 (6.2)	10.6 (14.7)
	Surprise	19.0 (22.7)	16.7 (18.3)	11.6 (21.8)	14.6 (21.2)	17.1 (26.6)
	Contempt	2.8 (6.9)	1.0 (2.4)	1.4 (1.9)	1.1 (3.0)	2.1 (4.0)
	Fear	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

[a]Each score represents the mean score of the percent time of presence of emotion in response to each interaction type.

Table 6
Mean Scores of Basic Emotions for Teaching Session 2 (standard deviation)

		Teaching Session 2				
		Type of Event				
Outcome Variable	Measures	Cellphone (*n* = 8)	Criticize Lesson (*n* = 8)	Name Call (*n* = 8)	Refusal (*n* = 8)	Verbal Threat (*n* = 8)
Basic Emotions	Anger	0.7 (1.9)[a]	0.2 (0.4)	3.5 (6.4)	0.0 (0.0)	0.6 (1.2)
	Sadness	0.0 (0.0)	0.2 (0.4)	0.2 (0.6)	0.0 (0.0)	0.0 (0.0)
	Disgust	3.0 (6.4)	2.9 (8.0)	1.3 (3.3)	1.9 (4.7)	0.4 (1.0)
	Joy	7.0 (9.5)	4.5 (9.3)	4.3 (8.1)	8.7 (15.3)	3.7 (8.1)
	Surprise	11.3 (10.7)	17.5 (14.9)	5.3 (11.5)	20.3 (22.1)	16.0 (19.4)
	Contempt	4.1 (7.7)	1.7 (2.0)	0.0 (0.0)	2.9 (5.5)	3.1 (4.7)
	Fear	0.8 (2.1)	0.8 (2.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

[a]Each score represents the mean score of the percent time of presence of emotion in response to each interaction type.

Research Question 2

In order to answer RQ2, descriptive statistics run using SPSS on the data extracted from iMotions Affectiva Affdex software were examined to determine whether there were differences in the mean percent of time a preservice teachers' emotional valence (positive, negative, neutral) was expressed by events between teaching session 1 and 2. The descriptive data shown in Table

7 represents the mean scores and standard deviations of the difference in percent of time the emotional valence was present in response to each event from teaching session 1 to teaching session 2. In addition, emotional valence (positive, negative, neutral) was examined for differences between the baseline time (2 minutes), disruptive teaching time (4 minutes), and total teaching time (6 minutes) of session 1 and session 2 (Table 7).

Table 7
Differences in Percent of Time of Emotional Valence between Teaching Sessions

		Positive Valence		Negative Valence		Neutral Valence	
		(*n*=)	M(SD)	(*n*=)	M(SD)	(*n*=)	M(SD)
Event	Cellphone	9	-.83 (14.40)[a]	9	2.75 (4.85)	9	-1.92 (16.01)
	Criticize Lesson	9	-3.72 (6.39)	9	6.26 (6.34)	9	-2.54 (6.88)
	Name-calling	9	-6.53 (15.35)	9	8.41 (13.80)	9	-1.88 (13.62)
	Refusal	7	-.87 (10.11)	7	1.10 (12.61)	7	-9.08 (9.57)
	Verbal Threat	9	7.26 (18.01)	9	-22.33 (19.49)	9	.08 (16.85)
Time	Baseline	9	-2.42 (5.89)	9	-1.01 (7.84)	9	3.43 (10.50)
	Disruptive	9	-5.34 (6.57)	9	.95 (2.27)	9	4.40 (5.73)
	Total Teaching	9	-4.55 (5.18)	9	-2.56 (3.74)	9	4.23 (4.78)

[a]Each score represents the difference in mean score of the percent time of presence of valence in response to each event or time block between teaching sessions 1 and 2.

Participants expressed more positive valence during teaching session 1 for all disruptive student behavior events and teaching time blocks except verbal threat of violence which detected higher negative valence. Results in Table 7 summarize mean difference in valence categories (positive, negative, and neutral) by disruptive student behavior events and time blocks between teaching sessions 1 and 2. The verbal threat of violence event revealed the largest mean difference in negative valence with a decrease from session 1 to session 2 (M=-22.33, SD=19.49) and the smallest mean difference in neutral valence with an increase of less than .10% (M=0.08, SD=16.85). Positive valence scores decreased the most for the name-calling event (M=-6.53, SD=15.35) and the overall time blocks of disruptive teaching (M=-5.34, SD=6.57) and total teaching time (M=-4.55, SD=5.18). Participants expressed more negative valence during teaching session 2 for all disruptive student behavior events and teaching time blocks, except

baseline. Participants expressed more neutral valence during teaching session 1 for cellphone, criticize lesson, name-calling, and refusal events in simulated teaching session 1.

Research Question 3

In order to answer RQ3, a series of dependent t-tests were conducted to determine whether there was a statistically significant mean difference in self-reported stress for pre-test and post-test scores for each teaching session. Additionally, a dependent t-test was conducted to determine whether there was a statistically significant mean difference in self-reported stress scores between teaching session 1 to teaching session 2. No outliers were detected through visual inspection of boxplot. The assumption of normality was not violated, as assessed by Shapiro-Wilk's test (p = .055). Results in Tables 8 revealed participants reported less stress at the end of teaching session 2 (M = 2.00, SD = 1.00) as opposed to teaching session 1 (M = 3.11, SD = .60), a statistically significant mean decrease of 1.11, 95% CI [-1.71, -.51], $t(8) = -4.26$, p = .003. Results in Table 9 revealed no statistically significant change in mean score of self-reported stress was observed during session 1 from pre (M=2.56, SD=.88) to post session (M=3.11, SD=.60) or during session 2 from pre (M=1.89, SD=1.05) to post session (M=2.0, SD=1.0).

Table 8
Daily Stress Survey Raw Scores

	Daily Stress Survey			
	Teaching Session 1		Teaching Session 2	
Participant	Pre	Post	Pre	Post
1	3[a]	4	1	3
2	1	3	3	1
3	3	3	1	2
4	2	2	3	1
5	3	3	3	1
6	2	4	1	3
7	2	3	1	1
8	3	3	1	3
9	4	3	3	3

[a]Each score represents a Likert scale as follows (1=not stressed, 2=somewhat stressed, 3=stressed, 4=very stressed).

Table 9
Results of Daily Stress Survey Dependent T-Test

	Daily Stress Survey	
Time	Teaching Session 1 (*n*=9)	Teaching Session 2 (*n*=9)
Pre	2.56(.88)[a]	1.89(1.05)
Post	3.11(.60)	2.00(1.00)

[a]Each score represents the mean score of reported stress in each teaching session with the standard deviation in parentheses.

Research Question 4

The qualitative data collection, using video stimulated recall (VSR) methodology, was organized after the quantitative data collection was complete. Seven of the nine participants were included in the qualitative study (six female and one male), while two participants were not available.

Thematic Analysis

The data gathered from the VSR interviews were analyzed using thematic analysis allowing the researcher to organize, describe, and interpret themes within the data (Braun & Clarke, 2006). The researcher used inductive thematic analysis (Boyatzis, 1998), identifying themes that emerged from coding the preservice teachers' language during VSR. Data analysis was conducted according to the six-phase framework for doing thematic analysis, as outlined in Table 10 (Braun & Clarke, 2006; 2017).

Table 10

Description of Six Phase Framework for Doing Thematic Analysis

Analytic Steps	Steps of the current study
Familiarizing yourself with data	The researcher transcribed preservice teachers' reflections during their VSR verbatim (7 sessions, 20 - 30 minutes each). A research assistant listened to the recordings and reviewed the transcripts for accuracy.
Generating initial codes	The researcher and assistant analyzed the transcripts for codes with the purpose of the research guiding the analysis.
Searching for themes	The researcher and assistant searched codes, organized, and combined them to identify themes. Themes were defined from data that had meaning relative to the study.
Reviewing themes	Themes and subthemes were reviewed for overlap and combined to narrow down themes. The transcripts were reviewed again to ensure all themes were captured.
Defining themes	Terms were used to define the central focus of each theme.
Producing the report	The researcher described and summarized themes to share in their dissertation.

Findings

The thematic analysis yielded three main themes: "cognitive dissonance," "behavior-induced stress," and "challenging environment" (see Table 11).

Table 11
VSR Themes and Frequency of Coded References

		Frequency of references	
Theme	Sub-themes	TLE 1	TLE 2
Behavior-induced stress	Frustrated with student criticism Annoyed with student actions Anxious about student attitudes Defeated with lack of control	42	15
Cognitive Dissonance	Loss of control Uncertainty Helplessness Discomfort	22	16
Challenging Environment	Real vs. virtual classroom Proximity Control Feeling "outside of classroom" Behavior management limitations	18	10
Emotional Regulation	Trying to stay calm Nervous laughter Behavior regulation	11	6
Desensitization	Feeling more prepared Knowing what to expect	0	8

Text Search Queries

The word frequency query function of NVivo was used to list the most frequently occurring words in the participant transcripts from session 1 and session 2. Table 12 shows the results of the word frequency query. The first five words listed were the same in both sessions. The next five words listed in the table were selected due to their high frequency relative to other words and their relevance to the research. It is worth noting that the word like, which was the most frequently occurring word for TLE session 1, was primarily used in the context of participants making statements such as "so, like, I didn't know what to do…" and not affirm or compare.

Table 12
Word Frequency Query Results

	TeachLivETM Session 1	TeachLivETM Session 2
Word	Frequency	Frequency
like	102	27
just	69	38
know	50	24
felt/feel	28	20
time	18	14
classroom	27	10
student(s)	31	16
frustrated (-ing)	16	7
control	13	11
behavior(s)	10	5

Based on the results of the word frequency query, the word "know" was run as a text search query to gain a greater understanding of the context of how it was used and if it was consistent with the themes that emerged from the data. Findings of the text search query are seen in the word trees displayed in Figures 5 and 6.

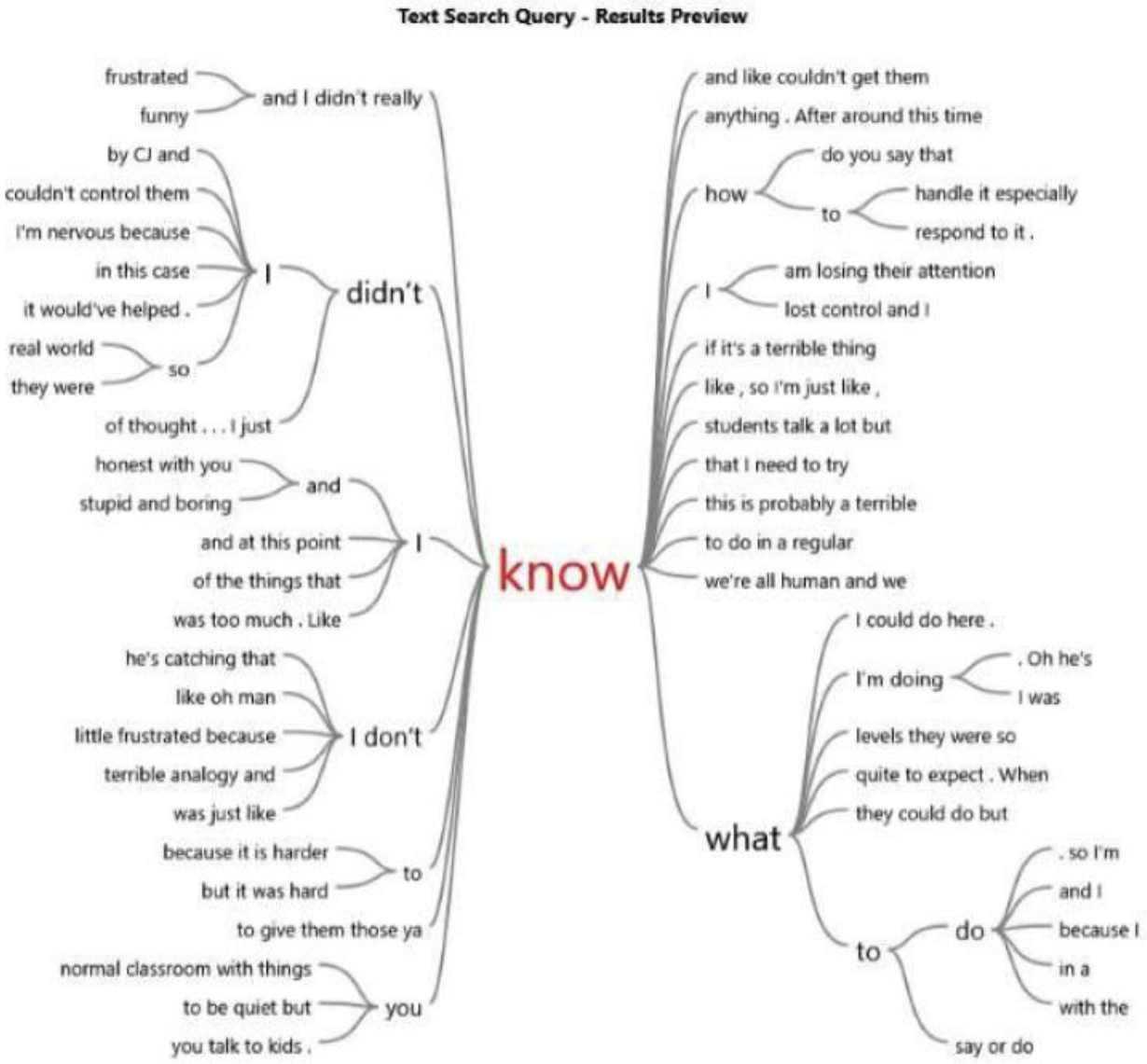

Figure 5*:* Text Search Query Word Tree for "know" from VSR for Session 1

Visual analysis of the word tree was conducted to examine the various contexts in which the word, "know," occurred. In session 1, the word, "know," most often occurred with the words "I," "didn't," "don't," and "what," all of which make up the most prevalent phrases of "I didn't know what to do," I don't know what to do," and "I didn't really know what to do…" As such, the word, "know," in TLE session 1 was most often used in the context of confusion and uncertainty, consistent with the theme of cognitive dissonance.

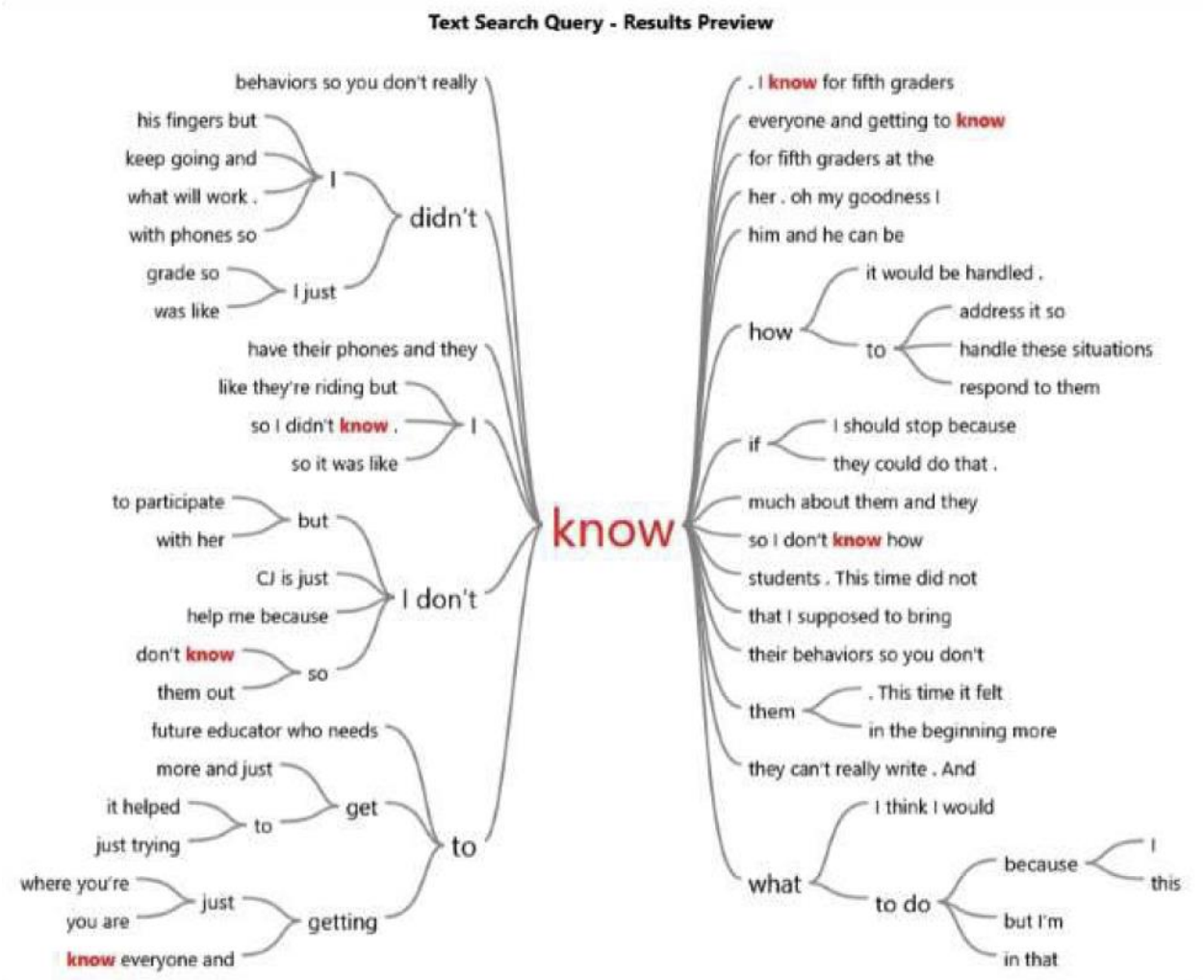

Figure 6: Text Search Query Word Tree for “know” from VSR for Session 2

In session 2, the word, “know,” also occurred most often with the words “I,” “didn’t,” “don’t,” and “what,” but also with the words “to” and “how.” Similarly, to session 1, the most prevalent phrases included those that suggested uncertainty or confusion such as “I didn’t know what to do,” I don’t know what to do,” and “I don’t really know how…” As such, the word, “know,” in TLE session 2 was also consistent with the theme of cognitive dissonance.

Individual Participant Experiences

Participant 1, a white female in the 35+ age group, currently employed in a classroom setting at the elementary level, specifically commented on the limitations in the virtual environment in both sessions and attributed stress, in part, to these limitations. In the VSR from session 1, she commented, "I think it was making me more agitated that I couldn't do anything meaningful…," Similarly, in session 2, she stated, "I was feeling anxious because I just didn't have any strategies to control behavior from a distance which is pretty much the same way I felt the last time."

Participant 2, a white female also in the 35+ age group and currently employed in a classroom setting at the secondary level, also used words associated with feelings of stress in both VSRs. During session 1, she references specific behaviors in comments such as, "That was frustrating when she was just like, well, this is boring, and when I said to put her cell phone away, she said no. That she was texting her boyfriend." She also mentioned specific references to the suppression of her feelings of stress: "I was just really frustrated by the end, and it stayed with me for a little while after because that buildup of frustration and keeping it capped and not reacting. And then I kind of reacted after it was over to someone because I was still stressed out a bit, and I was embarrassed because I accidentally snapped." In session 2, she acknowledged reduced stress: "This time, I kind of knew what to expect from the students, so I didn't feel quite as stressed going into it but was hoping that I could get them to respond to me better this time."

Participant 3, a white female traditional student, 20-24-years-old, with no formal classroom experience, detailed her feelings in the context of the COVID-19 crisis during her VSR: "So overall, throughout this session, I was just feeling like frustrated, but also I was kinda like stressed because that's like when this whole quarantine started. And it was right at the

beginning, so I was like wait, what? Why is this happening? So I was stressed in general, but overall, here, I just felt kind of frustrated and I didn't really know what to do." During VSR following her second session, also during the quarantine, she reported less stress: "I feel like my second try was much better than the first one, and even though the students were still disruptive, I do feel like my second time was much better…"

Participant 4 is a Black male in the 25-29-year old age group, who was enrolled in internship 1 and working full-time as a paraprofessional in an inclusive elementary classroom at the time of the study. He specifically stated that he went into the second session with less stress: "I think, at this point, it was a round two and I knew what to expect. At this point. I knew it was round two, and I was more prepared and just trying to think of everything I could employ…" In his first session, he acknowledged the difficulty of maintaining control: "I know I lost control, and I was just doing my best to give the appearance of maintaining control. As soon as I heard the chimes go off, I just felt relieved that it was over. I was like, oh man."

Participant 5 is a white female, 20-24-years-old. She was an Elementary Education major enrolled in internship 1 and worked part-time in a classroom. She was not available to participate in the VSR.

Participant 6, a Hispanic female, 20-24-years-old, Elementary Education major was enrolled in internship 1 during the Spring 2020 semester, and also worked part-time in a classroom. She specifically expressed that she was less stressed in the second session. In the first session, she stated, "I was frustrated and I just wanted to walk away," but by the second session, acknowledged a reduction in stress; "This time, I didn't feel as stressed out as the first time… From my first experience, I was like, OK, I need to do something to make it better. So I was reflecting on that and thinking about what I did the first time." She also noted being distracted

by outside factors: "… like concerned that, OK, I'm being watched and recorded, and I need to focus. And I wasn't really like taking everything in because so much to think about."

Participant 7, a white female, 20-24-year-old special education major enrolled in internship 2 and employed as a full-time paraprofessional at an inclusive elementary school, specifically stated a reduction of stress between the two experiences. In session 1 VSR, she stated, "…so I'm nervous because I didn't know what quite to expect. When I received the negative attitude from CJ, it definitely made me freeze and become a bit anxious." In session 2, she recalled, "I wasn't as nervous this time because the second time around, I felt more prepared… This time did not feel as stressful as the first time."

Participant 8, a Black female, 30-34-year-old, special education major who works full-time as a paraprofessional in a secondary classroom, was not available for the VSR.

Participant 9 is a Hispanic female in the 30-34-year-old age group enrolled in internship and working full-time in an elementary school. During session 1, Participant 9 commented primarily on specific behaviors and frustration with comments such as, "Sean was being very extra…I remember feeling frustrated because I could only get that one student to talk… so I was getting, like, very nervous"; "I was smiling here because I have to admit, CJ was being pretty funny, but I really didn't know how to respond to it." In the second session, she offered much more narrative and was much more reflective of specific behavior management strategies she was attempting to use: "I think I need a lot of signals and visuals and hand gestures. Like, I was trying to get him to participate"; "I didn't want to reprimand in that moment, so I was just trying to encourage positive behavior." She expressed frustration that her strategies did not work: "And, that moment, I just wanted to say, 'shut up CJ.' I was like, I just didn't know what to do because

I just wanted to continue teaching, and I feel like, now, looking back, I should have addressed it and tried to get her to stop. Grrrrr!"

Social Validity

Six of the nine participants responded to a social validity survey at the conclusion of the study, using questions from the Park & Ryu (2019) study. Results showed that 100% reported that they felt the experience in the simulator was valuable for preservice teachers. All six also felt the actions/reactions of the avatars, when participants asked them questions, were realistic. Five students responded to a question about behavior, and felt that, overall, in the simulated experience, behavior was "natural." Three responded that they were more aggressive than the students in their classrooms. The other two responded that the behaviors were realistic. Participant responses varied on questions regarding suggestions to improve the authenticity of the simulated experience.

Trustworthiness/Validity

Based on guidelines established by Creswell (2013), two forms of validation were used for this study. The researcher used triangulation and peer review of the data gathered throughout all phases of the study. Triangulation was conducted through the use of data collected, analyzed and extracted from iMotions, self-report measures from participants, and qualitative data gathered from video stimulated recall sessions. NVivo software was used to examine video stimulated recall reflections. NVivo allows for extraction, visualization and interpretation of large amounts of natural language text, without bias to enhance reliability and trustworthiness. It provided more in depth analysis of participant reflections and a crosscheck for accuracy of the manual coding stage conducted by the researcher. Extraction from NVivo included text

frequency and text search queries to interpret the data. Hierarchical linking of codes (tree nodes) was done to visually depict and interpret the data.

Additionally, the researcher used a peer reviewer as a research associate (Creswell, 2103) for all (100%) VSR reflections. The researcher discussed questions, concerns, or discrepancies with the peer reviewer. Coding with a peer reviewer generated 97% reliability.

Summary

Analysis in this study indicated mixed results in terms of expressed emotion and stress. The research questions based on facial recognition of emotion revealed that, on a broad scheme, behavior events did not elicit meaningful change in the mean positive, negative, or neutral valence. Additionally data analysis conducted at the emotion and event level of teaching sessions also revealed minimal difference in mean scores for teaching session 1 and teaching session 2 for disgust, joy, surprise, or contempt. However, inspection of means and standard deviations shows that surprise had the highest mean of any emotion, at all events, during both teaching sessions, and was highest for the refusal event of teaching session 2 (M=20.3, SD=22.1).

Analysis for research question 2 revealed there was a mean difference in the percentage of time positive valence was present for the first disruptive events time block from session 1 to session 2, eliciting a mean decrease of 5.3% in expressed positive valence. There was also a difference in positive valence scores for the first full teaching session and second full teaching session, with a mean decrease in time of 4.5% in expressed positive valence, and a difference in neutral valence for full teaching sessions, with a mean increase of 4.2% in expressed neutral valence in session 2 compared to session 1.

The self-report measure of stress, analyzed for research question 3, showed participants reported less stress in teaching session 2 (M = 2.00, SD = 1.00) as opposed to teaching session 1

(M = 3.11, SD = .60), a statistically significant mean decrease of 1.11, 95% CI [-1.71, -.51], $t(8) = -4.26$, $p = .003$. No statistically significant change in mean score of self-reported stress was observed from pre to post session in either simulation experience.

Qualitative analysis revealed the top three themes of cognitive dissonance, behavior-induced stress, and challenging environment. The thematic analysis conducted using NVivo was done separately for session 1 and session 2. Consistent themes emerged in both sessions, but at varying degrees based on coding and frequency of words associated with each theme. Behavior-induced stress had the highest number of coded references in session 1 with cognitive dissonance being second, and then challenging environment being third. During session 2, cognitive dissonance had the highest number of coded references with behavior-induced stress being second, and challenging environment being third. The theme of emotional regulation also emerged, as well as desensitization, which was only noted in VSR reflections of the second simulated teaching session. All participants noted, in various ways, a reduction in stress entering or during the second session. Several participants specifically referenced the reduction of stress, and all participants alluded to the interaction between the behavior of the students in the simulated environment and their own feelings of stress.

The word with the highest frequency, and meaningful to the research, was “know” for both teaching sessions. Text queries of the word “know” for both sessions revealed participants were often making statements of “I don’t know…”

Further discussion of these results occurs in Chapter 5.

CHAPTER FIVE: DISCUSSION

Introduction

Exploring the relationship between stress and emotion expression in preservice teachers can potentially lead to innovative preparation methods so that they may be better prepared to adaptively emotionally regulate during stressful teaching events, preventing emotional exhaustion. In this chapter, the researcher presents the discussion, limitations, and future implications of a research study, focused on examining the effect of repeated exposure to disruptive student behavior on preservice teachers' emotions and stress response. Due to unexpected limitations imposed by the COVID-19 quarantine, the researcher was forced to pivot from the original design of the study and used qualitative measures to replace the physiological measure of stress that would have called for face-to-face interaction. In addition to results from the initial research questions, findings from the additional qualitative component will be discussed.

Purpose of the Study

The present study aimed to examine the effect of repeated exposure to stress-inducing teaching events, involving disruptive student behavior, on preservice teachers' affective response as measured by facial expression of emotions, self-report stress measures, and video stimulated recall reflections. With almost half of new college graduates leaving the teaching profession within a few years (AACTE, 2018), new teachers report being underprepared in the area of behavior management (Abebe & HaileMariam, 2011) and the susceptibility to emotional exhaustion during the first years of teaching (Vos, et al., 2017). New methods for preparing

teachers for stress-inducing behavior problems, not replicable in the traditional teacher preparation setting, are needed.

Simulating Disruptive Behavior Using Avatars

This study relied on replicating disruptive student behaviors, using avatars in a simulated environment, to elicit stress-inducing affective responses of preservice teachers. The behaviors exhibited by the avatars were based on a 2019 *Breaking Bad Behavior* report that surveyed over 1400 general education and special education teachers, nationwide, to determine the scope of disruptive student behavior (District Leadership Forum, 2019). In the simulated environment, live interactors controlled and voiced the behaviors of the students and progressed through the five disruptive behavior events, randomly, for 4 minutes of a 6 minute teaching session.

In terms of eliciting stressful emotions using avatars exhibiting significant behaviors in the simulated classroom, based on findings in the survey on stress and the qualitative analysis of VSR, the study was successful. Participants verbally acknowledged feeling stress and related emotions in both teaching sessions. In the video stimulated recall, two participants also specifically mentioned that the setting replicated the feeling of a "regular" classroom. Participant 6 shared, "It took me a while to relax and remember it wasn't a real classroom, but it felt in that moment that it was."

It should be noted, however, that several respondents mentioned specifically the effect of the virtual environment in their reflections as a constraint on their ability to manage behavior. Participant 9 stated, "It felt strange to teach on a computer and try to figure out how to manage student behavior on a screen instead of in a classroom. I think I would've been able to get behaviors under control better if it were in a real classroom."

A similar response from Participant 2 was noted: “It would’ve been nice if I could get in closer proximity. I felt like I was alienated at the front of the classroom, and I wanted to get closer to them because that’s not what it would be like in a regular classroom.” Other participants made statements such as, “…if this was in a real-world classroom and if a student was acting like CJ was, I would’ve kicked her out of the classroom…”; “it is harder to know what to do in a virtual classroom where you can’t really walk over to the student to talk to them.” Proximity, in particular, was alluded to as a management technique many participants would have used if not in the virtual environment.

Behavior and Stress

The five disruptive student behaviors in this study were designed to elicit emotion-expression information, related to stress and emotions, and to the specific behavior events. In the final analysis of facial recognition, data reflected a decrease of positive valence between the first and the second disruptive teaching time block. This decrease in positive valence, paired with an increase in negative valence, suggests that participants expressed more stress in the second disruptive teaching block. If facial expression alone were being used as an indicator of desensitization, the decrease in positive valence and increase in negative valence may be interpreted as an indication participants’ did not experience a desensitization to behaviors. This, however, is not consistent with both the survey and video stimulated recall.

In the daily stress survey administered pre and post for each session, there was a statistically significant mean decrease in the self-reported stress. This decrease in stress was also reported during the video stimulated recall. During session 1, one participant rated herself as a “1” and shared in the open response question, “I am feeling calm.” When finished with the session, however, she said, “I feel anxious, overwhelmed, like I didn’t do a good job at all. I felt

like I wasn't in control." In session 2, she rated herself as a "2" and said she wasn't very stressed and was, "thinking about this session in a positive way." In her post, she rated herself a "3" and said, "I was stressed about delivering content." Overall, results of both the stress survey and video stimulated recall session, indicated that preservice teachers experiencing disruptive student behavior events mostly appraised them as stressful and uncontrollable in both teaching sessions, but less so in teaching session 2.

The inconsistency between the valence of facial expression of emotion and participant self-reports may be explained in several ways including, that some action units such as a smile or cheek raise may have been elicited or expressed on participants' faces increasing the likelihood of positive valence, but might have been attributable to other factors as well. One participant during the VSR specifically mentioned smiling because she was "giving up," and another stated that she was "laughing so that she didn't scream." It is also possible that if the data extracted from iMotions was detecting positive valence and participants reported negative feelings, an explanation may involve expressive suppression- "not letting their feelings show"- which is a maladaptive regulation strategy that has been found to be used by teachers (Chiang, 2009). In contrast to reappraisal, which should positively alter the emotional experience, suppression does not change the negative emotional experience, but simply the expressive behavior that is observed. Physiological measures collected with facial expression of emotions would have given a better indicator of stress. An increase in physiological measures of stress while experiencing a positive valence maybe associated with the negative effects of inhibiting emotion expression.

Another factor, considering the extreme behaviors and the fact that participants knew they were being observed, may have been an instance of smiling when experiencing stress or when embarrassed (Ambadar, Cohn, & Reed, 2015). Some students admitted they felt like they

did not know how to deal with the behaviors encountered, which may have been embarrassing or have induced "nervous laughter" that was coded as a positive emotion. Three participants indicated they were nervous about the simulation experience and being "watched."

Accuracy of Facial Expression Recognition

The findings of this study are consistent with the current literature suggesting that, given the multi-channel nature of emotion, facial recognition alone may not be an accurate measure of affective state when not used with other physiological measures for multimodal data collection (Fwa & Marshall, 2018). The study was originally designed to include physiological measures in conjunction with the facial recognition software to analyze changes in levels of the emotion and stress components of affect (Gross, 2015). Due to the COVID-19 shutdown, the study was moved to an online platform so this data was not able to be collected. Several specific findings during the facial recognition component of the study, however, provided insight into the use of facial recognition in remote, simulated teaching sessions.

One major consideration with using this method is that participants were talking during the majority of the teaching sessions. The success coach from iMotions who conducted trainings with the researcher throughout the study on the use Affectiva software and output data from Affdex cautioned that artifacts in the data may be a result of talking. Surprise, in particular, which occurred at the highest percentages throughout the study, is identified when the mouth opens a bit and the jaw drops; therefore, suprise may have occurred at a higher percentage due to the fact participants were teaching (ie., moving their mouths) throughout the recorded sessions used for data analysis. This affirms the use of multimodal data collection to study emotions and stress, especially when the study is occurring outside of the controlled environment of a lab, and/or participants are talking during data collection.

If an accurate representation of the participants' affective state, the relatively high percentages of "surprise" can have implications for the study. Surprise is not automatically calculated in a valence score; therefore, it was not included as positive or negative valence. Surprise was the highest mean percent of emotion throughout all events of both teaching sessions, but it is the only basic emotion not specific to negative or positive valence (iMotions, 2020). Future research should account for surprise in the inclusion of valence scores, depending on the study's goals.

An additional implication for the overall goal of this study is the emotion expression of surprise may have been due to the novice teachers encountering unexpected behaviors during the teaching sessions. Surprise may tie directly to the concept of cognitive dissonance, which has been tied to increased likelihood of perseverance and learning when the dissonant state is adaptively resolved (Wall, 2018).

Results from this study were associated with more pessismistic appraisals of emotion-focused coping in the first teaching session and more optimistic appraisals of emotion-focused coping in the second teaching session. In relation to stress, five of the seven participants who volunteered for the video stimulated recall indicated feeling less stress in the second session, including statements such as: "I wasn't as nervous this time, because the second time around because I felt better prepared," and, "This time, I kind of knew what to expect from the students, so I didn't feel quite as stressed going into it." This is supported in research on cognitive dissonance and desensitization. Reduced feelings of stress in session 2 may also be a reflection of increased ability in emotion-focused coping techniques.

Discussion

The majority of participants (89%) in this study were working in classrooms as paraprofessionals, full- or part-time, at the time of this study and had more experience than traditional preservice teachers. The special education undergraduate program at the university in which the majority (78%) of these students were enrolled uses a teaching residency model that allows students to work as paraprofessionals during their preservice experience. This experience likely shaped their ability to manage their stress as they already may have become desensitized, depending on the setting, to the types of behaviors exhibited by students. Creating a level of cognitive dissonance was potentially a challenge since these participants had more exposure than their traditional peers. However, this was achieved, according to responses on the social validity survey and qualitative responses.

In this study, participants were expressly aware of the inability to use proximity strategies and referred to the practice repeatedly. In light of the proximity issue associated with online learning and the relative uncertainty regarding face-to-face educational practices that transfer into an online learning environment, the assumption cannot be made that classroom behavior management strategies preservice teachers are learning and practicing in their educator preparation programs for brick-and-mortar schools will be applicable or effective in online learning environments. While proximity, for example, is an appropriate strategy for the traditional classroom, future teachers must be better prepared to navigate and manage behaviors in an online environment using verbal de-escalation, verbal praise, redirection, and other techniques that do not require a physical presence.

It should be noted that the present study was designed so that no management techniques would stop the behaviors in an effort to induce a stress response.

Although the intent of the study was to create a safe opportunity for students to engage in repeated events to promote desensitization, more needs to be investigated on the topic of ethical use of intentional stress-inducing events with preservice teachers. All participants acknowledged, verbally, feeling stress or emotional discomfort of some sort during their experiences. Finding the appropriate levels is critical for the emotional well-being of participants. Using a desensitization model that specifically uses the evidence-based procedures, validated in well-documented stress inoculation training, that includes steps to ensure individuals are equipped with appropriate coping strategies as they experience the cognitive disequilibrium of stress-inducing events, and adapt new schema. If teachers do not develop the necessary coping strategies, they may feel failure and hopelessness ultimately leading to an increase in their emotional exhaustion and likelihood of leaving the teaching profession.

Limitations

Results from this mixed-methods study should be interpreted with caution due to small sample size, limitations of facial expression recognition software as a measure of stress, setting, absence of physiological measures of stress, and limitations of facial expression recognition software as a measure of stress given the speaking actions of participants during the data collection. In terms of sample size, more than half of the participants who signed up to participate in the study were not available, or "too stressed" to participate due to circumstances revolving around COVID-19. Three individuals reported they were trying to "get their things moved back home." Two specifically stated they lost their job and "didn't know how they were going to pay rent," so they were too busy trying to solve personal circumstances to focus on participation in the current study. Future research should include more participants.

Limitations of the iMotions analysis due to participants speaking during data collection is also a critical issue to be considered. Talking involves movement of lower facial muscles which can cause changes in facial expressions that may impact how an expression is coded, potentially leading to misclassification of the presence of an emotion. In situations where respondents are talking, the *iMotions Pocket Guide to Biometric Research* (2020) recommends to mark and exclude all data portions where respondents talk, eat, or drink in order to ensure the accuracy of the facial expression analysis. Given that participants were talking throughout the majority of each 6-minute session due to teaching a lesson to students, this was not a viable solution as it would have eliminated the majority of the video, and an inability to measure facial expression immediately before and after an event.

Additional confounding environmental factors threatened internal control. The researcher planned to conduct the study in a lab on the university campus, but campus closure as a result of COVID-19 resulted in remote data collection using video conferencing software. As such, each participant was in their own home, where the researcher had no control over the physical setting, so observed measures of participant facial expression of emotions may be impacted by events outside of the study. Two participants specifically referenced feeling stressed due to the quarantine circumstances of COVID-19. One participant did not participate in VSR because she said it was too hard as a single Mom trying to work and help her 3 children at home with schoolwork.

Although, the short duration of the study decreases the likelihood that changes in the dependent variable were due to a time-related effect, the length of the study which was reduced from four teaching sessions to two teaching sessions due to participant availability, limited the

time and exposure to events which may have decreased the chance of any change in the dependent variable.

Implications for Future Study

Today's teachers must enter classrooms fully prepared to successfully manage high levels of stress often associated with student discipline problems in order to reduce the amount of teacher turnover directly related to emotional exhaustion (Carlyle & Woods, 2002; Carver-Thomas & Darling-Hammond, 2017; Chang, 2013; Podolsky et al, 2017; Rumschlag, 2017). In addition to focusing on implementation of better instructional methods, educator preparation programs need to find ways to address the affective component of teaching such that preservice teachers are better equipped with the skills and ability to adaptively regulate their emotions and reduce their susceptibility to burnout (Greenberg et al., 2014). Based on this study's preliminary findings and existing research on the evidence-based practice of stress inoculation training (Meichenbaum, D., 2017; Meichenbaum & Deffenbacher, 1988; Prachyabrued et al., 2019; Serino et al., 2014), the researcher recommends future research focus on preparing teachers and other educational staff through simulation experiences using desensitization principles of stress inoculation training.

As with the current study and the Park & Ryu (2019) study, potential researchers should consider exploring the emotional experiences of preservice teachers in virtual immersive classrooms by planning realistic classroom interactions designed to elicit emotions that might be experienced in a natural classroom setting. Based on participant responses in the current study and existing research, TeachLiveTM provides a "suspension of disbelief" (Dede, 2009; Dieker et al., 2013; Hayes et al., 2013) needed to ensure an authentic "classroom" experience where preservice teachers feel immersed in the experience of teaching and have the opportunity to

develop their pedagogical practice. A simulated virtual learning platform provides a safe way to gradually introduce preservice teachers to the stressors of teaching in a controlled environment while giving them the opportunity to develop new schema potentially increasing their emotional regulation ability and adaptive behavior patterns. Faculty and administrators of educator preparation programs may wish to consider developing more course modules or assignments embedded throught the semester to specifically target the affective components of teaching in the controlled setting of an immersive simulation classroom. As preservice teachers become adept at navigating the mild stressors of the simulation classroom, the behaviors and intensity of behaviors could be increased to provide a desensitization effect over the course of a semester.

Future research should also consider participants' personal and professional knowledge and experience working with youth with disruptive behavior patterns. As with the Park & Ryu (2019) study, preservice teachers' prior classroom experience and training could be factors influencing their level of confidence and emotional states. Additionally, the participants' experience in an online platform teaching should also be considered. As was noted in the current study, participants' knowledge, training, and experience with behavior management in a natural classroom setting often evoked confusion and a lack of control when expected to implement behavior management remotely. As such, participants' affective response may not have been a result of the behaviors they were experiencing from students in the classroom, but more in response to the unfamiliar setting.

Lastly, given the noted limitations of collecting data via facial expression recognition software while participants' are talking, future research with preservice teachers' preparation should include events that do not require any participants to talk or include a control group of participants that do not talk. The researcher intends to design a similar study looking at

disruptive student behavior, but through observation of a class through an observation window for a natural setting, or through the use of videos for participants to observe. Additionally, as noted previously, constraints on time, setting, and participants resulting from COVID-19 placed significant limitations on the ability to conduct multimodal data collection. Therefore, future research will also include physiological measures of stress in addition to facial expression of emotions and participant reflections.

Conclusion

The goal of this study was to explore changes in preservice teachers' affective response to disruptive student behavior through repeated exposure in a simulation classroom with the goal of desensitizing preservice teachers to those stressors, thus decreasing the probability of negative physiological and emotional reactions when they experience them in the real world classroom (Meichenbaum, D. 2017)

Emotions are products generated from individuals' appraisals of their circumstances. Teaching is an emotional practice; for teachers, the circumstances of their profession include dealing with disruptive student behaviors which, if not experienced during their teacher preparation programs, often elicit negative emotions and stress and drive novice teachers from the profession. Teacher preparation programs must find more effective ways to address the affective components of teacher preparation.

Findings from this study align with Lazarus & Folkman's transactional model of stress and coping and Gross' process model of emotion regulation which provided the theoretical framework for this study. These appraisal theories view emotions, stress, and expressive behavior of emotions as emerging from an ongoing cognitive appraisal and reappraisal process (Lazarus & Folkman, 1984; Gross, 2015). Participants' changes in facial expression of emotion

and negative valence would suggest that they increasingly perceived a threat, loss, or challenge to their personal goals while also perceiving insufficient resources to successfully cope adaptationally and/or emotionally at the secondary appraisal level in response to repeated exposure to disruptive student behavior. While the changes in facial expression of emotions of participants would suggest "stress inoculation" did not occur for two teaching sessions in the simulation classroom, quantitative analysis of participant stress survey responses and more in-depth qualitative analysis of participants' reflection of their experience in the simulation sessions gives a preliminary indication that "stress inoculation" has the potential to work at building preservice teachers' emotion regulation ability during times of stress-inducing disruptive student behavior. Qualitative data supported findings from the stress survey indicating statistically significant decrease in participants' self-reported stress level.

Video stimulated recall reflections based on Lazarus and Folkman's and Gross' appraisal theories indicated that participants showed signs of positive reappraisal during the teacher-student disruptive event transactions. Overall decreases in preservice teachers' statements regarding behavior-induced stress, cognitive dissonance, and challenging environment suggested participants' either increasingly appraised less of a threat, loss, or challenge to their personal goals and/or also perceived increased internal or external resources to successfully adapt to the stress-inducing situations that initiated the emotion generative process. Given these findings, eliciting cognitive dissonance through stress-inducing teaching events, coupled with training in coping strategies in teacher preparation programs, has the potential to reduce stress and early career burnout common during the induction phase of teaching. The potential for reduction in stress with repeated exposure to stressful teaching situations in low-risk simulation experiences is worth additional research given the potential to enhance teacher well-being, teacher-student

interactions in the classroom, and alleviating teacher shortages and the associated costs to school districts resulting from teacher turnover due to emotional exhaustion and burnout.

APPENDIX A: IRB STUDY APPROVAL

UNIVERSITY OF CENTRAL FLORIDA

Institutional Review Board
FWA00000351
IRB00001138, IRB00012110
Office of Research
12201 Research Parkway
Orlando, FL 32826-3246

APPROVAL

February 11, 2020

Dear Missy Glavey:

On 2/11/2020, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title:	Examining Changes in Preservice Teachers' Stress in Response to Disruptive Student Behavior in an Immersive Rehearsal Classroom
Investigator:	Missy Glavey
IRB ID:	STUDY00001399
Funding:	None
Grant ID:	None
IND, IDE, or HDE:	None
Documents Reviewed:	• HRP-251 - FORM - Faculty Advisor Review.pdf, Category: Faculty Research Approval; • Daily Stress Survey, Category: Survey / Questionnaire; • Glavey_Eileen Dissertation IRB HRP-503 Version 2.docx, Category: IRB Protocol; • irb_HRP-502 Consent Glavey Disseration Version 2.pdf, Category: Consent Form; • Qualtrics - Interest in Study, Category: Other; • Recruitment Flyer Dissertation Version 2.docx, Category: Recruitment Materials;

The IRB approved the protocol on 2/11/2020.

In conducting this protocol, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system. Guidance on submitting Modifications and a Continuing Review or Administrative Check-in are detailed in the manual. When you have completed your research, please submit a Study Closure request so that IRB records will be accurate.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

APPENDIX B
RECRUITMENT FLYER

RESEARCH OPPORTUNITY

I am looking for **undergraduates from the College of Education with a designated major in Exceptional Education, Elementary Education, Secondary Education, or Teacher Education** to participate in a study aimed to reduce novice teacher stress!

Researcher: Missy Glavey, Doctoral Candidate
Faculty Advisor: Rebecca Hines, Ph.D.

Criteria:

1. An undergraduate student in the College of Education
2. Designated education major
3. Available for five TeachLivE™ sessions (a 15-30 minute information session and 4 teaching rehearsal sessions, up to ten minutes each).
4. Cannot be wearing any head coverings that block any part of the face

You will receive a **$20 gift card** upon completion of the study.

Location:

TeachLivE™ Lab,
Teaching Academy, School of Teacher Education
College of Community Innovation and Education

If you are interested to participate please complete the following Qualtrics Survey http://ucf.qualtrics.com/jfe/form/SV_9AyErnsUXLuGpNP

If you questions concerning the study, please contact:
Missy Glavey
mglavey@knights.ucf.edu

APPENDIX C
BEHAVIOR DESCRIPTIONS FOR INTERACTOR

Directions for Interactor regarding student behavior:

All students need to be compliant for the first two minutes so that I can get an accurate baseline measure of the participant's physiological state before dealing with student disruption. After **2 minutes** of baseline begin disruptive behavior.

After first two minutes, students will start to be disruptive at different times, making noises, giggling, complaining, talking out, etc.

Please include the following specific behaviors in random order in every session. . .
Student saying this is stupid or similar criticism (about the lesson)
Student refusal to participate (includes a firm "no!…")
Student on cell phone ignoring teacher attempts to get them to participate
Student makes fun of Andre' (student with disability) calling him a name and then repeating it
Student makes a verbal threat of violence toward another student

Please have the intensity of behaviors up to a level 4 at times. Behaviors can be random, but need to be in a different order for the second session.

The participant may say "END SESSION" at any
point they are not comfortable continuing.
Please STOP immediately if they say to end the session.

APPENDIX D
LESSON PLAN

This lesson is provided as a guideline for you to follow. You are not expected to follow an exact script. You may start each simulated teaching session as if starting a new lesson, or pick up where you left off last time.

States of Matter: Solids, Liquids, and Gases	
Learning Objective:	Students will be able to differentiate between a solid, liquid, and gas. Students will be able to give examples of changes in states of matter from heating and cooling.
Lesson Introduction:	• Tell your students that they will be learning about the states of matter. Explain that everything in our lives is made up of matter. It includes the air we breathe, the clothes we wear, the books we read, the food we eat, etc. • Ask them if they know what the 3 states of matter are, descriptions, examples, etc. • Identify the three states of matter and discuss
Explicit Instruction:	• Define the word molecule by explaining that molecules are what is in all matter. Molecules are the smallest possible amount of a substance. • Explain to your students that a solid is something that keeps its own shape because the molecules are packed tightly together. • Have your students come up with examples, and offer examples, such as desks, books, and chairs. • Remind your students that a liquid is something that doesn't have its own shape because the molecules are more loosely packed together. • Liquids take the shape of whatever container they are put in. Some examples include water and juice. Ask your students to come up with additional examples of liquids. • Explain to your students that a gas has no particular shape because the molecules are spaced apart and move around freely. They move around and can fit any container they're put in. Tell your students that air is made of gases, and share that gas usually can't be seen. • Pose the following question: Can a solid turn into a liquid? Let them respond with examples and explanations. • Explain that a cube of ice can turn into a liquid with heat. Discuss. • Ask your students if a liquid can turn into a gas. Have them think, and discuss, and share with the whole group.
Formative Assessment:	• Provide examples and and ask them to respond solid, liquid, or gas (ie., waterfall, soup, smoke, snow, balloon, helium, ice cube, rain, air, pizza, tree, steam, book, paint, etc.) • Ask your students to give an example of a time when a solid can change into a liquid. Have them explain when a liquid can change into a gas.

APPENDIX E
RANDOMIZED PARTIAL COUNTERBALANCING

Randomized Partial Counterbalancing - Order of Conditions/Events

Participant	Teaching Session 1 Condition/Event				
1	B	A	D	E	C
2	B	A	D	E	C
3	B	A	E	C	D
4	D	B	E	C	A
5	B	C	A	E	D
6	B	A	C	E	-
7	A	B	E	C	-
8	B	E	C	D	A
9	D	B	C	E	A

Note. A=cellphone; B=criticize lesson; C=name call; D=refusal; E=verbal threat

Participant	Teaching Session 2 Condition/Event				
1	B	C	A	E	D
2	B	A	C	D	E
3	B	A	D	E	C
4	D	B	C	A	E
5	A	B	C	E	D
6	A	B	D	C	E
7	B	D	A	C	E
8	B	A	D	C	E
9	B	A	E	D	C

Note. A=cellphone; B=criticize lesson; C=name call; D=refusal; E=verbal threat

APPENDIX F
SOCIAL VALIDITY SURVEY DATA

Q1 How did you perceive the virtual students, were their reaction/responses natural as like real classroom students?	Q2 When you asked questions to the virtual students, were their reactions/responses natural as like real classroom students?	Q3 Was there anything you noticed that disrupted your teaching in the virtual teaching simulation?	Q4 What would you suggest to add more to the virtual classroom to improve the authenticity of the virtual classroom environment?	Q5 What would you suggest to add more to the virtual students' reactions or behaviors to improve the authenticity of the virtual students?	Q6 Do you see value in having pre-service teachers participate in a similar virtual teaching simulation experience with disruptive students?
I think they reacted in a way that students would or could in a classroom so I think their behaviors and conversations were representative of actual students.	Yes! I can totally see them carrying themselves this way in a classroom.	Talking while a teacher is talking but what bothered me the most is that the student being provoked would talk back so it was harder to pull them out of that discussion... it's different and more manageable when it's one student being disruptive than having two actively engaged in a discussion...	Maybe have the students respond well to one of the teacher's commands in regards to behavior, I believe this could increase the teacher's feeling of control therefore feel more in comfortable in giving commands as the session goes on.	I think they were expressive in their reactions and verbal responses.	Yes! A total reality check!
Yes, they were similar to students with behavior issues.	Yes, I think they were natural. They did not feel overly scripted.	Behavior only interrupted the simulation.	More movement, but I am not sure that is possible with the technology we currently have.	There weren't any behavior parameters set up for the classroom, which would be something you would address with a new class before beginning to teach anything, especial a class with kids with behavior problems.	Yes. It can help to get some of the shock out of their system. I think it would help to then have them learn how to implement a classroom behavior plan as well as individual BIPs. I think this could be used in a lot of different ways.

Q1 How did you perceive the virtual students, were their reaction/responses natural as like real classroom students?	Q2 When you asked questions to the virtual students, were their reactions/responses natural as like real classroom students?	Q3 Was there anything you noticed that disrupted your teaching in the virtual teaching simulation?	Q4 What would you suggest to add more to the virtual classroom to improve the authenticity of the virtual classroom environment?	Q5 What would you suggest to add more to the virtual students' reactions or behaviors to improve the authenticity of the virtual students?	Q6 Do you see value in having pre-service teachers participate in a similar virtual teaching simulation experience with disruptive students?
Yes! The virtual students behaved and sounded like real students! They said some things to me that I have heard in the classroom before.	Yes, their reactions and responses seemed natural.	I felt disrupted when a student would talk over me and not allow another student to feel confident in their answer.	Not sure	Not sure	Yes I do. It might be an easier way to get yourself acquainted with possible disruptive behaviors from students.
They students felt more aggressive than my actual students. The scenario felt similar to an average workday otherwise.	The responses did feel natural for the most part.	Everything was disruptive, but what got me the most was the calling out.	I would lower the aggression, and perhaps have the students interact with each other more. In my usual classroom environment, the kids tend to talk top and respond to one another more than myself or the Teacher.		This is definitely a good experience that will either deter or encourage pre-service teacher. I would hope for the latter of the two.
I think some of the students were more extreme than actual students in a classroom. I was overwhelmed by the one students who did all the talking and thought he was bit annoying but I didn't know how to get him to give others a chance to speak without being rude.	I think the questions I asked were similar reactions that real students would give. I know In a real classroom, some students will be rising off while other students may be eager to talk.	I think the only thing that distracted me was the student who would not stop talking. His outburst were very disruptive and I did not know how to handle the situation.	im not sure.	I think the students are very diverse in the way they act and the things they say.	I think this experience would be great for pre-service teachers to try because it is very overwhelming and it will give them an opportunity to watch themselves and reflect on what they should and shouldn't do. This is better than throwing them into the classroom with no experience.

Q1 How did you perceive the virtual students, were their reaction/responses natural as like real classroom students?	Q2 When you asked questions to the virtual students, were their reactions/responses natural as like real classroom students?	Q3 Was there anything you noticed that disrupted your teaching in the virtual teaching simulation?	Q4 What would you suggest to add more to the virtual classroom to improve the authenticity of the virtual classroom environment?	Q5 What would you suggest to add more to the virtual students' reactions or behaviors to improve the authenticity of the virtual students?	Q6 Do you see value in having pre-service teachers participate in a similar virtual teaching simulation experience with disruptive students?
I thought they were pretty natural just a little on the aggressive side	Sometimes they were a little aggressive	I'd like the desk to be spread out a little bit more so I can see all faces at one time	Being able to have close proximity to students and also have eye contact. Being able to give a student a chance to be removed from the classroom to have a cool down session would be helpful as well	Being able to give a student a chance to be removed from the classroom to have a cool down session would be helpful as well	It's always a good idea to get experience in different formats

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