EVIDENCE-BASED AND MAKERSPACED: PRESERVICE TEACHERS' DISPOSITIONS, PERCEPTIONS, AND PREPAREDNESS TO TEACH STUDENTS WITH EMOTIONAL AND BEHAVIORAL DISABILITIES

by

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ABSTRACT

ABBY FORGANG HOLLAND. Evidence-Based and Makerspaced: Preservice Teachers' Dispositions, Perceptions, and Preparedness to Teach Students with Emotional and Behavioral Disabilities. (Under the direction of DR. HEATHER COFFEY)

The purpose of this qualitative research project was to explore the perceptions, practices, and roles that a team of six (6) preservice teachers developed regarding make-based learning, which is informed by constructionism and teaching students with emotional and behavioral disabilities. Participants were students in a seminar course that involved weekly clinical visits to the makerspace inside a separate public school for students with exceptional emotional and behavioral needs. They also spent one afternoon per month designing and carrying out projects in a university makerspace. Data included written observation forms and written assignments, spoken narratives through individual interviews, and photographic evidence of the artifacts that participants created in the university makerspace. Three common themes emerged across participants: (1) making connects to social-emotional learning, which can benefit students with EBD; (2) time in school reserved for the makerspace should not be overshadowed by library visits or other activities; and (3) using evidence-based practices is not the only pathway to finding "what works"

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DEDICATION

This dissertation is dedicated to all students with invisible disabilities.

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LIST OF ABBREVIATIONS

ADHD	Attention Deficit/Hyperactivity Disorder
CLL	Constructionist Learning Laboratory
EBD	Emotional and Behavioral Disability
ED	Emotional Disturbance
IDEA	Individuals with Disabilities in Education Act
IRB	Institutional Review Board
PST	Preservice Teacher
STEAM	Science, Technology, Engineering, Arts, and Mathematics
STEM	Science, Technology, Engineering, and Mathematics

CHAPTER 1: INTRODUCTION

Preamble

I am an adoptive parent of a teenage boy with mental illness. We met when he was nine years old and in 3rd grade. He was a tiny, skinny child who could fly into a rage over what I would consider a minor annoyance or inconvenience. One afternoon, early in our relationship, I noticed him staring out the window when he was supposed to be doing his assigned silent reading. I decided to add a few minutes to the kitchen timer to make up for lost time reading. He then turned the library book into confetti, slammed his bedroom door, and cried until he fell asleep. Yet he was loveable. He could tell clever jokes. He loved the family dogs, and I would find him sweeping floors and cleaning his room the morning after a tantrum. At age 13, he became more violent, smashing lamps and punching holes in walls. He started running away, sometimes overnight. When his dad and I placed him in a group home that provided constant supervision, the staff would send us videos of him fighting with others. He broke into a car and stole a teacher's phone. He experimented with illegal drugs. At the time of writing, he is 15 and living in a psychiatric residential treatment facility due to risk of harming himself and others. He will be arraigned after time of writing. He is potentially facing placement in juvenile detention until his 18th birthday.

When our son attended public school, he earned a reputation as a troublemaker. He earned poor grades. Teachers frequently called and emailed me about his impulsive and aversive behaviors. Yet when he was in 5th grade, he entered a competition that involved building a contraption that would prevent an egg from breaking when launched from the roof of the school. He and his dad spent weeks designing the artifact and

sacrificed dozens of eggs to come up with the best design. The day of the competition, my son nestled an egg inside the cage he built with pipe cleaners and duct tape. After the launch, it remained intact. All the other eggs shattered. Winning that competition was a source of pride.

I am confident that more opportunities to engage in similar projects would not have kept our boy out of a psychiatric facility. It is possible, however, that he would have been happier in school. Therefore, I was drawn to the makerspace at "City Academy", a K-12 separate school for students diagnosed with emotional disturbance (ED).

This first chapter will present the case for the need for this study. I will then present my research question and describe the theoretical framework within which I situate my question. I also present key terms and definitions used throughout the study.

Background

According to the U.S. Department of Education, Institute of Education Sciences and National Center for Education Statistics (2018) public schools in the United States provide special education to more than 350,000 students with ED. The students represent approximately 0.5% of the school-age population (Office of Special Education and Rehabilitation Service, 2017). Data from the 2017 report show students who fall under this disability category are the most likely to be removed from a regular educational setting and receive exclusionary discipline for 10 or more school days. Among youth and young adults with disabilities, students classified as ED have the highest incidence of involvement in the criminal justice system. Only 48% of these students spend 80% or more of the school day in a regular classroom (U.S. Department of Education, 2020), and 17% attend school in a separate setting (Sanford et al., 2011). On average, students with

ED perform two grade levels behind their peers in reading, math, and writing (Gage et al., 2014). By high school, these students may be performing almost 3.5 grade levels below their classmates (Epstein et al., 1989). Only 51.1% graduate from high school (U.S. Department of Education, 2014).

The Individuals with Disabilities Education Improvement Act of 2004 (IDEA) uses the term ED to identify the disability. Although students who receive special education for emotional and behavioral concerns represent less than 1% of the school population, approximately 20% of children and more than 46% of teenage students experience a mild-to-severe mental health condition (Merikangas et al., 2010; National Research Council and Institute of Medicine (NRC & IoM), 2009). For the purposes of this dissertation, I use the term emotional and behavioral disabilities (EBD) to include the larger population of students whose mental health can impair academic and social growth in school. I use ED to identify the smaller population that receives special education. The term EBD is prevalent in academic literature and has wide support in both education and mental health communities (Forness & Kavale, 2000).

Statement of the Issue

Students who manifest symptoms of EBD, including non-compliance, aggression, depression, and anxiety, can present a challenge to classroom teachers (Buttner et al., 2016; Cook et al., 2007; Willmann & Seeliger, 2017). Teachers may identify the students themselves, not their disability, as a challenge to classroom management. Instead of perceiving a disability that requires intervention, teachers could believe the students themselves are problematic individuals who do not belong in a regular classroom (Orasti & Causton-Theoharis, 2013). Kern (2015) claimed some teachers believe their purpose is

not to teach social skills, but rather academics and blame families for students' lack of behavioral control. Scott et al. (2011) asserted that the absence of effective practices in classrooms leads to students with EBD failing courses and teachers exiting the profession. While there are ample evidence-based practices intended for students with ED, some teachers may not have knowledge or confidence in their abilities to implement them (Gable et al., 2012).

Evidence-Based Practices for Students with EBD

An instructional strategy with reliable research to document positive outcomes can be considered an evidence-based practice (Cook et al., 2008). Reliable research consists of a minimum of three supporting empirical studies published in peer-reviewed journals (Simonsen et al., 2008). Gable et al. (2012) identified a set of evidence-based practices intended for students with EBD that are published in peer-reviewed journals and special education textbooks. Evidence-based practices identified in this study that target academics include: (1) choice-making opportunities; (2) teaching students self-monitoring strategies; (3) a systematic approach to cooperative learning; (4) peer-assisted learning; and (5) specialized instruction to promote learning and study skills.

Gable et al.'s (2012) study found many general education teachers rarely give students choice-making opportunities. Yet giving students choices costs little time or preparation and has been reported to have successful results across grade levels and educational settings (Jolivette et al., 2017). Concerning specialized instruction to promote learning and study skills, Gable et al. (2012) found 32.1% of general and 24% of special educators never, seldom, or sometimes use this strategy. Specialized instruction involves a special educator using alternative methods to instruct students with documented

disabilities (Blake & Monahan, 2007). General and special educators often believe teaching student self-monitoring strategies is important, but do not instruct students how to use them (Gable et al., 2012). Self-monitoring involves students observing and recording their behaviors. Students can use a paper or electronic form to collect self-reported data (Hunter et al., 2017). Systematic cooperative learning is group work, heterogeneous groups of learners mastering a specific task. A teacher assigns or students assign themselves specific, non-hierarchical roles to complete an assignment collectively (Damon & Phelps, 1989).

The Constructionist Learning Laboratory

Although not overtly employed as evidence-based strategies, instructors used these tactics at the Constructionist Learning Laboratory (CLL), an experimental school based in a Maine juvenile detention center from 1999-2002 (Cavallo et al., 2004; Stager, 2001, 2005, 2013). The traditional school at the center faced challenges that included low student motivation, limited literacy levels, past negative school experiences, a high number of students with learning disabilities, and an inflexible high school curriculum (Stager, 2001). The governor and State Commissioner of Education recognized the futility of using traditional methods to instruct children and youth with "a long history of school failure" (Stager, 2001, p. 1). The governor welcomed the experiment and freed the CLL from the state's curricular and assessment requirements (Stager, 2013). The purpose of the CLL was to create "an environment in which knowledge was constructed inside the head of the learner through the act of making something shareable outside of their head" (Stager, 2013, p. 487). Students spent the school day working on personally meaningful projects (Stager, 2001). Projects included radio documentary production, building

classical guitars, raising caterpillars, video game design, correspondence with authors, writing a newsletter, and running a photo studio on visitation days (Stager, 2013).

Educators in the CLL applied evidence-based practices intended for students with EBD (Gable et al., 2012) in the following ways:

1. Choice-making--most of the students' projects emerged from a topic or subject of their own interest (Stager, 2013).
2. Teaching students self-monitoring strategies--students began the school day writing a to-do list. At the end of each day, they took photos of their work, labeled them, and hung them at their workstation (Stager, 2013).
3. Systematic Approach to Cooperative Learning--the group of students stayed together the whole day to build community and mitigate interruption (Stager, 2013).
4. Peer-assisted learning--in the CLL, students assumed the roles of teacher and learner (Cavallo et al., 2004).
5. Specialized instruction to promote learning and study skills--one goal of the CLL was to develop habits and attitudes for students to become disciplined and successful learners. A second goal was to develop basic skills in language, numeracy, and technological fluency. Eliminating segregation by age and grade level allowed flexibility in specializing each students' learning (Cavallo et al., 2004).

During the three-year experiment, Stager (2005) reported the students did not steal or damage a single item. At no time did a teacher remove a student from the classroom for disciplinary purposes. In the detention center there was an average of one

violent or destructive incident per day, but none occurred in the experimental school. The recidivism rate at the detention center was over 70%, but only 14% among students who attended the CLL (Cavallo et al., 2004). Some students exited the CLL and moved directly to higher education (Stager, 2013). The absence of standardized assessments and grades indicates that no quantitative data can evidence academic achievement.

Many of the students in the CLL had a learning disability (Cavallo et al., 2004). Among students with disabilities, those with ED are the most likely to enter the juvenile justice system (Office of Special Education and Rehabilitation Service, 2017). It is reasonable to infer that some of the students in the CLL had emotional, behavioral, or psychiatric impairments. Plummeting recidivism rates and the absence of criminal acts in the CLL suggest a similar school setting could benefit a larger population of students with EBD. Fewer than 1% of students with EBD have an Individualized Education Plan and receive special education (Office of Special Education and Rehabilitation Service, 2017), yet approximately 20% of children and more than 46% of teenage students experience a mild-to-severe mental health condition (Merikangas et al., 2010; National Research Council and Institute of Medicine (NRC & IoM), 2009). It is imperative that general classroom teachers employ appropriate, research-based practices in their classrooms. Constructionist approaches to learning is one way that teachers can use all five strategies that Gable et al. (2012) identified.

Constructionist Learning

Constructionist learning happens when students carry out "long-term projects based on personal interest, expertise, and experience" (Cavallo et al., 2004, p. 2). Constructionism is a learning theory that claims, "knowledge is socially constructed and

best achieved through the act of making something shareable" (Cavallo et al., 2004, p. 3). It is the learning theory that undergirds the maker movement, considering its focus on problem solving and creation of digital and physical artifacts (Halverson & Sheridan, 2014; Martinez & Stager, 2013, Papavlasopoulou et al., 2017). Papert (1991) coined the term constructionism and was also a member of the research team that conceptualized the CLL (Cavallo et al., 2004). The maker movement emerged from constructionist principles in the early 2010s, due in part to advances in communication technologies (Dougherty, 2012). The movement gained popularity in informal learning environments, but interest is expanding in K-12 settings (Martin, 2015). I use the following terms to discuss the phenomena of students designing and completing projects:

- **The maker movement** is a response to "people's need to engage passionately with objects in ways that make them more than just consumers" (Dougherty, 2012, p. 12). The Internet drives the movement. It brings together the sorts of people who formerly participated in isolated hobbyist communities (Dougherty, 2012).
- **Makerspaces** are physical environments equipped with technological and non-technological tools, often found in libraries and museums (Somanath et al., 2016).
- **Making** is "a class of activities focused on designing, building, modifying, and/or repurposing material objects, for playful or useful ends, oriented toward making a 'product' of some sort that can be used, interacted with, or demonstrated" (Martin, 2015, p. 31).

- **Make-based learning** is the knowledge students and other learners build when creating and interacting with physical objects (González González & Aller Arias, 2018). It is also called maker-centered learning (May & Clapp, 2017).
- **Make** can be a noun to identify a student's creation (Fulton & Urbanski, 2020).

In an analysis of 43 peer-reviewed articles, Papavlasopoulou et al. (2017) determined that making is a promising approach in design and fabrication, problem solving, and computer programming. Other positive effects include increased student self-efficacy and engagement. Approximately half of teacher preparation programs include opportunities to explore how to teach in a makerspace. Only 12.7% of undergraduate programs offer an entire course (Cohen, 2017). Scant literature (Gomez, 2019; Somanath, et al., 2016) examined how make-based learning can affect students with EBD, and none to date have involved preservice teachers (PSTs). The gap in research drove this study.

Purpose of the Study

The purpose of this qualitative study was to engage PSTs in qualitative research as part of a yearlong seminar course. The intent was to explore how explicit and experiential study of make-based learning, characteristics of students with EBD, and evidence-based practices affected preparation to teach K-12 students with or at risk of developing EBD. PSTs observed and worked alongside students with EBD in a school makerspace and carried out their own self-designed projects. Data collection included the PSTs' written reflections at the end of the first semester, course assignments, an observation guide PSTs completed during or after clinical school visits, and individual interviews.

Research Question

What perceptions, practices, and roles do PSTs develop in a seminar course focused on make-based learning, evidence-based practices, and clinical observations in a special education school?

I used a qualitative inquiry approach to answer this question through a narrative analysis. The unit of analysis was the experiences of six (6) pre-service teachers as they learned about makerspace education and its potential role in engaging students with emotional and behavioral disabilities (EBD).

Significance of the Study

Among students with disabilities in the U.S., students with ED are the most likely to drop out of school (U.S. Department of Education, 2014), be placed in restrictive settings, and become involved with the criminal justice system (Sanford et al., 2011). On average they perform two years behind their peers in academic subjects (Gage et al., 2014). Although less than 1% of the U.S. school population is classified as ED, one in five children and almost one in two adolescents experience some form of mental illness (Merikangas et al., 2010; National Research Council and Institute of Medicine (NRC & IoM), 2009). General education teachers can mitigate the misappropriation of special education by using evidence-based practices for students intended for students with EBD. Yet according to Gable et al. (2012), teachers may be unaware or insufficiently trained to use these practices confidently (Gable et al., 2012). An experimental school in a detention center implicitly used five evidence-based strategies and successfully facilitated students in completing long-term projects. The constructionist principles behind the experimental school laid the foundation for the maker movement, which is gaining popularity in K-12

school settings. Yet limited literature examines how making can affect students with EBD.

The purpose of this study was to explore the perceptions, practices, and roles PSTs developed in a seminar course focused on make-based learning through visiting a makerspace inside a special education school. Chapter two begins with the theoretical and conceptual frameworks that ground the study. The discussion continues with the federal government's definition of ED and description of diagnoses that can qualify a student for special education. I then explore factors that contribute to the misappropriation of school services. I also explore the research-to-practice gap concerning use of evidence-based practices. In the next section I describe the maker movement in schools with a focus on cultural relevance and equitable access for students with EBD. In the last section I address the need for professional development to guide teachers toward implementing make-based activities in school. Chapter three is a description of narrative methodology and the approaches I took to collect and analyze data. Chapter four is a discussion of findings from the research study. I draw conclusions from the findings in Chapter five.

CHAPTER 2: LITERATURE REVIEW

The purpose of this qualitative study was to involve preservice teachers (PSTs) in observations of K-12 students with emotional and behavioral disabilities (EBD) in a makerspace while also learning about this pedagogy in an actual makerspace on the campus of Southern City University. During one academic year, PSTs participated in clinical observations in a school specifically for students with EBD and completed individual projects in the university makerspace. PSTs also completed course readings about instructing students with EBD and using evidence-based practices. In this study, I examined the perceptions and practices PSTs developed and the roles they assumed as developing teachers. This review describes the special education label, Emotional Disturbance (ED), highlights evidenced-based practices related to effective education of students with emotional disabilities, presents a history of the maker movement, and provides an overview of research in the field related to make-based education and special education.

Theoretical and Conceptual Frameworks

This study is grounded in the constructionist theory of Papert (1991) and the conceptual framework of makerspace (Dougherty, 2013). Papert (1991) recognized that learners construct knowledge through experience. Learning *best* happens when students create a tangible artifact that demonstrates their newly constructed knowledge. Papert (1991) asserted that constructionism embraces constructivism. Both theories identify that humans can build knowledge irrespective of the context of the learning. Papert then added the idea that “this happens especially felicitously in a context where the learner is

consciously engaged in constructing a public entity, whether it's a sand castle on the beach or a theory of the universe" (1991, p. 1).

Through a constructionist lens, a teacher has limited control over what and how a student learns. Learning can happen anywhere. Stager (2009) agreed with Papert (1991) in his assertion that learning happens when students apply existing knowledge to a new situation. Therefore, following a constructionist mindset, a teacher's role is not to fill minds with knowledge, but to provide meaningful and productive contexts for learning. Stager gives four words of advice to all educators: "less us, more them" (2013, p. 489). Stager (2009) also encourages teachers to briefly demonstrate a concept and then ask students to *do something*. Dougherty reiterates this concept through his practice of bringing students to a classroom and asking, "What do you want to make?" (2012, p. 13).

Building on constructionist theory, in an attempt to use the theory as a model for practice, I limited traditional classroom teaching and learning to one meeting per month and I took the participating PSTs to the university makerspace where they could build their own knowledge and artifacts. Instead of developing a rigid syllabus and assignments, I asked them what they wanted to make. I also brought them to the makerspace inside a special education school so that they could observe constructionism in action with a specific population of students with special learning needs as they engaged in make-based learning.

Review of the Literature

This literature review opens with the IDEA (2004) definition of ED and follows with a brief description of diagnoses that could qualify a student for special education. I then discuss which student populations are more and less likely to receive school-based services. Next is an overview of evidence-based practices that can meet the academic needs of students who struggle with mental health. As scholarly research is not always accessible to teachers (Reinke et al., 2014), what follows is a consideration of the research-to-practice gap and implications for the teaching force in the United States. The next section describes principles behind the maker movement in schools with a focus on developing a maker mindset in students, cultural relevance, and equitable access. In the last section I address the need for professional development intended to guide K-12 teachers toward implementing make-based activities in school. This involves preservice and in-service training.

Definition of Emotional Disturbance

Although Forness and Knitzer (1992) proposed renaming the disability category EBD and provided a more comprehensive definition, the following is the current IDEA (2004) definition of Emotional Disturbance (ED):

(i) A condition exhibiting one or more of the following characteristics over a long period of time and to a marked degree that adversely affects a child's educational performance:

(A) An inability to learn that cannot be explained by intellectual, sensory, or health factors.

(B) An inability to build or maintain satisfactory interpersonal relationships with peers and teachers.

(C) Inappropriate types of behavior or feelings under normal circumstances.

(D) A general pervasive mood of unhappiness or depression.

(E) A tendency to develop physical symptoms or fears associated with personal or school problems.

(ii) Emotional disturbance includes schizophrenia. The term does not apply to children who are socially maladjusted, unless it is determined that they have an emotional disturbance under paragraph (c)(4)(i) of this section.

Diagnoses

Diagnoses that could qualify a student for special education for ED include oppositional defiant disorder, conduct disorder, and ADHD (Forness et al., 2012). A diagnosis of oppositional defiant disorder means the student exhibits patterns of negative and/or hostile behaviors that last a minimum of six months. The student may struggle with controlling his or her temper and often directs anger at an authority figure (Steiner et al., 2007) such as a caregiver or teacher. A lack of intervention can lead to peer rejection, a reduced capacity for problem-solving, and academic failure (Reid et al., 2003). Conduct disorder is a more serious diagnosis characterized by antisocial behaviors that can include aggression toward people or animals, theft, property damage, and disregard for rules. These behaviors can lead to truancy and a lack of concern about school performance (Fairchild et al., 2019). Conduct disorder frequently co-occurs with ADHD. A diagnosis of ADHD without comorbidities, however, can also impede school success. According to Mohammadhasani et al. (2018), capturing a student's attention is an important first step to learning. Difficulty controlling anger, aggressive tendencies, and a shorter attention

span connect to subsections A, B, and C of the above definition. Less destructive behaviors can also interfere with a student's functioning in school.

Other diagnoses are mood and anxiety disorders (Forness et al., 2012). A common mood disorder is depression, which aligns with subsection D. Manic depression is another mood disorder in which the student experiences depressed periods interspersed with exceptionally elevated moods (Harrison, 2002). Disruptive dysregulation mood disorder is a diagnosis that identifies individuals between the ages of six and 18 who exhibit chronic irritability and temper outbursts. This diagnosis can be associated with refusal to comply with instructions, aggression toward peers (Linke et al., 2020), and frequent school suspensions (Roy et al., 2014). This diagnosis connects to subsections A, B, C, and E of the IDEA definition.

Forness et al. (2012) also identified psychotic disorders. Symptoms of a psychotic disorder include delusions, false beliefs, disorganized thoughts and speech patterns, nonsensical utterances, and difficulty distinguishing between internal thoughts and external reality. Schizophrenia is one of several psychotic disorders. Other diagnoses that can lead to psychotic behaviors include medical conditions such as epilepsy, lupus, and tumors (Lieberman & First, 2018). The symptoms connect to subsections A, B, C, and E. Any of these diagnoses connect to section B, how a student interacts with others at school.

Interpersonal Relationships

In accordance with subsection B of the IDEA (2004) definition, Graziano et al. (2007) claimed that a student with ED can act impulsively and mistakenly dismiss their classmates' feelings, leading to social isolation and difficulty forming friendships.

Lowenthal (2001) explained how a student with ED may lack functional relationships with adults. The student could disregard teachers' attempts to form relationships, even if there is a desire to connect with others. As reflected in subsection C, a student with ED can manifest a range of externalizing and internalizing behaviors (Walker et al., 2004). Externalizing behaviors include physical and verbal aggression, coercive conduct, and criminal acts. Internalizing behaviors include depressed mood, anxiety, social isolation, sleep disorders, and obsessive-compulsive conduct (Eisenberg et al., 2009), as identified in subsections D and E. Externalizing behaviors can be more disruptive to the classroom. Therefore, teachers are more likely to recognize them and seek additional resources for the student. Internalizing behaviors can equally impede learning, yet students are less likely to receive school-based services (Lane et al., 2014; Mattison et al., 2007).

Which Students Receive Special Education

Diagnoses and behaviors do not automatically qualify a child for special education. IDEA (2004) regulations stipulate that the student's behaviors must interfere negatively with educational performance and exhibit over time. Although only 0.5% of the school-age population receives special education for ED (Office of Special Education and Rehabilitation Service, 2017), the percentage of students with EBD is much higher. Approximately 20% of children and more than 46% of students ages 13-18 live with a mental health condition (Merikangas et al., 2010; National Research Council and Institute of Medicine (NRC & IoM), 2009). A variety of cultural, economic, and social factors can explain the gap between who receives and who could benefit from school-based services.

Cultural Factors

ED is the only category under IDEA that does not rely on test scores or other standardized measures to identify students. The only criteria are adult perception (Walker et al., 2010). Cultural viewpoints and misunderstandings can affect an educator's decision to refer a student for special education. School personnel can misconstrue a behavior as maladaptive when considered normal within a student's home context (Harris-Murri et al., 2006; Hart et al., 2010). It may not be the student who is *disturbed*, but the professional's mindset toward working with the student (Algozzine, 2017). The reason behind the referral may not be the student's behaviors but the teacher's reaction. According to Skiba et al. (2006a), school personnel might interpret a student's demeanor as indicative of special needs when the problem may relate to an unsupportive schooling environment.

Students of color overrepresent the population of students classified as ED. (Mitchell et al., 2019). Approximately half of students labelled ED are White, which is proportionate to all students in public schools. Black students represent 25% of the specialized population but only 16% of the total school population. Students identified as two or more races represent 5% of students classified as having ED but only 3% of the school-age population (McFarland et al., 2017). Three of four students identified as ED are male (Lipscomb et al., 2017).

Teachers who identify as members of the dominant culture (e.g., white, middle class, mono-lingual females) may interpret behaviors differently depending on the student's race and gender (Sullivan, 2017). Intersections of an ED label and race could determine the level of services that students receive. Black students with ED are overrepresented in more restrictive placements, and underrepresented in less restrictive

environments (Skiba et al., 2006b). For this reason, Lloyd et al. (2019) urged educators to pay closer attention to racial, cultural, and gender differences when identifying and evaluating students with EBD. Misunderstanding between individuals of different races and genders can lead to a misappropriation of services, as can parents' perceptions of special education.

Caregivers viewing the ED label as pejorative can also lead to a mismatch between qualifying for and receiving special education. Mattison (2014) identified that parents may object to the term and decline services. The author described meetings with parents who insist their child is not disturbed, a juvenile delinquent, nor crazy. This could indicate that students with caregivers who advocate for their children are less likely to receive special education. This may connect to data that show children and youth in out-of-home care are more often diagnosed with ED than those with no documented history of neglect or maltreatment (Smithgall et al., 2005). In a study concerning students in Chicago Public Schools, Wulczyn et al. (2009) found nearly 20% of middle-grades students in foster care received school-based services for ED, compared to only 1-2% of the general population. In addition to racial factors and student home placements, economic factors can also explain which students receive school services for emotional and behavioral needs.

Economic Factors

Mattison (2014) claimed the main demographic factor for ED is socioeconomic status. Lipscomb et al. (2017) found 62% of students identified with ED live in a lower-income household. Only 22% have at least one parent with a 4-year college degree or higher (Mattison, 2014). Gershoff et al. (2007) explained that a sense of material

deprivation can correlate to parental stress and an unresponsive parenting style, which can hinder a child's social/emotional development. Unstable work among lower-income families can also lead to behavioral problems in children, due to stress of financial hardships and less time to provide mindful caregiving (Yoshikawa et al., 2006). Job loss can lead to marital problems, which is associated with emotional and behavioral problems in children (Kalil, 2009). Further, depression is more common among people from a lower socioeconomic background (Yoshikawa et al., 2012); more than half of students classified with ED have at least one parent with a psychiatric illness (Mattison, 2014). Working parents may be less likely to refuse services given time constraints and other stressors. The correlation between socioeconomics and an ED diagnosis extends beyond the family to also include school demographics.

Social Factors

Almost 33% of students classified with ED attend a low-performing school, meaning it ranks in the bottom 10% of performance or has significant achievement gaps (Lipscomb et al., 2017). Low-performing schools tend to have a higher concentration of novice (Lewis et al., 2012) and lower-quality teachers, based on the level of earned degrees, certification, and college attendance (Goldhaber et al., 2019). Many of the nation's lowest-performing schools have a concentration of students living in poverty (Kannapel et al., 2005). Teachers with fewer qualifications, less experience managing a classroom, a developing cultural awareness, and perceptions of poor teachability could all lead to overrepresentation of students of color, particularly Black males, receiving an ED classification and placement in restrictive environments.

Educators tend to compare a student's behaviors to local norms when determining who is most in need of help. There can be vast differences between the characteristics of students who receive services from school to school. In a Massachusetts study of 140 students who receive special education for ED, students in lower-income schools were more likely to exhibit externalizing behaviors. Students who attended affluent schools were more likely to manifest internalizing behaviors (Wiley et al., 2010). Teachers' decisions regarding student behaviors may also depend on availability of resources and an impression that efforts to obtain services would be successful (Safran & Safran, 1987). General education teachers in lower-income schools may seek help only when behaviors are severe. Meanwhile, it could be more acceptable for teachers in higher-income schools to refer students who exhibit comparatively moderate behaviors (Wiley et al., 2010).

Cultural, economic, and social factors can play a part in determining which students receive a label as ED. To undo educators' misperceptions of student behavior that stem from negative stereotypes, Harris-Murri et al. (2006) asserted that teachers and other school staff must be aware of individual and institutional biases that influence perceptions of student ability. The first step is helping teachers acknowledge not just students' cultural heritage but also how their own backgrounds affect dispositions, attitudes toward teaching and learning, and thoughts about the worthiness of curriculum (Ladson-Billings, 1994). The next step could be employing evidence-based practices geared toward students with EBD.

Evidence-Based Practices for Students with EBD

An instructional strategy with reliable research to document positive outcomes can be considered an evidence-based practice (Cook et al., 2008). Reliable research

consists of a minimum of three supporting empirical studies published in peer-reviewed journals (Simonsen et al., 2008). Evidence-based practices for students with EBD that target academics include (1) choice-making opportunities; (2) instructing students in self-monitoring performance; (3) a systematic approach to cooperative learning; (4) peer-assisted learning; and (5) specialized instruction to promote learning and study skills (Gable et al., 2012). These strategies could be helpful in both separate classrooms for the smaller population of students who receive special education, and the larger population of students in general settings whose mental health may interfere with classroom learning.

Choice-Making Opportunities

For students with or at-risk for EBD, choice-making opportunities can improve interest in reading (Ennis et al., 2020), writing (Heintzelman, 2016), and vocabulary (Skerbetz & Kostewicz, 2013). Giving students choices costs little time or preparation and has been studied successfully across grade levels and settings (Jolivette et al., 2017). As Fulton and Urbanski (2020) explained, a teacher's role ideally is to facilitate students making educational decisions for themselves, not follow a directed sequence of tasks. This way, students learn problem solving skills and gain confidence in their ability to select their own pathways to learning.

Self-Monitoring

Self-monitoring allows students to independently observe and record their learning and behaviors (Hunter et al., 2017). For students with EBD, this practice can reduce off-task behaviors in a group setting (Blood et al., 2011), improve academic productivity (Carr & Punzo, 1993), and increase attention (Gulchak, 2008). According to Cook et al. (2017), teachers who plan to engage a student in self-monitoring should first

decide which behaviors to target, determine procedures for cueing students, select the medium for recording performance, teach the student how to monitor his or her self, and finally implement the procedure. Teachers can maintain a spirit of autonomy by setting an expectation for self-monitoring, which allows students to decide what to record and how often. Students and teachers can negotiate the use of a paper or electronic form and decide if incentives promote buy-in. Students who benefit from discrete cues could select a mobile app that sends a notification at regular intervals, reminding them to document what they are doing (Cook et al., 2017). Students who prefer to see a visual representation of progress might benefit from graphing frequency of target behaviors.

Systematic Approaches to Cooperative Learning

The colloquial term for systematic cooperative learning is group work, heterogeneous groups of learners carrying out an assigned task. For students with EBD, group work can increase on-task behavior, cooperation with peers, and academic performance (Salend & Sonnenschein, 1989); provide opportunities to practice communication skills (Sutherland et al., 2000); and boost acceptance among classmates (Slavin, 1995). Generally, either the teacher forms groups or students assign themselves specific roles to complete an assignment collectively (Damon & Phelps, 1989). Yet when a teacher prioritizes choice-making and students self-monitor their actions, pairing of "stronger" with "weaker" students or deciding who is the group note-taker may be a superfluous use of time. As Stager (2013) suggested, teachers can encourage students to partner with others who have similar interests or aim to improve a skill. Thus, collaboration happens naturally.

Peer-Assisted Learning

Peer-assisted learning can be a form of cooperative learning, but also incorporates peer tutoring and mentoring. Benefits to students with or at-risk for EBD include increased reading achievement (Wehby et al., 2003); advanced generation of main idea statements about informational text (Wexler et al., 2018); a reduction in disruptive behaviors, and improved academic participation (Sinclair et al., 2019). Jellison et al. (2017) claimed that peer mentoring is more effective when teachers foster an inclusive environment and establish opportunities for mentoring that last a whole school year--not to complete one specific task. Mentor-mentee relationships among peers can benefit students who are perceived as unpopular or vulnerable, as opportunities to work with another student can allow them to be viewed more positively. Students can pair with another based on commonalities in experiences, preferences, and preferred activities outside of school.

Specialized Instruction

Specialized instruction involves a special educator using alternative methods with individual students to promote success (Blake & Monahan, 2007). McKenna et al. (2020) argued that general education settings can pose challenges to students with EBD and their teachers. Some students with EBD grapple with academic performance (Gage et al., 2017). Students who receive instructional tasks beyond their developmental level may fall further behind their peers, potentially reinforcing feelings of inadequacy (Garwood & Ampuja, 2018). General settings can be less predictable than specialized classrooms (Scott & Alter, 2017), which can exacerbate a student's attempt to maintain attention. Therefore, McKenna et al. (2020) advocated that students with EBD receive some direct instruction either individually or in a small group setting. This is an option for a student

who does not qualify for special education. All of the above strategies can be effective, but only when teachers are both versed in vetting instructional resources and open to using practices based in scientific research.

Research-to-Practice Gap

Although sufficient evidence-based practices exist to engage students with EBD, both general and special educators may not have the appropriate training nor dispositions employ them (Billingsley et al., 2006; Buttner et al., 2016; Gable et al., 2012; Mihalas et al., 2009; Simpson et al., 2011; Wagner et al., 2005). Roadblocks that can explain the lack of translation include a dearth of mental health training in preservice (Forness et al., 2012), a focus on subject-matter competency in an age of high-stakes testing (Niesyn, 2009), and a general perception that the regular classroom is not an appropriate setting for students with EBD (Cook, 2002). Kern (2015) claimed teachers often believe their purpose is to teach academics and blame families for a student's lack of behavioral control. For these reasons, Garwood and Van Loan (2018) emphasized that teacher preparation should focus on learning to connect with *all* students, not just those who are enjoyable and seem well-adjusted.

Myers et al. (2017) argued that new special education teachers are left to their own devices if preservice education does not include sufficient preparation in classroom management. Beginning teachers might model tactics after their classroom neighbors, who may not value evidence-based practices. Teachers may also turn to popular, online resources for strategies to improve classroom management. Beahm et al. (2019) reported that teachers access over one million educational resources found on Pinterest and Teachers Pay Teachers each day. As neither includes a peer review process to ensure

content is accurate, teachers may read misleading information and implement ineffective strategies. The popularity of these web-based resources confirms findings by Simons et al. (2003) who stated that teachers often believe controlled experimental studies do not reflect the complexity of classroom dynamics. Instead, many prefer to take stock in tactics and advice from colleagues.

To address the research-to-practice gap, the Council for Exceptional Children (2015) developed standards for the preparation of special educators. Teacher preparation programs are required to adhere to the standards, ensuring that in-service teachers know how to implement evidence-based interventions with fidelity. Standard 5.0 states, "Beginning special education professionals select, adapt, and use a repertoire of evidence-based instructional strategies to advance learning of individuals with exceptionalities" (p. 5). Yet none of the seven key elements that follow specify that beginning special education professionals acquire research skills. An additional problem is no such standard exists for general education teachers.

Although research points to areas for improvement in teacher education, Darling-Hammond and Podolsky (2019) reported that many classroom teachers have not completed, or even started, a teacher preparation program. More than half of special education teachers working with students with EBD are not fully certified (Cook et al., 2003), due in part to a teacher shortage projected to reach over 300,000 by the year 2025 (Sutcher et al., 2016). Reasons for the shortage include the fact that teachers in the U.S. receive about 30% less pay than other college graduates in the workforce (OECD, 2017). K-12 educators in the U.S. face larger class sizes, teach more hours per week, have fewer contractual hours for planning, and work with more lower-income students than

colleagues in other developed countries (OECD, 2014). Harvey (2014) reported that enrollment in teacher education programs is declining nationwide, and the public narrative of teacher bashing can steer college students away from the profession.

Policy decisions that address educator shortages tend to involve either lowering standards for qualification or making teaching a more attractive career (Sutcher et al., 2016). Lowering standards is not likely to lead to teachers researching and using evidence-based strategies. An unstable teaching force can have a negative impact on teacher quality (Kraft & Papay 2014; Ronfeldt et al., 2013; Sorensen & Ladd 2018). Yet more opportunities to engage students in problem solving and less focus on high-stakes testing could make teaching in a K-12 setting a more rewarding experience. Centering classroom activity around students designing their own projects could be more enjoyable than delivering lessons based on standards that are aligned to passing a standardized test. Nicastro et al. (2020) found that when teachers designed instruction around concepts of constructionism and creative learning, students gained a deeper understanding of curricular objectives. The authors also found that both teachers and students attained a sense of satisfaction and engagement. Giving students freedom to take charge of their own learning has a theoretical grounding in constructionism, a learning theory that emphasizes learning through making (Papavlasopoulou et al., 2019). In the next section, I describe the maker movement and implications of students making in classrooms.

The Maker Movement

Constructionism (Papert, 1980/1996; 1991) is the educational theory that undergirds make-based learning. Constructionism is the idea that learning best happens when students create artifacts they can share with others. Papert (1991) developed the

theory while working in a middle school, observing differences between math and art classes. In math, he observed students solving short problems with one right answer, one time, correctly or incorrectly. In art, students carved sculptures. Each student created something different and had opportunities to amend mistakes. An art project could span for weeks, giving students time to talk, watch their classmates work, and swap feedback. Constructionism emerged as an idea of putting math and art together, making room for students to experiment, discuss possible solutions, and find divergent ways to solve a problem.

Martinez and Stager (2013) deemed Papert the "father of the maker movement" (p. 17). Dale Dougherty receives credit for popularizing the maker movement, primarily through his company, Maker Media. Dougherty's company publishes *Make* magazine and sponsors Maker Faires (Halverson & Sheridan, 2014). Skeptics that a maker "movement" exists may claim that humans have been making objects since the time of cave paintings. Halverson & Sheridan (2014) countered by explaining that the difference between modern making and historical crafting is the act of using physical and digital forums to share processes and practices with like-minded others.

FabLabs and Makerspaces

Physical settings for making happen in a variety of contexts. Gershenfeld (2005) created the first FabLab at the Massachusetts Institute of Technology. The purpose was to allow users to solve problems through invention instead of purchasing new items. FabLab users "work at the intersection of the digital and the physical" (Halverson & Sheridan, 2014, p. 499), using technological tools such as 3D printers and laser cutters. FabLabs are

environments where visitors focus on engineering, robotics, and design. Makerspaces, however, can attract visitors with a wider variety of interests.

Makerspaces appear in informal settings for learning such as public museums and libraries (Somanath et al., 2016). Differing from FabLabs, makerspaces in museums and libraries can have a focus on crafting, music production, and computer programming in addition to working with cutting-edge tools. Museums are natural locations for makerspaces as patrons often expect hands-on art and science exhibits (Halverson & Sheridan, 2014). Makerspaces can give libraries a modern purpose (Moorefield-Lang, 2015) beyond providing a quiet space for reading and research. Cun et al. (2019) argued that 21st century libraries are environments for various modes of learning, designing, and sharing. Unlike universities and museums, public library access is free. Patrons using a makerspace in a public library can explore available technologies and find novel uses for analog objects such as paint and library discards. Colegrove (2013) suggested that libraries offer lendable technology which could allow users to borrow an item instead of purchasing one. As makerspaces are becoming more common in public libraries, the school library has become a popular spot for makerspaces in K-12 settings.

Blakemore (2018) claimed that makerspaces in school libraries should be an area where students can ask questions, search for answers, and engage in learning and understanding. A makerspace in a school library allows students to draw connections between making and literacy. Students can take advantage of tangible and digital media to design and implement a project. Woods and Hsu (2019) affirmed that the library is an ideal spot for a school makerspace since it is historically a location where educators encourage informal learning. Among schools with makerspaces, 90% are housed in the

library. Classrooms can be another location for making if the school does not yet have a designated makerspace.

Classroom Makerspaces and Cultivating a Maker Mindset

Access to technological tools can be limited in a classroom. Therefore, the focus on constructionist activity can shift toward instilling a maker mindset. Chu et al. (2015) posited that cultivating a maker mindset involves educators examining student self-efficacy, motivation and interest. Regalla (2016) claimed that developing a maker mindset in students can nurture social-emotional competence and resilience when facing frustration. Students completing projects that involve creating, sharing, and reflecting can develop social-emotional skills such as empathy, relationship building, and self-awareness. Even when makers work alone, final projects on display can allow others to find inspiration. Students can develop a tolerance for frustration by focusing on process, not perfecting a final product. Teachers can help students overcome frustration by asking how the problem can be broken down into smaller pieces, encouraging them to take breaks, and reminding them to seek help from peers.

Social-emotional competence and willingness to be frustrated are important skills for students with EBD. Cullinan and Sabornie (2004) found that boys with EBD have less empathy and fewer positive peer interactions than students without disabilities. Harrington (2006) correlated frustration intolerance with depressed mood. As both are manifestations of EBD, opportunities to work constructively through frustrating moments may help students develop coping skills and self-regulation. Because students with EBD may not fit the mold of “good student”, they might receive fewer opportunities for make-

based activities in school. For this reason, access to a school makerspace and make-based activity in classrooms should be inviting to all learners.

Equitable Access and Cultural Relevance

Halverson and Sheridan (2014) claimed one promise of the maker movement in schools is "to democratize access to the discourses of power that accompany becoming a producer of artifacts" (p. 500). Therefore, when students have an opportunity to take part in make-based activity, it must be available to everyone. Democratizing access means honoring all represented backgrounds, dispositions, and abilities. Students in both regular and special education equally deserve classroom time and space to be makers. According to Barton et al. (2017), however, making continues to be perceived as an activity for middle- to upper-class Whites with sufficient time, technological knowledge, and financial resources. Teachers might inadvertently perpetuate the stereotype.

Between 2005 and 2014, 85% of *Make* magazine covers depicted White men and boys working with robotics, electronics, and vehicles (Buechely, 2013, as cited in Vossoughi et al., 2015). A 2014 survey from Make Media found that 97% of Maker Faire attendees have a college degree, 70% have an advanced degree, and the average annual income is $103,000 (Blikstein & Worsley, 2016). The average teacher in the U.S is White, female, and earns a base salary of $55,100 (Loewus, 2017). While there are differences in gender and monetary earnings, teachers and Maker Faire attendees share similar educational credentials. According to NCES (2018), the highest earned level of education among public school teachers is 39.9% bachelor's, 47.7 master's, and 8.7% doctoral degrees or one year's work beyond the master's level. Yet Black and low-income students are overrepresented in the population of students identified as ED

(McFarland et al., 2017; Lipscomb et al., 2017). Only a small minority has a college-educated parent (Mattison, 2014).

Demographic similarities between teachers and Maker Faire attendees suggest both tend to identify with the dominant culture, meaning they tend to value commerce and social advancement (Ladson-Billings, 2017). They may also esteem invention and competition among peers. This could unintentionally create a cultural divide between teachers and some populations of students in a school makerspace. According to Blikstein and Worsley (2016), a narrow view of making--formed from media images and public events--could alienate groups of students who do not identify with the dominant culture.

Yet Dougherty opened a 2011 TED talk claiming that “All of us are all makers. We’re born makers." *All of us* are not an exclusive group of wealthy, scholarly, and White people. For this reason, Campos et al. (2019) asserted the importance of forming communities of makers in schools that extend beyond the makerspace. These communities can include “networks of support” (p. 2), people who can cultivate inspiration, add introduce sources of knowledge, and reflect local identity. This can not only shatter a dominant view of making, but also promote cultural responsiveness. Freire (1970) conceptualized problem-posing education as the act of students posing problems that relate to themselves and their communities. Problem-posing education challenged “the ‘banking’ concept of education” (Freire, 1970, p. 45), in which students are “depositories” of knowledge and the teacher is the “depositor”. Problem-posing education can also disrupt the hierarchical structure of teachers as authority figures who transfer information into assumedly empty minds. When problem-posing happens in a

classroom, the teacher and students both instruct and learn together, becoming jointly responsible for cognitive growth (Freire, 1970). For *all of us* to become makers, educators must play an active role in shattering the narrow view of making (Blikstein and Worsley, 2016) and include communities of support that can heighten awareness of problems and contribute to solutions.

Barton et al. (2017) found that three forms of engagement can support sustained engagement in a makerspace: critical, connected, and collective. The authors spotlighted Jennifer and Emily, two members of a youth-centered makerspace. The team posed the problem that people in their Michigan community lacked appropriate means to stay warm and visible in the cold and dark. The solution would offer protection from not just the elements, but from being bullied for their choices in clothing. Their make was a light-up, heat-up bomber jacket with a faux fur lining that took 8 months to complete. The students sought advice from peers about fashion choices, engineers who assisted with circuitry and power requirements, and a neighborhood mom who taught the team to use a sewing machine. Part of the success could be attributed to Jennifer and Emily completing their project in a non-school setting. The facilitators in the makerspace valued practices seldom found in school--design, creativity, and the importance of failure and iteration. As Buchholz et al. (2014) pointed out, broader views of learning can appeal to youth who have historically felt marginalized in school. When introducing these principles to school settings, Vossoughi et al. (2015) urged that educators develop a sensitivity to ways injustices can pop up.

Vossought et al. (2015) observed teachers offering make-based activities as a reward for what they perceived as good behavior. Rewarding a student with a make-

based activity can invoke attitudes of ability grouping and tracking. The authors also noted that when teachers deemed students off-task, they provided more directed assistance and fewer "opportunities for authorship" (p. 217) compared to students who looked busy. The authors recommended that teachers engage in ongoing reflection and action to confront their deficit ideologies related to their make-based pedagogy.

Addressing the need for ongoing reflection, Martin et al. (2018) examined "what counts as making" (p. 38) and who has authority to decide. The authors highlighted Deonne, a teenage African American female attending a maker class as part of the school day. Deonne reluctantly joined a team project but felt rejected by her peers, explaining that her classmates "knew how to do more stuff" (p. 40). The researchers noticed her withdrawing from the group and seeking solo activities such as sewing hair bows that she distributed to friends. The researchers were initially unsupportive of Deonne's choice to opt out of a larger group project to focus on smaller tasks, even though she found them personally meaningful. Upon reflection, Martin et al. (2018) discovered their definition of making, which centered on long-term projects and use of technology, was limiting. Their concept of "what counted" undervalued how differences in technical knowledge can limit group dynamics. The researchers then decided to provide more support for shorter-term projects and encouraged students to spend time exploring tools and materials on their own. The intent was to offer more varied entry points to making, building on students' varying interests. The researchers' findings could support students with EBD, particularly those who have difficulties forming and maintaining interpersonal relationships.

Fields et al. (2018) also examined how teachers can incorporate equitable, constructionist activity in high school classrooms. Their work explored how an e-textiles

unit (sewing circuits into clothing or other pliable objects using conductive thread, LEDs, digital sensors, and microcontrollers) in a computer science class could increase engagement among students who are female, of color, speak a language other than English at home, and participate in the Free and Reduced Meal Program. Findings suggest that encouraging peer pedagogy, prioritizing student choice, and supporting collaboration are effective strategies when introducing making into a classroom. These strategies align with three of five evidence-based practices for students with EBD (Gable et al., 2012). Although neither Martin et al. (2018) nor Fields et al. (2018) discussed how making could benefit students with EBD, nearly half of teenage students suffer from mental illness to some degree (Merikangas et al., 2010; National Research Council and Institute of Medicine (NRC & IoM), 2009).

Including Students with Disabilities

Alper (2013) proposed a "mixed-ability maker culture" (p. 1) to include people with disabilities in maker communities. Her aim was to bring together individuals with and without disabilities for the purpose of making adaptive objects. Manifestations of mixed-ability making include Seo's (2019) study of blind makers. Make Media spotlighted a wheelchair clinic in which students in a STEM school hacked wheelchairs for individuals in need. One of the hacks was a device that clamps a wheelchair to a grocery cart (Shriver, 2016). Bosse et al. (2019) described the SELFMADE project, which set out to empower individuals with disabilities, encouraging co-creation of assistive tools. The focus centered around 3D printing adaptive objects including a mug with two large handles with grips for each finger, intended for individuals with limited hand mobility. Rahman (2018) created Disability Lab, a community of makers that

designs systems for people with physical disabilities. Completed projects include a wheelchair anti-tip bar and a bearing removal tool that allows people with limited mobility to service their own chairs. Although all these projects honor inclusion, the school project focused on hacking objects *for*, not *with* people with disabilities. These communities that include people with disabilities in making are not affiliated with a school. None include people with "invisible" disabilities.

Alper (2013) honored a spectrum of disabilities including physical, sensory, cognitive, speech-language, and intellectual. She did not mention EBD. To explain why, Gomez (2019) argued that society as a whole has empathy for individuals with disabilities that are recognizable. Individuals tend to be more willing to offer resources and support to others who look, and sound disabled. Patton (1995) identified that teachers and students often do not characterize students with EBD as individuals with a disability. The students instead appear to be disobedient, lacking a clear perception of reality, and unwilling to take responsibility for their behaviors. The social tendency is to punish, marginalize, or dismiss such people from communities (Gomez, 2019). Although "constructionist principles provide a wonderful opportunity for emotions and feelings to be developed" (p. 7), limited studies explore what students with EBD learn and produce in a makerspace.

Including Students With EBD

Somanath et al. (2016) worked alongside students with EBD in an enrichment program at an alternative school in Canada. The authors identified most of the students live with foster families or group homes. Many of the students carried diagnoses that include anxiety and oppositional defiant disorder. The authors and makerspace staff first

introduced students to circuitry and coding through closed-ended projects that included making an LED bookmark, simple video game, or animation. Researchers found the students quickly lost interest and chose to use their time surfing YouTube and chatting. During the second phase, however, students had an opportunity to complete open-ended building tasks. Options included designing a working windshield wiper, elevator, or blinds.

The opportunity to be creative motivated the students. Findings suggested that creativity is "a feeling which lacks in other aspects of their lives, which are heavily monitored, regulated, and surveilled" (Somanath et al., 2016, p. 155). Another takeaway similar to Martin et al.'s (2018) study is entry point. Students who were less comfortable with computation started with art supplies. A student more comfortable with technology built a robot to clean surfaces. He started with a motor and lastly attached a pipe cleaner to serve as a broom. The students communicated that becoming technologically literate was not enough. They wanted to work on projects that were personally relevant, made room for creativity, and sharpened skills for subsequent tasks.

In a similar effort, Gomez (2019) applied a single-case (n=4) research design to reveal how participation in a makerspace affected social interactions among students with EBD. The participants attended school in a separate setting. The author found four observations that aligned with the broader literature about makerspaces. First, they are safe spaces. Students felt safe in the makerspace, recognizing they were able to make mistakes without a negative consequence. Second, time in makerspaces can spark opportunities to learn in ways a traditional classroom cannot. The loosened time restrictions led to more natural and conversational social interaction. Next, the

makerspace has a purpose geared toward social-emotional development. Unlike a social skills class where students talk about appropriate interactions, the students applied social skills in the makerspace. They had a natural opportunity to practice conflict resolution and problem solving. Finally, students enjoyed the time in the makerspace. Their moods elevated as they enjoyed coding and building robots.

As makerspaces and making in classrooms gain popularity, limited research explores how K-12 educators can prepare to give students opportunities to develop their own projects. In the next section I review research that focuses on professional development opportunities for preservice and in-service teachers.

Bringing Maker Education to Classroom Teachers

In 2014, President Obama created a pledge to promote making in institutes of higher education, which received signatures from individuals that represent 150 colleges and universities (Rodriguez et al., 2018). One year later, the White House celebrated a Week of Making which culminated in hosting a Maker Faire on June 18, 2015. The President challenged school leaders, K-12 teachers, volunteers, and companies to "ensure that all of our [meaning the nation's] children have access to these opportunities" (Kalil & Rodiguez, 2015, para. 2, emphasis in original). The Obama administration expressed a belief that making can motivate students to excel in STEM subjects, contribute to career preparation, and help young people acquire 21st Century skills including teamwork and problem solving. The President specifically called on teachers to encourage student participation in making, tinkering, and invention (Kalil & Rodriguez, 2015). Professional development opportunities for current and future teachers are an integral part of answering this call.

Professional Development in Preservice

Despite President Obama's prompting, Cohen (2017) reported that only about half of teacher preparation programs offer an opportunity to explore make-based teaching and learning. Jones et al. (2017) examined a 2.5-hours workshop for PSTs and early-career teachers. The intention was to explore how teachers can bring maker principles into classrooms. The workshop featured a short lecture and demonstration of how to use a 3D printer, a vinyl cutting machine, microcontrollers, and design software. Participants noted the technologies could facilitate differentiation, increase levels of engagement, and promote student inquiry. Some participants, however, noted that future colleagues might be reluctant to change their practice. PSTs recognized that administrators expect teachers to work as grade-level team members and deliver the same lessons, every day, in every subject. These PSTs also reported their lack of technological knowledge, time barriers, and insufficient funding would prevent them from bringing such activity into their classrooms. The researchers recognized that the format of the workshop might not have communicated appropriately the foundations of making. A lecture and demonstration can only *explain* a maker mindset. Papert (1980, 1991) claimed learning best happens through experience. It is also possible that 2.5 hours was not sufficient time to encourage educators to adapt a maker mindset. Limited opportunities exist for additional training.

Only 12.7% of undergraduate programs offer an entire course in making (Cohen, 2017). Cohen et al. (2017) investigated an elective university course that focused on the ways in which making can affect perceptions of learning. Much of the course time was dedicated to make-based activity in pairs or small groups. Assignments were open-ended, such as designing and fabricating an arcade game. Students also participated in assigned

reading, written reflections, lectures, class presentations, and discussions. The authors found that the course facilitated positive help-seeking behaviors, peer teaching and learning, and collaboration. Although Cohen et al. (2017) worked with adult learners, the findings connect to evidence-based strategies for students with EBD: peer assisted learning, choice-making, and collaborative learning (Gable et al., 2012). A separate teacher preparation program requires a course in make-based learning.

Rodriguez et al. (2018) examined the UTeach program and the UTeach Maker micro credential at University of Texas at Austin. All PSTs enrolled in UTeach complete a course that introduces PSTs to principles of making and popular digital tools that include microcontrollers and Scratch software. Upon course completion, PSTs can earn an additional micro credential by creating an online portfolio. The portfolio highlights a PST's understanding of maker philosophy, a completed project, evidence of connecting with a community of makers, and discussion of how to incorporate making in K-12 settings. Interestingly, UTeach does not house a makerspace. This pushes PSTs to form liaisons in the community to access equipment such as CNC routers and 3D printers. The program is notable as there is a focus both related to how the PSTs develop an identity as a maker and learn how to introduce making to future students. Yet earning the micro credential is an extension of the teacher preparation program and not a requirement

Falls and Olmanson (2018) also introduced constructionist principles to undergraduate PSTs. While the UTeach program (Rodriguez, 2018) requires that PSTs locate an outside community of makers, Falls and Olmanson (2018) facilitated a collaborative class project. The purpose was to create artifacts that could help future students gain a deeper understanding of a concept in their content area. The intent was to

cultivate empathy through adapting principles of human-centered design, which places the user at the center of the design process to promote products and services that are useful, usable, and enjoyable (Zoltowski et al., 2012). Falls and Olmanson (2018) soon discovered, however, that the PSTs' limited experience and lack of guidance in soliciting outside input led to teams creating items that they personally enjoyed, ignoring anticipated needs of students. One group of preservice history teachers created memes because they found humor in historical events. The authors claimed the project unintentionally created an "echochamber" (p. 1262) of students *self*-empathizing instead of determining the needs of future students. Upon reflection, the authors redesigned the project to ensure students seek feedback from others outside the class community. This supports Campos et al.'s (2019) assertion that maker communities in schools must extend beyond the school. While the need to build empathy toward students is essential for future educators, this study did not directly involve K-12 students.

Neither UTeach (Rodriguez et al., 2018) nor the human-centered design project (Falls & Olmanson, 2018) examined the impact of PSTs collaborating with K-12 students in a makerspace. Shively et al. (2020) filled this gap in research by inviting PSTs to develop and implement an after-school STEAM workshop for elementary students. PSTs learned strategies to teach in a makerspace. The students' make was a board game to teach their peers about severe weather preparedness. A participant noted that the experience highlighted a "need to create environments where children are able to practice self-regulation and collaborate" (p. 8). PSTs found opportunities to prepare for their future careers in areas that include differentiating instruction and managing student

behavior. Although not overtly stated, these learning opportunities point toward evidence-based strategies for students with EBD (Gable et al., 2012).

Findings from this study also connect to Beahm et al.'s (2019) concern about the popularity of unvetted sources for teaching strategies, particularly Pinterest and Teachers Pay Teachers. While planning the STEAM workshop (Shively et al., 2020), one of the PSTs suggested the students make tornadoes in a 2-liter bottle. A meteorologist assisting the team explained why the activity was not an accurate depiction of a tornado and pointed the PSTs toward a list of reliable websites. This sparked conversation about how PSTs will plan future lessons without access to content experts. PSTs then discussed the importance of critical thinking in terms of evaluating resources and information. While the connections to evidence-based practices, concerns about addressing student behavior, and finding reliable teaching resources are all pertinent to this study, it is not clear if the facilitators of the workshop fully embraced constructionist methods of making.

Shively et al. (2020) reported the theme of the workshop was severe weather preparedness, which seemed to take precedence over making. Students collectively contributed to producing one make, a board game to share with classmates. There was no discussion about students with divergent interests or self-direction. Much of the focus on preparing for the workshop involved lesson planning and rehearsing. Yet Stager and Martinez (2013) implored that teachers raise expectations and relinquish ownership of the classroom to the students. Instead of scripting and practicing their lessons, teachers can briefly demonstrate a concept and then ask students to manage their own learning. Another concern is that the study explored an after-school program, not an activity during the school day. This limits the possibility of providing equitable access.

In a similar study, O'Brien et al. (2016) discussed findings from a study concerning an Elementary Science Methods course which centered on the Next Generation Science Standards and maker education. The final project for the course was hosting a school Maker Faire. Similar to Shively et al.'s (2020) study, the Maker Faire was an extracurricular family activity outside of the normal school day. Another similarity is the focus on PSTs driving instruction. The school Maker Faire featured a variety of stations including building squishy circuits--using pliable materials to conduct electricity, launching balloon rockets, constructing bird feeders from repurposed materials, and building racing cars with LEGOs. These activities offered limited opportunity for students to diverge from following instructions to complete a pre-planned activity with a fixed result.

Tensions between the structured Maker Faire (O'Brien et al., 2016) and more authentic opportunities for student making include the PSTs' desire to have pre-prepared materials ready to go. They anticipated every problem that might occur and communicated a sense of responsibility to provide structure. During the event, PSTs offered guiding questions, participated in parallel play by building a rocket alongside a struggling student, and gauged student emotions to determine how much scaffolding was necessary. Another finding was how the presence of parents influenced decisions. PSTs felt pressured to be content experts and had concerns about appearing unprofessional by not facilitating every moment of the activity. In-service teachers may have the same concerns.

Professional Development for Inservice Teachers

According to Hira et al. (2014), practicing teachers should be prepared to understand technologies and pedagogies associated with making. Smith and Smith (2016) claimed that teachers may struggle to balance traditional structures for learning with the idea of students learning new skills through tinkering. Educators may also have difficulties in changing their pedagogical practices since many teach the way they were taught (Britzman, 1991).

Oliver (2016) explained that professional development activities can include presentation and discussion about similarities and differences between making and other opportunities for informal learning. Teachers could also develop a "Maker Manifesto" (Hatch, 2014) that lists core values their school makerspace would support. Professional development opportunities can also include visiting nearby makerspaces and joining online maker communities. Teachers could spend workshop hours doing open-ended projects that involve circuitry, tinkering with 3D modeling software, and coding applications like Scratch. Oliver (2016) also suggested that professional development courses offer stations with guided activities and time for debriefing and discussing how making can tie into existing curricula. If teachers are reluctant to buy into the idea of making in school, facilitators should lead a discussion in which individuals discuss a time they learned something experientially and if it happened during school. Teachers can then discuss differences between hands-on and more traditional learning to reflect on the quality of what they learned.

Paganelli et al. (2017), explored Oliver's (2016) suggestions through offering time in a makerspace as part of a professional conference. A group of 25 practicing teachers attended a one-hour session in which they experienced a makerspace as if they

were students. Activities included bookmaking, music production, and building a habitat. While the feedback was overall positive, some felt the experience lacked support and direction. Others, however, enjoyed the opportunity and freedom to create. An opportunity for further research is professional development that explores the ways teachers can differentiate for students with disabilities and fragile mental health.

Summary

While less than 1% of the school-age population receives special education that addresses mental health needs, 20% of children and nearly half of teenagers experience some level of mental illness. General education teachers using evidence-based practices for students with EBD is one way to mitigate the misappropriation of services. While make-based learning is a natural way to use evidence-based strategies, cultural perceptions could exclude students who do not identify with the dominant culture. Therefore, teachers should examine their biases prior to introducing students to making. Although making has received attention in communities of people with disabilities, the paucity of literature suggests people with emotional and behavioral disabilities are left out of the conversation. Making has been found to be a promising practice in education (Papavlasopoulou et al., 2017), and limited literature examines experiences of PSTs in coursework grounded in making and maker education. Some research explores professional development for inservice teachers, but no known study involves teachers discussing how to engage students with EBD in a makerspace. In the next chapter I discuss the methods I used in a qualitative research project that brought PSTs to a makerspace in a special education school.

CHAPTER 3: METHODOLOGY

Overview

The original purpose of this qualitative study was to engage preservice teachers (PSTs) in an action research project about teaching K-12 students with emotional and behavioral disabilities (EBD) in a makerspace. The intent was to explore how -or if- individual dispositions, exposure to make-based learning, and knowledge of evidence-based practices affected plans to teach students with and at risk for emotional and behavioral disabilities. I taught one section of EDUC 3600, which is a one-hour, topics-based educational seminar at "Southern City University," a large public institution in the Southeastern United States.

During this year-long course, I engaged a group of six PSTs in regular visits at "City Academy", a K-12 public school that exclusively serves students who receive special education for emotional and behavioral needs. While visiting the school, the PSTs visited the makerspace, which was adjacent to the library. This makerspace, funded through a Title I Federal Grant, featured a sewing machine, 3D printer, programmable robots, materials to build circuits, and bins of arts and craft supplies. The college students also met in the university makerspace monthly to engage in their own semester-long making projects to learn more about making and how this process might be an effective approach for teaching students in special education. Students also completed reading assignments related to their field experience at City Academy. These readings focused on make-based learning, teaching students with EBD, and evidence-based practices. In March of 2020, my plan for the study abruptly came to a halt with the Covid-19

pandemic. I quickly pivoted to a new mode of data collection as participants could no longer visit City Academy nor the university makerspaces. As such, this dissertation focuses almost entirely on the interviews and reflective assignments from the PSTs throughout the rest of the course. I reorganized the course in Canvas, an online Learning Management System. Though the data collection methods changed, I continued to collect the verbal and written components of the original study and maintained my original research question:

> What perceptions, practices, and roles do PSTs develop in a seminar course focused on make-based learning, evidence-based practices, and clinical observations in a special education school?

I sought to learn more about how this group of PSTs would translate their experience in the university makerspace and the theory they learned in class related to Constructionism to their observations and experiences at City Academy. To facilitate understanding of participants' experiences, I interviewed them and collected their course-based reflections. I wanted to learn more about the ways in which PSTs viewed making, an approach to education that has had effective outcomes with special populations of learners (Fields et al., 2018) might also have implications for engaging students with EBD. In the following sections, I first describe my selection of narrative inquiry as a methodological approach; then, I describe the process I used to collect, organize, and analyze data. Finally, I attend to the ethical issues and (de)limitations of the study.

Narrative Inquiry Approach

One purpose of qualitative research is to understand the varied truths among different individuals' experiences. Researchers can use qualitative methods to explore individual experiences and seek a general understanding of an event or phenomena (Coffey & Atkinson, 1996; Cutcliffe & McKenna, 2002). Jerome Bruner (1991) conceptualized an approach to qualitative research that honors the participants' sense of the world through narrative. In a general sense, people generate knowledge through storytelling; however epistemologically, narrative inquiry enables us to better understand others' intentions and perspectives through their own words. Therefore, narrative inquiry can be a path toward individual and collective understanding. Narrative as a methodological approach is the process of collecting and analyzing the stories that people tell to describe and interpret their experiences (Overcash, 2003). As Moen (2006) explained, it is human tendency to rely on stories to make sense of their surroundings and understand the behaviors of others. Narrative data can consist of people's written and spoken words regarding observable activities (Taylor & Bogdan, 1984). They often appear as extended text (Miles & Huberman, 1984).

Using Bruner's suggestion that narrative "operates as an instrument of mind in the construction of reality" (1991, p. 6), I sought to explore the realities this group of future teachers were developing in relation to constructionist learning and teaching students with EBD. Considering my role as a course instructor, I also took into consideration Moen's (2006), three basic claims about narrative inquiry. Moen (2006) claimed that humans organize their experiences into narratives. Secondly, the stories that people tell depend on past and present experiences, individual values, to whom they tell the story, and the context for storytelling. People tell and retell stories differently, depending on the

setting in which they find themselves. They tell stories at different times, to different people. College students recounting stories to their instructor may behave differently than when they chat with their dormmates. For this reason, Anastas (2000) affirmed that narratives must be understood within the context the researcher gathered them. I reiterate that the participants' narratives positioned me as their course instructor. I collected various forms of data to capture narratives that are presumably true. I was, however, also responsible for assigning the participants' semester grades. Moen (2006) also claimed that multiple voices are present within one person's story. Narratives link the individual to his or her social context, which means that multiple voices are present within one individual's stories. In this study, the participants shared narratives that include not just themselves, but also their classmates, the City Academy community, and sometimes me.

In educational settings, narrative inquiry brings researchers and educators together to construct school experiences collaboratively (Connelly & Clandinin, 1990) In this study, a group of PSTs shared written narratives through individual interviews. Collecting and analyzing the PST's' narratives allowed me to understand how -or if- the experiences influenced their perceptions of make-based learning, use of evidence-based practices, and roles as future educators of students with EBD

Research Context

Description of Setting

The first site for this study is "Southern City University," a large public institution that serves approximately 30,000 students. The university is in a large metropolitan area in the Southeastern United States and brands itself as the state's urban research

university. One feature is the makerspace, located in a high-traffic area of the university library. The makerspace features technological equipment including 3D and large-scale printers, a laser cutter, CNC router, and vinyl-cutting machine. The space also invites low-tech making with tools that include a sewing machine, discarded library materials, cardboard, art supplies, and fabric. In my role as a Graduate Assistant for the Southern City's chapter of the National Writing Project and Teaching Fellows, I had the opportunity to learn more about the university makerspace through trainings and visits with the Teaching Fellows during their EDUC 3600 seminar in the fall of 2019.

Similarly, I became familiar with the second site for this project, "City Academy," through my role as a Teacher Consultant through Southern City University's chapter of the National Writing Project. In the 2018-2019 academic year, I provided professional development to the faculty at City Academy around facilitating make-based learning with students with exceptionalities. The same year, another Teacher Consultant and I co-facilitated after school workshops for City Academy faculty in which they could explore being makers themselves.

City Academy is a separate public school for students with EBD located in the largest school district in the state. According to data from 2019-2020, City Academy serves 80 students with a student/teacher ratio of five to three. The majority of students (61%) are male. The racial makeup of students is as follows: 59 Black, three Latinx, and 13 White. Five identify as two more races, and none are Asian or Native American. Of the 80 students, 77 are eligible for free lunch (Institute of Education Sciences, National Center for Education Statistics, 2020). According to the most recent data published on the state's department of public instruction website, 57% of City Academy students are

economically disadvantaged, compared to 46.5% of students across the state. State data reports 311.69 criminal acts per 1,000 students at City Academy compared to an average of 6.9 incidents per 1,000 students statewide. Only 12% of students graduate within four years of high school, compared to 86.5% of students statewide. It is also worth noting that City Academy owns 56.88 book titles per student, compared to only 18.3 statewide (North Carolina School Report Cards, 2019). Due to frequent student transfers in and out of City Academy, the low graduation rate may be skewed. Through conversation with City Academy teachers, I learned that students can earn their way back to a regular public school, but some prefer to stay.

In 2018, City Academy leaders applied funds from a Title 1 School Improvement Grant to provide faculty with professional development in make-based learning and purchase materials. As a result of this grant funding, the makerspace moved from a section of the library to a separate, adjacent classroom. The makerspace houses laptops and tablets, a sewing machine, programmable robots, gadgetry to build electronics, and bins filled with art and craft supplies. During the 2019-2020 school year, until the Covid-19 pandemic ended in-person learning, all City Academy students had time built into their schedule to visit the makerspace weekly.

To prepare the PSTs for clinical visits to the makerspace at City Academy, I provided selected readings about the concepts of making and teaching students with EBD. I facilitated monthly class meetings in the makerspace at Southern City University to provide the PSTs with an opportunity to be makers. The intent was for the PSTs to apply this new knowledge and skill to their experience at City Academy. Throughout the year-long seminar, I assigned one clinical hour per week at City Academy. I encouraged

them to visit the makerspace, but the PSTs' schedules and did not always align with the master schedule at City Academy. A lack of overlap in semester breaks, the school district requiring background checks, inclement weather, and the Covid-19 pandemic were impediments that prevented the PSTs from visiting one hour per week.

Participants

Study participants (n=6) are recipients of the state's Teaching Fellows Scholarship Program, which is a forgivable loan repaid through years of service to public schools. Southern City University is one of five institutions of higher education in the state that offer the scholarship. One stipulation to becoming a Fellow is an intent to instruct either a STEM subject or special education. Therefore, all participants were preparing to become either special education or STEM teachers. I assigned pseudonyms to protect their privacy. Table 1 provides participant demographics.

Table 1

Participant Demographics

Name	Race	Gender	Plan of Study
Alex	White	female	K-12 special education
Bailey	White	female	elementary special education
Jamie	White	male	elementary special education
Kennedy	Pacific Islander	female	elementary special education

Lane	White	male	secondary math education
London	White	female	middle grades science and social studies

All participants were first-year undergraduate students apart from London. London was in her second year at Southern City University.

Study Design

This study took place over two academic semesters in 2020. In the fall of 2019, prior to data collection, I assigned the PSTs course readings and provided prompts to write responses on online discussion boards. I frequently asked the PSTs to compare what they read to what they experienced at City Academy. PSTs also met in the university makerspace once per month. This enabled me to introduce the concept of make-based learning with an entire class of PSTs, while also sharing the theoretical foundations of constructionism. The PSTs' clinical visits during the fall also fostered prolonged engagement at City Academy before collecting data.

I received approval through the university's Institutional Review Board (IRB) in December 2019. Some of the Teaching Fellows who enrolled in the fall course that I facilitated chose to enroll in a different section of EDUC 3600 to explore a new topic. Six PSTs enrolled in the section of the spring course that I facilitated. All of them consented in writing to participate in this study. My intent at the time was to conduct action research with the study participants. During the spring of 2020, the PSTs continued to visit City Academy weekly and the university makerspace monthly. Once I had clearance to collect

data, I asked the PSTs to reflect in writing about what they learned in the fall about make-based learning and teaching students with EBD.

I also asked the PSTs to complete an observation form following each visit. The purpose of the observation form was to collect data regarding the age of City Academy students, time of observation, what City Academy students were doing in the makerspace, and if they observed evidence-based practices (i.e., choice-making, peer assisted learning, cooperative learning, self-monitoring). The form also included open-ended questions regarding how the visit prepared them for a career in teaching, and how the experience at the City Academy makerspace is similar to the university makerspace. (See Appendix A). Due to inclement weather, illnesses, and lack of overlap between semesters at City Academy and Southern City University, I only collected nine forms at the onset of the Covid-19 pandemic.

I also asked the PSTs to collect responses from their peers to a survey that I drafted and then asked the participants to review. The intent of the survey was to explore PSTs' perceptions of teaching K-12 students with EBD and make-based learning. (See Appendix B) Inclusion criteria for completing the survey included current enrollment at Southern City University with an intent to become a K-12 teacher. Exclusion criteria included participation in the Teaching Fellows program. The PSTs collected 85 responses. When the pandemic put a sudden end to all in-person schooling, I put data collection on hold. When the school district announced that remote learning would continue into the fall of 2020, I modified the study design.

During the summer 2020, I modified the IRB. I received approval to carry out individual interviews with the study participants. As the revised study design focused on

the participants' narratives, the survey results were no longer relevant. I had assigned a written reflection concerning results of the survey, which did confirm the participants' perceptions of make-based learning and teaching students with EBD. For this reason, I included responses to this assignment in the data that drove the findings.

As the purpose of constructionist learning is to construct knowledge inside of the learner's mind and make something shareable outside one's mind (Stager, 2013), I collected the artifacts that the PSTs created in the university makerspace during the spring semester. Since the PSTs and I were limited to remote instruction at the end of the Spring 2020 semester, I asked the PSTs to contribute to a shared Google Slideshow that I called the "Virtual Maker Faire". I asked the PSTs to include an image of their make and written description.

Through collection of interviews, reflections, class assignments, and PST-developed artifacts, I sought to learn how PSTs developed identities as makers and as future teachers. I also wanted to learn how these PSTs characterized make-based learning and whether they found it as potentially beneficial for students with ED.

Role of the Researcher

I served as a teaching assistant for one section of EDUC 3600, Teaching Fellows Seminar, during the 2019-2020 school year. I was responsible for selecting course readings and reading written reflections. Readings included "The Maker Movement" (Dougherty, 2012), "What Makes a Good Project?" (Stager, 2009), "Engaging 'At-Risk' Students Through Maker Culture Activities" (Somanath et al., 2016), and "Behaviour Approaches for Children with Disabilities" (Vukovic, 2018). To aid in understanding

evidence-based practices, I asked the PSTs to read "Evidence-Based Teaching Strategies for Students with EBD" (Ryan et al., 2008) and review the table on page 505 of Gable et al.'s (2012) study that measured teachers' knowledge and use of such practices. The table lists evidence-based practices for students with EBD and organizes them by academic/non-academic strategies as well as school-wide, classroom-level, and individual practices. I also assigned a task late in the Spring, 2020 seminar in which PSTs would locate a non-vetted teaching resource and analyze the document in an attempt to find any grounding in research. The purpose was to help them determine the quality of online resources.

To provide opportunities for constructionist learning, I coordinated the Fellows' visits to City Academy, facilitated the monthly gatherings at the university makerspace, and provided both in-person and virtual instruction. For verification purposes, Fellows were required to use City Academy's visitor monitoring system. I had the liberty to contact school administration if I suspected the Fellows were not completing visits as assigned.

Consent

All PSTs enrolled in the seminar consented in writing to participate in the study. There was no need to delete data collected under pseudonyms of students who did not consent. Nor was there a need to keep the PSTs' identities private. When I revised the IRB to include individual interviews, participants consented in writing to participate a second time.

Data Collection Methods and Procedures

I received IRB approval December 2019. As the fall semester had just ended, data collection began in January and continued into the following fall semester. The first set of data was a written reflection from each participant concerning what they learned during the prior semester. Study participants distributed an online survey to their peers in the College of Education. These methods of data collection reflect the original purpose of the study, action research. When I revised the course to account for the pandemic, I asked the participants to reflect in writing about the survey findings.

As I revised the design to account for the pandemic, the data for this study includes six participants' interviews. I revised the IRB and received approval to interview individual participants following an interview protocol (see Appendix C). All six participants consented to an interview. From September to October 2020, I interviewed each participant individually via Zoom. As the participants told such rich stories during the interviews, I shifted from an action research to a narrative inquiry approach.

I approached this study through a constructionist lens. Considering that learning best happens through experience and making an artifact, I share photographic evidence of the participants' makes in the findings. These artifacts served as data to triangulate the interview data related to their understanding of the relationship between make-based education and teacher identity. While it may be a stretch to consider photographs a narrative, the images do contribute to how each participant described their experiences in the university makerspace (Overcash, 2003). As pictures can enhance meaning in a children's book, the pictures I included in the findings paint a clearer picture of the perceptions, practices, and roles PSTs developed during the seminar course.

Data Analysis

A code is a researcher-generated construct that assigns an interpreted meaning to individual datum for later purposes of pattern detection, categorization, and assertion. Coding is the process of assigning codes to data. Saldaña (2016) explained that a code captures a datum's essence as a title captures the essence of a book, film, or poem. Coding requires a researcher to view data through an analytic lens. Yet "what type of filter covers that lens" (Saldaña, 2016, p. 6) can impact the ways in which the researcher perceives and interprets the data. In this study, data consisted of students' spoken and written words as well as photographs of artifacts that a course instructor collected, muddled over, and organized.

I interpreted the data as an educator exploring a constructionist approach to teaching students with emotional and behavioral disabilities. I paid close attention to the PSTs' perceptions of students, teachers, and the school they visited. I noted how participants described practices that may shape their identity as teachers, such as a fixed or moldable idea of what and who they want to teach, and their willingness to learn from clinical experiences. Phrases that clued me into these findings include references to the teachers and students, "it made me switch" (majors), (this experience was) "more beneficial to the people that are going into special ed", "I learned that", and "how do you teach?" (referring to what a teacher does at school). I also paid attention to PSTs referring to students by their names. This is a small nuance but remembering students' names can suggest the extent to which the PSTs attempted to form relationships at City Academy. I viewed the data to determine what roles the participants played in these experiences, such as observer at City Academy, helper or assistant teacher, and friend to City Academy students. Phrases that clued me in to identifying these three roles include "I observed", "I

helped", "I am not the teacher", and "[I tried] to be a friend instead of a college student coming to watch". I examined the artifacts to explore how the participants conceptualized making, whether as a hobby, approach to solving a meaningful problem, or both.

Early in the coding process, Saldaña (2016) reminded researchers to circle, highlight, or color significant quotes or passages of text that are worthy of later attention. Saldaña (2016) cited Bernard and Ryan (2010) who recommended using features of word processing software to begin coding and categorizing data during transcription. While I transcribed each interview, I used italics to identify key moments in the conversation and inserted margin notes to later locate passages that identified a perception, practice, and role.

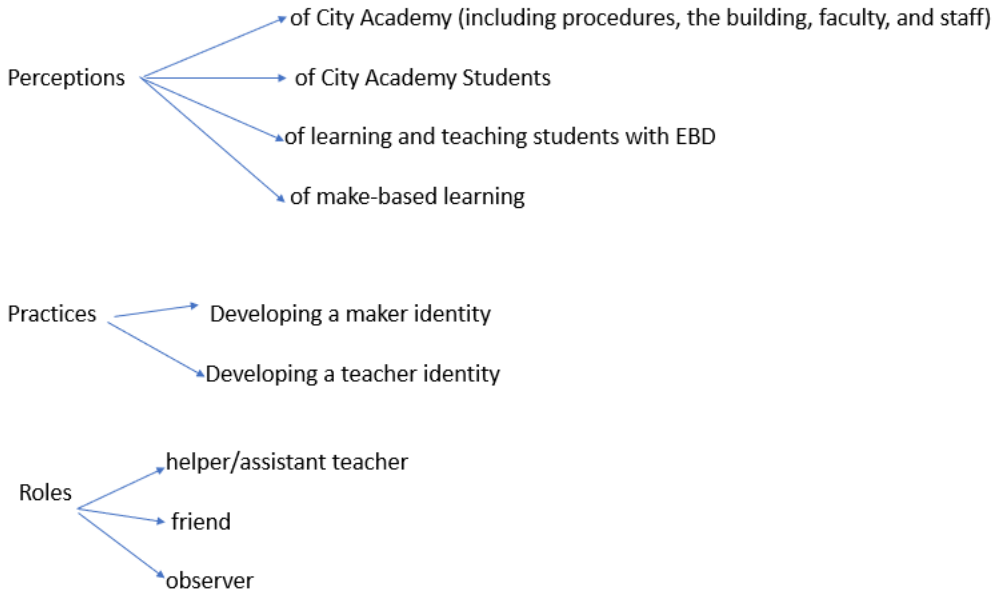
Saldaña (2016) also suggested that when working with multiple participants, it may be helpful to code one participant's data before progressing to subsequent participants. What I found helpful about this approach is that I could later draw comparisons and distinctions between participants. Following Auerback and Silverstein's (2003) recommendation (as cited in Saldaña, 2016), I always kept the research question in view when I analyzed data. This strategy allowed me to focus on identifying the participants' individual and collective perceptions, practices, and roles. I also kept in mind questions that Emerson et al. (2011) advised when coding (as cited in Saldaña, 2016). Questions included, how do members characterize what is going on?, What assumptions are they making?, and What did I learn from these notes?

This process led me to "lumping" rather than "splitting" the data. (Bernard, 2011, as cited in Saldaña, 2016). I generated codes from the participants' interview transcripts and assigned labels to larger sections of data taken from that section of data. Because I

often did apply one code to a larger chunk of text, I relied on margin notes and highlighting text to organize the data instead of using qualitative coding software such as CAQDAS or NVIVO. The result was a choice to organize individual findings into categories as follows:

Figure 1

Organization of Individual Findings



Lumping data under these categories allowed me to describe how the individual participants developed their own perceptions, practices, and roles in the seminar course. I noticed, however, that the PSTs expressed similar beliefs about three ideas relevant to the research question. In addition to reporting individual findings, I shared collective findings. I again lumped data, preserving the participants' stories. The stories identify similar assertions of what students should do in a school makerspace, why making can

benefit students with EBD, and their approaches to determining best practices in a classroom. I was then able to identify these as overarching themes.

To ensure that findings are reliable, I started with fresh copies of each transcript and assigned shorter in-vivo codes to data that falls under the categories and themes. This second analysis allowed me to split the data I previously lumped. It also led me to notice how many times a PST referenced City Academy students, their developing identities, what the PSTs observed, or described how they plan to figure out what works. (See Appendices D-I). The following table lays out the frequency in which each participant referred to a category or theme.

Table 2

Frequency in Which Each Participant Referred to a Category or Theme

Participant	Perception of City Academy	Perception of students	Perception of teaching students with EBD	Perception of make-based learning	Developing a maker identity	Developing a teacher identity	Role of helper/ assistant teacher	Role of friend	Role of observer	Making can benefit students with EBD	Maker-spaces are for making	EBPs are one of several approaches
Jamie	26	9	4	5	14	27	6	2	2	3	6	3
Bailey	12	11	4	10	5	5	2	2	0	3	3	8
London	18	10	5	9	7	23	13	0	3	5	4	7
Alex	12	15	1	8	5	12	2	0	1	2	8	9
Kennedy	9	10	4	9	3	2	2	0	2	2	3	2
Lane	12	12	2	17	2	6	2	0	1	4	2	5
Total	89	67	20	58	36	75	27	2	9	19	26	34

I agree with Saldaña's (2016) recommendation that coding should be a collaborative effort. This not only provides varying perspectives on one set of data, but it can also allow researchers to determine reliability. Since this project was a solo endeavor, I accepted Saldaña's advice to "shop talk with a colleague or mentor about your coding and analysis" (2016, p. 34). During the fall, 2020 semester, when I conducted interviews, analyzed data, and drafted the findings, I scheduled monthly teleconferences with a dissertation coach at Southern City University's writing center. In these meetings I expressed concerns about my inductive approach, relying on the research question to organize findings. The coach affirmed that my approach was viable, especially regarding my practice of involving the participants in analysis. Each participant had an opportunity to read the section of the findings about them. I also asked each participant to read the section about collective findings to ensure that my analysis was accurate. This engagement in member checking not only allowed me to make a more collaborative effort toward data analysis, but it also ensured the trustworthiness of the study.

Trustworthiness

According to Shenton (2004), qualitative researchers can satisfy four criteria to ensure trustworthiness. Credibility refers to internal validity; transferability refers to the generalizability of the study; dependability refers to the reporting process; confirmability refers to affirming that the findings reflect the ideas of the informants, not the researcher's preferences.

Shenton (2004) claimed that one way to ensure a study is credible is to develop a familiarity with the culture under study. Lincoln and Guba (1985) recommended that researchers form relationships with participants to establish trust. I had positive

relationships with all six participants prior to the start of the study due to my role as a teaching assistant. Korstjens and Moser (2018) claimed that "prolonged engagement" (p. 121) in the research setting can establish credibility. In addition to being familiar with the PSTs prior to the study, I co-facilitated professional development for City Academy faculty during the 2018-2019 school year. This allowed me to get to know the City Academy community and gain an appreciation for the school's culture.

Triangulation is another strategy to safeguard credibility. Triangulation refers to a researcher using various methods to collect data (Miles & Huberman, 1994; Shenton, 2004). Data collection methods for this study included individual interviews, observation forms, and written reflections. Miles and Huberman (1994) suggested that the use of negative evidence can build a researcher's credibility. In Chapter 4, I do report findings that some PSTs found the project minimally relevant to their future careers. Guba and Lincoln (1989) claimed that member checking is the most important provision to support the credibility of a research study. Participants had three opportunities to review my findings. Following each interview, I emailed the PST a transcript and asked them to annotate any content they wished to remove or seemed inaccurate. When I wrote the findings that emerged from individual participants, I asked the PSTs to member-check the document. When I completed the cross-findings, I asked the PSTs to read the document and report back to me anything they wished to remove or seemed inaccurate.

Transferability, or external validity, considers the extent to which the findings of one study can be applied to another. Thick description (Geertz, 1973) can enhance transferability. The researcher is responsible for providing thorough details about the participants and context. This can enable the reader to determine if findings are

transferable to their specific setting (Firestone, 1993; Korstjens & Moser, 2018). Shenton (2004) argued that it is impossible to determine if findings and conclusions are applicable to other populations when the project is specific to a small number of environments and individuals. For this study, I provided detailed descriptions of City Academy, Southern City University, and the participants. Yet no other known study to date has brought together PSTs and K-12 students with EBD to a school makerspace. Therefore, this work can only suggest a framework for future research. I agree with Shenton's (2004) claim that a qualitative study must ultimately be understood within the context of the organization(s) in which it took place.

A researcher can bolster dependability by reporting the processes within the study in enough detail so that a future researcher can replicate the study. Albeit with qualitative research, the same design in a similar context can produce different results. A dependable study includes sections devoted to the research design and implementation, an operational detail of data gathering, and a reflective appraisal of the project (Shenton, 2004). For this study, I included the survey, observation guide, and interview protocol in the appendices. Although I did not include survey data in the findings, I did cite some of the PSTs' reactions to the data they collected. As I mentioned in the data collection methods and procedures section, the participants in this study provided much thicker descriptions verbally than in writing. While I do not regret asking the PSTs to fill out observation reports, I should have spent more time modeling the procedure and shared an exemplar report. These strategies may have provided more useful data.

Confirmability regards the researcher's concern with objectivity (Shenton, 2004). According to Patton (1990), it is inevitable that the researcher's biases intrude in research

findings. Shenton (2004) reiterated the importance of triangulation in reducing bias. Miles and Huberman (1994) asserted that researchers admit their own dispositions. For this reason, I opened Chapter 1 with a personal vignette of how my own son with EBD benefitted from an opportunity to explore make-based learning at school and at home. I also provided a separate subjectivity statement (See Appendix J). In the statement I reflect on my reluctance to interview the participants. I also discuss my own maker identity and discontent with standards-based schooling.

Ethical Issues

Participation in this study was by consent. Students willing to be included in the study signed consent forms at the onset and again when I requested individual interviews. I abided by the tenets for research set by the university's Institutional Review Board. I stored data in a Google Drive folder that only I could access.

Limitations

Limitations concern weaknesses of a study that are beyond the researcher's control (Theofanidis & Fountouki, 2018). Participants were students at only one university. Clinical visits took place exclusively at City Academy. The study followed participants for one academic year, which was disrupted at the onset of the COVID-19 pandemic. To my knowledge, no prior study considers what happens when PSTs spend time in a makerspace alongside students with EBD. Therefore, the work can only suggest a framework for future research. No findings should be used to inform other populations of preservice teachers nor teacher preparation programs. Longitudinal work with the PSTs is a possibility beyond the scope of this dissertation. Another limitation is that this study began before the Covid-19 pandemic interrupted in-person schooling.

Dougherty (2013) argued that fostering a maker mindset in school is a type of learning that best happens face to face. He could not have predicted a global pandemic would happen seven years later, sparking a sudden shift to remote instruction in many school districts across the United States. Nor could I have predicted a novel virus outbreak would occur when I started this project. At the time of writing, students are largely still learning from home. In the district where City Academy is located, students have the option to continue remote instruction for the remainder of the school year. As Americans adapt to studying and working from home, I suspect that some form of remote learning may remain an option for K-12 students in some school districts. It remains unclear how teachers who identify as makers could encourage students to carry out projects when face-to-face interaction is limited. I found that restricted access to technology in the university makerspace got in the way of the PSTs completing their makes. Benabdallah et al. (2021) affirmed a similar difficulty in a study of eight students in a graduate-level digital fabrication course. The authors found that the shift to remote learning exacerbated student inequalities, even though the university shipped 3-D printers to the students' homes. The long print times in addition to the fumes, heat, and noise these machines generate created a new source of stress for students who lived with roommates. It is not yet known how inequalities would surface among a population of K-12 students in which the majority is economically disadvantaged.

Delimitations

Delimitations of a study result from the researcher's specific choices (Simon & Goes, 2013; Theofanidis & Fountouki, 2018). I chose to carry out research with PSTs and not in-service teachers due to practical access. "Prolonged engagement" (Korstjens &

Moser, 2018, p. 121) with Southern City University's Teaching Fellows and City Academy faculty already existed. I facilitated learning experiences in two makerspaces to explore the perceptions, practices, and roles that PSTs developed in a course in which they could learn "especially felicitously" (Papert, 1991, p. 1) through experience and building artifacts.

Considering delimitations of remote learning, Benabdallah et al. (2021) noted the importance of facilitating equal access to both human and material resources. Instructors must play a large role in managing access to resources and being specific about learning objectives. Instructors should make sound decisions about not just what materials are necessary, but how to distribute them. Students attending schools in the district where City Academy is located can rent Chromebooks. Students can borrow Internet hotspots if needed. A possible solution is to allow families to pick up bundles of consumable materials for making (i.e. wires and batteries to build circuits, art supplies, and small tools). Providing material resources, however, does not solve problems related to insecure housing or cramped/overcrowded living conditions. These are potential challenges for K-12 students who are economically disadvantaged.

Summary

I applied a narrative inquiry approach to explore the perceptions, practices, and roles that PSTs developed during a seminar course that focused on make-based learning and K-12 students with EBD. PSTs completed written reflections as assigned, completed field observation guides and took part in individual interviews. I coded and organized the data applying Saldaña's (2016) approaches. My use of thick description, triangulation, and member checking contribute to the trustworthiness of this qualitative study. I

followed ethical guidelines established by the university's Institutional Review Board and provided both limitations and delimitations.

CHAPTER 4: FINDINGS

The purpose of this qualitative study was to explore how preservice teachers (PSTs) experienced a makerspace in both their own university course context and in a field experience. I sought to observe how these experiences influenced PSTs perceptions of the possible role makerspace education might play in their identity development as teachers. Over the course of the 2019-2020 academic year, a team of six PSTs visited a makerspace inside a special education school weekly to observe and participate as appropriate. To gain first-hand experience with making, the PSTs gathered in the university makerspace monthly to engage in semester-long projects. During the fall semester, PSTs learned about principles of constructionist learning and strategies to instruct students with EBD. Data collection began in the spring of 2020 upon IRB approval.

The intent of the study was to explore the perceptions, practices, and roles that PSTs developed in relation to these activities. Most of the data in this chapter includes PSTs' spoken narratives that I collected through individual interviews via Zoom in the fall of 2020. Even though I pivoted away from action research to account for the Covid-19 pandemic, I included data the PSTs generated from the original intent of the study. These data provide triangulation to support interview data.

The following question guided the study:

> What perceptions, practices, and roles do PSTs develop in a seminar course focused on make-based learning, evidence-based practices, and clinical observations in a special education school?

I organized the findings by examining the PSTs' individual perceptions of both City Academy and make-based education, what practices each PST developed related to the course and their observations, and what roles they assumed in both settings. In the second part of the chapter, I describe three common themes that emerged from all participants. The main findings of this study were: (1) making connects to social-emotional learning, which can benefit students with EBD; (2) time in school reserved for the makerspace should not be overshadowed by library visits or other activities; and (3) using evidence-based practices is not the only pathway to finding "what works".

Overview of Individual Participants

The discussion begins with Jamie and Bailey, two first-year college students preparing to become special educators in an elementary school setting. Both Jamie and Bailey have a fixed role in mind working alongside young students with exceptionalities. Both of their makes were adaptive items for people with EBD. The discussion moves to London, who started the project with an intent to be a middle grades science and social studies teacher. During this project, however, London began to consider additional licensure in special education. Alex is working toward a K-12 license in special education and originally intended to teach students with profound disabilities. As the project progressed, Alex discovered a passion for working with students who have higher cognitive functioning but experience what she termed "roadblocks" to learning. She changed her course of study from adapted to general curriculum. This means she will be qualified to work in a general setting instead of a self-contained classroom. Kennedy did not change her mind about her future in the classroom yet has a less fixed identity as an elementary special education teacher than Jamie and Bailey. Lane plans to teach high

school mathematics. Unlike the other PSTs, Lane perceived the experience as a practical way to gain classroom management skills. He did not appear to modify his perceptions or practices about forming relationships with students who have mental health challenges. Concerning the perceived importance of developing relationships with students from vulnerable populations, Lane and Jamie occupy opposite ends of a spectrum.

Jamie

[Visiting City Academy] "Taught me not to fall victim to first perspective about the competency of a student"

(Observation Report, February 4, 2020)

Jamie is a White male pursuing licensure in K-6 Special Education. He was a first-year college student during the time of study. In an interview conducted September 14, 2020, Jamie described himself as a "sort of preppy White guy [who] comes in with his fancy bow ties and... khaki pants." Jamie showed a passion not just for special education, but also the students who may benefit from it. His interest in special education stems from his own journey managing ADHD. In class, he expressed feelings of awkwardness about being a male studying elementary education. He revealed, "I don't know how to ask to work on assignments with people. I'm the only guy in all my classes. How do I reach out to classmates without sounding weird?" Despite these feelings, he was a regular participant in class discussions. He described the atmosphere in the seminar as a place where he and others could speak freely. In his words, "I knew if I had something to say, I could just say it in our Teaching Fellows class. Maybe something that was relevant? Maybe just a little bit of a joke? I can just say it." Jamie's self-conscious, yet affable personality shaped his perceptions of students and teachers at City Academy.

Jamie's Perceptions

Perceptions of City Academy

In the interview, when I asked Jamie if he had preliminary perceptions about City Academy, he stated,

> I am going to be completely honest. It was a bit more threatening than my school I feel I'd grown up at. I feel there's a lot more security checks in place, which in that type of school is necessary. But I feel it was helpful to actually get to know the kids. I think then you realize, "oh, this isn't a place for bad kids." This is a school for kids who need the specific kind of help that the regular school system can't help with.

When I asked him to say more about initial feelings toward the school his first impressions of both teachers and staff were negative in tone.. As he described it:

> I would say they had experienced teachers. And some had a bit of an attitude. And that's not to say anything about the quality of their teaching. And maybe it's the type of teacher that's needed in a school environment like that? I mean, they were friendly. But they were also just very no-nonsense. And in some sense, you could feel like their patience was being tried by the students. I think the teachers would use different methods than I would've to deal with students. At that point, my biggest method was reasoning, and they taught off of authority. I think that is respectable, but there was an establishment that "you're going to respect me, or you're going to get in trouble. Why do you respect me? Because I'm your teacher," and that's what you do.

The following interaction took place when I asked him to clarify.

Abby: Are you referring to the teachers, or some of the paraprofessional staff?

Jamie: Some of the staff, the staff they brought on to handle the students, I feel, were a lot more in that category of like, "hey, you're just going to respect me." And they also sort of antagonized students in some senses.

Abby: Like triggered them, is that what you mean?

Jamie: Sort of [pause] escalated the situation opposed to de-escalating it. They wouldn't say things that would calm down the student, but just make them more mad. I mean, the teacher should be respected, but what you're saying to the kids is just going to make them want to throw things, like want to punch you in the face, maybe there's a better way to say it.

Yet Jamie's skepticism matured into self-discovery over the course of the year. He acknowledged that his early judgments may have been based in inexperience. When I asked him how his perceptions changed over time, what follows was his response.

> As a prospective teacher who doesn't know all the arts of the trade, it was very easy for me on the outside to come in on my Friday every week and find ways to nitpick and see how their work could have been done more effectively, work with students who are easily excitable. But I feel that I trusted the students more [than the paraprofessional staff]. I knew how to communicate with them [students]. I feel like I gained their trust…I feel there was an established trust that allowed a deeper intimacy with them to grow.

Perceptions of City Academy students. Among the team of PSTs, Jamie expressed the most positive feelings toward City Academy students. He revealed this in the interview when I asked how he felt in mid-March, when the first cases of Covid-19

popped up in the state. The pandemic put a sudden, unexpected end to the PSTs' school visits, in-person classroom meetings, and scheduled gatherings in the university makerspace. He directed his response toward how the pandemic disrupted the relationships he was forming with students. He expressed:

> I believe the decision [to close schools] made sense. But it was very unfulfilling as I feel the relationships didn't get to end in a natural way. It's possible that I will see those kids again, but it won't be in the same context. It will be under the pretense like we were just sort of ripped out of that relationship in that class.

When I asked Jamie what he missed the most about visiting City Academy, his response centered on warm feelings toward students.

> I miss how real the kids are. I feel like though they were 7th graders, they were very mature. They just understood a lot of things. It was such an interesting thing to see the kids that were young but also knowledgeable, just about things that are really important, and [I] also appreciated their energy and the fact that they're genuine. It was a good thing to look forward to every week.

Speaking to the authenticity of City Academy students, what stood out about Jamie is his insight into the ways students "present avenues" to form relationships with caring adults. When I asked Jamie about his perceptions toward students, he took the time to describe individual students' strengths:

> First off was "Z." I loved Z. What I observed about him was, he was interpersonally intelligent. He just knew how to talk to people; he knew how to make people laugh. He didn't have any difficulties talking to people that were older than him. He was very creative-minded. I feel like he paced himself; he

> knew why he wanted to have control over himself. I feel another one I connected with was "S." I just felt he had a good heart, and I feel he maybe struggled with trusting people a bit. Because you could tell when the kids started warming up to us. It was really sweet, and it was more than I expected. It could have been like, "I don't really care about these people who come in here every week." But I think they really started caring. Another one I got really close with was "J." J was really into anime. He just loved to talk. He had so many things he was passionate about. I knew nothing about it, but he was like, "Do you watch Naruto? Do you know Naruto?" "No." "But in Naruto they did this thing," *and it made me realize there are ways that children will present to you to get close to them. You just have to go down their avenue, and not necessarily your own, if they're presenting you one* (emphasis added). The way I got close to J, I listened about Naruto. I talked to him about his computer games, just walk and talk. So, I feel that was my biggest takeaway. *Kids are always presenting avenues to get to know them. But I think it's harder sometimes to tell which one. Some are not as favorable or easy as other ways* (emphasis added).

Jamie's open personality and willingness to show vulnerability may connect to his passion for students who receive special education. I found further evidence of his passion in how he perceived teaching and learning.

Perceptions of Learning and Teaching Students with EBD

Jamie views learning as a social activity. When we spoke in September, he expressed discontent with distance learning, as Southern City University had not yet returned to in-person instruction. He opined that "online learning just makes us do less

work or do less intentional work" because "part of the motivation for learning is just the social aspect." Other evidence that points to his preference for interpersonal learning appeared in a reflection, reporting that course reading only provided "some loose expectations with how I need to approach with my students" (Feb. 18, 2020).

Regarding Jamie's perceptions of teaching students with EBD, what seemed more important than book study was engaging in interpersonal connection. This allowed him to learn to separate the human from the disability. Jamie evidenced this in a written reflection concerning responses to a survey the PSTs conducted during the Spring 2020 semester. The survey fit the original study design, action research. The study pivoted to narrative inquiry due to the unexpected shift to distance learning due to the pandemic. In his words,

> A common opinion [among respondents] is that children with emotional behavioral disturbances are, as one person put it, "students who have trouble controlling their emotions and particularly how they respond to those emotions." This camp puts emphasis on the student and how their maladaptive thinking or behavior is what qualifies them for the condition. This is also captured in other responses, though maybe a little less elegantly, with responses that categorizes it as "anger issues," or as "fits/ disruptive behavior." I would refer to this as *behavior first language that mostly focuses on the actions over the student itself* (emphasis added). This may seem sort of an overreaction to what seems like just the reality of how we view children with emotional [and] behavioral disorders. I think that this line of thinking is a pitfall that can lead to us [future educators] devaluing the individual as someone who exists with a condition, and not

> allowing a condition to overwhelm the person's identity with that being the only thing of note about them. I don't think this is something we think intentionally, but just a line of thinking that we need to try not to get caught in (March 17, 2020).

Jamie's refusal to devalue a person with a disability connected to his approach to make-based learning. He approached making as means to make daily life easier for himself and others.

Perceptions of Make-Based Learning

In Jamie's view, the primary purpose for making is to solve a problem. The problem he identified was remembering to take morning doses of medication to control ADHD symptoms. In the fall he had an ambitious idea to create a "fun" pill dispenser. After several sessions in the makerspace grappling with the idea, his final product in December was a mason jar with plastic dividers and different cut-outs in the lid to contain pills of varying shapes. The project evolved in the spring, after concluding that fabricating a dispenser does not fully solve the problem of remembering to medicate. In his words, "I had the problem of it was difficult for me to take medicine in the morning. And I think of reasons for that and then think about how I can ... an efficient solution, and then how do I create it?" The next step toward the solution was to make an "ADHD Command Center."

Jamie's Practices

Developing a Maker Identity

Jamie perceived making as a social activity. When I asked him to describe his project, he mentioned the ways he verbally bounced ideas with the other PSTs. This is Jamie describing the make he developed in the spring semester:

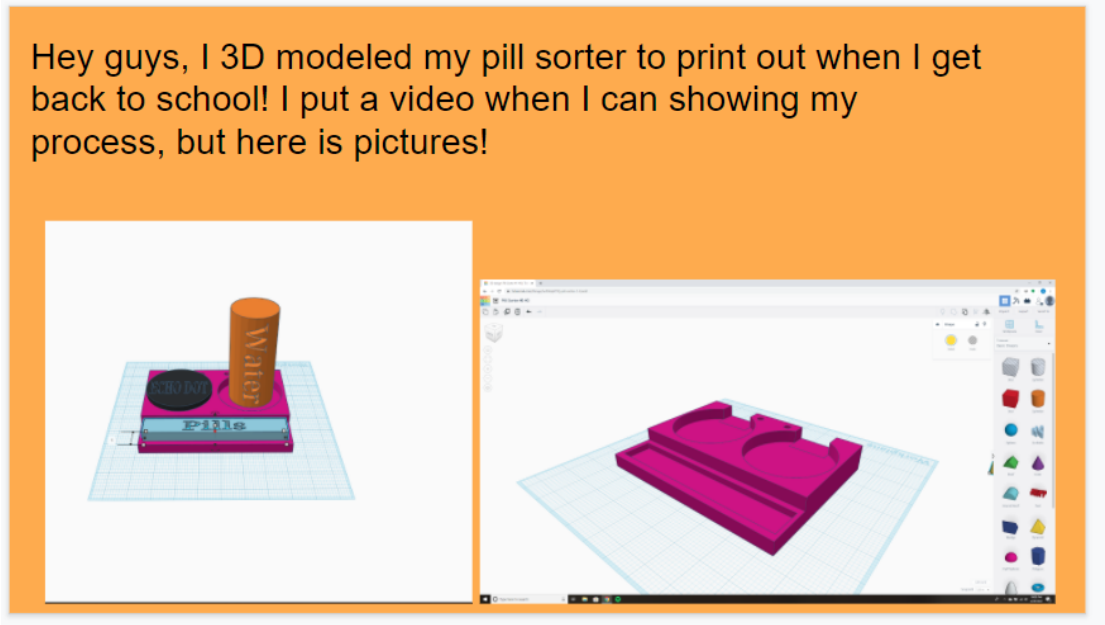
> What I was working on was an effective way to help someone with ADHD manage taking medications--to make sure they did it more consistently--and add some measure of efficiency to it. I was inspired by my mom who takes ADHD medications, and a lot of it is early in the morning. I had to do that too when I was still on medication. I was inspired to create something that you could place on your bedside table that would help you to remember to take your medicine. I think [Bailey] in our class maybe mentioned the idea of having a timer to go with it, and then the other Teaching Fellows and I just brainstormed, "what would be other cool things to have in this?". We came up with a couple ideas that we liked. So, in my design I had first a plastic--3D printed--sheet that everything would go into. It had a cutout for a pill container that you could just set in there… I put a little pencil holder in there if you want to put a notepad in one of the side holders instead. "Oh, here's the times I take my medication/ here's the days." But I just tried to provide a lot of variety with what you could use it for.

Jamie enrolled in several 3D printing workshops at the university during the spring semester. Unfortunately, the university moved to distance learning before he could finish his project. He expressed that he learned 3D modeling basics during the workshops but will have to "relearn skills" when in-person learning resumes. The intended culminating activity for the course was for each student to show off their project during the allotted final exam time. Since the PSTs and I were not able to finish the course in-

person, I created a Google Slideshow titled “Virtual Maker Faire” and asked each member of the team to create a Google slide. Below is Jamie’s contribution.

Figure 2

Jamie’s Artifact



Jamie identified with making as an iterative process. He explained next steps in his project by stating that “once we are in person, and I get to, like, try this stuff again, that’s something that I want to experiment around with, actually print my design out to see how I can improve this, what needs to change.”

Developing a Teacher Identity

Jamie discussed how his time at City Academy shaped his identity as a teacher-to-be. As a first-year student, Jamie felt “like a fish out of water,” noticing the high school students at City Academy were not much younger than he was. In the interview he expressed uncertainty about his future role, hypothetically asking “How do you teach?” and “How do you get a child to, like, listen to you and actually do what you want them to

do?" But what stuck out about Jamie was his willingness to observe others and notice how his changing perceptions informed his practice. As he noted,

> I mostly at the beginning I felt like I was out of my league. I didn't really know what I was getting into, and while that was happening, I was starting to understand things more. Maybe like halfway through I started the nitpicking, possibly? And then, maybe just like --there were instances where I got frustrated with the staff and it was hard for me to empathize with them. Of like, why they teach the way they did. It being where I am now, I appreciate the staff for trying, first of all, being teachers in a difficult setting, with different challenges the teachers have to deal with, and I am appreciating that my teaching style is going to develop, and I don't know exactly where it's gonna land. I appreciate getting to see that. It helped me too a bit, seeing that. Because as a teacher I realized I wasn't being very authoritative, and that's something that I am realizing now, babysitting. There are times when I can reason, "Hey, there are times when we have to do this" And there are other times I have to be more stern. [Deepens tone] "Hey, we're going to do this" --and talk to you about why we need to do this. So, I feel it was helpful for developing my skills as a more well-rounded teacher.

Like the other PSTs, Jamie spoke positively about Mr. R., the teacher at City Academy who facilitated learning in the makerspace. He stated, "I felt very close with Mr. R. and I liked his teaching style." Jamie observed that students "would try to start a conversation with Mr. R., and Mr. R. would just have to be like 'h-h-hey hey, stop' and he was always good about getting them back on task and keeping the lesson rolling." When I asked Jamie what he observed when not busy with students, he responded:

> The most interesting thing was the relationship between Mr. R. and the students. I think the way he was able to course-correct the students was just…I don't even know how he did it. He did it in a way that was just so friendly but also firm. You knew that you [referring to students] shouldn't do it, but you're appreciative with his gentleness. And so, the observing part was great for realizing how you can be both firm and gentle with a student.

Even though Jamie identified he had a lot to learn prior to beginning his career, he was confident that he was on the right track studying to become an elementary special education teacher. Drawing from his own experiences, he explained the time at City Academy may have contributed to interest in teaching students with EBD. He argued:

> I believe that going [to City Academy] helped me realize that I do have a passion for working with different areas of special education. At first, all I really knew about it and I was mostly passionate about was ADHD, and disabilities in that family. Because that is what I dealed with. But going to that school made me realize I have a passion for this type of learner, and learners who have to go through this.

Jamie's passion for educating others is also evident in the roles he assumed in the project.

Jamie's Roles

Helper and Friend

It is worth noting that while Jamie and I teleconferenced he was babysitting a 2nd grader and a 4th grader, talking to me while occasionally stepping away to redirect the young learners and assist with distance learning. In accordance with his practice as a developing educator, he told me, "I really love the kids; they're sweet. It's also really

good experience I think, because I'm not just managing one, but I have to keep my eyes on two of them".

Because I often travelled to City Academy with Jamie, I was able to observe his interactions with students. He consistently checked-in with the students to ask how they were feeling and let them know he was happy to see them. This was Jamie's response when I asked what roles he assumed at the school:

> I would say the roles I assumed were, first off, as someone who was there to keep the students on track and help keep them focused. I think we were also there to help spark creativity and engage with the students one-on-one. I feel like it was also an opportunity for us to create connections and friendships with the students. In a professional way, of course, we got to be more intimate with the students.

Assistant Teacher

Yet Jamie kept in mind his role as a college student observing a K-12 classroom.

> I enjoyed engaging and being there and trying to keep the students on-task *in a way that was constructive without going out of my place - I'm not the teacher in the class* (emphasis added). I feel like we were most useful when the makerspace stuff started. I remember working with "A" and I really enjoyed that because we just started brainstorming things that we like to do. And a lot of them--not all of them--were like things we could actually do. He wanted to make a green robot that cooked and cleaned and had a robot dog. Which I was like, "That's great!" But a lot of it, we were just there to help spark the kids' creativity.

Summary

The above findings suggest that Jamie constructed knowledge through experience. Both his narrative and artifact suggest that he developed a skill to create something personally meaningful. By getting to know the students' names and individual interests, Jamie demonstrated a developing practice of building relationships with his future students. While he expressed concern about knowing how to teach, his story suggests that the experiences in both makerspaces may inform future knowledge of teaching and learning. Regarding what he learned in both makerspaces, Jamie wrote the following in an observation report on February 4, 2020, "I have learned more about how passion drives you to work more to pursue your project and that passion fuels creativity".

The discussion continues to Bailey, who also identified as a future elementary special education teacher. Bailey also developed makes that were intended to benefit people with EBD. While Jamie developed a practice of "finding avenues" to get to know students of all temperaments, Bailey discovered that students with exceptionalities are more capable of "big ideas" than expected.

Bailey

"I had never heard of the software Scratch and here is this student showing me the video game he made in a couple of days. He learned how to use the program by just playing around with it. I thought it was the coolest thing ever."

(Observation Report, January 31, 2020)

Bailey is a White female pursuing licensure in elementary special education. She was a first-year college student during time of study. Her goal is to teach in a self-contained classroom upon graduation. Bailey hopes to begin her career in the local urban district and then return to her rural home county. Bailey arrived at Southern City

University having completed an internship in a self-contained classroom her last year of high school. She is the only PST that began this project already familiar with students who receive special education for EBD. Bailey is more reserved than Jamie yet indicated that she too learns best through experience (Written reflection, February 18, 2020). Bailey's mother is also an elementary school teacher. When the university is out of session, Bailey sometimes returns home to spruce up her mom's classroom. In class she has taken time to show me and the other PSTs photos of the door decorations and bulletin boards that she created.

Bailey's Perceptions

Perceptions of City Academy

I interviewed Bailey on September 14, 2020. When I asked what she had preliminary perceptions about City Academy, she did not mention the level of security or small class sizes. Instead, she drew connections to her prior internship and spoke positively about student-teacher relationships. As the conversation unfolded:

> I remember thinking--cause I did an internship in high school and it was very similar to one of the kids that I interacted with in the internship. I wanted to know more about EBD because of the student that I worked with during my high school internship. I was intrigued by how to help him and how to figure out the best way he can learn, and so when I was interacting with the kids at City Academy, I saw how…he was interacting with the kids and how he treated them more like friends instead of student-teacher bonding, and I thought that was really cool.

Perceptions of City Academy Students. Like Jamie, Bailey spoke fondly of City Academy students. When I asked her to describe the people in the makerspace, this was her reply:

> I was observing middle schoolers. I think there was 3 or 4 of them and they each had their own way of thinking. Each of them wanted to do something really cool that I had never even thought of. Like one of them wanted to create their own video games. Another wanted to survey people and figure out a problem, which I thought was really cool.

Perceptions of Learning and Teaching Students with EBD

Bailey was the only participant with prior experience with students with EBD. Although her perceptions toward the students' ability matured over time, her words suggested a deficit mindset early in the project. When I asked Bailey how her perceptions changed over time, she responded:

> At the beginning, I guess I was skeptical about how they would do in the makerspace and like how broad they would go with their projects and whether they'd be like little projects or if they'd be like really big ones that had a bunch of parts in it. And so, in the beginning, I was skeptical on what they would be able to do, their ability to what lengths they'd go to. But then over the year, I realized that these kids have big ideas and big thought processes and those could come to life in the makerspace. And it was just really cool to see that.

Bailey indicated that she was developing an understanding that students with EBD can have "big ideas" and she began developing a sense of advocacy for this population of students. What follows is a response to viewing results of the survey she distributed with

the other five participants. The purpose of the survey reflects the original study design, action research. The intent was to capture preservice teachers' perceptions of make-based learning and teaching future students with EBD. Respondents were limited to PSTs at Southern City University who were not Teaching Fellows. In Bailey's words:

> Some of the responses really upsetted me that some of these future teachers think of students with EBD that way. Some of their responses were autistic and ADHD/ADD. I can understand how people may misjudge students with EBD to have these other disorders because they have some similar characteristics. Then you get deeper into the responses and you come across things like: "anger issues, depression, neglect, schizophrenia, broken homes, suicidal, troubled students, disruptive, rude, difficult to handle." All of these responses honestly made me cringe. Some of the things that were said frighten me that these people are soon to be teachers. This proves that a lot of people have misconceptions of what EBD really is. I think that people can learn more about what the disability actually is. From these responses it shows me that there is room for growth of the knowledge of EBD (Written reflection, March 17, 2020).

Perceptions of Make-Based Learning

While Jamie believed the purpose of making is to solve a problem, Bailey explained it as an activity to carry out a project of interest, learning new skills along the way. In her words,

> I've had to describe to people what make-based learning is. Whenever I'd be talking to my mom or my friends about going to [City Academy] and talking about what we're doing, I would say it's an environment where there is so much

> that you can use that's at your disposal to create something that you want. And you go through these steps, and you make a plan on what you want to do, and you go through, and you learn how to do so many little things, like little tasks that you never, that you really want to learn how to do, but you haven't had a chance to. Like, this is your chance to learn how to sew, or learn how to 3D print, or create your own video game, the options are endless. So, I would describe it as taking an idea that you have, or something that you want to learn how to do, and you do it. You get the materials that are at your disposal and you do it.

I then asked Bailey to say more about the making process. She replied:

> It doesn't happen "Boom!" It's a process, you have to make, like, a plan. I mean like when I first started sewing, I got excited because I could sew a straight line. But now, I've made a couple of weighted blankets, I've made--tried to make--masks [i.e., face coverings as this took place during the pandemic], and like the first couple that I made were really scary lookin'. Now they look [pause] *better* [emphasis in original]. And so, it's a process, it's like a learning curve that you have to go through.

Bailey did not discuss consulting others to get to the other side of the learning curve. Nor did I observe her asking the other PSTs for help in the university makerspace. Yet she described the atmosphere at City Academy makerspace as a beehive of collaborative activity. She observed:

> Sometimes, if a kid got on to something and he was really excited about what they were working on, like they would sit down and work on it, and get in the zone, on doing it. But other times, when they were trying to think through a process they

> would talk to others, “so this is what I am trying to do" kinda thing, trying to figure out the way to get there. I remember the two guys I was working with, they bounced ideas off each other doing similar projects. And they were trying to make the video games, and trying to create something in a 3D printer, and so they were trying to figure out the programs of each, and they were talking to each other and me about how to do certain things on the programs. They were working through it together, because the boy that was working on the video game, the other one had already made a video game--a couple of videogames--and so he would go through and show him the ones that he’s already made and give him ideas.

While the discussion about collaboration sounded exciting, Bailey also described how frustration is part of the process. She drew a similarity between herself and City Academy students. As she explained,

> *In the makerspace here on [the university] campus, I was just like these kids* (emphasis added). I had no idea how to do what I wanted to make. So, I started to play around with the idea and I eventually came up with a pretty amazing product. There were times where it got difficult. Like today, one of the students became frustrated with the software he was using. He wanted to give up, but he didn't. He continued to play around with the software, and he figured out how to do what he was wanting to create. I have learned that right when you become frustrated is the key point in which you should push on and you will soon enough figure out what you are trying to make. (Observation Report, Jan. 31, 2020).

Bailey’s perceptions of making as freedom to create anything and the importance of pushing through moments of frustration informed her maker identity.

Bailey's Practices

Bailey did mention in class and in the interview, she had plans to create "a t-shirt quilt of...old cross country race t-shirts." At the university, however, all of Bailey's makes were adaptive objects for people with exceptional needs. Like Jamie, Bailey wanted to invent objects that could improve the lives of people with EBD.

Developing a Maker Identity

The culminating project at the end of the Fall 2019 semester was to have each student in the seminar share their make. Bailey brought a portable weighted blanket, wowing everyone who saw and interacted with it. In the Spring 2020 semester, Bailey planned to create even more adaptive objects and design a website. As she described them,

> My project was to make more of the weighted blanket kind of things, and more fidget bracelets. I would sew little weighted blankets using rice and other materials and the fidget bracelets were different things. I made some zipper ones out of some zipper and a little connector and then I made some scrunchies with different textures on them and stuff like that. So, I was able to do that at home, kind of [referring to staying home during the pandemic]. And then I also created a website to potentially sell anything. I haven't actually sold anything yet, but I did create a website to sell.

The images below include Bailey's portable weighted blanket (Figure 2) and her contribution to the Virtual Maker Faire at the end of the Spring 2020 semester (Figure 3).

Figure 3

Bailey's Artifact A

Figure 4

Bailey's Artifact B

Developing a Teacher Identity

Like Jamie, Bailey began her college career at Southern City University with a concrete plan to become a special education teacher. She entered the seminar with prior knowledge working with a student with EBD during a high school internship. Bailey already had an active interest in determining how to facilitate learning for students with EBD. When I asked her if she had preliminary perceptions about visiting City Academy, she replied,

> I was super excited because special education just has my heart. And walking into a school that was purely for special education kids, I was super excited. And when I got there to tour, I was in awe cause it was like nothing I'd ever seen before and so it was really cool, and *I felt like this is what I want to do*. *It just kind of reassured this kind of thing* [emphasis added], and it just sparked my interest.

Bailey had her mind set on a future career in special education. she may have discovered students with exceptionalities are capable of more than what she previously thought. She explained,

> The time in the space really showed me that these kids have so many ideas of their own and their thought processes are so much bigger and more elaborate than I would've imagined. Like I don't think I had that as a kid, like these big ideas of what they wanted to do. So, I think that really prepared me to let my kids think freely and support them in their big ideas and...it taught me how to support the kids whenever they come up with these big ideas and how I can help them reach those.

The roles Bailey assumed in City Academy's makerspace evidenced a desire to learn from her students.

Roles

Helper

Among all six PSTs, Bailey expressed the most enthusiasm for City Academy students' makes. Bailey even took time outside of her clinical hours to teach herself coding after students approached her with questions. When I asked her what roles she assumed in the school makerspace, the following was her reply:

> I worked with two of the kids specifically when I was participating. They would ask me questions about how to do certain things in [Scratch] and I had no idea--I'd never seen the program before, *so when I got back to the dorm that day I went and downloaded these programs, and I was trying to figure it out. That way I could help them better the next time I went* [emphasis added]. And I really just

> liked talking to them and seeing their ideas and showing me what they'd done before. And it was really cool. But I'd say that the main way I participated was like trying to figure it out the best that I could, even though they were so much more skilled in those programs than I was.

Like Jamie, Bailey worked as a babysitter during the summer of 2020. In June, I received a group text from Bailey about babysitting a child who took an interest in making. She shared an intention to teach one of the children how to code video games (personal communication, June 8, 2020).

Friend

Bailey also assumed a role as professional friend to City Academy students. She identified that her purpose in the makerspace was "to be a friend instead of a college student coming in to watch." Her aim was to "talk with them, have easy conversations with them and see what they were like, see what their personalities were like, and be able to get to know them personally." Although she shared less than Jamie about her fondness for the students, she seemed more vested in helping them develop new skills.

Summary

Bailey's interview responses and makes suggest that she constructed knowledge through experience. Her project in the spring semester was a portable weighted blanket intended to soothe students with anxiety. At the time of writing, she continues to make "fidgets" (i.e., bracelets with zippers and textured hair scrunchies to ease more distracting fidgeting in a classroom). Bailey also built a website to sell them. Her experience and interest in teaching students with exceptional needs potentially influenced her identity as a maker.

In the university makerspace, Bailey applied previous knowledge to hone her sewing skills, which she then applied to create personally meaningful artifacts that reflect her dedication to teaching students with exceptional needs. Her experience observing City Academy students code video games and then teaching herself to use Scratch software confirms the element of constructionism which suggests that learning can happen anywhere and builds on prior experience. I did not provide any parameters for what I wanted PSTs to do. I asked Dougherty's question, "What do you want to make?" (2012, p. 13). In turn, Bailey evidenced her own concept of constructionist theory and an assertion to include students with EBD in mixed-ability maker culture (Alper, 2013). Finally, Bailey's narratives support the idea that a teacher's role is not to transmit knowledge but provide a meaningful context for learning.

The discussion moves to London, who also developed positive relationships with City Academy Students. What distinguishes London from the others is her confidence in what teachers are supposed to do and a changing mindset toward her future teaching context.

London

"Teaching at-risk students involves a lot [of] care and time. Students need different approaches for learning and at-risk students are no different. The best way to prepare for [teaching] these students is understanding how [to] interact...and allow the time for them to open to the teacher."

(Written reflection, February 18, 2020)

London is a White female preparing for a career as a middle school science and social studies teacher in a general setting. She was a second-year student at Southern City

University during the project. London is highly independent. She lives off-campus and supports herself working in a grocery store. She speaks quickly and excitedly unless something upsets her. Since the project ended, London expressed having a hard time in one of her classes. Her tone slowed and quieted when I asked how she was handling the Fall 2020 semester. Among the team of PSTs, however, London was more content with distance learning opposed to in-person instruction. She expressed being happy to stay home and attend synchronous classes from the couch.

London's Perceptions

Perceptions of City Academy

London spent time in multiple classrooms at City Academy, perhaps due to the day and time she selected to visit each week. Jamie's and Bailey's time was largely limited to the makerspace and occasionally the gym. City Academy students sometimes invited the PSTs to stay and observe the physical education class that followed their time in the makerspace. I interviewed London on September 14, 2020. It was then that she explained, "I observed the music teacher, Mr. M., and I also observed Mr. R. I did every now and then get to see other teachers…I was in a classroom with Dr. N... She's *awesome* [emphasis in original]". When I asked about preliminary perceptions of the school, the following was her response:

> I didn't know how to react. I had never been in an area where there was that many children who required such a special need of some sort. So, it was overwhelming, it was, "how do I help? How do I do this?" For the first two weeks I sat around in a corner observing how Mr. M. did it and how he talked to the students. By week four to six, I was getting more comfortable in how to talk to the students, and this

> was back in fall. So now, when I got to see them last spring, I was way more comfortable with the students. I sat and talked to them and helped them with whatever I could.

I asked London if her perceptions of the school changed over time. In her response she referenced family members with exceptionalities and knowledge of "handling situations." She then shared how she praised City Academy to people outside the university community. London stated the following in the interview:

> I have my diabetic brother, my special needs cousin, and my special needs brother. So, I did have a perception of how you're supposed to handle situations when they come up. My cousin is extremely autistic, my younger brother is in that medium range, and he can socialize but he's very much an awkward person. So, going in there I had a little bit of perception, but that was only toward the autism... So, as I was working with them and I'd get to the school and see how the school was handling things, it was never against the child unless the child lashed out. It was always, "we're going to do this together." It was a together thing until it got to that point. My perception of the school and of the students grew to be more of an understanding of the caring aspect. It was always, "ohh, let me tell you about the school I went to!" It was never "ugh, it was *this* [emphasis in original] school… An amazing school with an amazing staff…it's a beautiful school and they have amazing things, and oh my gosh!"

London praised City Academy teachers. She spoke about Mr. R., who teased and encouraged his students. As London observed,

> Mr. R. would lovingly pick on the kids. And the kids would pick on him back. It was never an "ohmigod I can't believe you said that!" It was… "I didn't think you could do that/C'mon show me you could do that." And he would push the kid to do it. And when the kid finished it, he'd be like, "I didn't know I could do that, Mr. R." "Well, I knew you could do that, why didn't you?" That's a lot of what I saw. It was a give and take. It was, "I give you this challenge, take it. And give me back what you did."

London's perception of Mr. R. is similar to the other PSTs. Jamie discussed how Mr. R. was both friendly and firm at the same time. Bailey commented on how he treated the students as friends. What I also find interesting is that unlike Jamie, London did not divulge any negative impressions of the teachers and staff. Jamie wanted to learn how to interact with students in a style similar to Mr. R.'s. Bailey and London spoke favorably of his demeanor but did not express a goal to adopt a similar teaching style.

Perceptions of City Academy Students. Like Jamie and Bailey, London spoke positively about the students she met during the project. She stated:

> I love the little group I was with the majority of the day. Yeah, a few of them were a little quirky, couldn't really get 'em to talk. But other days you come in, and there was a little boy, I'm not gonna say his name because I don't know if I'm allowed--he had a severe learning disability--but as soon as he saw me, he was all over me. "You gotta sit beside me! You gotta sit beside me! You gotta do this with me!" And [when the pandemic put an end to clinical visits] I missed that interaction.

London observed that many City Academy students are eager learners who participate in class. She also perceived the students as quick to express themselves when things went awry. She credited the teachers for creating a supportive and open atmosphere. The comment below illustrates these perceptions.

> The students usually were very observant. I hardly ever noticed a student that wasn't…I got into the 4th, 5th grade with Mr. R…Most of them are very forthputting with answers. They weren't hiding. I never saw a teacher not pick on [meaning call on] a student unless it was a specific one and it was, "Hey, I just want to know if you are listening." But even in the small classrooms, you'd have six students, and five of them, minus the one kid who was just very shy and didn't know how to talk or didn't know how to answer properly--or felt he didn't--they were all going, "I got it! I got it! Let me know, let me know." It's a very open classroom. It was a very comforting, "please tell us what's wrong." I observed a lot of that between teachers and students.

While London's enthusiasm for the project appears genuine, it is not yet known if she will develop appropriate academic language to describe students with exceptionalities.

Perceptions of Learning and Teaching Students with EBD

Unlike Jamie and Bailey, London was more forthcoming with describing student behaviors. Yet it is also worth noting that she viewed students' outbursts as a learning opportunity. She explained,

> I learned how to handle certain situations. Like students lashing out. I did experience that once or twice. Where a kid would be so upset that they would just walk out. And I watched how teachers handled that. It wasn't, you know, "get

> your butt back here" or anything aggressive. It was [in a warmer tone] "talk to me," which I think is an important thing for teachers, especially trying to connect better to students. "Talk to me. Don't push me away, tell me what's wrong." I did experience a lot of that, and it prepared me [that] this could happen. Be prepared for what could come. It also prepared me on understanding that every student comes from a totally different background. That every student is going to sit there, and not every student has the same thing wrong with them. It's understanding there's different parts to it. Not just one set circle. You're going to have spikes all over that circle and you gotta understand how you're going to handle all of that.

London potentially learned here that "handling situations" best happens through warmth and a teacher making a genuine attempt to understand why a student is upset. Teachers may be less effective at diffusing student anger when responding aggressively. This situation may also have affirmed London's knowledge that students come from diverse backgrounds, and a lack of cultural understanding between teachers and students can sometimes lead to student outbursts. London's words also suggest, however, that she perceived students with exceptionalities as people with shortcomings. She respectfully expressed how the experience taught her to communicate with students who are working through behaviors, yet referred to individual differences as something "wrong with" students that teachers must learn to "handle."

Perceptions of Make-Based Learning

Jamie viewed making as means to solve a problem, while Bailey considered making an opportunity to learn new skills. London's view is a bit of both, with a focus on

producing makes that have a benefit. She also stressed using materials that are already available, repurposing instead of consuming. London explained her idea of making as the following:

> Making in a space makes it a makerspace. You draw up an idea that could be potentially beneficial to you or someone else and you kinda use what you got to do it. You might wanna make the table and you have so many pieces of plywood or so many pieces of 2x4s. You make it whatever you think would work. And it's with whatever you have…In the classroom it's making your area to where it's a comfortable area for students to express their own ideas. So, a makerspace may not just always be what you make, but it's how you make it and how you make it work for your students.

London's Practices

Developing a Maker Identity

London's final project for the Fall 2019 semester was a quilted blanket she made for her niece. In a personal communication on October 26, 2020, London wrote, "Not going to lie. My niece carried that blanket for three months after she got it, so it was great." Her idea for the Spring semester was to build a sensory table to hold sand and other palpable materials. She planned to donate it to a City Academy. The pandemic, however, forced London to change her plans. She reported that:

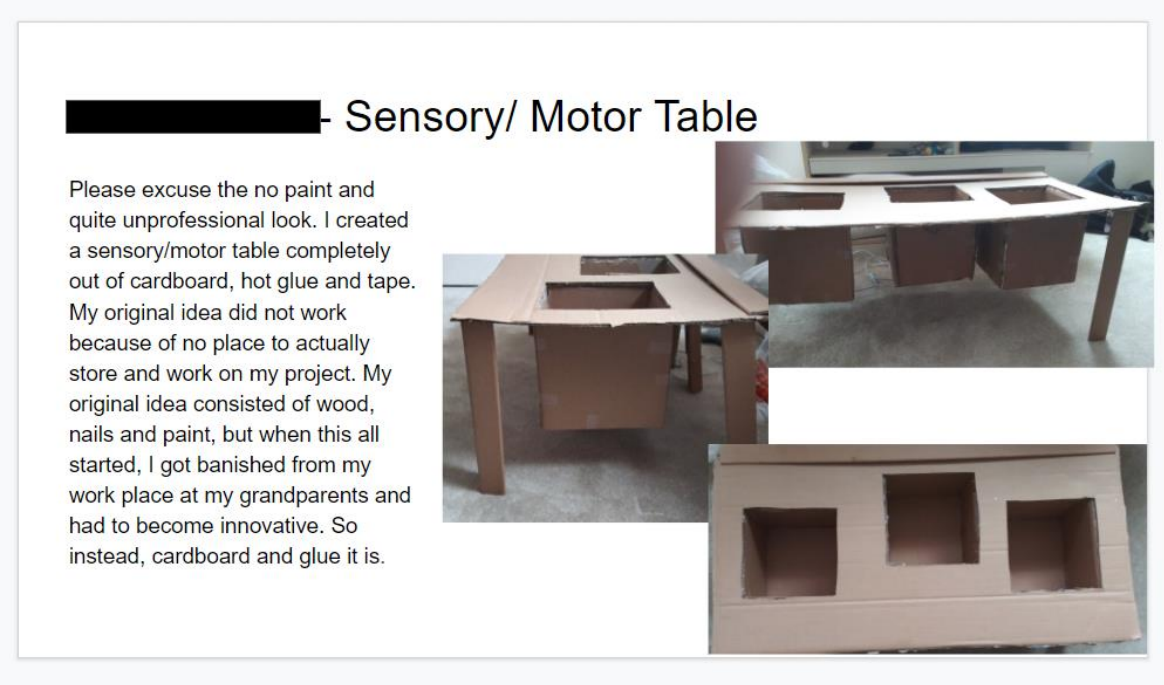
> [The pandemic] did kinda make it a little hard with the ideas that we wanted to do, because some of us had to change our original perspective of our makerspace project. I wanted to do it to where I could donate it at the end, but school got shut down and I was stuck at home. I didn't have the necessary materials to build it the

way I wanted to, and then I couldn't give it away. So, I ended up having to use what I had at home, which was cardboard and a hot glue gun. Which worked out in the end, but it still is one of those kinda...it disrupted what we tried to do. And it had to make you think more outside the box for the things you needed...It ended up being recycled.

Below is an image of the sensory table that London created. Early in the Spring 2020 semester she told me the original plan was to use sturdier materials. She also wanted to affix caster wheels to the legs so teachers could easily move the table to different classrooms. London's flexibility and willingness to adapt also comes through in her developing identity as a teacher.

Figure 5

London's Artifact



Developing a Teacher Identity

Unlike Jamie and Bailey, London expressed less commitment to who and what she plans to teach. Even though her course of study was to prepare to teach science and social studies, she contemplated a career in special education. Our exchange follows:

> **Abby:** You are a STEM major, right? You're not [majoring in] special ed?
>
> **London:** I am a science and social studies--middle school science and social studies is what I am doing. Even though I am slightly over here going "maayyybe I might go dabble?" Because I like working with special education. People say middle school is the worst…But that's the thing that I love about it--the challenge. And it's something I could do. I could work for City Academy, that'd be awesome!
>
> **Abby:** Are you dabbling toward maybe adding on a special ed...
>
> **London:** I want to finish my degree first because my family is riding on me finishing. They're like, "You gotta do it. You gotta be the first [member of the family that earns a college degree]." So, I wanna finish it, but maybe after I finish doing all the things I need to do, finish this, and pay off what I do need to pay off. Maybe, I might go back. Because I will have the majority of the credits. And then I could sit there and dabble in special education. It's K-12, so ohhh, middle school special education? Ha haa!

Even though London planned to be a general educator at the time of study, she developed an understanding that general educators are responsible for meeting students' exceptional needs. London also suggested in the quote below that general educators should complete more coursework in preservice to learn how to modify instruction to meet learners'

individual differences. She credited her time at City Academy for coming to this understanding. These ideas came to light in the following exchange:

> **London:** [Audio deteriorated] Preservice teachers need to understand what comes of it. It doesn't matter [what] you're gonna teach--I'm teaching middle school. There's always a chance I'm gonna have one kid or a few kids that are not gonna be standards that--per education standards--completely normal. There are going to have one or two completely crazy abnormalities [such as] dyslexia that you're going to have to sit there and figure out. And I think that doing makerspace and learning about special education--more than just a basic classroom. One class that you really don't do anything on, I think it needs to be a little bit more spread out. Because if more teachers had the experience at City Academy that we get, I think they'd be more understanding and more cautious of what's gonna come.
>
> **Abby:** You cut out earlier. Are you saying that preservice teachers need more exposure to what EBD is?
>
> **London:** Yes. They need more exposure to what [long pause] EBD is, and they need more exposure to how to handle special education in general. EBD is a big one because you're going to have multiple students that are going to go either way. They're going to be on the small end of the spectrum that can be still in school, and you're going to have them on the wide end of the spectrum, in schools that we go to. I think PSTs need more experience in understanding all of that, and also understanding makerspace is a great way for both students that are just--I can't think of a better word--normal, and those that do need a little bit of extra help.

In a written reflection submitted March 17, 2020, London reiterated her thoughts that preservice teachers preparing for general education may enter the profession with insufficient knowledge of how to work with all populations of students. She wrote,

> Teachers are the heads of the pack and who lead the troops into chaos, but many of these young teachers are not having the information about new ideas and ways to go about things for a future. Every teacher will have a minimum of one student with ADHD, one emotional behavioral and one who might have an IEP. Not knowing the basics for these students could lead to a path of despair for a year. However, knowing that every student is a student first and needs to find their own groove can help students. What new teachers miss is that not every student can do a cookie cutter education. Some will end up needing more attention than others, while some want to work without being noticed. These lessons of how to work with each student, whether it be disabled or just not wanting to be forthcoming are important and need to be taught. Knowing the research is fine but knowing how to work with students is majorly important since that is the concept of the entire job itself.

London's confidence about teachers leading instruction differed from Jamie's humble question, "how do you teach?", and Bailey's emphasis on supporting students' "big ideas". It appears that London views her future role as more of a classroom leader while Jamie and Bailey envision themselves as facilitators of student learning. There may be tension between London's potential perspective and principles of constructionist learning. She may not yet ascribe to the theory that students construct knowledge in their minds, which limits the capacity to which teachers can transmit knowledge. Even though

she seemed confident in what teachers do, I noticed she was willing to observe and learn from City Academy teachers.

Roles

Assistant Teacher

When I asked London what roles she assumed at City Academy, she emphasized having a passive role in the beginning that led to actively assisting two teachers. As she explained,

> At first, I was just an observer. I was learning. That was my first part, learning how the classroom worked. Then I got to be more of an assistant so to speak. I was there if [the music teacher] Mr. M. needed, "hey, can you read this for me. Can you help this student?" I assumed the assistant teacher role. I wasn't just sitting and observing. I was actually doing something. My final act was helping Mr. R. [in the makerspace]; I became a second a little bit. It was me and another [college] student. I got to be a second of, "hey, can you help this, can you do this? I trust you to do this, and I'll help you do it." I did get a bit of that assistant teacher role which was nice because I wasn't just sitting. I was actually doing something. That's what I really loved about City Academy. It's one of the schools where they let you do something with the teacher's permission. And the teachers are very open to letting you do it.

As London carried out the role of assistant teacher, she recognized her time at City Academy as hands-on, experiential learning. London also experienced one-on-one time with a student working through an emotional struggle. She described what happened in the following statement:

> [The way] so many of the other clinicals are set in…you observe. But with Teaching Fellows and all of that it's, "*well go do it"* [emphasis in original]. "Don't just sit there and watch. If the teacher's okay with you, help. Do something, get your hands-on experience. If you don't, then you're not learning anything. You're just watching." You can't go in with a notebook and take notes and learn something as much as if you're, "Oh, let me go in and let me go help! Let me do this, the teacher needs help." I assist the teacher in any way I can. That was something that really helped. It was the hands-on. It was learning how to take on situations. I wouldn't say "crisis averted" because it wasn't specifically averted. However, I did get to experience the first half of an issue, where I sat with the student, and "hey, talk to me. What's going on?" So, I did also get that quiet time with that student, that one-on-one, where you just, "talk to me." It didn't end the crisis. Later on, in the day, apparently it blew up. But the student felt comfortable enough with me to talk about it. And I thought that was awesome.

Summary

Through a constructionist perspective, London did construct knowledge through her experiences at City Academy. Her stories suggest she learned how to "handle" a situation with a distressed student. She ideated that teachers at City Academy are open to college students jumping in and helping instead of sitting back and observing. She planned to create a personally meaningful artifact in the university makerspace; her original intent was to donate the sensory table to City Academy. Through conversation in the university makerspace, I learned that she had some experience with carpentry and

wanted to apply this skill to new situations. London's stories, however, may demonstrate a limited belief that her students will learn best through constructing knowledge and creating artifacts. While she does not mention if or how she intends to transmit knowledge to future students, she does mention that not all students will "sit there". Her mention that not all students "can do a cookie cutter education" may suggest a perception that her job is to attempt a traditional approach first, and then consider non-traditional approaches if students do not meet her idea of success. One potential area for growth is London's use of deficit language. It is possible that she is too early in her journey as a general educator to understand the impact of uttering phrases like something being "wrong with" a student and "completely crazy abnormalities".

London developed a positive perception of students with EBD, recognizing that they may manifest behaviors that require intervention. Her time at City Academy sparked an interest in pursuing special education after finishing her license to teach science and social studies. Although London did use deficit language at times, she identified as a teacher and felt more confident in this role than the other PSTs. The conversation now moves to Alex, who also communicated a change of career plans because of this project.

Alex

> "Going into City Academy, I was expecting severe disability, violence, and disorder. While that may be true for some of the students there, the majority strike me as intelligent young people who strive to learn. I think the experience has made me a lot more comfortable with the idea of teaching students with EBD."
>
> (Written Reflection, February 18, 2020)

Alex is a White female pursuing a K-12 license in special education. She was a first-year college student during the time of study. Alex suffered a series of illnesses and injuries during the Spring 2020 semester. When the university closed to students in March, Alex did not go home. She secured a room in a dormitory and completed the semester in isolation. In an interview on October 1, 2020, Alex expressed that she "lost a lot of motivation...when everything went down." When we spoke the following fall, she seemed disappointed with distance learning but more upbeat than I found her at the close of the study. During the Fall 2020 semester, Alex played an active role in a student volunteer organization that aims to tutor students in foster care. This aligns with Alex's interest in trauma-informed teaching.

Alex's Perceptions

Perceptions of City Academy

Alex, Jamie, and Bailey did not have their own transportation during the time of study. The four of us regularly carpooled to City Academy on Friday mornings. When I asked how she felt about the pandemic disrupting her visits, she replied, "I really missed the sense of community that we had, all going together every week. It felt like an important part of my routine that got disrupted. I was really upset about not going anymore."

Alex, like the other PSTs, spoke positively about City Academy. When I asked her about preliminary perceptions of the school, she discussed the higher level of safety protocols and questioned how district leaders allocated resources. She reported:

> The security level that they had kinda stressed me out every time that we went. I understood why it was that way, but it still, when we would go down to go

outside, they'd have to scan us through three doors. It didn't feel like a school. But I could tell that they put a lot of focus on resources like the makerspace. The library, you could tell, they put a lot into that. But the gym was not very big at all. So, it made me wonder how they decide how to put resources into the school and things like that.

Perceptions of City Academy Students. Like Jamie, Alex referred to City Academy students by name. In contrast to Jamie, Bailey, and London, Alex's words expressed more empathy than praise. This is evidenced in the following exchange.

Abby: When you visited City Academy, who did you observe, and what were some of your early feelings about the school and the students?

Alex: The first student that I observed was J.M. That wasn't how it ended. He wasn't there at the end. But when I met J.M., I thought that he seemed very unmotivated to work. But it seemed that he was frustrated that he felt like he couldn't do it, not that he didn't want to do it. I thought he was really sweet. I liked J.M. a lot. I liked spending time with him because when he did start to focus, he really, really tried. And I also remember thinking like he seemed lonely. He didn't talk to the other kids the way the other kids did. And it made me sad because he knew, but he was choosing not to.

Abby: What was the work in the makerspace he felt he couldn't do?

Alex: It was when we were doing Global Read Aloud [this is a project that City Academy students completed in the Fall 2019 semester. I will discuss this in a later section]. I remember multiple times he was asked to read. He said he wouldn't do it, and then when they would fill out the charts with the information,

he wouldn't try. I don't think that he wasn't capable of doing it. It was just that he didn't think he could, so he wouldn't.

Abby: How old is he?

Alex: 14? 15? Something like that?

Abby: And he was nervous reading those kids' books in front of an audience?

Alex: Yeah. He seemed very stressed out about it.

But when I asked her to describe other students, she sped up the tempo of her voice.

Abby: You mentioned J.M. Who were some of the students that you interacted with in the spring?

Alex: It was...I can't remember his name… I spent the last maybe the last two or three times we went in the spring with him, and he was working on his maker project. He was trying to build a catapult. He was completely the opposite of J.M. He knew he could do it; he wanted to do it. And he didn't want help, but he did want to tell me about it. He explained his entire project to me. And when I asked, "Have you thought about this?" He was, "Yep! I already know. Yep! I already figured it out." And I was like, "Okay! continue please."

In Alex's accounts of these events, it appears that she discovered how students can respond when they are comfortable in the classroom and have a say in what they are learning. Alex mentioned that she enjoyed J.M.'s company but was concerned about his lack of confidence when Mr. R. asked him to read out loud. Z, on the other hand, chose the catapult project. He was excited about it and wanted to show it off to Alex and other PSTs.

Perceptions of Learning and Teaching Students with EBD

Among the team of PSTs, Alex spoke more than the others about how City Academy students' level of engagement increased when students were making, as opposed to doing more teacher-centered activities in the makerspace. Seeing the students participate in self-directed tasks changed how she felt about the students. Alex expressed concern that:

> Until they were doing the maker project, it seemed like none of them really wanted to be there [the makerspace]. It never seemed like any of them wanted to walk to that room. Any of them, if you asked them to do something, didn't seem super comfortable with it. Most of them didn't do all the work they were given. I remember one time we went there was a chart on the board. While they were reading the book, they would fill out all this information. I didn't see a single one do it. So, it seemed like none of them wanted to be there, and then once they started the maker projects, all of them were so excited to tell us about what they were doing and why they chose to do it. And they were actually trying to do it. And I was like, "Okay, you guys just didn't like that stuff. That makes sense." My view definitely changed of the students.

Perceptions of Make-Based Learning

Alex described make-based learning as "an educational strategy teaching students independence through making things." Alex's definition of a makerspace was "an area with resources focused on make-based learning." When I asked her to elaborate on what kinds of resources, she replied, "*Everything* [emphasis in original]. I don't even know,

umm, technological resources, artistic resources, research material. I don't know how to explain the rest of it. I think technology is the biggest part, the broadest area."

There may be tension between this reply and Alex's decision to partake in "just knitting" when we visited the university makerspace. She identified that making is often a technological pursuit but chose a more analog activity for herself. The activity she chose, however, is something she enjoyed and continues to do. It is unclear if Alex perceives herself as a "true" maker since she shied away from working with technology.

Alex's Practices

Developing a Maker Identity

Like Jamie, Alex attended additional workshops in the university makerspace. Jamie was interested in learning to 3D print while Alex's interests were sewing and knitting. After attending the first workshop she looked forward to another. She explained, "I was looking at another class later in the year. I was upset I wasn't able to go to it. I think it was something art-based. It wasn't super-techy. I can't remember what it was, but I had it in my calendar, and I was very upset."

During the interview, Alex informed me she was currently knitting a blanket. She showed me how she stored the blanket-in-progress under her desk so she could knit during virtual classes. At the end of the Fall 2019 semester, Alex developed a plan to make scarves and gloves for the purpose of donating them to City Academy students in need. The following spring, she attended maker sessions at the university with the other PSTs and worked on a separate knitting project that was not yet complete at the end of the semester. Due to an illness toward the end of the semester, she did not contribute to the Virtual Maker Faire.

Developing a Teacher Identity

Jamie and Bailey set out to study elementary special education. London had plans to teach middle school science and social studies but considered working toward additional licensure in special education. Alex also identified that her time at City Academy led to changing her mind about the students she hopes to teach. Her original plan was to teach an adaptive curriculum for students with more severe disabilities. Alex changed her mind and pursued licensure to teach a general curriculum to students with higher cognitive functioning. She explained,

> It made me switch. I was going to do adapted curriculum because my initial goal was to have a self-contained classroom with students with severe disabilities. But going to City Academy, I realized that I wasn't sure that I wanted to do that. And I really enjoyed working with students with emotional/behavioral, or more--I don't know how to explain it--just like higher-functioning disabilities. I preferred that because it allowed me to get to know the student as a person, and how it affects them as a person. Whereas I think with low-functioning disabilities, it seems like that has to be your priority as a teacher, the disability and not them. And I didn't like the idea of that, so I switched to general curriculum. That was the biggest impact that City Academy made on me was changing what I thought I wanted to do. Because I really enjoyed it.

Like Jamie, Alex expressed the importance of getting to know the human behind the disability. What I also found interesting about Alex's developing professional identity is the tension between what she observed at City Academy and what she learned in other preservice coursework. While her university instructors communicated that teachers

should treat students with sensitivity, she watched Mr. R. cajole and "play rough" in the classroom. Here was our conversation:

> **Abby:** You hinted at [Mr. R.'s] rapport with students. What can you tell me about that?
>
> **Alex:** Being a special ed major, I get taught all the time. Like, "You can't do this; you can't do this. And there's a fine line where you could really upset a student." And it seemed like Mr. R. walked that line so easily. He knew what was too far and what wasn't, what would upset somebody and what wouldn't. And he did just enough to make them comfortable--the students. Like he joked with them, probably more than my teachers ever joked with me. Because they do kind of play rough, he would play rough with them. At first it was off-putting because I thought, "This is not how a teacher acts." And then I realized how comfortable it made his students. And so, I feel there is that line and he is just perfect at staying right on it.
>
> **Abby:** What do you feel your professors are telling you that you can't do?
>
> **Alex:** It's very trauma-based, a lot of the trauma-based stuff. I don't know how to explain it. Mr. R. was rougher with his students than I think I would ever be allowed to or be able to. But I think it worked for his classroom. So, it made sense. But they drill into our heads that "They're fragile!" You can't joke about this, and this, and this.

Since none of the other PSTs mentioned trauma-informed teaching, I asked if this related to her pursuing a K-12 license while Jamie and Bailey were in preservice elementary programs and London's course of study led to becoming a general educator.

Alex informed me that her minor is child and family development, which "focuses a lot more on trauma-based education." Alex also mentioned learning about trauma-informed teaching in "not just college education, but high school and some family experiences." She explained this further when discussing the choices she made during clinical school visits for other education courses. She identified that "when we [PSTs] go to schools for other classes, my priority has always been wanting to go to the special education classrooms." Then, she stated, "the thing that really made me research trauma-based education was we went to a school, and I was the only person who wanted to go to the special ed room. So, I spent the entire time there."

Alex shared a detailed narrative about two siblings in a self-contained classroom inside another school. The older brother had autism and the younger sister was non-verbal, in a wheelchair, with "a lot going on." Alex learned first-hand how trauma can impact a learning environment. She described how every day the staff escorted the sister to the nurse to be medicated. The brother cried in fear that she would not return. In her words, "It was a big thing every day, but that, that really put it in perspective for me. That I was the only person in my class that got to see that".

Alex's expressed pride in being the only one in her class who wanted to visit a self-contained classroom. Yet at the same time, she discovered at City Academy that she no longer wanted to teach in a classroom like the one she described. Regardless of Alex's intention to work in a self-contained classroom or support students with exceptionalities in a general setting, she considered herself an advocate for people with disabilities.

Roles

Assistant Teacher

In accordance with the other PSTs, Alex mentioned her role at City Academy was more than that of an observer. She mentioned that she did instruct the students but made sure the students had agency. As she put it,

> I know we [The PSTs and I] had talked about how we were there to observe, but we [the PSTs] wanted to be a part of it as much as we could. So, I never tried to be part of the actual making, but I definitely a few times showed them how to use something. I assumed the role of the teacher for a small amount of time. I also made sure to ask them questions so that they felt they were as knowledgeable as possible about what they were building. Some of them were--the student that was building a catapult--knew when catapults were invented. Before I asked, I was like "Wow, you did research, okay." But it was mostly just me asking them questions about why they were building what they were.

Summary

Looking through a constructionist lens, Alex's narratives suggest that she understands how learning happens "especially felicitously" when students engage in make-based learning. She learned through practical experience that she may be able to form more meaningful relationships with future students who do not have profound disabilities. Unlike Jamie, Bailey, and London, Alex's practices as a maker may not connect to her future role as a K-12 teacher. While she did use her time in the university makerspace to practice a skill she enjoys, it is unclear if she applies existing artistic skills to new situations. What I also noticed about Alex's stories is the tension between what she learned in a traditional classroom and what she learned through experience at City

Academy. She learned that students with disabilities are “fragile” yet Mr. R. “plays rough” and teases his students. This affirms the limited role a teacher has in traditional teaching and learning.

It appears that Alex wants to advocate for students with disabilities and expressed the importance of seeing the human behind the disability. She learned about student confidence and motivation, which she may not have learned if she had not participated in field experiences. This potentially supports the theory that students construct knowledge through experience. However, she does not always follow through with her plans. She did not execute her original maker project, distributing hand-made, warm clothing items to City Academy students. Nor did she complete a make during the spring semester. The conversation now shifts to Kennedy, who was less forthcoming about her passion to teach. She also referred to City Academy students by their names, which suggests that she took a personal interest in them.

Kennedy

> “Emotional Disturbance? That sounds so wrong! That doesn’t sit right with me. Emotional Disturbances? What does that mean? That’s so [pause] odd. To call it like that? That doesn’t sit well with me.”
>
> (Interview, September 28, 2020)

Kennedy is a female Pacific Islander who is pursuing a license in elementary special education. She shared that she performs martial arts and has a black belt. Kennedy was a first-year college student during the time of study. The quote above refers to the IDEA term that identifies emotional and behavioral disability.

Kennedy's Perceptions

Perceptions of City Academy

Kennedy's visits to City Academy were limited to the makerspace with Mr. R. In an interview on September 28, 2020, she described the makerspace facilitator as "really nice." She explained how "he kept everything on track, and if the students were going off-track, he would pull them into something more interesting. But he would get all of his lesson plan done." Kennedy did not discuss how Mr. R. related to his students. Outside of the makerspace, Kennedy described the atmosphere at City Academy as strict, perhaps out of necessity. This is evidenced in the following exchange:

> **Kennedy:** For us [visiting college students], it might seem they're [the teachers and paraprofessional staff] too strict on the students, but it might be the perfect way to communicate with the students even though it's not strict for them. Because *they're used to it*…
>
> **Abby:** Any other feelings? Did they mature over the school year?
>
> **Kennedy:** I think so because I was stuck there when there was a hurricane... The teachers were trying really hard to get all the kids in order without them freaking out. The one student that was [pause] aggressive, they gave him a coloring page… and he was not having it… He threw the markers on the ground, crumpled up his paper, and I was like, "What's going on?" And he was like, "I don't know! I don't want to sit down!" And I was like, "Well, you have to for your safety." Then the teacher pulled him aside… Obviously, teachers pull students aside. But the way that she talked to him was so *scary* [emphasis in original]. And I didn't even want to look at them. I was like, "What is going on?"

Perceptions of City Academy Students. While the other PSTs spent much of their time at City Academy with middle schoolers, Kennedy chose to observe elementary students. When I asked how she felt about school buildings closing due to the pandemic, she indicated feeling sadness because she "was able to form a connection with them, the three students in [the] class. She remembered thinking, "'I'll see you next week!' but then I never came next week."

Kennedy replied with the following when I asked her about the three students in the class:

> Two of them are nice, kind, and very shy. But the other one, if it's not his way, he'll start yelling or throwing something. Or if he really doesn't like what's going on, he'll not pay attention, draw random stuff in his notebook. When, "You gotta draw a pond or something," "I don't know how to draw that." I'm like, "It's okay, I can show you." So, I did a little for him, and I said, "Now, you make one." And he said, "Oh, okay, this is not that hard."

While Kennedy's narrative may be accurate, her word choices may reflect a developing understanding of students with EBD. This appears in the next section as well.

Perceptions of Learning and Teaching Students with EBD

In a written reflection dated March 17, 2020, Kennedy stated the following about students with EBD:

> EBD is an emotional disorder characterized by deficits or disturbances of behavior. Since those students are more likely than other students to lash out, those students are also the ones who are misunderstood by their teachers and peers as well. One student could react completely differently than students with

> EBD because they have a harder time regulating their emotions and feelings. Those students also do not know how to control their behaviors, which lead to them lashing out at others.

Yet Kennedy also explained how feelings of frustration can be an asset in a makerspace. When I asked her if she believed if making can benefit students with EBD, she replied,

> I feel like it does. Because if they're frustrated about something, they can take it out on their project. And maybe it will come out even better. Cause they're so frustrated, maybe they'll be passionate about what they are making.

I mentioned I found this interesting and wanted to know more about how a student can turn feelings of frustration into passion for a project. She continued, "Maybe they'll put in more effort? Because they're so frustrated with whatever is going on? And if they don't want to talk to anyone they'll just focus on the project?"

Perceptions of Make-Based Learning

Kennedy defined make-based learning as "like a hands-on activity that will help you learn what you need to learn, without having to sit down and learn in a chair completing worksheets." She did not mention if makes can solve a problem or serve a purpose. In the university makerspace, however, Kennedy chose to hone her sewing skills and fabricate a variety of garments from new materials.

I asked Kennedy how she would use the City Academy makerspace if she had the opportunity to carry out Mr. R.'s role. She stated that she would "have [students] research about what they want to make, using the iPads, and not just out of whatever they are thinking about at the time. And actually, find ways they can make that come to life."

When I asked if she would give any parameters to what students could create, she replied that her students could make "Anything they want. And then they would do research on it and find the best way to make it."

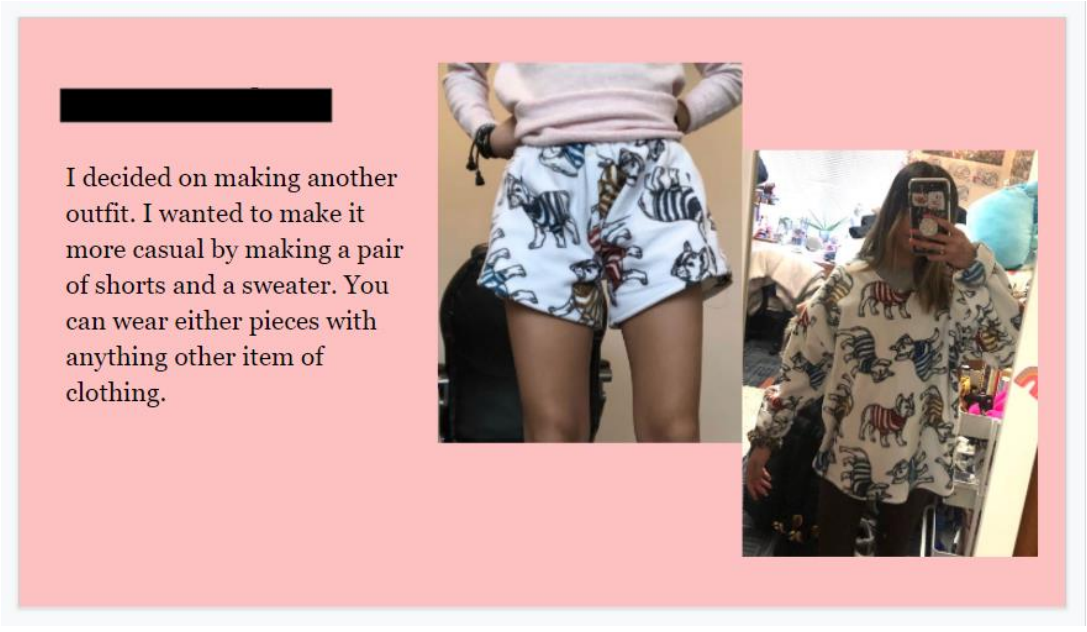
Kennedy's Practices

Developing a Maker Identity

Kennedy's maker identity is more of a DIYer than tinkerer. The quote above suggests she may not value iteration or tinkering. Her project in the Fall 2019 semester was learning to sew hair scrunchies. During our final meeting in December, she brought a collection and invited all the females in the class to pick one as her gift to them. In the spring, Kennedy constructed a pair of shorts and sweater. Below is her contribution to the Virtual Maker Faire.

Figure 6

Kennedy's Artifact A



It is also worth noting that Kennedy sewed and sold face coverings to aid in combating the pandemic. Below is an image of three that she assembled and sent me prior to the start of the Fall 2020 semester.

Figure 7

Kennedy's Artifact B

Developing a Teacher Identity

Kennedy's plans to teach elementary special education did not change during the project. But she did mention how she gained an understanding of how to teach students with EBD. As she explained,

> Going into college, I didn't even know what EBD was. So, I learned it from your class. I feel I have a better understanding of [EBD students] because I was able to

go into City Academy and work hands-on with them. And it's not that I am going to treat them any differently.

When I asked Kennedy how her time at City Academy prepared her for a future career as a teacher, the following exchange transpired:

Kennedy: I feel like now, just observing how teachers will respond to certain students. I feel I can take that in, and know how to treat my students, and whatever techniques that worked for them, I could use, and whatever techniques that didn't work I won't use obviously.

Abby: Did you see something that worked and didn't work?

Kennedy: Just some words that the teachers would use, and the students would just not care. But I don't know, it was just very odd.

Kennedy did not elaborate on the final statement. The above exchange suggests that she potentially did not engage in critical thinking during or after her visits to City Academy. Her observation reports triangulate this finding. On February 4, 2020, in response to a question asking in what ways did the visit prepare her for a career as in special education, she wrote, "I got to learn how to help my students learn even if they have different learning styles". Her answer to the same question on February 20 was, "Today's visit prepared me as a future special educator because I am now familiar with how some EBD student act and how to address them when they aren't on task." When I asked during the interview if she would like to return to City Academy, and in what capacity, she replied, "I would definitely do clinicals, and *maybe if they do teachers' assistants* (emphasis added)". This last statement suggests that Kennedy may not have

paid any attention to the paraprofessionals that contribute to a five to three ratio of students to teachers.

Kennedy's Roles

Assistant Teacher and Observer

Kennedy explained that while she visited the makerspace, she would assist Mr. R. and other teachers, but assumed the role of an observer as well. In her words,

> I felt like I was a teacher assistant every time I was there because whenever the teachers needed help and another teacher was busy, I would step in and help. But I also observed, like when we were in the library. I would just sit and watch because I didn't know where everything was. In the makerspace, if they had a problem and didn't want to ask Mr. R., I would help them and help anyway I could.

Kennedy did notice there were few opportunities to help when students were outside the makerspace. She described how "In the library they were either checking out books or they were playing on the iPads, so I was sitting there. They'd play with the robots that go under everything...*don't do that!*" [emphasis in original]. Kennedy also explained that while at City Academy, "I get to interact with the students and help them stay on task when they get distracted. I also get to help the teacher talk about the lesson plan and help execute the plan with the students" (Observation report, February 20, 2020). This last quote suggests that she may not have sought out opportunities to engage in make-based learning with the students at City Academy.

Summary

It appears from Kennedy's responses that she was not as willing as Jamie to get to know the students or as excited about the students' makes as Bailey. She does not speak with confidence about being a teacher like London nor express empathy for students like Alex. I found it interesting that the other PSTs praised Mr. R.'s affinity with students yet Kennedy mentioned helping out when the students did not want to interact with him. This aligns with her earlier perception that Mr. R. was good at his job because he would finish the lesson plan. She did not communicate anything about how Mr. R. told jokes and teased the students while maintaining a respectful atmosphere. A potential growth area for Kennedy could be understanding the importance of building rapport with students.

Kennedy's words and artifacts suggest that she may not yet comprehend what it means to construct knowledge. While her artifacts may be personally meaningful, they suggest a tendency to follow directions rather than focusing on exploration and tinkering. Kennedy explaining that she would have students research "the best way" to create something and not "just out of whatever they are thinking about at the time" demonstrates that she may not yet be interested in helping students apply existing knowledge to a new situation.

Kennedy's passive role in the makerspace, using the word "odd" to describe the school, and definition of EBD as deficit in behavior suggest that the project did not lead her to reflect. In some ways this resembles Lane's mindset, who also viewed the experience as a means to understanding how to manage a classroom.

Lane

> "My experiences at City Academy helped much more with at risk students. At City Academy, I received firsthand experience with EBD students and got to see both positive and negative sides of their behavior in many situations."
>
> (Written reflection, February 6, 2020)

Lane is a White male planning to teach high school mathematics. He was a first-year student during the time of the project. Lane is from a suburban area near Southern City University and commutes to campus.

Lane's Perceptions

Perceptions of City Academy

Lane informed me he had no preconceived notions of the school prior to his first visit. His time at City Academy was limited to observing Mr. R. and the students in the makerspace. While some of the other PSTs spoke about Mr. R. relating to and joking with students, Lane and Kennedy noticed his efficiency in carrying out a lesson plan. The following are Lane's words about his perceptions of Mr. R. The statement came from an interview that took place on September 15, 2020.

> He was going on with the lesson plan that he had. He always had the lesson plan on the board, at the beginning of class every time. And he typically followed along with it directly. Most of the time he was going through the lesson plan and occasionally having to stop to get the students back on track because they would get distracted easily, or he would be asking them questions to see if they were paying attention to the lesson.

Perceptions of City Academy Students. Lane scheduled his visits during a block of time when middle school students occupied the makerspace. He visited by himself

since he had his own transportation. He described the students as "Good kids [who] were nice to be around even if there were problems from time to time." Lane described the students as less mature than other adolescents of the same age. As the Spring 2020 semester progressed, the class Lane observed dwindled in size. He viewed this as a positive experience for the lone student that remained. In his words,

> Back in the fall, it felt like even though they were the same age students, they seemed a lot more childish. But also, they seemed to get along more. When there were conflicts between them, it was more stuff that you would expect to see from elementary schoolers. But in the spring with the class, I worked with, it seemed I was more in a higher middle school or high school setting. [I observed] the way they interacted with each other, which may have just been because in the spring it was like three or four boys that were about the same age, and then they kind of transitioned because of the different circumstances. But one thing I noticed that when it came down to when there was only one student left that I was working with for the last three weeks or so of the semester, he was a lot more focused on his work and seemed a lot more optimistic about his project, and a lot more sure of his abilities than when he was around the other students, which maybe they were just distracting each other, joked around too much. But he seemed to get a lot more progress done when it was just him, and me, and the teacher.

Lane observed that the students were childish, while Jamie considered them mature. Jamie noticed how City Academy students were interpersonally intelligent, yet Lane perceived them as joking around and distracting each other. What I find interesting about these observations is how differently these two PSTs see their future role as teachers.

Jamie envisions himself as a teacher who will try to find students' "avenues" to get to know them. Lane, however, focused on limiting distractions and keeping students on-task.

Perceptions of Learning and Teaching Students with EBD

Like Jamie's and Bailey's determination to teach elementary special education, Lane's plans to teach high school math are firmly in place. He described the clinical visits as "a lot more beneficial to the people that are going into special ed, just because that's kind of the field they're working with," but he did mention learning classroom management skills. Lane describes takeaways from the experience in the following:

> I believe that my clinical hours at City Academy helped me prepare for my future time as a teacher by showing me some circumstances where students can act out more often or there are often distractions in the classroom. And it gave me some tools or expertise to be able to handle these situations and figure out how to get students back on track when the discussion in the classroom kind of gets off-topic.

Like Kennedy, Lane mentioned students "acting out" and learning to "manage" a classroom, while the PSTs who emphasized relationships did not always discuss "problematic" behaviors. Even though London mentioned students not always having control over their emotions, she viewed the incidents as opportunities to learn how to form connections with students.

Perceptions of Make-Based Learning

Lane highlighted Mr. R.'s ability to execute a lesson plan. When students used the makerspace to carry out projects, Lane noticed that Mr. R. took a more active role with

the students. Here he explained how Mr. R. facilitated class activity when students were making:

> Mr. R. was kind of jumping around from table to table, helping them with each of their projects every couple of minutes. And then getting it so they could continue on their own for a little while he could work with another one.

During the Spring 2020 semester, Lane worked closely with a student who took an interest in fabricating a denim jacket. He did seem emotionally invested in the student's project, but claimed it was "pretty frustrating" (interview, September 15, 2020) when school closed in March. Lane did not know if the student finished. In a follow-up to the interview, I asked Lane about the student's project. He responded with the following:

> The project he was working on was cutting, sewing, and designing his own denim jacket. Originally, he wanted to make jeans, but that idea kind of flopped when he saw how difficult it would be, but he changed his mind pretty quickly. I was there for a few weeks seeing him go through the process, but I think the furthest I saw him get was cutting out all the pieces of the pattern, not cutting any pieces of the actual denim (personal communication, September 24, 2020).

Although Lane described the student's first idea as something that "flopped," what he observed aligned with his description of make-based learning. Lane explained that he sees making as an iterative process that encourages students to approach a task in more than one way. This was evidenced in the following exchange:

> **Abby:** How would you describe making to someone who has never heard of it?
>
> **Lane:** I think I would describe it to them as coming up with an idea for a project that you want to do or something you want to create and using different materials,

> whatever you can find, to try to make that project or result happen. And it's a process that kind of encourages failure because once you fail at trying to do it one way, it encourages you to look at it a different way, use different materials, think of different strategies for how to make it happen and try again, and it's a process that encourages you to learn by making--making something with your own hands and using your own brain, and all the resources at your disposal to create something.

The question remains if Lane perceived the student as not willing to attempt making jeans, or if the decision to make a jacket was the student's attempt to "think of different strategies." But in the mention that Lane was frustrated that he only got to see the student cut out the pattern, it appears that he values students *completing* their projects after finding the best process.

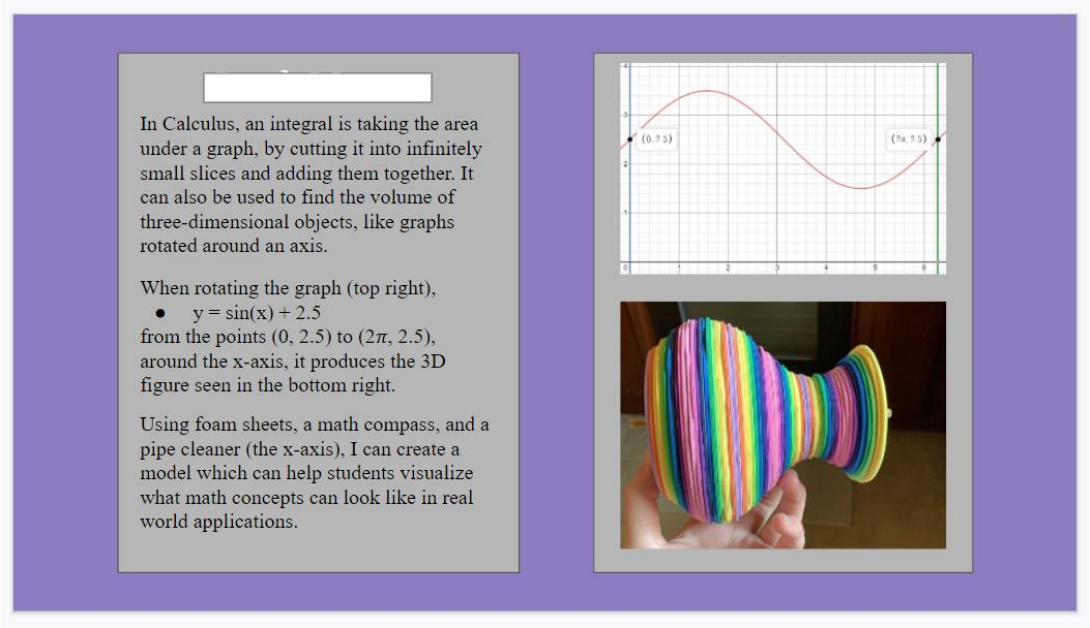
Lane's Practices

Developing a Maker Identity

When the PSTs gathered in the university makerspace, I noticed that Lane would quickly get to work on the math calculations that led to completing his project. This contrasts with Jaime's approach of using time in the makerspace to verbally bounce around ideas with his classmates. Yet I do recall Lane mentioning how much fun it was for him to sit and complete calculations on his own. At the end of the Fall 2019 semester, Lane shared a project that demonstrated a calculus skill he plans to teach to future students. The following spring, Lane created a model to help future students visualize how students can apply calculus to real-life situations. Figure 8 is Lane's contribution to the Virtual Maker Faire:

Figure 8

Lane's Artifact



There is tension between this artifact and Lane's belief that in a math classroom, "it's kind of hard to think of creative projects that you can do because there's not a ton of math concepts that can be visualized in a hands-on thing. It's a lot of theoretical stuff with numbers." I recall mentioning in the university makerspace that I can see a future "Mr. Lane" collaborating with an art teacher. Further evidence of Lane's ability to bring making into a future math class appeared in the speaker notes of the slideshow, where PSTs could share constructive feedback. London wrote, "The way you created an I Can statement out of a makerspace project makes you able to teach."

Developing a Teacher Identity

Lane potentially identifies with a teaching style that is task-oriented and no-nonsense. He did mention the importance of talking to other teachers about classroom strategies to figure out "what works". He also mentioned that tactics that suit others may

not for him since he may "have a different teaching style than the hypothetical teacher." This refers to a willingness to learn from colleagues, even if Lane perceives them as having teaching styles that differ from his. He stated an intention as a beginning teacher to "Test out different things and see what works best. Because everyone's experience is different."

Yet behind Lane's serious demeanor is a failure-positive mindset that he hopes to develop in his future students. Failure-positivity is a core value in the development of a maker mindset. Failure can drive the creative process and lead to additional tinkering, troubleshooting, and learning (Martin, 2015). As Lane stated it:

> I think the most common way that I could use [principles of make-based learning] is just encouraging failure and trying again and try to get rid of that negative stigma of failure. And because especially in high school, students tend to think, "Oh, I did badly on this. I'm not good at this. I'm never going to be good at this." It's easy for them to get into that mindset. So, with math especially, it's important to let them know that just because they got it wrong this one time, doesn't mean they can't keep trying and figuring it out, figuring out what works for them to solve the problem. And one thing that I always think about with math is for most questions, there's infinitely many wrong answers but only one right answer. So, the odds that you come up with that one right answer on the very first try is [pause] crazy. So, I don't see any reason to get discouraged, or not finding the right answer on the first try of a math problem.

Even though Lane takes himself seriously as a math teacher and eschews creativity, he hopes to instill a growth mindset in students.

Lane's Roles

Observer and Helper

In the observation reports Lane submitted on February 18, 2020, Lane mentioned how a clinical visit allowed him to learn "more about behavioral issues within students, and [see] what ideas of maker projects interest them." He stated that the visits helped him "see examples of students who have difficulties focusing or sitting still during class." Looking beyond classroom management, Lane identified getting the chance to "Have one on one time with a student and get to communicate with someone of a younger age while they are working on a project," and that he "Gained very minor experience with planning on sewing and designing clothes, which I have never had experience with before."

Through the lens of constructionism, Lane's data would suggest that he has developed a sense that students learn best through experience, even if that experience is limited to answering a math problem incorrectly. Lane's discussion of "figuring out what works for them to solve the problem" may lead to applying mathematical knowledge in a new situation, but Lane's stories do not yet explain *how*. His artifact, however, demonstrates that Lane did something (Stager, 2009) with a mathematical concept. The above data suggest that Lane may be convinced that math is "a lot of theoretical stuff with numbers". Yet additional experiences that connect math to tangible artifacts may allow him to discover that students can learn mathematical concepts in an "especially felicitously" (Papert, 1991, p. 1) manner.

Even though the six PSTs developed a wide range of perceptions, practices, and roles, three beliefs emerged across all the participants. In the next section I describe how the team collectively expressed their perception of (1) how making can benefit students

with EBD; (2) evidence-based practices have value, but they one of multiple means to figure out what works in classrooms; and (3) time in school reserved for the makerspace should not be overshadowed by library visits or other activities.

Themes Across Participants

The first part of this chapter addressed how each participant developed perceptions and practices and assumed various roles throughout the course of the project. In the next section I shift away from individual narratives to explore common beliefs across participants. They include: (1) making connects to social-emotional learning, which can benefit students with EBD; (2) evidence-based practices have value, but they one of multiple means to figure out what works in classrooms; (3) instructional time in a makerspace should not be overshadowed by library visits or other activities. In this section, I identify data that evidence how these beliefs emerged.

Perception: Making Connects to Social-Emotional Learning, Which Can Benefit Students with EBD

All six PSTs perceive that make-based learning can benefit students with EBD. The benefits fell under categories, control over emotions and student agency. Two PSTS discussed how making can help students redirect negative emotions and four spoke to how opportunity to design projects is an agentive act.

Control Over Emotions

London and Kennedy perceived that making can help students with EBD channel their feelings. London compared making to art therapy but took it a step further. She explained how students can paint to release anger or express happiness. But when making, students can build a model volcano or simulate an explosion. Kennedy expressed how making can

turn negative emotions into productivity. Restating her words, “Cause they’re so frustrated, maybe they’ll be passionate about what they are making…And if they don’t want to talk to anyone, they’ll just focus on the project?” Here, Kennedy explains that students can redirect internalized feelings of frustration into an opportunity to focus on their makes.

According to Papert, learning can happen “especially felicitously” (1991, p. 1) when the learner engages in making something shareable. Kennedy and London identified that students with EBD may not experience joy when completing a meaningful project, but productive time in the school makerspace may help students release negative feelings.

Agency

According to Bandura (1989) a mechanism of human agency is an ability to take control over one’s thought processes, motivation, and action. The PSTs expressed a perception that making can be one way to provide agency to students whose school hours are heavily monitored and controlled. Bailey, Alex, and Lane identified how opportunities to make choices in a makerspace can help students reclaim ownership over their actions.

Bailey described how teachers may plan out an entire day for their students with EBD, limiting what they can and cannot do. But when making, students have “their own freedom to learn what they want to learn and do what they want to do, and what they don’t. They’re not being told no”. Alex echoed Bailey’s perception that students with EBD have less freedom than their non-disabled peers. But when they had opportunities to design their own projects in the makerspace, “that brought back that sense of

independence for a lot of them". Lane also identified that students have limited choices but making provides a freedom to "pursue whatever they want, the way they want to do it". He added an assertion that, "especially with students who have emotional/behavioral disorders, [making] gives them the chance to learn in their own way. I think it's definitely beneficial".

Jamie spoke to how making can give students a sense of pride and control over their learning. In his words:

> We talked about J. earlier. It made him feel in control to be able to know things about what they're doing and create games on Scratch, show off. That pride that a student can have in just [their] own creation. I don't know if that student is going to feel the same way about their math homework, or their reading homework. Is that something they're going to want to show off to their parents, their friends? I feel this allows them to create something they have pride in, they're proud of, and that's fulfilling education that's going to make them want to actually learn.

The above quotes affirm Stager's (2009, 2013) assertion that formal instruction should involve less us (teachers) and more them (students). Even in a restrictive setting where students are closely monitored, the PSTs' words demonstrate that teachers can shift away from direct instruction to provide a meaningful context for learning. The four PSTs mentioned how time in a makerspace can allow students to have agency over what they learn.

Classroom Practice: **Making Should not Be Overshadowed by Library Visits or Other Activities.**

The makerspace at City Academy is adjacent to the library. Mr. R. and his students often used their block of time reserved for the makerspace to check out and return books. During the fall semester, the school community participated in the Global Read Aloud, an international initiative that involved reading and discussing short stories from perspectives across the globe. During students' time in the makerspace, Mr. R. carried out planned lessons that focused on reading and discussing a children's story. Meanwhile, students were in a new building with an untouched makerspace filled with barely used art supplies, a sewing machine, and a 3D printer. While none of the PSTs stated the project was not worthwhile, the team agreed that time in a makerspace should not be overshadowed by other activities.

Jamie expressed that the students may have found some elements of the Global Read Aloud were interesting, "but it felt too much like one of their other classes." He stated how making felt like an activity that students could do only if there was time left at the end of class. He described the library activity as filling "our quota of what we have to do because someone told us we have to do it." But then, "here's the fun part, where we're making stuff." Bailey also noticed that students at City Academy "really didn't do a whole bunch of making...they did a whole bunch of reading projects."

Two PSTs explained how Mr. R. could have incorporated making as an extension activity for the books he read with his students. This idea supports the purpose of constructionist learning. Students construct knowledge inside of their minds to make something shareable outside their minds (Stager, 2013). A directive to read independently, read in small groups, or watch a video of a narration of the book supports Stager's (2009) recommendation that educators should quickly demonstrate a concept

and then ask students to do something. It would also support Stager's four words of advice for educators, "less us, more them" (2013, p. 489). Jamie and Bailey evidence an evolving understanding of constructionist theory.

Bailey mentioned that one of the books was about Native Americans. She described that one way to give the Global Read Aloud a more constructionist spin could making "something that kind of correlated to the culture in that way. Like have an idea over what the project would be, but let each kid have their own creativity with it." As Jamie explained:

> [Making is] supposed to be where kids can make whatever they want, but I think it'd be really interesting if they were like, "oh what if you lived in one of these third world countries [referring to the setting of some of the books], and you had access to all this, what is something you would make to help you in your day? …Would you want a backpack? …Would you want to try to make shoes? …You're 11 years old, and what would you need to make?" There's a lot of things I think they'd be interested in making.

London, Alex, Kennedy, and Lane described how they would have alternated between reading activities and making. London stated that reading the selected books "took up a good portion of the time. Sometimes the kids didn't get a chance to do something." She explained that "maybe making it to where one day is the book and the library time, and the rest of the week is makerspace." Alex thought Mr. R. should have not just introduced making earlier, but also incorporate more discussion. She noticed that students were not interested in the books. They "weren't going to be interested in it. I

wish he'd focused more on student interest. It didn't seem like he did for the first semester."

Kennedy and Lane pointed to unused tools and materials. Kennedy said that if she assumed Mr. R.'s role, "I wouldn't be reading a book because I think they already do that in their core classes...Most of the materials they had in the bins and drawers, no one touched it." Lane did not indicate if he would have avoided all library activity. He did state that, "I personally would've used the vast assortment of materials they had more often... the majority of the time I was there during the reading thing, so they didn't really have time to work with all the maker stuff."

Regardless of splitting time between reading and making, or eliminating all imposed reading activity in the makerspace, a read aloud provides limited opportunity for students to apply existing knowledge to a new situation. Unfortunately, the read alouds may have functioned more as means to transmitting knowledge than providing a meaningful context for building new knowledge.

While the PSTs expressed slightly different plans to find instructional and managerial strategies for their classrooms, the whole team agreed that City Academy missed out on an opportunity for students to get started with make-based projects at the onset of the 2019-2020 school year. Although opinions differed about the Global Read Aloud, everyone involved in the project expressed that the makerspace was the wrong venue for a teacher to guide a class through reading and discussing one text. The PSTs also shared similar beliefs how they will plan for instructional time with students.

***Role*: Finding "What Works"**

During the seminar, the PSTs learned that providing choices, specialized instruction to promote learning and study skills, peer-assisted learning, cooperative learning, and self-monitoring are evidence-based, academic strategies intended for students with EBD (Gable et al., 2012). These five strategies also align with constructionist approaches to learning. Constructionist learning is the process of creating an artifact that represents learning that took place inside the students' mind (Stager, 2013). When teachers assume a constructionist philosophy, students have choice in the kind of artifact that physically displays what students know. Specialized instruction involves a special educator using alternative methods to instruct students with disabilities. Special educators can assist students in determining what sort of artifact would best evidence what they learned. Constructionist learning leads to sharpening skills and learning new ones. A peer who knows how to operate a sewing machine or code video games can mentor a peer who wants to learn or improve these skills. If no one in the class is an expert in a specific skill, students can form small, collaborative groups. The students can teach themselves or ask the teacher to provide a brief demonstration. To engage in self-monitoring, students completing long-term projects can keep a journal to keep track of what they accomplished each day. These strategies took place in the Constructionist Learning Laboratory, an experimental school inside a juvenile detention center from 1999-2002 (Cavallo et al., 2004; Stager 2004, 2005, 2013).

Even though the group of PSTs learned that these strategies have grounding in educational research, they all expressed a common belief that evidence-based practices are not the only pathway to finding "what works." The PSTs reported they plan to conduct some scholarly research to find effective classroom strategies, but they also

explained that they will rely on their own intuition, consult other teachers, and utilize internet resources like Google and social media platforms like Pinterest (risking the use of non-vetted resources) and.

Intuition. Jamie and Alex expressed that evidence-based practices stemming from educational research are important, but teachers can also rely on gut feelings. Jamie expressed that there are certain facets of teaching that require grounding in research, "like how you teach material, how you discipline kids". But he also mentioned that "there's also... tools of the trade that you pick up [over time] that you can't really research." In this instance, Jamie referred to how Mr. R. could both tease his students and be firm in his expectations for their conduct. Alex mentioned that in her early years of in-service, she wants to be sure that her strategies are not "just something that I made up or not actually working, just seems like it's working." However, she also stated that she wouldn't "necessarily be angry if [she]found something that worked and it wasn't evidence-based" After all, if she finds something that works, "it can be evidence-based later." Alex's confidence confirms a belief that she can construct pedagogical knowledge through experience.

Other Teachers. Five of the six PSTs mentioned seeking other teachers' advice to determine what works. Lane mentioned that consulting other teachers is one of a variety of ways to go about finding effective teaching strategies. He stated that "It's just important to get a variety of sources and figure out what works. Test out different things and see what works best. Because everyone's experience is different." London mentioned staying in contact with other Teaching Fellows and people at Southern City University. She explained that she would consult "maybe you, Abby, or Dr. C. to figure out what I

am having a problem with...I'm gonna get a good answer that could probably push me further".

The PSTs' intentions to learn from veteran teachers affirm Cavallo et al.'s (2004) assertion that knowledge is socially constructed. Bailey, Alex, and Jamie mentioned taking in a blend of research and talking to future co-workers, which evidences intentions to apply existing knowledge to a new situation. Bailey indicated that during her first years in the classroom she "would probably go off of, like kind of research-based practices," but she would also consult her colleagues to "see what works for them." Alex stated that she is a social learner and therefore plans to look to "other teachers and seeing what works for them, and then doing research on that specifically, that practice" Jamie, who is also a social learner, stated that he intends to apply what he learned during preservice, but then "probably also go to [his] co-teachers for help" because that is "how [he] learn[s] things the best"

Google and Pinterest. The PSTs have a developing understanding of the difference between scholarly research found in journal articles or textbooks and non-vetted teaching resources. I shared a series of scholarly readings with the PSTs during the Fall, 2019 seminar. During the Spring, 2020 course, I asked them to read "Evidence-Based Teaching Strategies for Students with EBD" (Ryan et al., 2008) and review the table on page 505 of Gable et al.'s (2012) study that measured teachers' knowledge and use of such practices. The table lists evidence-based practices for students with EBD and organizes them by academic/non-academic strategies as well as school-wide, classroom-level, and individual practices.

I also assigned a task late in the Spring, 2020 seminar in which PSTs would locate a non-vetted teaching resource and analyze the document in an attempt to find any grounding in research. Unfortunately, this assignment was due after the shift to remote learning. I believe the PSTs would have completed the assignment more intentionally had we not been suddenly and unexpectedly limited to remote instruction. This potentially contributed to the PSTs sharing a willingness to use non-vetted resources in their future classrooms.

Jamie stated, “I’m going to be honest. I think I’d Google. Of course, I’d want to *try* (emphasis added) to find something that was more than just like the mom blog or something like that”. Bailey mentioned that during her high school internship in a contained special education classroom, she and the teacher would “make little lessons for the class.” She stated that she would still “go to Pinterest” because that is what she knows. London admitted that she would Google information to add to existing knowledge. In her words she would follow “what [she] already know[s], and what Google might say.” Lane identified that if he felt like what he was doing was not working to its full potential, he would Google first but then “do some research to find out what has positive results and what was proven to actually be effective. And then use those strategies.” Kennedy, who does not always engage in critical thinking said, “I don’t know. It doesn’t really matter. If I find something on Pinterest and it works in my classroom, I don’t care if it’s researched or not, I’m gonna use it.”

Reviewing the data through a constructionist lens validates the idea that learning can happen anywhere. Not only can a learner derive teaching strategies from scholarly journals, but they might also rely on intuition, consult future colleagues, and use Pinterest

and Google as a resource. Despite finding value in all these resources, I am concerned that foundational education courses might not stress the importance of vetting resources.

Conclusion of Findings

In this chapter, I presented PSTs' perceptions, practices, and roles developed through their regular visits to City Academy and the university makerspace. Findings suggest that some took an active interest in making, and others viewed the experience as a practical way to learn how to manage disruptions in the classroom. Each PST developed a distinct maker identity ranging from making to solve a practical problem to carrying out DIY projects with new materials. Although individual PSTs had their own takeaways from the experience, all agreed that (1) make-based learning can benefit students with EBD; (2) new teachers should access a variety of resources including scholarly research when planning instruction; and (3) a school makerspace should be utilized solely for self-directed projects. In the next chapter, I will discuss the findings in relation to the literature

CHAPTER 5: DISCUSSION

In this study, I collected narratives from a team of six undergraduate preservice teachers (PSTs) enrolled in a seminar course. The PSTs designed long-term projects in a university makerspace and regularly visited a makerspace inside a special education school. Giving students time and space to design their own artifacts of learning has a foundation in constructionism. This learning theory suggests that "knowledge is socially constructed and best achieved through the act of making something shareable" (Cavallo et al., 2004, p. 3). Constructionist theory undergirds the maker movement (Halverson & Sheridan, 2014; Martinez & Stager, 2013, Papavlasopoulou et al., 2017). Making is a promising practice (Papavlasopoulou et al., 2017) that has had effective outcomes with special populations of learners (Fields et al., 2018).

Prior research centered on teachers delivering constructionist learning to a vulnerable population took place in the Constructionist Learning Laboratory (CLL), an experimental school inside a juvenile detention center from 1999-2002. The authors reported plummeting recidivism rates, fewer violent incidents, and students exiting detention to enter higher education. While attending the experimental school, incarcerated students with a myriad of disabilities built classical guitars, raised caterpillars, published a newsletter, and produced radio documentaries (Cavallo et al., 2004; Stager 2004, 2005, 2013). Few researchers (Gomez, 2019; Somanath et al., 2016) have since examined how make-based learning could impact students with emotional and behavioral disabilities (EBD). Yet a "maker movement" (Dougherty, 2012, p. 11) emerged in the 2010s that combined constructionist principles with modern communication technology. To understand how teacher preparation faculty can prepare

PSTs to introduce make-based learning to students with or at-risk of developing EBD, I carried out a qualitative research project that centered on one question:

> What perceptions, practices, and roles do PSTs develop in a seminar course focused on make-based learning, evidence-based practices, and clinical observations in a special education school?

Data included the PSTs' written assignments from the seminar course and individual interviews, as well as artifacts of their own makes that served as indicators of their conceptualization of how making and teaching students with EBD are related. As I approached this work through a constructionist lens, I included these artifacts that evidence the (sometimes limited) knowledge that participants constructed in the university makerspace. Findings suggest that each participant developed individual perceptions, practices, and roles related to make-based education and three common themes emerged: (1) making connects to social-emotional learning, which can benefit students with EBD; (2) time in school reserved for the makerspace should not be overshadowed by library visits or other activities; and (3) using evidence-based practices is not the only pathway to finding "what works". Using a lens of a constructionism, a theory that learners construct knowledge and best demonstrate learning through making something shareable (Cavallo et al., 2004), I discuss each theme in the following sections.

Discussion of Findings

In chapter 4, I presented findings related to individual PSTs' experience with this project and themes that emerged collectively across participants. This second set of

findings are grouped into three themes: (1) making connects to social-emotional learning, which can benefit students with EBD; (2) time in school reserved for the makerspace should not be overshadowed by library visits or other activities; and (3) using evidence-based practices is not the only pathway to finding "what works".

Theme 1: Making Can Benefit Students with Emotional and Behavioral Disabilities

In the second part of Chapter 4, I identified the PSTs' collective belief that making connects to social-emotional learning, which can benefit students with EBD. Two specific benefits from the cross-findings included: (1) making can aid students in controlling emotions; and (2) making can contribute to building student agency. Two additional findings connect to the literature and beliefs that individual PSTs shared: (3) making can encourage Freirean pedagogies; (4) making can encourage culturally relevant pedagogies; and (5) teachers and teacher candidates who want to explore making with students should receive adequate preparation.

Finding One 1: Making Can Aid in Regulating Students' Emotions

In Chapter 2, I reviewed literature that detailed how developing a maker mindset in students can build social-emotional competence (Chu et al., 2015; Gomez, 2019; Regalla, 2016). Social-emotional skills are important for students who, according to the IDEA (2004) definition of emotional disturbance (ED), can have difficulties forming interpersonal relationships and exhibit a general mood of unhappiness. Findings in this study supported the prior literature. Kennedy mentioned that students with EBD can redirect internalized feelings of frustration toward their makes. London described how making resembles art therapy, in that it provides an opportunity for creative expression. Going beyond tasks like painting, students with EBD could release pent-up frustrations

through projects such as launching a rocket or building a model of an erupting volcano. What distinguishes art from making is the focus on interacting and engaging in the artifacts that students create.

The existing research, however, can neither fully support nor counter how PSTs developed these beliefs. Chu et al.'s (2015) study involved children (assumedly) without disabilities attending Saturday workshops. Gomez (2019) observed students with EBD in a makerspace but approached his work as an observer. Regalla's (2016) work is theoretical, not a research study. This study provides some evidence to suggest that making assists students with EBD in channeling their emotions and that these PSTs developed this understanding through their observations and participation in this project. Unlike prior research that brought PSTs to school makerspaces, the participants of this study not only engaged with K-12 students in a school makerspace. They also constructed knowledge about makerspaces the *best* way -- through actual experience in the university makerspace, building on prior knowledge they learned from course readings.

Finding Two: Making Is an Agentic Practice

Jamie, Bailey, Alex, and Lane expressed that making can allow students to take control over what and how they learn during the school day. They found that the time in the makerspace might allow students to have more freedom in an otherwise restrictive, controlled learning environment. The PSTs observed students teaching themselves to code video games. Bailey, Jamie, and Alex mentioned Z, who was working on a project about catapults. Lane observed a student learning to sew a denim jacket. Bailey mentioned one clinical visit in which a student was designing a survey to "figure out a problem." I recall this day. The purpose of her survey was to discover the ways in which

City Academy improved students' lives. But due to inclement weather and the shift to remote learning, we never saw her again. Even though the PSTs spoke to how making can help students become agents, they had limited opportunity to see this in action.

This finding supports Somanath et al.'s (2016) research, which introduced make-based activities to students who were identified with emotional and behavioral challenges (i.e., anxiety and oppositional defiant disorder) in an alternative school. Somanath et al. (2016) found that the opportunity to be creative motivated the students. The students sought control over their learning, as many other aspects of their lives are "monitored, regulated, and surveilled" (p. 155). Based on the findings of this study, the participating PSTs may be more prepared to introduce their future students with EBD to constructionist learning. They may have a deeper understanding that students with EBD often have limited control over what and how they learn in school.

Finding Three: Making Can Encourage Freirean Pedagogies

Freire proposed that problem-posing education can liberate students from a "'banking' concept of education" (1970, p, 45). The banking concept assumes that teachers are gatekeepers of knowledge who serve to deposit information into students' minds. Problem-posing education centers around students identifying and solving problems that affect their communities and themselves. While the PSTs found this rarely happened at City Academy, some of them did confront personally relevant concerns in the university makerspace. Jamie designed his ADHD command center to help others remember to take their medications. Bailey's portable weighted blanket was intended to soothe students with anxiety. These makes evidenced a call for solving a problem in relation to connecting with or supporting students with EBD.

Freire (1970) posited that when a classroom community engages in problem-posing education, teachers and students seamlessly shift roles. Through dialogue, teachers and students become jointly responsible for learning. In the literature I reviewed in Chapter 2, Martin et al. (2018) learned from Deonne "what counts as making" (p. 38). According to the authors, Deonne was a student in a high school class that focused on making. She withdrew from a group because she felt that she lacked technological knowledge. She then proceeded to sew hair bows to distribute to her friends. At first, the research team did not support Deonne's decision, because sewing hair bows is a shorter-term project that requires limited use of technology. Upon reflection, however, Martin et al. learned that their original course design undervalued how differences in technical knowledge can interfere with group dynamics. The authors decided that short-term projects and opportunities to explore tools do "count" (2018. p. 38). In this instance, the student informed the experts.

In this study, City Academy students taught Bailey how to code video games using Scratch software. Bailey subsequently taught Scratch to the students she babysat the following summer. Further, Bailey and Jamie informed me of possibilities in which people with EBD can be included in making adaptive objects. Prior to this, I only saw the potential of making with students with EBD. I did not consider how makers could construct artifacts for people who experience ADHD and a need to fidget.

Freire also argued that banking education creates hierarchical, "vertical patterns" (1970, p. 53) in which teachers dispense and students receive discipline. In this study, Kennedy mentioned that some of the teachers at City Academy were stricter than expected. Jamie described how some teachers and paraprofessionals at City Academy

"taught off authority" and assumed a culture in which students are supposed to respect teachers unquestionably. He described how the teachers and staff sometimes escalated tense situations when there may have been an opportunity to de-escalate. Mr. R., however, could be an exception. Bailey mentioned how Mr R. treated the students like friends. London described how there was "a give and take" between Mr. R. and the students. Alex noted his ability to joke and "play rough" with students without hurting their feelings.

Through their observations at City Academy, PSTs were able to see how schools operate in a hierarchical structure. The PSTs observed how an authoritative teaching style can be more effective than an authoritarian style. Authoritative teachers are warm, allow students to participate in making decisions, and can have a positive impact on students' lives. Authoritarian teachers may restrict autonomy, impose control over students, and enforce strict rules (Uibu & Kikas, 2014). I argue that a teacher who claims to embrace a constructionist philosophy cannot assume an authoritarian role. Restricting autonomy limits a student's ability to learn a new concept and then do *something* to demonstrate understanding (Stager, 2009).

Although Mr. R.'s students had limited opportunities for making, the PSTs did gain a feel for how students can react to authoritative and authoritarian teaching styles. At this time, it is not fully clear how Mr. R.'s authoritative style could impact City Academy students' engagement in problem-posing, constructionist learning. Yet future PSTs who engage in prolongued engagement with Mr. R. in the City Academy makerspace might gain a deeper understanding of Freire's (1970) theory of problem-posing education through making. In conversation with Mr. R., I learned that he has attended Constructing

Modern Knowledge Summer Institutes. During these four-day institutes, attendees carry out perosnally meaningful projects and interact with other educational experts. They are "minds-on institute[s] for educators committed to creativity, collaboration and computing" (Constructing Modern Knowledge, 2020, para. 1). Making is one way a teacher can develop a more authoritative practice; another way is through using culturally relevant pedagogies.

Finding Four: Making Can Encourage Culturally Relevant Pedagogies

Campos et al. (2019) claimed that Freire pioneered culturally relevant pedagogies through his emphasis on dialogue and using students' experiences as a foundation for learning. Campos et al. (2019) asserted the importance of providing "networks of support" (p. 2) for students who are making. These are people who can introduce new sources of knowledge and reflect local identity. Regarding diverse identities among teachers and students, Ladson-Billings (1994) asserted that teachers must acknowledge their own cultural background, implicit biases, and how these can affect perceptions of academic achievement. Campos et al. (2019) cited Gay (2010), who claimed that teachers must cease viewing students through a deficit perspective to become genuinely responsive to students' cultures. Instances of both cultural responsiveness and deficit mindsets emerged in the study. Jamie mentioned how students "present avenues" to get to know them. He shared knowledge of student interests such as J., who was "really into anime". Yet Kennedy stated that students with EBD "do not know how to control their behaviors".

It is worth noting that students at City Academy and students with an ED label nationally share similar demographics. In Chapters 2 and 3, I identified an

overrepresentation of male, Black, and economically disadvantaged students. Clinical visits to schools in which the students do not look like the PSTs are important if the goal is to build awareness of how individual and institutional biases can influence perceptions of student ability. Clinical visits must also be coupled with instruction on how to engage all populations of students appropriately and guidance on reflections that include discussion of implicit bias.

Finding Five: Teachers and Teacher Candidates Who Want to Explore Making with Students Should Receive Adequate Preparation

About half of teacher preparation programs in the United States offer opportunities to study make-based teaching and learning, and only 12.7% offer an entire course (Cohen, 2017). A paucity of researchers have explored what pre- and in-service teachers learn in such courses and workshops. Jones et al. (2017) studied the impact of a 2.5-hour workshop that began with a lecture and then introduced attendees to popular equipment in makerspace (i.e., a vinyl-cutting machine, 3D printer, and microcontrollers). The teachers--both preservice and practicing--expressed doubts that underfunded schools would provide access to such equipment. They also expressed reluctance that grade-level teammates would be willing to change their pedagogical practices. These findings counter what I observed in this study. One reason, however, could be that the PSTs I worked with were early in their preservice journey. They may not have been aware of team dynamics that can occur in a school setting where teachers across a grade level are expected to teach the same content, using the same methods, on the same day.

Cohen et al. (2017) reported different findings. Their study examined the perceptions of students in a semester-long course that examined principles of constructionist learning. Similar to this study, Cohen et al.'s (2017) participants--both pre- and in-service teachers--completed readings and carried out projects in a makerspace. The participants suggested that the make-based activities they completed supported collaborative and peer learning. In written reflections, they described how classmates were willing to share their knowledge. Echoing Freirean pedagogies, one participant noted that she was learning and teaching at the same time. This study both affirmed and countered Cohen et al.'s (2017) findings. Jamie mentioned brainstorming with the other Fellows in the university makerspace. Bailey recalled that two students at City Academy "bounced ideas off each other doing similar projects." Lane, however, described how a student was able to be more productive without peers distracting him. This finding highlights the importance of encouraging collaboration when preparing teachers to support make-based learning. Since not all teachers are social learners, some may require additional coursework to nurture collaborative learning. Maintaining a constructivist approach, such coursework ought to allow students to *experience* collaborative learning, not read about it.

Like this study, Shively et al. (2020) created a field experience for first-year teacher candidates. Unlike this study, the PSTs planned and implemented maker workshops as part of a STEAM-based afterschool program. PSTs had support from their course instructor and a content expert who guided the participants toward reliable and accurate resources. The emphasis on planning lessons led to findings that do not relate to this study. Shively et al.'s (2020) participants expressed the importance of careful lesson

planning and viewed mistakes as opportunities to improve. The participants came to appreciate the process of planning lessons, receiving feedback, and revising. They were also able to model patience and flexibility for the students. Positive feedback from the elementary students validated the PSTs' efforts.

Tensions between the findings in Shively et al.'s (2020) study and this one target an emphasis on writing and revising lesson plans. I find a misalignment between principles of making and teachers carefully planning what students will do in makerspace. Dougherty (2013) quoted Piaget's (1973) belief that teachers "should lead the child to construct for [them]self the tools that will transform [them] from the inside" (p. 10). The essence of making is knowing the difference between directing students to execute a task and nurturing students to self-direct themselves to figure out what to do (Dougherty, 2013). Stager promotes that teachers adopt the mantra, "less us, more them" (2013, p. 489). In situations in which teachers do suggest or demonstrate a concept or skill in a makerspace, the demonstration ought to be brief and open-ended. Students should also be free to return to other work when the demonstration is over. In this study, the PSTs did not facilitate instruction or spend any time in City Academy classrooms without a teacher present. Writing and executing lesson plans was not a part of this study. In retrospect, this was an advantage. The PSTs were able to focus on observing and interacting with students in an urban school without the added stress of wondering if their lesson would "work." The lack of connecting lesson planning to the makerspace could have also instilled a sense of trusting students to know what to do.

I did not locate any prior studies that involved PSTs engaging in make-based learning with students in urban schools. The few studies that did explore making in

urban-characteristic settings focused on students, not teachers. An urban characteristic school may not be located in a large or midsize city but experiences some challenges related to urban schools in larger areas (Milner, 2012). I argue that if teachers want to facilitate maker activities, they should first observe a variety of school makerspaces. The PSTs' positive perceptions of an urban school supports this claim.

In addition to learning about making, the PSTs in this study may have developed more positive perceptions of urban schooling. Alex mentioned that she expected to find violence and disorder at City Academy, but quickly discovered that most students are "intelligent young people who strive to learn." Jamie admitted that the level of security intimidated him at first. He later recognized that getting to know the students helped him understand that "this is a school for kids who need [a] specific kind of help." London admitted to being overwhelmed inside a school "where there [were] that many children who required such a special need" but became "way more comfortable" after a few weeks. This is a further demonstration of my dedication to constructionist learning. I provided a meaningful context for learning how to teach. In turn, the PSTs applied existing knowledge of urban schooling to a new situation.

In this study, all six participants believe that make-based learning can benefit students with EBD. The findings align with other research that suggests making help students control their emotions. Other researchers have also found that making can be an agentive activity. Although I could have done more to introduce the PSTs to problem-posing education (Freire, 1970), some did use the university makerspace to solve a meaningful problem. Some PSTs in this study also overcame negative perceptions of an urban school for students with exceptionalities. Future study could examine what PSTs

learn through facilitating make-based learning and observing students making in other urban settings.

Theme 2: Time in School Reserved For The Makerspace Should Not Be Overshadowed By Library Visits Or Other Activities

Makerspaces evolved from the first FabLab at the Massachusetts Institute of Technology. Early makerspaces appeared in museums and libraries (Somanath et al., 2016). As Cun et al. (2019) and Moorefield-Lang (2015) pointed out, adding a makerspace can modernize spaces once reserved for borrowing books and silent study. Colegrove (2013) pointed out that a culture of lending books and other media can lend itself to patrons borrowing and tinkering with technological tools instead of purchasing new items. Blakemore (2018) claimed that makerspaces in libraries can allow students to draw connections between literacy and making. Fourie and Meyer (2015), however, noted that only a few publications identify a need for books and other reference materials in a makerspace.

Prior research that connected makerspaces to libraries matters because all six PSTs observed that much of the activity they observed at City Academy focused on the Global Read Aloud. The PSTs found that Mr. R. often used the block of time students had in the makerspace to deliver a planned lesson based on a multicultural children's story. City Academy students seldom used the tools and materials in the makerspace. I often observed that the students would enter the makerspace, go to the library next door to return and check out books, and then return to the makerspace to read and discuss a story. Sometimes the students would ask to play with the robots, and Mr. R. would reply that they would if there was time at the end. I was not aware if Mr. R. worked within

curricular, cultural, or Title 1 restraints. As mentioned in Chapter 3, the library at City Academy features over fifty titles per student. Reading is a fundamental part of the school's culture. From a constructionist viewpoint, a school makerspace inside or adjacent to a school library can nurture learning. Students can view text using media materials and then combine the prior and new knowledge through building an artifact.

No known study has examined how K-12 students use school hours in a makerspace. Therefore, I cannot depend on prior research to support nor counter what the PSTs perceived and what they would have done. Jamie and Bailey mentioned that if they could assume Mr. R.'s role, they would carve out time for make-based extension activities connected to the books they read with students. London would have alternated days of "library time" and "time for the kids to actually make stuff." Alex wished Mr. R. had "focused more on student interest" because the students she observed were not enjoying the Global Read Aloud. Kennedy and Lane mentioned that Mr. R. seldom used the materials and tools for making. These findings do affirm the importance of targeted professional development for teachers and school media specialists who wish to include their school in the maker movement. If there is a makerspace in a school and time to use it, the students should use it for making. The PSTs identified how they would combine making and literacy, which limited research does support (Blakemore, 2018). Future research could contribute toward finding the right balance between the two. The next belief also pertains to teacher professional development, the PSTs' perceptions of evidence-based practices and practice-based evidence.

Theme 3: Using Evidence-Based Practices Is Not the Only Pathway to Finding "What Works"

The PSTs in this study indicated that they plan to apply some scholarly research to their practice but will also consult with other teachers and look to familiar online resources. This finding aligned with Hott et al. (2019) and Opfer et al. (2017), who found that a majority of teachers use Pinterest and Teachers Pay Teachers. Beahm et al. (2019) pointed out that teachers deem resources on these popular websites trustworthy because they often include *practice-based evidence*, first-hand testimonials from other teachers. Results from this study align with Beahm et al.'s (2019) research which suggests that teachers may gravitate toward teaching resources that are accessible and user-friendly, regardless of whether they have been vetted for evidence-based practices.

Knowing that PSTs in this study and practicing teachers may lean away from scholarly research is an important finding as it confirmed a persistent research-to-practice gap in K-12 education. In Chapter 2, I cited the Council for Exceptional Children's (2015) standards to prepare special educators. Initial Preparation Standard Five states that beginning special education teachers select, adapt, and use evidence-based practices; however, the key elements under this standard do not address research skills. Similarly, no such standard exists to prepare general educators. The PSTs' skepticism toward evidence-based practices can either suggest a lack of knowledge or an expression of autonomy. Some of the PSTs mentioned they are unfamiliar with scholarly research, which is not surprising considering that they were largely first-year university students. They may want to carry out constructionist learning in an attempt to discover what works best for their students. It is not yet known how these practices will evolve in their subsequent years of preservice. One recommendation for teacher preparation is to begin

developing PSTs' research skills in foundations courses. Teacher educators should continue to reinforce the importance of educational research into advanced coursework.

Implications

PSTs' Deficit Language

One important area for future study is an exploration of the deficit language that the PSTs used during the interviews. In four of six interviews, I found at least one utterance of deficitlanguage. PSTsdid this when referring to all learners with EBD and when referring to individual students at City Academy. For example, Bailey admitted that she was initially skeptical of what students with EBD "would be able to do" in the makerspace. London referred to a City Academy student as "one kid" who "didn't know how to talk or didn't know how to answer properly". She mentioned that "not every student has the same thing *wrong with them*" (emphasis added), and later referred to students' exceptional needs as "completely crazy abnormalities". Kennedy claimed that teachers and paraprofessionals taking a firm tone with students "might be the perfect way to communicate with the students even though it's not strict for them. Because *they're used to it*" (emphasis added). She also described EBD as "an emotional disorder characterized by *deficits or disturbances of behavior*" (emphasis added). She explained that "those students are more likely than other students to lash out, those students are also the ones who are misunderstood by their teachers". I am not certain if this refers to all teachers or those she observed. Lane described the students at City Academy as "a lot more childish" than same-age peers without disabilities. He described conflicts between middle school students as "stuff that you would expect to see from elementary schoolers", and while in the makerspace, the students "joked around too much".

In isolation, the utterances quoted above suggest a deficit mindset. Tewell explained that teachers with a deficit mindset may focus on students' "weaknesses in knowledge, motivation, and cultural values that they presumably lack" (2020, p. 138). Bailey admitted that she changed her mindset as she spent more time at City Academy. While London expresses great enthusiasm for the City Academy community, her word choices do suggest that she views students' exceptionalities as something "wrong". These uses of deficit language to describe students with emotional and behavioral disabilities indicate that students need instruction related to an asset focused approach to teaching early in their teacher education programs. Teacher candidates, especially those who plan to go into special education must have coursework that targets awareness of a deficit mindset and implicit bias.

Implications from this study might also inform coursework related to culturally responsive teaching; a focus on the theory of culturally responsive teaching prior to their participation in field experiences could potentially have aided Kennedy and Lane in developing an asset mindset. Fullam (2017) asserted that the aim of culturally responsive teaching is to shift teachers' mindsets away from a deficit mindset to embrace a point of view that regards students' cultures as an asset. When teachers see student culture in a positive light, they can leverage it in the learning process. Fullam (2017) acknowledged that teachers engaging in critical self-reflection can be a difficult task. Members of the dominant culture can hold "firmly entrenched beliefs" (p. 132) about students who are of color and economically disadvantaged. I argue that such development and training should begin during the first year of preservice teacher preparation. This training can also

involve applying prior knowledge to a new situation, and identifying possible gaps -or errors- in prior knowledge.

Tangentially related to constructionism and make-based education, Ladson-Billings (1994) advocated for critical self-reflection during interviews to enter teaching preparation programs. She cited interviewers asking, "Why do you want to be a teacher?" (pp. 94-95). If the answer was limited to "I just love kids", Ladson-Billings and colleagues steered the candidates toward other professions such as pediatrics, social work, or recreation. Candidates more likely to become culturally responsive teachers expressed interest in sharing important ideas and constructing knowledge. They are less concerned with memorizing facts and more interested in building on student assets to guide understanding. At risk of engaging in what Jamie called "nit-picking", I noticed that the more engaged PSTs shared narratives about getting to know City Academy students and their interests. The PSTs who expressed less about student interests paid more attention to Mr. R.'s ability to follow a lesson plan. Darling-Hammond's work has implications for teacher preparation that focuses on culturally responsive pedagogies and developing an asset mindset.

Suggestions for Future Study

Make-based Learning in Restrictive Settings

From this study, I gleaned that more research related to make-based learning needs to be conducted within restrictive settings. Another opportunity for future research is to observe teachers and students in schools with makerspaces to explore how different school communities use these spaces. Considering that making could have potential to

strengthen trusting relationships between teachers and students, I recommend more research centered on make-based learning in restrictive and urban school settings.

Longitudinal Study with the PSTs

Another opportunity for future research is longitudinal study with the team of PSTs. I am curious to find out how they will employ making in their classrooms during their first few years of in-service. I also want to know if their attitudes towards making will impact job satisfaction and staying in the profession. As the Covid-19 pandemic prevails into 2021, another area for future research is an exploration into how K-12 teachers can promote make-based learning in virtual settings.

Summary

In this study, six PSTs in a seminar course completed course readings, completed self-directed projects in a university makerspace, and observed K-12 students in a makerspace inside a separate school for students with EBD. Findings suggest that each participant developed individual perceptions, practices, and roles, yet three common beliefs emerged: three major themes emerged: (1) making connects to social-emotional learning, which can benefit students with EBD; and (2) time in school reserved for the makerspace should not be overshadowed by library visits or other activities; and (3) using evidence-based practices is not the only pathway to finding “what works”.

Five findings support the first theme. First, making can help students with EBD control their emotions. Second, making is an agentive practice. Agency is of particular importance for students in restrictive school settings where they are closely monitored. The PSTs did arrive at this conclusion even though they observed limited evidence of City Academy students designing and making artifacts. A third finding is that making can

support problem-posing education (Freire, 1970) and culturally relevant pedagogy (Ladson-Billings, 1994) when dialogue and community action are in the forefront. Teachers who want to make with their students, however, should receive sufficient preparation to ensure that their practices encourage self-direction, not directing students.

The PSTs seldom observed maker activity inside City Academy. Much of the time was dedicated to literacy- and media-based instruction. Some PSTs perceived an opportunity to incorporate making with the Global Read Aloud, while others noticed the tools and materials in the makerspace received little use. While there may be a purpose or benefit to housing a makerspace inside or adjacent to a school library, the PSTs argued that if there is time in a school day in a makerspace, students should be making. Finally, the PSTs suggest there is limited value to employing evidence-based practices in their future classrooms. In accordance with previous literature (Beahm et al., 2019; Hott et al., 2019; Opfer et al., 2019) the PSTs in this study appreciate more accessible educational resources and guidance from veteran teachers. This could suggest either a lack of knowledge about scholarly research, or an early interest in independent professional development.

When describing students with EBD, four of the six PSTs evidenced a deficit mindset in the selection of negative or judgments related to student ability. This use of deficit language suggests a need for future research into how or if coursework that targets culturally responsive teaching could shift their perceptions of students from vulnerable populations. Other opportunities for further research include explorations into ways K-12 students use their time in makerspaces, and how teachers could nurture making with their students learning from home.

Conclusion

The purpose of this action research project was to explore the perceptions, practices, and roles that six PSTs developed in a seminar course that focused on bringing maker education to students with EBD. An analysis of written coursework and individual interviews led to individualized and collective findings. PSTs developed a common perception that making can benefit students who present challenges with their mental health. Participants' future educational practices may reflect an assertion that time for making should be free from teacher-centered activity. The PSTs also identified a future role of skeptical teacher-researcher. They collectively value scholarly research but also identify limitations to using evidence-based practices.

Limited research about make-based learning has included students in urban settings. No known study has involved PSTs in two makerspaces--one to develop a maker identity and another to interact with K-12 students. An opportunity for further research is replicating this study, bringing teacher candidates to makerspaces in both university and K-12 settings. Another possibility is a longitudinal study with the participants to explore how they will incorporate making during their first years of in-service.

References

Algozzine, B. (2017). Toward an acceptable definition of emotional disturbance: Waiting for the change. *Behavioral Disorders, 42*(3), 136-144. https://doi.org/10.1177%2F0198742917702117

Alper, M. (2013, June 24-27). *Making space in the makerspace: Building a mixed-ability maker culture*. Proceedings of the Interaction Design and Children (IDC-13), New York, NY. https://teethingontech.files.wordpress.com/2013/03/idc13-workshopmeryl-alper.pdf

Anastas, J. (2000) *Research design for social work and the human services*. Columbia University Press.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Prentice Hall.

Barton, A. C., Tan, E., & Greenberg, D. (2017). The makerspace movement: Sites of possibilities for equitable opportunities to engage underrepresented youth in STEM. *Teachers College Record, 119*(6), 11-43.

Beahm, L. A., Cook, B. G., & Cook, L. (2019). Proceed with caution: Using web-based resources for instructing students with and at risk for E/BD. *Beyond Behavior, 28*(1), 13-20. https://doi.org/10.1177/1074295619836076

Benabdallah, G., Bourgault, S., Peek, N. & Jacobs, J. (2021, May 8-13). Remote learners, home makers: How digital fabrication was taught online during a pandemic. In *CHI Conference on Human Factors in Computing Systems.* Yokohama, Japan. https://doi.org/10.1145/3411764.3445450

Billingsley, B. S., Fall. A.-M., & Williams, T. O. (2006). Who is teaching students with emotional and behavioral disorders?: A profile and comparison to other special educators. *Behavioral Disorders, 31*(3), 252-264. https://doi.org/10.1177%2F019874290603100301

Blake, C., & Monahan, E. C. (2007). Rethinking teacher preparation for E/BD students: Towards a partnership model. *Support for Learning, 22*(2), 60-65. https://doi.org/10.1111/j.1467-9604.2007.00448.x

Blakemore, M. (2018). Problem scoping design thinking and close reading: Makerspaces in the school library. *Knowledge Quest, 46*(4), 66-69. https://files.eric.ed.gov/fulltext/EJ1171732.pdf

Blikstein, P. & Worsley, W. (2016). Children are not hackers: Building a culture of powerful ideas, deep learning, and equity in the maker movement. In K. Pepper, E. Rosenfeld & Y. Kafai (Eds.), *Makeology: Makers as learners* (pp. 64-80). Routledge.

Blood, E., Johnson, J. W., Simmons, K., & Crouch, S. (2011). Using an iPod touch to teach social and self-management skills to an elementary student emotional/behavioral disorders. *Education and Treatment of Children, 34*(3), 299-321. http://doi.org/10.1353/etc.2011.0019

Bosse, I., Krüger, D., Linke, H., & Pelka, B. (2019). The Maker movement's potential for an inclusive society. In J. Howaldt, C. Kaletka, A. Schröder, & M. Zirngiebl (Eds.), *Atlas of social innovation: Vol. 2. A world of new practices* (pp. 201–206). Oekom.

Britzman, D. (1991). *Practice makes practice: A critical study of learning to teach*. State University of New York Press.

Bruner, J. (1991) The narrative construction of reality. *Critical Inquiry, 18*(1), 1-21. https://www.jstor.org/stable/1343711

Buchholz, B., Shively, K., Peppler, K., & Wohlwend, K. (2014). Hands on, hands off: Gendered access in crafting and electronics practices. *Mind, Culture, and Activity, 21*(4), 278–297. https://doi.org/10.1080/10749039.2014.939762

Buttner, S., Pjil, S. J., Bijstra, J., & van den Bosch, E. (2016). Personality traits of expert teachers of students with E/BD: Clarifying a teacher's x-factor. *International Journal of Inclusive Education, 20*(6), 569–587. https://doi.org/10.1080/13603116.2015.1100222

Campos, F., Soster, T., & Blikstein, P. (2019). "Sorry, I was in teacher mode today": Pivotal tensions and contradictory discourses in real-world implementations of school makerspaces. In *Proceedings of the 8th Annual Conference on Creativity and Fabrication in Education (Fablearn 2019)*. ACM, New York, NY, USA. https://doi.org/10.1145/3311890.3311903

Carr, S. C., & Punzo, R. P. (1993). The effects of self-monitoring on academic accuracy and productivity on the performance of students with behavioral disorders. *Behavioural Disorders, 18*(4), 241-250. https://www.jstor.org/stable/23887466

Cavallo, D., Papert, S., & Stager, G. (2004). Climbing to understanding: Lessons from an experimental learning environment for adjudicated youth. In Y. B. Kafai, W. A. Sandoval, N. Enyedy, A. S. Nixon, & F. Herrera (Eds.), *International Conference of the Learning Sciences 2004: Embracing Diversity in the Learning Sciences* (pp.

113-120). Lawrence Erlbaum Associates. https://doi.dx.org/10.22318/icls2004.113

Chu, S. L., Quek, F., Bhangaonkar, S., Ging, A. B., Sridharamuthy, K. (2015). Making the maker: A means-to-an-ends approach to nurturing the maker mindset in elementary-aged children. *International Journal of Child-Computer Interaction, 5*, 11-19. https://doi.org/10.1016/j.ijcci.2015.08.002

Coffey, A., & Atkinson, P. (1996). *Making sense of qualitative data: Complementary research strategies.* Sage.

Cohen, J. D. (2017). Maker principles and technologies in teacher education: A national survey. *Journal of Technology and Teacher Education, 25*(1), 5-30. https://www.learntechlib.org/p/172304/

Cohen, J. D., Huprich, J., Jones, W. M., & Smith, S. (2017). Educators' perceptions of a maker-based learning experience. *The International Journal of Information and Learning Technology, 34*(5). https://doi.org/10.1108/IJILT-06-2017-0050

Colegrove, P. (2013). Editorial board thoughts: Libraries as makerspace? *Information Technology and Libraries, 32*(1), 2-5. https://ejournals.bc.edu/index.php/ital/article/view/3793/pdf

Connelly, F. M., & Clandinin, D. J. (1990). Stories of experience and narrative inquiry. *Educational Researcher, 19*(5), 2-14. https://doi.org/10.2307/1176100

Constructing Modern Knowledge. (2020). *Constructing Modern Knowledge 2021*. https://constructingmodernknowledge.com/

Cook, B. G. (2002). Inclusive attitudes, strengths, and weaknesses of pre-service general educators enrolled in a curriculum infusion teacher preparation program. *Teacher*

Education and Special Education, 25(3), 262-277. https://doi.org/10.1177/088840640202500306

Cook, B. G., Cameron, D. L., & Tankersley, M. (2007). Inclusive teachers' attitudinal ratings of their students with disabilities. *The Journal of Special Education, 40*(4), 230–238. https://doi.org/10.1177/00224669070400040401

Cook, L., Cook, B.G., Landrum, T.J., & Tankersley, M. (2008). Examining the role of group experimental research in establishing evidence-based practices. *Intervention in School and Clinic*, *44*(2), 76-82. https://doi.org/ 10.1177/1053451208324504

Cook, B. G., Landrum, T. J., Tankersley, M., & Kauffman, J. M. (2003). Bringing research to bear on practice: Effecting evidence-based instruction for students with emotional or behavioral disorders. *Education and Treatment of Children 26*(4), 345-361.https://www.jstor.org/stable/42899766

Cook, S. C., Rao, K., & Collins, L. (2017). Self-monitoring interventions for students with EBD: Applying UDL to a research-based practice. *Beyond Behavior, 26*(1), 19-27. https://doi.org/10.1177%2F1074295617694407

Council for Exceptional Children (2015). *What every special educator must know: Professional ethics and standards.* https://exceptionalchildren.org/standards/ initial-special-education-preparation- standards

Cullinan, D., & Sabornie, E. J. (2004). Characteristics of emotional disturbance in middle and high school students. *Journal of Emotional and Behavioral Disorders, 12*(3), 157-167. https://doi.org/10.1177/10634266040120030301

Cun, A., Abramovich, S., & Smith, J. M. (2019). An assessment matrix for library makerspaces. *Library & Information Science Research, 41*(1), 39-47. https://doi.org/10.1016/j.lisr.2019.02.008\

Cutcliffe, J. R., & McKenna, H. P. (2002). When do we know that we know? Considering the truth of research findings and the craft of qualitative research. *International Journal of nursing studies*, *39*(6), 611-618. https://doi.org/10.1016/S0020-7489(01)00063-3

Damon, W., & Phelps, E. (1989). Critical distinctions among three approaches to peer education. *International Journal of Educational Research, 13*(1), 9-19. https://doi.org/10.1016/0883-0355(89)90013-X

Darling-Hammond, L., & Podolsky, A. (2019). Breaking the cycle of teacher shortages: What kind of policies can make a difference? *Education Policy Analysis Archives, 27*(34), 1-11. https://doi.org/10.14507/epaa.27.4633

Dougherty, D. (2011, January). *We are makers* [Video file]. https://www.ted.com/talks/dale_dougherty_we_are_makers

Dougherty, D. (2012). The maker movement. *Innovations, 7*(3), 11-14. https://www.mitpressjournals.org/doi/pdf/10.1162/INOV_a_00135

Dougherty, D. (2013). The maker mindset. In M. Honey and D. E. Kanter (Eds.), *Design, make, play: Growing the next generation of STEM innovators* (pp. 7-11). Taylor & Francis.

Eisenberg, N., Valiente, C., Spenrad, T. L., Cumberland, A., Liew, J., Reiser, M., Zhou, Q., & Losoya, S. H. (2009). Longitudinal relations of children's effortful control, impulsivity, and negative emotionality to their externalizing, internalizing, and

co-occuring behavior problems. *Developmental Psychology, 45*(4), 998-1008. https://doi.org/10.1037/a0016213

Ennis, R. P., Lane, K. L., Oakes, W. P., & Fleming, S. C. (2020). Empowering teachers with low-intensity strategies to support instruction: Implementing across-activity choices during third-grade reading instruction. *Journal of Positive Behavior Interventions, 22*(2), 78-92, https://doi.org/10.1177/1098300719870438

Epstein, M. H., Kinder, D., & Bursuck, B. (1989). Achievement and emotional disturbance: Academic status and intervention. In M.H. Epstein, K. Kutash, & A. J. Duchnowski (Eds.), *Outcomes for children and youth with emotional and behavioral disorders and their families: Programs and evaluation best practices* (2nd ed., pp. 451-477). Pro-Ed.

Fairchild, G., Hawes, D. J., Frick, P. J., Copeland, W. E., Odgers, C. L., Franke, B., Freitag, C. M., & De Brito, S. A. Conduct disorder. *Nature Reviews Disease Primers*, *5*(43), 1-25. https://doi.org/10.1038/s41572-019-0095-y

Falls, Z. & Olmanson, J. (2018, March 26-30). "There's nothing wrong with fun": Unpacking the tensions and challenges of human centered design for learning with pre-service teachers. In *Proceedings of the Society for Information Technology & Teacher Education International Conference* (pp. 1260-1265). https://digitalcommons.unl.edu/teachlearnfacpub/285/

Fields, D. A., Kafai, Y. B., Nakajima, T. M., Goode, J., & Margolis, J. (2018). Putting making into high school computer science classrooms: Promoting equity in teaching and learning with electronic textiles in *Exploring Computer Science*.

Equity, Excellence, and Education, 51(1), 21-35. https://doi.org/10.1080/10665684.2018.1436998

Firestone, W. A. (1993). Alternative arguments for generalizing from data as applied to qualitative research. *Educational Researcher, 22*(4), 16–23. https://doi.org/10.3102%2F0013189X022004016

Forness, S. R., Freeman, S. F., Paparella, T., Kauffman, J. M., & Walker, H. M. (2012). Special education implications of point and cumulative prevalence for children with emotional or behavioral disorders. *Journal of Emotional and Behavioral Disorders*, *20*(1), 4-18. https://doi.org/10.1177/1063426611401624

Forness, S. R., & Kavale, K.A. (2000). Emotional or behavioral disorders: Background and current status of the E/BD terminology and definition. *Behavioral Disorders, 25*(3), 264-269. https://doi.org/10.1177%2F019874290002500304

Forness, S. R., & Knitzer, J., (1992). A new proposed definition and terminology to replace "serious emotional disturbance" in Individuals with Disabilities Education Act. *School Psychology Review, 21*(1), 12-20. https://doi.org/10.1080/02796015.1992.12085587

Fourie, I. & Meyer, A. (2015). What to make of makerspaces: Tools and DIY only or is there an interconnected information resources space?. *Library Hi Tech, 33*(4), 519-525. https://doi.org/10.1108/LHT-09-2015-0092

Freire, P. (1970). *Pedagogy of the oppressed*. Penguin Modern Classics.

Fullam, J. P. (2017). From seeing to believing: using instructional video to develop culturally responsive teaching. *Journal for Multicultural Education, 11*(2), 131-148. https://doi.org/10.1108/JME-09-2016-0053

Fulton, S., & Urbanski, C. D. (2020). *Making middle school: Cultivating critical literacy and interdisciplinary learning in maker spaces*. NCTE.

Gable, R. A., Tonelson, S. W., Sheth, M., Wilson, C., & Park, K. L. (2012). Importance, usage, and preparedness to implement evidence-based practices for students with emotional disabilities: A comparison of knowledge and skills of special education and general education teachers. *Education and Treatment of Children,* 35(4), 499-591. https://www.jstor.org/stable/42900173

Gage, N., Adamson, R., MacSuga-Gage, A. S. &, Lewis, T. J. (2017). The relation between the academic achievement of students with emotional and behavioral disorders and teacher characteristics. *Behavioral Disorders, 43*(1), 213–222. https://doi.org/10.1177/0198742917713211

Gage, N., Wilson, J., & MacSuga-Gage, A. (2014). Writing performance of students with emotional and/or behavioral disabilities. *Behavioral Disorders, 40*(1), 3–14. https//doi.org/10.17988/0198 -7429-40.1.3

Garwood, J. D., & Ampuja, A. A. (2018). Inclusion of students with learning, emotional, and behavioral disabilities through strength-based approaches. *Intervention in School and Clinic, 55*(1), 46–51. https://doi.org/10.1177/1053451218767918

Garwood, J.D., & Van Loan, C.L. (2018). Pre-service educators' dispositions toward inclusive practices for students with emotional and behavioural difficulties. *International Journal of Inclusive Education, 40*(1), 1-16. *https://doi.org/*10.1080/13603116.2018.1447614

Gay, G. (2010). *Culturally responsive teaching: Theory, research, and practice.* (2nd ed.). Teachers College Press.

Geertz, C. (1973). *The interpretation of cultures*. Basic Books.

Gershenfeld, N. (2005). *Fab: The coming revolution on your desktop—From personal computers to personal fabrication*. Basic Books.

Gershoff, E. T., Aber, J. L., Raver, C. C., & Lennon, M. C. (2007). Income is not enough: Incorporating material hardship into models of income associations with parenting and child development. *Child Development, 78*(1), 70–95. https://doi.org/10.1111/j.1467-8624.2007.00986.x

Goldhaber, D., Quince, V., & Theobald, R. (2019). Teacher quality gaps in U.S. public schools: Trends, sources, and implications. *Phi Delta Kappan, 100*(8), 14-19. https://doi.org/10.1177%2F0031721719846883

Gomez. A. (2019). *The effects of makerspace learning on the social interactions among students with emotional or behavioral disorder* (Publication No.13877668) [Doctoral Dissertation, The University of Texas at San Antonio]. ProQuest Dissertations Publishing.

González-González C. S., & Aller Arias, L. G. (2018, April 23-27). Maker movement in education: Maker mindset and makerspaces. In: *Proceedings of the 2018 IV Jornadas de Interacción Humano-Computador (HCI)*. Popayán, Colombia.

Graziano, P. A., Reavis, R.D., Keane, S.P., & Calkins, S. D. (2007). The role of emotion regulation in children's early academic success. *Journal of School Psychology, 45*(1), 3–19. https//doi.org/10.1016/j.jsp.2006.09.002

Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation.* Sage.

Gulchak, D. J. (2008). Using a mobile handheld computer to teach a student with an emotional and behavioral disorder to self-monitor attention. *Education and Treatment of Children, 31*(4), 567-581. https://doi.org/10.1353/etc.0.0028

Halverson, E. R., & Sheridan, K. M. (2014). The maker movement in education. *Harvard Educational Review, 84*(4), 495-504. https//doi.org/10.17763/haer.84.4.34j1g68140382063

Harrington, N. (2006). Frustration intolerance beliefs: Their relationship with depression, anxiety, and anger in a clinical population. *Cognitive Therapy and Research, 30*(6), 699-709. https://doi.org/10.1007/s10608-006-9061-6

Harrison, P. (2002). The neuropathology of primary mood disorder. *Brain, 125*(7), 1428-1449. https://doi.org/10.1093/brain/awf149

Harris-Murri, N., King, K., & Rostenberg, D. (2006). Reducing disproportionate minority representation in special education programs for students with emotional disturbances: Toward a culturally responsive response to intervention model. *Education and Treatment of Children, 29*(4), 779-799. https://www.jstor.org/stable/42900563

Hart, J. E., Cramer, E. D., Harry, B., Klingner, J. K., Sturges, K. M. (2010). The continuum of "troubling" to "troubled" behavior: Exploratory case studies of African American students in programs for emotional disturbance. *Remedial and Special Education, 31*(3), 148-162. https://doi.org.10.1177/0741932508327468

Harvey, J. (2014). Getting beyond the blame game. *Educational Leadership, 71*(5). http://www.ascd.org/publications/educational-leadership/feb14/vol71/num05/Getting-Beyond-the-Blame-Game.aspx

Hatch, M. (2014). *The maker movement manifesto: Rules for innovation in the new world of crafters, hackers, and tinkerers.* McGraw-Hill Education.

Heintzelman, S. (2016). Using technology to teach students with EBD how to write. *Beyond Behavior, 25*(3), 3-9. https://doi.org/10.1177%2F107429561602500302

Hira, A., Joslyn, C. H., & Hynes, M. M. (2014, October 22-25). *Classroom makerspaces: Identifying the opportunities and challenges*. [Paper presentation]. 2014 Frontiers in Education Conference, Madrid, Spain.

Hott, B. L., Dibbs, R. A., Naizer, G., Raymond, L., Reid, C. C., & Martin, A. (2019). Practitioner perceptions of algebra strategy and intervention use to support students with mathematics difficulty or disability in rural Texas. *Rural Special Education Quarterly, 38*(1), 3–14. https://doi.org/10.1177/8756870518795

Hunter, W., Williamson, R. L., Jasper, A. D., Casey, L. B., & Smith, C. (2017). Examining self-monitoring interventions for academic support of students with emotional and behavioral disorders. *Journal of International Special Needs Education, 20*(2), 67-78. https://doi.org/10.9782/2159-4341-20.2.67

Individuals with Disabilities Education Act, 20 U.S.C. § 1400 (2004).

Institute of Education Sciences, National Center for Education Statistics. (2020). *Search for public schools.* https://nces.ed.gov/ccd/schoolsearch/

Jellison, J. A., Draper, E. A., & Brown, L. S. (2017). Learning together: The instinct to do good and peer-assisted strategies that work. *Music Educators Journal, 104*(2), 15-20. https://doi.org/10.1177%2F0027432117713823

Jolivette, K., Ennis, R. P., & Swoszowski, N. C. (2017). Educator "what-ifs": The feasibility of choice making in the classroom. *Beyond Behavior, 26*(2), 74-80. https://doi.org/10.1177/1074295617713977

Jones, W. M., Smith, S., & Cohen, J, (2017). Preservice teachers' beliefs about using maker activities in formal K-12 educational settings: A multi-institutional study. *Journal of Research on Technology in Education, 49*(3-4), 134-148. https://doi.org/10.1080/15391523.2017.1318097

Kalil, A. (2009). Joblessness, family relations and children's development. *Family Matters, 83,* 15–22.

Kalil, T., & Rodriguez, R. (2015, May 4). Building a nation of makers. *The White House*. https://obamawhitehouse.archives.gov/blog/2015/05/04/building-nation-makers

Kannapel, P. J., Clements, S. K., Taylor, D., & Hibpshman, T. (2005). *Inside the black box of high-performing high-poverty schools.* Prichard Committee for Academic Excellence. http://people.uncw.edu/kozloffm/highperforminghighpoverty.pdf

Kern, L. (2015). Addressing the needs of students with social, emotional, and behavioral problems: Reflections and visions. *Remedial and Special Education, 36*(1), 24-27. https//doi.org/10.1177/0741932514554104

Korstjens, I., & Moser, A. (2018). Series: Practical guidance to qualitative research: Part 4: Trustworthiness and publishing. *European Journal of General Practice, 24*(1), 120-124. https://doi.org/10.1080/13814788.2017.1375092

Kraft, M. A., & Papay, J. P. (2014). Can professional environments in schools promote teacher development? Explaining heterogeneity in returns to teaching experience.

Educational Evaluation and Policy Analysis, 36(4), 476–500. https//doi.org/10.3102/0162373713519496

Ladson-Billings, G. (1994). *The dreamkeepers*. Jossey-Bass Publishing Co.

Ladson-Billings, G. (2017). The (r)evolution will not be standardized: Teacher education, hip hop pedagogy, and culturally relevant pedagogy 2.0. In D. Paris & H. S. Alim (Eds.), *Culturally sustaining pedagogies: Teaching and learning for justice in a changing world* (pp. 141-156). Teachers College Press.

Lane, K. L., Oakes, W. P., Menzies, H. M., Germer, K.A., (2014). Screening and identification approaches for detecting students at risk. In H. M. Walker & F. M. Gresham (Eds.), *Handbook of evidence-based practices for emotional and behavioral disorders: Applications in schools* (pp. 129-151). Guilford Press.

Lewis, C. W., Chambers, T. V., & Butler, B. R. (2012). Urban education in the 21st century. In J. L. Moore & C. W. Lewis (Eds.), *African American students in urban schools: Critical issues and solutions for achievement* (pp. 11-30). Peter Lang.

Lieberman, J. A., & First, M. B. (2018). Psychotic disorders. *The New England Journal of Medicine 379*(3), 270-280. https://doi.org/10.1016/10.1056/NEJMra1801490

Lincoln, Y. S., & Guba, E. G. (1985) *Naturalistic inquiry*. Sage.

Linke, J., Kircanski, K., Brooks, J., Perhamus, G., Gold, A., L., & Brotman, M. A. (2020). Exposure-based cognitive-behavioral therapy for disruptive mood dysregulation disorder: An evidence-based case study. *Behavior Therapy, 51*(2), 320-333. https://doi.org/10.1016/j.beth.2019.05.007

Lipscomb, S., Haimson, J., Liu, A. Y., Burghardt, J., Johnson, D. R., & Thurlow, M. L. (2017). *Preparing for life after high school: The characteristics and experiences of youth in special education: Findings from the National Longitudinal Transition Study 2012: Volume 2: Comparisons among disability groups: Full report* (NCEE 2017-4018). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. https://ies.ed.gov/ncee /pubs/20184007

Lloyd, B. P., Bruhn, A. L., Sutherland, K. S., & Bradshaw, C. P. (2019). Progress and priorities in research to improve outcomes for students with or at risk for emotional and behavioral disorders. *Behavioral Disorders, 44*(2), 85-96. https://doi.org/10.1177/0198742918808485

Loewus, L. (2017, August 15). The nation's teaching force is still mostly White and female. *Education Week, 37*(1), 11. https://www.edweek.org/ew/articles/2017/08/15/

Lowenthal, B. (2001). Teacher strategies and interventions for maltreated children. *Early Child Development and Care, 168*(1), 1–15. https://doi.org/10.1080/0300443011680101

Martin, L. (2015). The promise of the maker movement for education. *Journal of Pre-College Engineering Education Research, 5*(1), 30-39. https//doi.org/10.7771/2157-9288.1099

Martin, L., Dixon, C., & Betser, S. (2018). Iterative design toward equity: Youth repertoires of practice in a high school maker space. *Equity & Excellence in Education, 51*(1), 36-47. https//doi.org/10.1080/10665684.2018.1436997

Martinez, S., & Stager, G. (2013). *Invent to learn.* Constructing Modern Knowledge Press.

Mattison, R. E. (2014). The interface between child psychiatry and special education in the treatment of students with emotional/behavioral disorders in school settings. In H. M. Walker & F. M. Gresham (Eds.), *Handbook of evidence-based practices for emotional and behavioral disorders* (pp. 104-126). The Guilford Press.

Mattison, R. E., Carlson, G. A., Cantwell, D. P., & Asarnow, J. R. (2007). Teacher and parent ratings of children with depressive disorders. *Journal of Emotional and Behavioral Disorders, 15*(3), 184-192. https://doi.org/10.1177%2F10634266070150030501

May, S. & Clapp, E. P. (2017) Considering the role of the arts and aesthetics within maker-centered learning. *Studies in Art Education, 58*(4), 335-350. https//doi.org/10.1080/00393541.2017.1368287

McFarland, J., Hussar, B., de Brey, C., Snyder, T., Wang, X., Wilkinson-Flicker, S., Gebrekristos, S., Zhang, J., Rathburn, A., Barmer, A. Bullock Mann, F. & Hinz, S. (2017). *The condition of education 2017* (NCES 2017-144). National Center for Education Statistics, U.S. Department of Education. https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2017144

McKenna, J. W., Garwood, J., Parenti, M. (2020). Inclusive instruction for students with emotional/behavioral disorders: Service in the absence of intervention research. *Intervention in School and Clinic.* Advance online publication. https://doi.org/10.1177%2F1053451220963084

Merikangas, K. R., He, J.P., Burstein, M., Brody, D., Fisher, P. W., Bourdon, K., & Koretz, D. S. (2010). Prevalence and treatment of mental disorders among U.S. children in the 2001-2004 NHANES. *Pediatrics 125*(1), 75–81. https//doi.org/10.1542/peds.2008-2598

Mihalas, S., Morse, W. C., Allsop, D. H., & McHatton, P.A. (2009). Cultivating caring relationships between teachers and secondary students with emotional and behavioral disorders. *Remedial and Special Education, 30*(2), 108–125. https//doi.org/10.1177/0741932508315950

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. (2nd ed.). Sage.

Milner IV, H. R. (2012). But what is urban education? *Urban Education, 47*(3), 556-561. https://doi.org/10.1177%2F0042085912447516

Mitchell, B. S., Kern, L., & Conroy, M. A. (2019). Supporting students with emotional or behavioral disorders: State of the field. *Behavioral Disorders, 44*(2), 70-84. https://doi.org/10.1177%2F0198742918816518

Moen, T. (2006). Reflections on the narrative research approach. *International Journal of Qualitative Methods, 5*(4), 56-69. https://doi.org/10.1177/160940690600500405

Mohammadhasani, N., Fardanesh, H., Hatami, J., Mozayani, N., & Fabio, R. A. (2018). The pedagogical agent enhances mathematics learning in ADHD students. *Education and Information Technologies, 23*(6), 2299–2308. https://doi.org/10.1007/s10639-018-9710-x

Moorefield-Lang, H. (2005). Change in the making: Makerspaces and the ever-changing landscape of libraries. *TechTrends, 59*(3), 107-112. https://doi.org/10.1007/s11528-015-0860-z

Myers, D., Freeman, J., Simonsen, B., & Sugai, G. (2017). Classroom management with exceptional learners. *Teaching Exceptional Children, 49*(4), 223-230. https://doi.org/10.1177/0040059916685064

National Center for Education Statistics (NCES). (2018). *Highest degree earned, years of full-time teaching experience, and average class size for teachers in public elementary and secondary schools, by state: 2011-12.* Table 209.30. https://nces.ed.gov/programs/digest/d18/tables/dt18_209.30.asp

National Research Council & Institute of Medicine (NRC & IoM). (2009). *Preventing mental, emotional, and behavioral disorders among young people: Progress and possibilities.* National Academies Press.

Nicastro, F., Calani Baranauskas, M. C., da Silva Torres, R. (2020, May 26-29). Constructionism and creative learning: Supporting the design of technology-based learning activities. In B. Tangney, J. R. Byrne, & C. Girvan (Eds.), *Proceedings of the 2020 Consructionism Conference* (pp.244-258). Dublin. http://www. constructionismconf.org /wp-content/uploads/2020/05/C2020-Proceedings.pdf

Niesyn, M. E. (2009). Strategies for success: Evidence-based instructional practices for students with emotional and behavioral disorders. *Preventing School Failure: Alternative Education for Children and Youth, 53*(4), 227-234. https://doi.org/10.3200/PSFL.53.4.227-234

North Carolina School Report Cards. (2019). *Lincoln Heights Academy*. https://ncreports.ondemand.sas.com/src/school?school=600461&year=2019&lng=en

O'Brien, S., Hansen, A. K., & Harlow, D. B. (2016, October 15-16). Educating teachers for the maker movement: Pre-service teachers' experiences facilitating maker activities. In *FabLearn '16: Proceedings of the 6th Annual Conference on Creativity and Fabrication in Education* (pp. 99-102). https://doi.org/10.1145/3003397.3003414

Office of Special Education and Rehabilitation Services, U.S. Department of Education. (2017). *39th annual report to congress on the implementation of the Individuals with Disabilities Education Act, 2017.* https://sites.ed.gov/idea/2017-annual-report-to-congress-on-the-individuals -with-disabilities-education-act/

Oliver, K. M. (2016). Professional development considerations for makerspace leaders, part one: Addressing "what?" and "why?" *TechTrends, 60,* 160-166. https//doi.org/10.1007/s11528-016-0028-5

Opfer, D. V., Kaufman, J. H., & Thompson, L. E. (2017). *Implementation of K–12 state standards for mathematics and English language arts and literacy: Findings from the American Teacher Panel.* RAND Corporation. https://www.rand.org/pubs/research_reports/RR1529-1.htm

Orasti, F. T., & Causton-Theoharis. J. (2013). Challenging control: Inclusive teachers' and teaching assistants' discourse on students with challenging behaviour. *International Journal of Inclusive Education, 17*(5), 507–525. https//doi.org/10.1080/13603116.2012.689016

Organization for Economic Cooperation and Development (OECD). (2014). *TALIS 2013 Results: An International Perspective on Teaching and Learning*, https://doi.org/10.1787/9789264196261-en.

Organization for Economic Cooperation and Development (OECD). (2017). *Education at a Glance, 2017*. Table D.3.2a. https://dx.doi.org/10.1787/eag-2017-en

Overcash, J. A. (2003). Narrative research: A review of methodology and relevance to clinical practice. *Clinical Reviews in Oncology/Hematology, 48*(2), 179-184. https://doi.org/10.1016/j.critrevonc.2003.04.006

Paganelli, A., Cribbs, J. D., Huang, X., Pereira, N., Huss, J., Chandler, W., & Paganelli A. (2017). The makerspace experience and teacher professional development, *Professional Development in Education, 43*(2), 232-235, https://doi.org/10.1080/19415257.2016.1166448

Papavlasopoulou, S., Giannakos, M. N., & Jaccheri, L. (2017). Empirical studies on the Maker Movement, a promising approach to learning: A literature review. *Entertainment Computing, 18*, 57–78. https://doi.org/10.1016/j.entcom.2016.09.002

Papavlasopoulou, S., Giannakos, M. N., Jacceri, L. (2019). Exploring children's learning experience in constructionism-based coding activities through design-based research. *Computers in Human Behavior, 99*, 415-427. https://doi.org/10.1016/j.chb.2019.01.008

Papert, S. (1980/1996). *Mindstorms: Children, computers, and powerful ideas.* Basic Books.

Papert, S. (1991). Situating constructionism. In I. Harel & S. Papert (Eds.) *Constructionism.* (pp. 1-12). Ablex Publishing.

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Sage.

Patton, P. L. (1995). Rational behavior skills: A teaching sequence for students with emotional disabilities. *The School Counselor, 43*(2), 133-141. https://www.jstor.org/stable/23900467

Piaget, J. (1973). *To understand is to invent: The future of education*. Grossman Publishers.

Rahman, S. (2018). About us. *Disability Lab.* http://disabilitylab.com/aboutusdisabilitylab.html#header2-t

Regalla, L. (2016). Developing a maker mindset. In K. Pepper, E. Rosenfeld & Y. Kafai (Eds.), *Makeology: makerspaces as learning environments* (pp. 257-272). Routledge.

Reid, M. J., Webster-Stratton, C., & Hammond, M. (2003). Follow-up of children who received The Incredible Years Intervention for oppositional-defiant disorder: Maintenance and prediction of 2-year outcome. *Behavior Therapy*, *34*(4), 471-491. https://doi.org/10.1016/S0005-7894(03)80031-X

Reinke, W. M., Frey, A. J., Herman, K. C., & Thompson, C. V. (2014). Improving engagement and implementation of interventions for children with emotional and behavioral disorders in home and school settings. In H. M. Walker & F. M. Gresham (Eds.), *Handbook of evidence-based practices for emotional and behavioral disorders: Applications in schools* (pp. 432-445). The Guilford Press.

Rodriguez, S. R., Harron, J. R., & DeGraff, M. W. (2018). UTeach Maker: A micro-credentialing program for preservice teachers. *Journal of Digital Learning in Teacher Education, 34*(1), 6-17. https://doi.org/10.1080/21532974.2017.1387830

Ronfeldt, M., Loeb, S. & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American Educational Research Journal, 50*(1), 4–36. https://doi.org/10.3102%2F0002831212463813

Roy, A. K., Lopes, V., & Klein, R. G. (2014). Disruptive mood dysregulation disorder: A new diagnostic approach to chronic irritability in youth. *The American Journal of Psychiatry, 171*(9), 918-924. https://doi.org/10.1176/appi.ajp.2014.13101301

Ryan, J. B., Pierce, C. D., & Mooney, P. (2008). Evidence-based teaching strategies for students with EBD. *Beyond Behavior, 17*(3), 22-29. https://www.jstor.org/stable/24011935

Safran, J. S., & Safran, S. P. (1987). Teachers' judgments of problem behaviors. *Exceptional Children, 54*(3), 240–254. https://doi.org/10.1177/001440298705400306

Saldaña, J. (2016). *The Coding Manual for Qualitative Researchers* (3rd ed.). Sage.

Salend, S. J., & Sonnenschein, P. (1989), Validating the effectiveness of a cooperative learning strategy through direct observation. *Journal of School Psychology, 27*(1), 47-58. https://doi.org/10.1016/0022-4405(89)90030-7

Sanford, C., Newman, L., Wagner, M., Cameto, R., Knokey, A.-M., and Shaver, D. (2011). *The post high school outcomes of young adults with disabilities up to 6 years after high school. Key findings from the National Longitudinal Transition Study-2* (NLTS2) (NCSER2011-3004). SRI International.

Scott, T., & Alter, P. J. (2017). Examining the case for functional behavior assessment as an evidence-based practice for students with emotional and behavioral disorders in general education classrooms. *Preventing School Failure: Alternative Education for Children and Youth, 61*(1), 80–93. https://doi.org/10.1080/1045988X.2016.1196645

Scott, T. M., Alter, P. J., & Hirn, R. G. (2011). An examination of typical classroom context and instruction for students with and without behavioral disorders. *Education and Treatment of Children*, *34*(4), 619-641. https://doi.org/10.1353/etc.2011.0039

Seo, J. (2019). Is the maker movement inclusive of ANYONE?: Three accessibility considerations to invite blind makers to the making world. *TechTrends 63*, 514–520. https://doi.org/10.1007/s11528-019-00377-3

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*, *22*(2), 63-75. https://doi.org/10.3233/EFI-2004-22201

Shively, K., Hitchens, C., & Hitchens, N. (2020). Teaching Severe Weather: Examining Teacher Candidates' Early Field Experience in a Makerspace Environment. *Journal of Education.* Advance Online Publication. https://doi.org/10.1177%2F0022057420908061

Shriver, A. (2016, February 6). *This makerspace brings STEM students together to hack wheelchairs*. https://makezine.com/2016/02/06/this-makerspace-brings-stem-students-together-hack-wheelchairs/

Simon, M. K., & Goes, J. (2013) *Dissertation and scholarly research: Recipes for success.* Dissertation Success LLC.

Simons, H., Kushner, S., Jones, K., James, D. (2003). From evidence-based practice to practice-based evidence: The idea of situated generalisation. *Research Papers in Education, (18)*4, 347–364. https://doi.org/10.1080/0267152032000176855

Simonsen, B., Fairbanks, S., Briech, A., Myers, D., & Sugai, G. (2008). Evidence-based practices in classroom management: Considerations for research and practice. *Education and Treatment of Children, 31*(3), 351-381. http://www.jstor.com/stable/42899983

Simpson, R. L., Peterson, R. L., & Smith, C. R. (2011). Critical educational components for students with emotional and behavioral disorders: Science, policy, and practice. *Remedial and Special Education, 32*(3), 230-242. https://doi.org/10.1177%2F0741932510361269

Sinclair, A. C., Gesel, S. A., & Lemons, C. J. (2019). The effects of peer-assisted learning on disruptive behavior and academic engagement. *Journal of Positive Behavior Interventions 21*(4), 238-248. https://doi.org/10.1177/1098300719851227

Skerbetz, M. D., & Kostewicz, D. E. (2013). Academic choice for included students with emotional and behavioral disorders. Preventing School Failure: *Alternative education for children and youth, 57*(4), 212-222. https://doi.org/10.1080/1045988X.2012.701252

Skiba, R. J., Poloni-Staudinger, L., Gallani, S., Simmons, A. B., Feggins-Azziz, R. (2006b). Disparate access: The disproportionality of African American students

with disabilities across educational environments. *Exceptional Children, 72*(4), 411-424. https://doi.org/10.1177/001440290607200402

Skiba, R. J., Simmons, A., Ritter, S., Kohler, K., Henderson, M., & Wu, T. (2006a). The context of minority disproportionality: Practitioner perspectives on special education referral. *Teachers College Record, 108*(7), 1424–1459. http://dx.doi.org/10.1111/j.1467-9620.2006.00699.x

Slavin, R. E. (1995). *Cooperative learning: Theory, research and practice* (2nd ed.). Allyn and Bacon.

Smith, W., & Smith, B. C. (2016). Bringing the maker movement to school. *Science & Children, 54*(1), 30–37. https://www.makersempire.com/wp-content/uploads/2018/02/Bringing-The-Maker-Movement-to-the-School-Smith-14.pdf

Smithgall, C, Gladden, R. M., Yang, D., & Goerge, R. (2005). *Behavior problems and educational disruptions among children in out-of-home care in Chicago*. Chapin Hall Center for Children at the University of Chicago. https://www.researchgate.net/publication/234708993

Somanath, S., Morrison, L., Hughes, J., Sharlin, E., & Sousa, M. C. (2016, February 14-17). Engaging 'at-risk' students through maker culture activities. In *Proceedings of the TEI'16: Tenth International Conference on Tangible, Embedded, and Embodied Interaction* [When Learning is Tough]. TEI, Eindhoven, The Netherlands. http://utouch.cpsc.ucalgary.ca/docs/EngagingAtRiskStudents-TEI2015.pdf

Sorensen, L. C., & Ladd, H. (2018). The hidden costs of teacher turnover. *National center for analysis of longitudinal data in education research (CALDER) Working paper no. 203-0918-1*. https://files.eric.ed.gov/fulltext/ED591843.pdf

Stager, G. (2001, July 29-August 3). Computationally-rich constructionism and at-risk learners. *Seventh World Conference on Computers in Education*, Copenhagen. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.18.8729&rep=rep1&type=pdf

Stager, G. (2005, August). *Papertian constructionism and the design of productive contexts for learning*. Paper presented at EuroLogo X, Warsaw. http://www.stager.org/articles/eurologo2005.pdf

Stager, G. (2009), What makes a good project?: Eight elements to guide great project design. *Creative Educator 5*. https://creativeeducator.tech4learning.com /v05/articles/What_Makes_a_Good_Project

Stager, G. (2013, June). *Papert's prison Fab Lab: Implications for the maker movement and education design*. Paper presented at IDC, New York. https://www.makersempire.com/wp-content/uploads/2018/02/Paperts-Prison-Fab-Lab- Implications-for-the-maker-movement-and-education-design-Stager-13.pdf

Steiner, H., Remsing, L., & The Work Group on Quality Issues. (2007). Practice parameter for the assessment and treatment of children and adolescents with oppositional defiant disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, *46*(1), 126-141. https://doi.org/10.1097/01.chi.0000246060.62706.af

Sullivan, A. L. (2017). Wading through quicksand: Making sense of minority disproportionality in identification of emotional disturbance. *Behavioral Disorders, 43*(1), 244-252. https://doi.org/10.1177/0198742917732360

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Learning Policy Institute. https://learningpolicyinstitute.org/product/coming-crisis-teaching

Sutherland, K. S., Wehby, J. H., & Gunter, P. L. (2000). The effectiveness of cooperative learning with students with emotional and behavioral disorders: A literature review *Behavioral Disorders, 25*(3), 225-238. https://doi.org/10.1177/019874290002500309

Taylor, S. J., & Bogdan, R. (1984). *Introduction to qualitative research methods: The search for meanings*. Wiley-Interscience.

Tewell, E. (2020). The problem with grit: Deficit thinking in library instruction. *Portal: Libraries and the Academy, 20*(1), 137-159. https://doi.org/10.1353/pla.2020.0007

Theofanidis, D., & Fountouki, A. (2018). Limitations and delimitations in the research process. *Perioperative Nursing, 7*(3), 155-162. https://doi.org/10.5281/zenodo.2552022

Uibu, K., & Kikas, E. (2014). Authoritative and authoritarian-inconsistent teachers' preferences for teaching methods and instructional goals. *Education, 3*(13), 5-22. http://dx.doi.org/10.1080/03004279.2011.618808

U.S. Department of Education. (2014). *The 36th annual report to congress on the implementation of the Individuals with Disabilities Education Act.* https://www2.ed.gov/about/reports/annual/osep/2014/parts-b-c/36th-idea-arc.pdf

U.S. Department of Education (2020). *The 41st annual report to congress on the implementation of the Individuals with Disabilities Education Act.* https://www2.ed.gov/about/reports/annual/osep/2019/parts-b-c/41st-arc-for-idea.pdf

U.S. Department of Education, National Center for Education Statistics. (2018). *Digest of Education Statistics, 2016* (NCES 2017-094).

Vossoughi, S., Hooper, P. K, & Escudé, M. (*2016*) Making through the lens of culture and power: Toward transformative visions for educational equity. *Harvard Educational Review, 86*(2), 206-232. https://doi.org/10.17763/0017-8055 .86. 2.206

Vukovic, R. (2018, March 01). Behaviour management episode 4: Behaviour approaches for children with disabilities. *Teacher*. https://www.teachermagazine.com /au_en/articles/behaviour-management-episode-4-behaviour-approaches-for-children-with-disab

Wagner, M., Kutash, K., Duchnowski, A. J., Epstein, M. H., & Sumi, W. C. (2005). The children and youth we serve: A national picture of the characteristics of students with emotional disturbances receiving special education. *Journal of Emotional and Behavior Disorders, 13*(2), 79–96. https://doi.org/10.1177%2F10634266050130020201

Walker, H. M., Ramsey, E., & Gresham, F. M. (2004). *Antisocial behavior in school: Evidence based practices*. Wadsworth.

Walker, J., Geddes, A., Lever, N., Andrews, C., & Weist, M. D. (2010). Reconsidering the term 'emotional disturbance': A report from Maryland. *Advances in school mental health promotion, 3*(2), 46-52. https://doi.org/10.1080/1754730X.2010.9715680

Wehby, J. H., Falk, K. B., Barton-Arwood, S., Lane, K. L., & Cooley, C. (2003). The impact of comprehensive reading instruction on the academic and social behavior of students with emotional and behavioral disorders. *Journal of Emotional and Behavioral Disorders, 11*(4), 225-238. https://doi.org/10.1177/10634266030110040401

Wexler, J., Reed, D. K., Barton, E. E., Mitchell, M., & Clancy, E. (2018). The effects of a peer-mediated reading intervention on juvenile offenders' main idea statements about informational text. *Behavioral Disorders, 43*(2), 290-301. https://doi.org/10.1177/0198742917703359

Wiley, A. L., Siperstein, G. N., Forness, S. R., & Brigham, F. J. (2010). School context and the problem behavior and social skills of students with emotional disturbance. *Journal of Child and Family Studies*, *19*(4), 451-461. https://doi.org/10.1007/s10826-009-9316-4

Willmann, M., & Seeliger, G. M. (2017). SE/BD inclusion research synthesis: A content analysis of research themes and methods in empirical studies published in the journal *Emotional and Behavioural Difficulties* from 1996–2014. *Emotional and*

Behavioural Difficulties 22(2), 142–161. https//doi.org/10.1080/13632752.2016.1255441

Woods, S., & Hsu, Y-C. (2019). Making spaces for STEM in the school library. *TechTrends, 64*, 388-394. https://doi.org/10.1007/s11528-019-00460-9

Wulczyn, F., Smithgall. C., & Chen, L. (2009). Child well-being: The intersection of schools and child welfare. *Review of Research in Education, 33*, 35-62. https//doi.org/10.3102/0091732X0832720

Yoshikawa, H., Aber, J. L., & Beardslee, W. R. (2012). The effects of poverty on the mental, emotional, and behavioral health of children and youth: Implications for prevention. *American Psychologist, 67*(4), 272-284. https//doi.org/10.1037/a0028015

Yoshikawa, H., Weisner, T. S., & Lowe, E. D. (2006) Introduction: Raising children where work has disappeared. In H. Yoshikawa, T. S. Weisner, & E. D. Lowe (Eds.) *Making it work: Low-wage employment, family life, and child development* (pp. 1-24). Russell Sage Foundation.

Zoltowski, C. B., Oakes, W. C., & Cardella, M. E. (2012). Students' ways of experiencing human-centered design. *Journal of Engineering Education, 101*(1), 28-59. https://doi.org/10.1002/j.2168-9830.2012.tb00040.x

Appendix A

Clinical Observation Guide

Please complete this form during or immediately after every visit to "City Academy".

What is your pseudonym?

Time of observation

- early morning
- midday
- afternoon

The students I observed are in

- elementary school
- middle school
- high school

During my visit, I primarily

- observed
- participated

Say more about your level of participation if it might help the research team.

(open-ended response)

During my clinical visit, students were

- engaging in make-based activities
- not making

If students were not making, describe what they were doing.

I observed that teachers (check all that apply)

- created structures for students to collaborate

- provided choices
- had students self-monitor their behavior
- specialized instruction for different students
- allowed peer-assisted learning

If helpful, explain how teachers implemented these strategies, and how they affected student learning.

In what ways did today's visit prepare you for a career as a special education or STEM teacher?

Compare your clinical visits to what you do in the makerspace on campus. What have you learned from each? Please do not include information that identifies you.

Appendix B

Preservice Teacher Dispositions Survey

Hello! A group of Teaching Fellows and a doctoral student are asking preservice teachers to participate in a UNCC Research Study related to teacher dispositions and preparedness to work with students with emotional and behavioral disabilities (E/BD). You have been selected because you are enrolled in at least one education course at UNC Charlotte. This is not an evaluation, but rather a survey to learn more about teacher preparation.

Principal Investigator: Abby F. Holland, doctoral student, UNC Charlotte.

Dissertation chair: Dr. Heather Coffey, associate professor, UNC Charlotte.

If you choose to participate, you will complete a short, anonymous survey early in the spring 2020 semester. The purpose of the survey is to explore preservice teachers' dispositions and preparedness to teach students with E/BD. Participation in this research study is voluntary. This survey will take 10-15 minutes to complete.

There are no unforeseen risks associated with participating in this study.

What we learn about preservice teachers' perceptions will be used to explore how future teachers intend to serve their future students with E/BD. Benefits of participation could include new approaches to teacher preparation.

The study provides an opportunity for Mrs. Abby Holland, Dr. Heather Coffey, and the UNCC TFs engaging in participatory action research to provide a blueprint for other teacher educators on how to engage students with E/BD and provide effective academic experiences for a population with different needs.

Your responses are confidential, and your privacy will be protected to the greatest extent possible. Undergraduate and graduate students studying education at UNC Charlotte will complete this survey anonymously. The data will be reported in aggregate form without identifying information. Information from the survey will be stored and shared using the UNC Charlotte systems that require a UNC Charlotte issued username and password.

If you have questions, contact Abby Holland at aforgang@uncc.edu, or Dr. Heather Coffey at hcoffey@uncc.edu. If you have further questions or concerns about your rights as a participant in this study, contact the Office of Research Compliance at (704) 687-1871 or uncc-irb@uncc.edu.

Are you over the age of 18? If the answer is no, please exit the survey. YES NO

Have you already completed this survey? If the answer is yes, please exit. YES NO

Are you an undergraduate or graduate student at UNC Charlotte preparing to become a K-12 teacher or currently teaching in a K-12 setting? If the answer is no, please exit the survey. YES NO

Choose the option that best describes you:

- undergraduate student
- undergraduate student currently student teaching
- post-baccalaureate student earning licensure while currently teaching
- earning a graduate certificate while currently teaching
- earning a graduate certificate in teaching while working in another profession
- early college high school student
- other

If you chose other to the previous question, please explain. (optional)

Choose the option that best describes you:

- early college high school student
- first-year undergraduate student
- sophomore
- junior
- senior
- post baccalaureate or graduate student
- other

If you answered other to the previous question, please explain (optional)

I am studying to become a

- regular or general educator
- special educator

I plan to teach

- elementary school
- middle school
- high school

For the question that follows, provide a 1 if you strongly disagree and 5 you strongly agree.

1. To what extent do you agree with this statement: In my future classroom, if a child consistently displays challenging or disruptive behavior, it is intentional. (S)he is bored, not understanding course content, seeking attention, or wanting to distract others.

2. To what extent do you agree with this statement: if a child consistently displays challenging or disruptive behavior, I will consider if he/she has a disability and refer him/her to special education.

3. To what extent do you agree with this statement: if a child consistently displays challenging or disruptive behavior, I suspect there is little to no discipline at home.

4. To what extent do you agree with this statement: If a child has an individualized education plan (IEP) and the disability category is emotional disturbance, the regular classroom is not an appropriate setting for him or her.

5. To what extent do you agree with this statement: in my classroom, when looking for effective ways to teach or manage a classroom, I would ask a neighboring teacher.

6. To what extent do you agree with this statement: in my classroom, when looking for effective ways to teach or manage a classroom, I would surf online resources like Pinterest or Teachers pay Teachers.

7. To what extent do you agree with this statement: in my classroom, when looking for effective ways to teach or manage a classroom, I would try to figure it out myself.

8. To what extent do you agree with this statement: in my classroom, when looking for effective ways to teach or manage a classroom, I would actively search for strategies that research has shown to be effective.

   Please tell the research team more about why you chose the answers to this section.

For the questions that follow, provide a 1 if you strongly do not agree, and a 5 if you strongly agree.

1. I have a clear understanding of what are evidence-based practices and where to find them.

2. I have a clear understanding of what are high-leverage practices, and where to locate them.

3. It makes no difference to me if a practice is based on empirical research. Only I know my students and classroom dynamics.

Please tell the research team more about why you chose the answers to this section.

For the questions that follow, provide a 1 if you strongly do not agree, and a 5 if you strongly agree.

1. I am familiar with makerspaces

2. If my future school has a makerspace, I would dedicate class time to students completing self-directed projects

3. If my future school has a makerspace, I would use non-instructional time to work on my own self-directed projects.

4. A makerspace is an appropriate setting for students classified as having emotional disturbance.

   Please provide the research team with additional information to explain the answers you chose.

This completes the survey.
Thank you for your participation. All answers are anonymous and will not affect your academic standing in any way. If you have any questions about the questions you just answered, please contact Abby Holland (doctoral student) at aforgang@uncc.edu.

Appendix C

Interview Protocol

Hello and thank you for agreeing to this interview via teleconference. I am using video so we can see each other. May I now begin recording audio?

Would you like to review the transcript for an opportunity to retract anything you regret saying?

For documentation purposes, please state today's date, your given name, and pseudonym.

Perceptions and practices about teaching students with EBD:

1. How did you feel when public schools closed, and you could no longer visit City Academy? What did you miss?

2. How did you feel about not being able to finish your own project in Area 49? Were you able to complete your project as initially intended? How did you adapt?

3. When you visited City Academy last year, who did you observe? What were some of your initial feelings toward the school and students?

4. How did your perceptions toward the school and students change over time?

5. What were some of the roles you assumed when you visited City Academy? Did you mostly observe or participate? In what ways did you participate?

6. What were students and teachers doing while you observed?

7. If you were the teacher, how would you have used the space and time with students?

8. How did time with these students prepare you for a future career as a teacher?

Perceived value of evidence-based strategies:

Some of the practices I asked you to observe in spring of 2020 were choice-making opportunities, students self-monitoring, collaborative learning, and peer-assisted learning. Those are evidence-based strategies for students with EBD geared toward academics.

1. In what ways did teachers at [City Academy] provide students with choices?

2. How did students self-monitor their behaviors and academic progress?

3. In what ways did students collaborate, and how did this look different from peer-assisted learning, in which one student mentors or tutors another?

4. Does it matter to you if research findings suggest these are effective practices? Why do you feel this way?

5. Considering your knowledge of evidence-based practices, how do you plan to research strategies for student learning when you begin a career as a teacher?

Perceptions of make-based learning:

1. How would you describe make-based learning to someone who has never heard of making or makerspaces?

2. Should teachers think about students' cultural backgrounds before engaging them in making? Why or why not?

3. Do you see yourself engaging future students in making? Why or why not?

4. Do you believe make-based learning can benefit students with EBD? Why?

Wrap-up questions:

1. Do you have additional thoughts about making, evidence-based practices, or students with EBD?

2. Do you see yourself returning to City Academy when schools reopen? If yes, in what capacity? (e.g., clinical visits for course credit or volunteer).

3. Are you working on any make-based projects currently?

4. Is there anything you regret saying and would like removed from the transcript? Would you like to review the transcript and delete any content before I begin data analysis?

Appendix D

Jamie's Codebook

category	In-vivo codes	total
Perception of City Academy (procedures, building, faculty, staff	"A good thing to look forward to every week" "It was a bit more threatening than my school I feel I'd grown up at." "I feel there's a lot more security checks in place, which in that type of school is necessary." But I feel it was helpful to actually get to know the kids. I think then you realize, "oh, this isn't a place for bad kids". (more positive perception when taking students into consideration) This is a school for kids who need the specific kind of help that the regular school system can't help with. (school meets the students' exceptional needs) I would say they had experienced teachers. (neutral) And some had a bit of an attitude. (negative perception of teachers). And that's not to say anything about the quality of their teaching. And maybe it's the type of teacher that's needed in a school environment like that? I mean, they were friendly. But they were also just very no-nonsense. And in some sense you could feel like their patience was being tried by the students. (teachers have a difficult job) I think the teachers would use different methods than I would've to deal with students. At that point my biggest method was reasoning, and they taught off of authority. (questions teachers' approaches with students) but there was an establishment that "you're going to respect me, or you're going to get in trouble. Why	26

do you respect me? Because I'm your teacher" and that's what you do. (controlling atmosphere)

I feel like some of the teachers -- not all of them -- like Mr. R. was an exception to that. (Mr. R. did not impose control)

The other teachers I had experience with was the art teacher. She seemed really sweet but also sort of taught in that manner. (some teachers were nice but still imposed control)

But also some of the staff, the staff they brought on to handle the students, I feel, were a lot more in that category of like, "hey, you're just going to respect me". And they also sort of antagonized students in some senses. (paraprofessionals were more authoritarian than teachers)

[paraprofessionals] Sort of [pause] escalated the situation opposed to de-escalating it. They wouldn't say things that would calm down the student, but just make them more mad. I mean, the teacher should be respected, but what you're saying to the kids is just going to make them want to throw things, like want to punch you in the face, maybe there's a better way to say it. (paraprofessionals controlled students rather than attempt to de-escalate tension)

I felt very close with Mr. R and I liked his teaching style.

The ladies in the office were also very nice.

As a prospective teacher who doesn't know all the arts of the trade, it was very easy for me on the outside to come in on my Friday every week and find ways to nitpick and see how their work could have been done more effectively, work with students who are easily excitable. (negative perception of procedures)
But I feel that I trusted the students more [than the teachers and paraprofessionals].

I think the most interesting thing was the relationship between Mr. R and the students. I think the way he was able to course-correct the students was just … I don't even know how he did it. He did it in a way that was just so friendly but also firm. You knew that you shouldn't do it, but you're appreciative with his gentleness. (perception that Mr. R. built positive relationships)

There was occasional calling out from a couple of the students in the class. Sometimes it was quick one-liners that they had. Sometimes someone would try to start a conversation with Mr. R, and Mr. R would just have to be like 'h-h-hey hey, stop' and he was always good about getting them back on task and keeping the lesson rolling

I could see that possibly in the PE class when they went outside. "Hey, if you keep on doing this, this is going to happen". That's a way of saying like, "hey, if you continue on this path there's consequences. But, if you turn back now we can work this out and there doesn't have to be consequences. (perception that teachers negotiate with the students)

If the remedial system they had, good behavior was rewarded with more freedom and the possibility of transferring out. I think that was what led to a lot of them to realize, "I'm mad, but if I do something right now, I lose my good graces and I just set myself further back. I think that was a way that students would self-monitor, realizing what are the consequences.

There was also the establishment monitoring them, reminding them, "hey, you're here right now. Do you want to go back?" There was a lot of support from their teachers in order to make sure they self-monitored, but a lot of it was their decision. They can be there, and they can act a certain way, but they know what happens when they do. In that sense it motivates them.

	They were told, "go fill out your chart." And the only reason they'd go and look the chart was because someone told them to go put something on it. (behavior cards did not motivate students to reflect unless a teacher told them to)	
	Of like, why they teach the way they did. It being where I am now, I appreciate the staff for trying, first of all, being teachers in a difficult setting, with different challenges the teachers have to deal with. (perception that the teachers have a challenging job)	
Perception of City Academy students	Real	9
	Mature	
	Understood a lot of things/Knowledgable	
	I appreciated their energy (perception that the students are energetic)	
	Because you could tell **when the kids started warming up to us**. It was really sweet and **it was more than I expected**. It could have been like, "I don't really care about these people who come in here every week. But I think they really started caring.	
	"I loved Z. What I observed about him was, he was interpersonally intelligent. He just knew how to talk to people; he knew how to make people laugh. He didn't have any difficulties talking to people that were older than him. He was very creative-minded. I feel like he paced himself, he knew why we wanted to have control over himself." (individual strengths, knew students' names)	
	I feel another one I connected with was S. I just felt he had a good heart, and I feel he maybe struggled with trusting people a bit. (individual strengths, knew students' names)	
	Another one I got really close with was Jing. Jing was really into anime. He just loved to talk. He had so many things he was passionate about. I knew	

	nothing about it, but he was like, “do you watch Naruto? Do you know Naruto? “No”. “But in Naruto they did this thing” (individual strengths, knew students’ names)	
	and it made me realize there are ways that children will present to you to get close to them. You just have to go down their avenue, and not necessarily your own, if they’re presenting you one. (students’ attempts to form relationships with adults -- extends beyond CA students)	
Perception of learning and teaching students with EBD (meaning what students with EBD learn and better approaches to teaching)	I enjoyed watching their interactions during the Global Readaloud. There was one section, I can’t remember what they were talking about, but talking about quality of life in one of the 3rd world countries. And it was so interesting, like, after seeing the kids learning, they were like, “Why don’t they just go somewhere else? Like why don’t they just leave?” And Mr R is like, “well, they can’t leave; you have to find a place and have money to leave”. **It was just so interesting, seeing their minds change on things, actually learn things about the world.** That was one thing that stuck with me. That lesson in particular, learning about what it was like in a different place. (perception that students are engaged and can express ideas about the world)	5
	when we were working with those iRobots, A was trying to figure it out because it was a pretty complicated system and Jing knew about it like that. Jing was like, “Hey, here, let me help you with this” . And he was working on it and like showed him. I think A was starting to understand? I think also, it was flawed in the sense that J wanted control. But it was also like, “**you can’t control the students when they were helping each other**” So that was cool to see. (students crave control, and make-based learning can provide it).	
	Yeah, I would say overall I think t**he students were wanting control in most of the things they were doing** - it would be hard to see… when peer-	

	assisted learning came up, it was usually followed by just a little bit of self-elevating or control. The term self-elevating, if I would apply it to the iRobot scenarios, that was J's opportunity to tell everyone, 'hey, I know how to do this really smart thing, this really technical thing". So even though he really was helping his friend, it was also a way for J to validate himself. (making provided students with opportunities to assist peers and feel smart)	
Perception of make-based learning	That's the whole premise of the makerspace project, was choices. you could choose to learn about and we have the resources to let you learn about it. There is a choice in how you wanted to guide your learning. I would describe it as using modern technology to come up with a solution for a problem, or using technology, I guess it doesn't have to be modern - but that's what it was like for me. I had the problem of it was difficult for me to take medicine in the morning. And I think of reasons for that and then think about how I can .. an efficient solution, and then how do I create it? I think that would be helpful, determining their experience with technology and what they're going to think are like issues that need solving. I think it would be cool to have something that was culturally-related to making. The idea of that came to me as we were talking. But I think that would be important to understand their exposure to technology and exposure to making in general. (scaffolding technological skills before honoring students' cultures) It's really cool. I think it's fun. It's a good way to learn.	5
Developing a maker identity	"I had learned a lot of skills to actually be able to do that." (skill-building)	14

"I still know a bit, but I feel like now when I go back I'm still gonna have to relearn skills." (skills can fade over time when maker does not use them)

What I was working on was an effective way to help someone with ADHD manage taking medications. - to make sure they did it more consistently - and add some measure of efficiency to it. (to solve a problem)

I was inspired by my mom who takes ADHD. medications, and a lot of it is early in the morning. (empathy)

I had to do that too when I was still on medication. (self-empathy)

I was inspired to create something that you could place on your bedside table that would help you to remember to take your medicine. (solve a practical problem)

I think [Bailey] in our class maybe mentioned that the idea of having a timer to go with it, and then the other TFs and I just brainstormed, "what would be other cool things to have in this?". We came up with a couple ideas that we liked. (collaborative) So if I made anything much bigger, I don't know if it would fit well on the printer. But I think once we are in person, and I get to like, try this stuff again, that's something that I want to experiment around with, actually print my design out to see how I can improve this, what needs to change. (iterative)

I have ADHD, SO I can think of what would be helpful for me to have, and that is what would inspire me to make something (self-empathy)

My idea for the first semester was modifying something physically to create a pill sorter or a pill container, which looking back, I literally just took an exacto knife and cut into a plastic container for like 45 minutes. Cause I didn't know how to do it, and I didn't have a very good exacto knife. I

	adapted in figuring out I wanted to make something myself. I don't think you need anything more efficient than just popping a lid to get a pill out. (wanting to improve an invention) It was fun brainstorming, but I think it was good that I shifted my focus over to this because I think the action of getting a pill out isn't what was difficult for me; it was remembering to do it and having something I could set up for ahead in the week. (honing in on the problem to solve it) So a part of my design, I think, the Echo Dot will just help it be a lot more versatile because I could set a reminder, "hey, you need to refill your pills this time on Sunday" (can incorporate existing technology) This really allows it to be more in the hands of the user. (artifacts are intended for others) In reality, all I'm doing is making just like a 3D printed frame for something that you put stuff into, but it allows you to be creative with how you use it, how you implement it toward helping you with medicine. (design is simple, but has a practical purpose)	
Developing a teacher identity	This sort of preppy White guy comes in with his fancy bow ties and stuff, khaki pants and stuff. So I feel there was an established trust that allowed a deeper intimacy with them to grow. (identifying as trustworthy) I knew how to communicate with them [City Academy students]. I feel like I gained their trust. (early perception that he would have taken a more human approach) Understanding that students are not motivated to "get good grades because then you'll be a good adult" "It's super fun" (babysitting students doing remote learning)	27

“It’s been really great” (babysitting)

Understanding that students watching their teachers on screens all day is exhausting (identifying as empathetic to too much direct instruction)

“when there’s no social aspect, what’s the drive to learn?” (encourages socialization)

I can’t explain to a 10-y.o., “hey, this is why you should enjoy learning”, cause I could just be playing Fortnite. (recognizes limits in persuading students to learn)

Getting good grades is not motivation “To get a sustainable job!” (recognizes limits in persuading students to learn)

I felt like a fish out of water, and it was an adjustment process, just to feel like “what do I do in a classroom”? How do you teach? How do you get a child to, like, listen to you and actually do what you want them to do? (acknowledgment that he is **developing** a teaching style)

It’s like, “why should you respect me”? Especially when we saw some of the high schoolers, these guys aren’t much younger than I am. (acknowledgment that he will be a young teacher in a hierarchical role even though he’s only a few years older)

And it’s probably like, “you probably have siblings that are older than me” (acknowledgment of small age gap between himself and high school students)

I think I mostly at the beginning I felt like I was out of my league.

I didn’t really know what I was getting into, and while that was happening, I was starting to understand things more. (acknowledging growth)

I believe that going there helped me realize that I do have a passion for working with different areas of special education.

Maybe like halfway through I started the nitpicking, possibly? And then, maybe just like - there were instances where I got frustrated with the staff and it was hard for me to empathize with them. (learning what not to do)

I am appreciating that my teaching style is going to develop, and I don't know exactly where it's gonna land. I appreciate getting to see that. It helped me too a bit, seeing that. (developing identity while learning from City Academy teachers)

Because as a teacher I realized I wasn't being very authoritative, and that's something that I am realizing now, babysitting. There are times when I can reason, "hey, there are times when we have to do this" And there are other times I have to be more stern. "Hey, we're going to do this" - and talk to you about why we need to do this. So I feel it was helpful for developing my skills as a more well-rounded teacher. (learning to be authoritative and not permissive)

I believe that going there helped me realize that I do have a passion for working with different areas of special education.

All I really knew about it and I was mostly passionate about was ADHD, and disabilities in that family. Because that is what I dealed with. But going to that school made me realize I have a passion for this type of learner, and learners who have to go through this. (developing a sense of diversity of exceptionalities, which fueled passion for SpEd).

I feel I also learned how to be more authoritative and how to set my foot down on things that need to be firm, and let kids know that they have to do a certain thing.

	But **I think also I learned how to establish a trusting relationship with students.** I mean, you can't just have pure authority, or most students will just either be afraid of you, or will just disrespect you behind your back. But **I think you also need an actual relationship with the student, where the student knows you and they know why they can trust you, and it's also good to have established rules.** (developing authoritative style) That's one thing I've been trying to do while babysitting. As mad as I can get sometimes, my one rule is I'm never gonna yell at you, I'm never gonna hit you, and he knows that. I told him, "hey, as mad as you made me, I never once yelled at you. I've talked to you sternly but I never yelled at you. And that's something that you can trust." (is developing an authoritative identity in multiple setting). **I'm trying to become more consistent,** and how do you work with a teacher where you don't know who they actually are. There are some classes in high school, I knew if I had something to say, I could just say it, sort of like in our TF class. Maybe something that was relevant? Maybe just a little bit of a joke? I can just say it and know the consequences of that action. But there's other classes where I will say things and I don't know the consequences. (importance of consistency) Just **knowing not to teach based off of how I am feeling**, but just off of something that I have established…(putting students' needs before personal moods/feelings)	
Role of helper or assistant teacher	Was babysitting during interview I would say the roles I assumed were, first off, as someone who was there to keep the students on track and help keep them focused. I think we were also there to help spark creativity and engage with the students one-on-one.	6

	I enjoyed engaging and being there and trying to keep the students on-task in a way that was constructive without going out of my place - I'm not the teacher in the class. I feel like we were most useful when the makerspace stuff started. I remember working with A. and I really enjoyed that because we just started brainstorming things that we like to do. But a lot of it, we were just there to help spark the kids' creativity, and me and Z. were talking about Beyblades. I remember one day, even before we started doing our makerspace projects, he was like, "I'm gonna make me a Beyblade"	
Role of friend	I feel like it was also an opportunity for us to create connections and friendships with the students. I think that was probably our biggest thing that we did - we were friends and we helped inspire to do things.	2
Role of observer	I felt a little out of role when we were doing the Global Readaloud, like I wasn't sure what my purpose was being there as much. (PSTs had fewer opportunities to engage with the students during the Global Readaloud) And so the observing part was great for realizing how you can be both firm and gentle with a student.	2
Making can benefit students with EBD	I think it allows them to have control over their education. And I feel that control is helpful for a lot of students. We talked about J earlier. It made him feel in control to be able to know things about what they're doing and create games on Scratch, show-off. That pride that a student can have in just your own creation. I don't know if that student is going to feel the same way about their math homework, or their reading homework. Is that	3

	something they're going to want to like show off to their parents, their friends? I feel this allows them to create something they have pride in, they're proud of, and that's fulfilling education that's going to make them want to actually learn.	
Makerspace should be for making	I feel like the global readaloud was a good way to use it, I feel it sort of started to drag for the kids as well. I feel they found parts of it interesting. **But it felt too much like just one of their other classes.** So I feel like you mix the cultural with the creative, and the making. And I think that's … the making part just felt like, maybe they were trying to have it be like a second class? **But it just felt like we disconnected from everything else.** "**Okay, we filled our quota of what we have to do because someone told us we have to do it". It's like "now, here's the fun part, where we're making stuff."** So I think the making should get talked about earlier. It would be awesome if they combined it with the cultural, like **how do we integrate these two?** **It's supposed to be where kids can make whatever they want, but** I think it'd be really interesting if they were like, "oh what if you lived in one of these 3rd world countries, and you had access to all this, what is something you would make to help you in your day? What would be a helpful thing that you would use? Would you want a backpack? How could you make something to carry things? Would you want to try to make shoes? I think that would be cool because it also gives kids inspiration. You're 11 years old, and what would you need to make? **(realizes that making should be about students being 100% in control, but with the realities of existing curricula, there is opportunity to give students *some* choice)** There's a lot of things I think they'd be interested in making. Zephaniah had his Beyblade and eventually he ended up making a catapult. That would just help the process and it would allow it to have some really interesting results if you mingle the two ideas. **But at that point, they [the two ideas] were just so isolated from each other that it was a 2nd class. (disconnect between student interests and the Global Readalous)**	6

EBPs are one of several ways to figure out what works	In-vivo codes	strategies	total
	I think research is definitely important. I think that's how you find universal strategies that you can explain to someone. But I think there's also strategies that they use where it's more difficult to explain why it works. When Mr. R. - I don't know how you do a research paper on gently playing with the kids and telling them to shut up. I think there's certain things that the teachers did that I would want them to be grounded in research. Like how you teach material, how you discipline kids. But I think there's also the element of tools of the trade that you pick up as you're a teacher that you can't really research.	EBP and intuition	3
	I feel like I'll probably go off of what I learned in my classes but then probably also go to my co-teachers for help. [sound quality deteriorates, but it sounds like he'd go to research for specific students] … learning disabilities, I will probably have to go ask a person for help because I think that's how I learn things the best.	EPB and other teachers	
	I'm going to be honest. I think I'd Google. Of course I'd want to try to find something that was more than just like the mom blog or something like that. I feel like I don't have as much good practical experience reading one of those things to find answers, a professionally written article. I think I have the experience to determine - or I am starting to get the experience - to determine bias and stuff like that. I am not as adept with professional research.	Google opposed to scholarly research due to lack of experience	

Appendix E

Bailey's Codebook

category	In-vivo codes	total
Perception of City Academy (procedures, building, faculty, staff	I was super excited because Special Education just has my heart. (excited about opportunity) And walking into a school that was purely for Special Education kids, I was super excited. And when I got there to tour I was in awe cause it was like nothing I'd ever seen before and so it was really cool I felt like this is what I want to do. It just kind of reassured it kind of thing, and it (the school) just sparked my interest. how [Mr. R} was interacting with the kids and how he treated them more like friends instead of student-teacher bonding, and I thought that was really cool. They [teachers] gave them [students] choices in a lot of different ways. I think they gave them a lot of choices with their behavior. "You can do this, or you can leave the room". You can sit down and talk to me about this, about how you're feeling, or go out. (fixed choices with a "right choice") Or whenever they [students] were coming up with their project, [teachers would say,] "you can go this route, or you can go this route, which one would you like to go do? I think those are the choices I remember. (teachers provided open-ended choices regarding projects). They let them choose what they were doing, but they also guided the choices. I can't remember the kid's name, but [Jamie] was working with him, and he was making like some kind	12

	of a robot, or trying to, and they would bring out materials. And, "which materials would you like to use for this part? Of the project, kind of thing. **They brought out materials, and it was like would you like to use this one or this one?** (teachers provided fixed choices) With their behavior, they had those sticker charts, didn't they? Little stars? And they kept up with them themselves. And if they had good behavior I think they got a star, or something like that. I know they had the sticker charts. And they used those to monitor their behavior. And I feel like that was - so they could see - like what the goal would be for good behavior, and like where they're at. And that way they can work to the goal. I really liked the atmosphere. I see myself doing more clinical hours there, definitely. I can see myself doing like my student teaching, potentially, there.	
Perception of City Academy students	I was observing middle schoolers. I think there was 3 or 4 of them and they each had their own way of thinking. Each of them wanted to do something really cool that I had never even thought of. Like one of them wanted to create their own videogames. Another wanted to survey people and figure out a problem, which I thought was really cool. [pause] at the beginning, I guess I was skeptical about how they would do in the makerspace and like how broad they would go with their projects and whether they'd be like little projects or if they'd be like really big ones that had a bunch of parts in it. And so in the beginning I was skeptical on what they would be able to do, their ability to what lengths they'd go to.	11

	But then over the year, I realized that these kids have like big ideas and big thought processes and those could come to life in the makerspace. And it was just really cool to see that	
	Sometimes, if a kid got on to something and he was really excited about what they were working on, like they would sit down and work on it, and get in the zone, on doing it. But other times, when they were trying to think through a process they would talk to others, "so this is what I am trying to do" kinda thing, trying to figure out the way to get there. (perception that the students collaborated in the makerspace)	
	Like I remember the two guys I was working with, they bounced ideas off each other because doing similar projects. And they were trying to make the videogames, and trying to create something in a 3-D printer, and so they were trying to figure out the programs of each, and they were talking to each other and me, about how to like do certain things on the programs.	
	They were working through it together, because the boy that was working on the videogame, the other one had already made a videogame - a couple of videogames - and so he would go through and show him the ones that he's already made, and give him ideas	
	Like I don't think I had that as a kid, like these big ideas of what they wanted to do.	
	And I really just liked talking to them and seeing their ideas, and showing me what they'd done before.	
Perception of learning and teaching students with EBD (meaning what students with EBD	I feel it [the behavior cards] can be self-monitoring by them seeing, like, where they are and where their goal is for good behavior, cause I feel they can monitor that. Like, how I am thinking about the sticker chart is like, it's like a day, and you get so many stickers for having that good behavior. And if feel if, **say a student had, if the goal was like ten gold stars, and say they had like five, then they could see that they**	4

learn and better approaches to teaching)	**have five but the goal is ten, then they can work harder to get to the goal of ten.** That's my prior perception. Going back to my internship in high school, with the one kid that had EBD. They would take him out of the room a lot whenever he would act out, he'd be taken to the behavior specialist, and he had those like fixed choices. Every day, for everything he was doing, "you can do this, or you can do this. Those are the only two options, and if you want to do something else, you can leave the room" kind of thing. So that's what started my idea of it. That was previous, before I went to CMA, and CMA was more, like, guided choices instead of fixed.	
Perception of make-based learning	I would say - I've had to describe to people what make-based learning is - whenever I'd be talking to my mom or my friends about going to CMA and talking about what we're doing, I would say it's an environment where there is so much that you can use that's at your disposal to curate something that you want. And you go through these steps, and you make like a plan on what you want to do and you go through and you learn how to do so many little things, like little tasks that you never, that you really want to learn how to do, but you haven't had a chance to. Like, this is your chance to learn how to sew, or learn how to 3-D print, or create your own videogame, the options are endless, and, so, I would describe it as taking an idea that you have, or something that you want to learn how to do, and you do it. You get the materials that are at your disposal and you do it. It doesn't happen 'boom!' It's a process, you have to make, like, a plan. I mean like when I first started sewing, I got excited because I could sew a straight line. But now, I've made a couple of weighted blankets, I've made, tried to make - masks, and like	10

	the first couple that I made were really scary lookin'. Now they look .. better. (opportunity to improve a skill) And so it's a process, it's like a learning curve that you have to go through. I think they (teachers) should think about it (students' cultures). Just because you don't want to risk the chance of offending somebody with what you're doing in class. (need to honor students' cultural backgrounds when planning maker activities) Like, going back to the example of the book they would read, it was like a Native American book and then creating some kind of representation of what they had. I'm thinking of when I was in elementary school and we did an Indian parade. And we would make like little instruments out of a paper towel roll, and noodles and beans. And go through and shake them. I don't want to risk the chance of potentially offending somebody because of something that we're making. And so I definitely think we should think about the cultural backgrounds, just in case, because you don't want to risk that, risk offending somebody because of what you are doing.	
Developing a maker identity	I brought my sewing machine home (during quarantine) and was able to keep sewing although there was a period of time I didn't have my sewing machine so it was hard, but during the summer I was able to keep working on it and that was fun but I was bummed not being able to finish it during the end of the semester. (making can happen in absence of shared space, but not as easily) My project was to make more of the weighted blanket kind of things, and more fidget bracelets. I would sew little weighted blankets using rice and other materials and the fidget bracelets were different things. I made some zipper ones out of some zipper and a little connector and then I made some scrunchies with different textures on them and stuff like that. So I was	5

	able to do that at home, kind of. (her makes are intended for people with sensory and other disabilities, everyday materials) And then I also created a website to potentially sell anything. I haven't actually sold anything yet but I did create a website to sell. I haven't actually sold anything yet but I did create a website to sell. (learning one skill led to learning another -- refers to Stager's "ecology of making") I saw them (the face coverings that Kennedy made during the pandemic), I saw she'd post pictures on Instagram. Mine do not look like that! (compares her skills to others) I am wanting to make a t-shirt quilt of all my old cross country race t-shirts. Cause at every single race I got a t-shirt and I don't wear them anymore but I don't want to get rid of them. My goal this semester is to make that t-shirt quilt - or this year, because I think it's going to take a long time. (upcycling)	
Developing a teacher identity	I remember thinking - cause I did an internship in high school and it was very similar to one of the kids that I interacted with in the internship. I wanted to know more about EBD because the student that I worked with during my high school internship - I was intrigued by how to help him and how to figure out the best way he can learn, and so when I was interacting with the kids at CMA, I saw how… what was his name? **(applies former knowledge to a current situation)** I think that the time in the space really showed me that these kids have so many ideas of their own and their thought processes are so much bigger and more elaborate than I would've imagined. So I think that really prepared me to let my kids think freely and support them in their big ideas and ..it taught me how to support the kids whenever they come up with these big ideas and how I can help them reach those.	5

	I want them (future students) to have the chance, the freedom to do their own learning. I just love the idea of it, and I really want my kids to have that opportunity, to learn something they've wanted to learn, and have their own freedom.	
Role of helper or assistant teacher	I worked with two of the kids specifically when I was participating. They would ask me questions about how to do certain things in the program and I had no idea - I'd never seen the program before, so I … when I got back to the dorm that day I went and downloaded these programs and I was trying to figure it out, that way I could help them better the next time I went. I'd say that the main way I participated was like trying to figure it out the best that I could, even though that they were so much more skilled in those programs than I was.	2
Role of friend	I kinda came into it trying to be a friend instead of a college student coming in to watch you. Especially in the 2nd semester I felt more comfortable in the space. I would talk with them, have easy conversations with them and see what they were like, see what their personalities were like, and be able to get to know them personally.	2
Role of observer		0
Making can benefit students with EBD	I think that, as a student with EBD, I feel like your whole day is planned out for you. Your lessons are planned out strategically, you are being told, 'you can do this, but you can't do that', no you can't do this kind of thing, so I feel that when they are introduced to making, they have their own freedom to learn what they want to learn and do what they want to do, and they don't, they're not being told 'no'. I think, like I've said before, it gives them the freedom to learn what they want to learn. So that whenever they are making, they can come up with an idea of what they want to do on their own,	3

	it's not a lesson plan that's already made, of what they're going to do that day, and they can come up with it themselves and therefore probably be more engaged in it **because it's their own idea and it's something that they want to do.**	
Makerspace should be for making	First semester they really didn't do a whole bunch of making. They did the reading project where they would read a story each week, and they would go through and talk about it, about how the characters were feeling and what was happening and that kind of thing, so **they never had a chance to participate in anything, just because they weren't making that semester.** They did a whole bunch of reading projects. I would have probably, if I were the teacher, I would have read those stories and found a way that you can make something out of the stories. Like, say, one of them was about Native Americans, and I can't remember the title of the book, but it was about Native Americans and we could make something that kind of correlated to the culture in that way, like have an idea over what the project would be, but let each kid have their own creativity with it	3

EBPs are **one of several ways** to figure out what works	In-vivo code	strategies	total
	If it works in the classroom, I say it works in the classroom. If research says it doesn't work, then okay. But if I can see that it works, and kids are learning from it, and are doing well with it, then I say it works.	EBP and experience	8
	Like if they are engaged and really understanding what they are doing and getting excited about it, and they are getting things from the project, like	"Whatever works"	

learning more things that they didn't know before, I would say that would be a successful project.	
Early in my career, I would probably go off of, like kind of research-based practices, but I'd also talk to my co-workers and see what works for them.	EBP and other teachers
Or, if I'm in a school, like in my county where there is only one special education teacher in an elementary school, and so, reaching out to other people in the community that are special education or reaching out to other people in other counties, and talking about what works for them, what works for their kids.	
I would research things to get ideas, and then take those ideas, go talk to other people that have been in the profession for longer, not just starting out, and see what works for them. And how they've taken those practices, and like, amended them into something that works for them.	
Cause I think there are more creative ideas on Pinterest and more like arts and crafts kinds of things, or making things, project-wise instead of the other [pause] things (in response to my question if she'd access the CEC website). I don't really know what's on those, but right now I would go to Pinterest because of the creativeness it gives.	Pinterest due to lack of familiarity with scholarly resources
Yeah, like when I did my internship when I was in high school, we'd make little lessons for the class, and I would go to Pinterest. It's just what I know right now.	
I don't even know what that is! (The CEC website)	Lack of familiarity with

	scholarly resources

Appendix F

London's Codebook

category	In-vivo codes	total
Perception of City Academy (procedures, building, faculty, staff	I was in a classroom with Dr. N. more.She's *awesome* So as I was working with them and I'd get to the school and see how the school was handling things, it was never against the child unless the child lashed out. It was always, 'we're going to do this together'. It was a together thing until it got to that point. My perception of the school and of the students grew to be more of an understanding of the caring aspect. It was always, 'ohh, let me tell you about the school I went to!' it was never 'ugh, it was *this* school'. Let me tell you about this school. There is an amazing school with an amazing staff. That was always how I talked about it. I still talk about it that way. it's a beautiful school and they have amazing things, and oh my gosh! And I'll just talk about it for an hour and not do my job That's what I really loved about CMA. It's one of the schools where they let you do something with the teacher's permission. And the teachers are very open to letting you do it.	18

I never saw a teacher not pick on a student unless it was a specific one and it was, ‘hey. I just want to know if you are listening’.

It’s a very open classroom. It was a very comforting, ‘please tell us what’s wrong’. I observed a lot of that between teachers and students.

Mr. R would lovingly pick on the kids. And the kids would pick on him back. It was never an ‘ohmigod I can’t believe you said that’.

It was ‘watch me!’ ‘I didn’t think you could do that. C’mon show me you could do that’ and he would push the kid to do it. And when the kid finished it, he’d be like, ‘I didn’t know I could do that, Mr. R.’ - ‘Well I knew you could do that, why didn’t you?’ That’s a lot of what I saw.

It was a give and take. It was ‘I give you this challenge, take it, and give me back what you did.’

In music, I noticed ‘pick a poster’ because he [Mr. M.] would do a Musicians of the Week. “Pick a poster, write a fact”. So you would get to choose both the poster where you want to start at, and the fact you want to do. I did get to see some choice-making. And a lot of the times, kids were really happy with doing it.

They had the little sheet, that was one part of it. That sheet showed them the points throughout the day for every class. They knew however many points they got could be a reward at the end of the week. Whether it be like candy, toy, something like that.

Mr. M. had a more specific ‘this how we’re gonna do it, and if you can do it, you know what you’re doing. You know how to stop your problems’.

Mr M hardly ever had to get on to the students, other than, ‘hey’ I’m over here, not over there with

	her, but right here [giggles]. That was the only time he had to "nick" at a student. Where a kid would be so upset that they would just walk out. And I watched how teachers handled that. It wasn't, you know, 'get your butt back here' or anything aggressive, it was 'talk to me', which I think is an important thing for teachers, especially trying to connect better to students,	
Perception of City Academy students	"higher risk versus typical kids in a regular school" a little quirky, couldn't really get 'em to talk he was all over me, 'you gotta sit beside me! You gotta sit beside me! You gotta do this with me!' So going in there I had a little bit of perception, but that was only toward the autism. It wasn't towards anything else. (prior experience with people with autism only) The students usually were very observant. I hardly ever noticed a student that wasn't. Most of them are very forthputting with answers. They weren't hiding. But even in the small classrooms you'd have six students, and 5 of them, minus the one kid who was just very shy and **didn't know how to talk or didn't know how to answer properly** - or felt he didn't they were all going, 'I got it! I got it! Let me know, let me know.' if the students started getting upset, they would back away. And Mr. M. would be like, 'okay. Back away, do what you gotta do'. They were self-monitoring it so that they didn't get in trouble Another time was a student was getting upset. And one of the students causing the issue just moved away. 'Hey, Mr. M., can I go sit over there? Can I	10

	go sit beside this student?" And it separated that issue - the students weren't going to yell across the classroom. He was against it and they didn't want to upset Mr. M. They separated themselves and created that space needed to not have a problem. So they were monitoring what they did there too. That was something that occurred quite a bit.	
Perception of learning and teaching students with EBD (meaning what students with EBD learn and better approaches to teaching)	I have my diabetic brother, my special needs cousin, and my special needs brother. So I did have a perception of how you're supposed to handle situations when they come up. My cousin is extremely autistic, my younger brother is in that medium range, and he can socialize but he's very much an awkward person. (perception that she's knowledgable) They're the little kits where you do the lights. You electronically set everything up and you can turn a light on or something? One of the students had it out. He was playing with it. A younger female student happened to come over and sit down and was like, 'what are you doing?'. The student playing with it started discussing it, describing what he was doing to the other student in a way that she was like, 'oh! Can I get one? I want to try'. And she actually did it. One other time I saw it, ironically, I was the student and the teacher, and the student was the teacher in that matter. They were teaching me how to use the little ball things, where you have the app that you roll around. They were teaching me how to use it. I was the student in one scenario, and he was the teacher. And I'm sitting there, like, 'I'm gonna break it'. It's so small. That was fun. They (PSTs) need more exposure to what [long pause] EBD is, and they need more exposure to how to handle special education in general. EBD is a big one because you're going to have multiple students that are going to go either way. They're going to be on the small end of the spectrum that can be still in school, and you're going to have	5

	them on the wide end of the spectrum, in schools that we go to. I think PSTs need more experience in understanding all of that , and also understanding makerspace is a great way for both students that are just - I can't think of a better word - normal, and those that do need a little bit of extra help.	
Perception of make-based learning	In makerspace you choose what you want to do. In the makerspace, it was more peer-to-peer because sometimes they happened to be together, and it was 'hey, we can only have one toy for our table' depending on the time, so what do you want to play with? What do you want to do? So the student, especially with peer, started talking about 'hey, this is what I like, this is what you like, this is what we can do, this is what we shouldn't do' (collaborative) Making in a space makes it a makerspace. You draw up an idea that could be potentially beneficial to you or someone else and you kinda use what you got to do it. You might wanna make the table and you have so many pieces of plywood or so many pieces of 2x4s. You make it whatever you think would work. And it's with whatever you have. When it comes to my job, I do a lot of that when it comes to putting stuff in bags for customers. I make my own little organization that works. (compares to creative process at work) In the classroom it's making your area to where it's a comfortable area for students to express your own ideas. So a makerspace may not just always be what you make, but it's how you make it and how you make it work for your students. (more about atmosphere than the final artifact).	9

	There's a lot of student-to-student teaching there. It was a lot of that.	
Developing a maker identity	It did kinda make it a little hard with the ideas that we wanted to do, because some of us had to change our original perspective of our makerspace project. (need to adapt) I wanted to do it to where I could donate it at the end (artifacts can be for others) but school got shut down and I was stuck at home, I didn't have the necessary materials to build it the way I wanted to, and then I couldn't give it away. So I ended up having to use what I had at home, which was cardboard and a hot glue gun. (need to adapt) Which worked out in the end, but it still is one of those kinda ...it disrupted what we tried to do. And it had to make you think more outside the box for the things you needed. (need to be more creative when unexpected things happen) My best friend and I sat on the floor and made that. (collaborative) She said, "we're just gonna estimate how big these are gonna be. Keep the [inaudible]? That's a good idea". (tinkering) It ended up being recycled. I didn't give it to my niece like I wanted to, but I haven't seen her in forever, oh well. (didn't go as planned)	7
Developing a teacher identity	I am a science and social studies, middle school science and social studies is what I am doing. Even though I am slightly over here going 'maayyybe I might go dabble? Because I like working with special education.	23

People say middle school is the worst, kinda like middle school, but that's the thing that I love about it - the challenge. And it's something I could do. I could work for [City Academy], that'd be awesome!

I want to finish my degree first because my family is riding on me finishing. They're like, 'you gotta do it. You gotta be the first.

So I wanna finish it, but maybe after I finish doing all the things I need to do, finish this, and pay off what I do need to pay off. Maybe, I might go back. Because I will have the majority of the credits. And then I could sit there and dabble in the special education. It's K-12, so ohhh, middle school special education? Ha haa!

I learned how to handle certain situations. Like students lashing out. I did experience that once or twice.

'talk to me'. Don't push me away, tell me what's wrong. I did experience a lot of that, and it prepared me - this could happen. Be prepared for what could come.

It also prepared me on understanding that every student comes from a totally different background.

That every student is going to sit there, and **not every student has the same thing wrong with them**.

You could have 24 students and 3 of them could specifically have dyslexia, but one of them could have dyslexia for Bs and Ds. One could have dyslexia for Js and whatever.

It's understanding there's different parts to it. Not just one set circle. You're going to have spikes all over that circle and you gotta understand how you're going to handle all of that.

I think you need to understand that certain groups of students may not exactly understand or like what you're gonna teach, or what you're gonna make. So it is a little bit of a cautious decision to do it if you know if a student comes from a specific background, to dive into it to make sure that what you're gonna do, what you're gonna say, how you're gonna act does not specifically offend or cause issue at a later date.

So it is important to learn a little bit more about your students' culture, especially with the United States, especially in the South, having more students of different cultures popping up,it's important to have a more diverse brain functioning, a better understanding to make sure you're not gonna upset them.

Preservice teachers need to understand what comes of it. It doesn't matter if you're gonna teach - I'm teaching middle school. There's always a chance I'm gonna have one kid or a few kids that are not gonna be standards that - per education standards - completely **normal.**

They are going to have one or two **completely crazy abnormalities** - dyslexia - that you're going to have to sit there and figure out.

I would understand that if having a student in the classroom who is from that culture and it's hey, 'are you okay if we explore it as a class, and that's something they do. But if it's something that isn't exactly planned out and understood, it could be taken the wrong way. So it's one of those 'understanding before you do it'. And I think certain teachers, especially new teachers who don't have to have that experience per se, or don't get that experience, it causes so many riffs and that might be the reason why so many teachers leave the field, it's they don't understand what comes with it.

One class that you really don't do anything on (SpEd) , I think it needs to be a little bit more spread out. Because if more teachers had the

	experience at CMA that we get, I think they'd be more understanding and more cautious of what's gonna come.	
	I want to go back and do more. I want to go maybe with another(City Academy) teacher, and maybe get **more experience in an actual classroom versus what most schools would call an elective because I want to see exactly what a teacher who they have to see all day handles a situation versus a teacher they only see for about 45 minutes a day.** (elective teachers do not have "actual classrooms")	
	I want to go back as a volunteer. I would love to, if I ever got to go back and actually sub or something. Because I did get to work with a substitute who used to do [former name of the school]. So she did get to help.	
	I would love to go back one day as a substitute and actually get to be that person in that seat who gets to do that. But that seems a little more far-stretched because **I don't have that one little nick of special education degree** I need. (wants to do more but does not yet have credentials)	
	I would go back as a sub [banter] but even the assistants that go with them all the time, even that would be cool to do for one day. I'd get to be that person who is there for the whole day, that they 'hey, I need your help' I can go do that. I may never actually get to teach there, but it'd be cool to do one day of subbing or being that specific person who is there for that student. That'd be cool. (wants to maintain relationship with City Academy)	
Role of helper or assistant teacher	I was getting more comfortable in how to talk to the students, and this was back in fall. So now, when I got to see them last spring, I was way more comfortable with the students. I sat and talked to them, and helped them with whatever I could.	13
	Then I got to be more of an assistant so to speak. I was there if Mr. M. needed, "hey, can you read this	

for me. Can you help this student? I assumed the assistant teacher role.

I wasn't just sitting and observing, I was actually doing something.

You don't see that in a lot of the other clinicals because so many of the other clinicals are set in .. you observe. But with TFs and all of that it's, '*well go do it'*. 'Don't just sit there and watch.

If the teacher's okay with you, help.' Do something, get your hands-on experience.

If you don't, then you're not learning anything. You're just watching.

You can't go in with a notebook and take notes and learn something as much as if you're 'oh, let me go in and let me go help!' Let me do this, the teacher needs help.

I assist the teacher in any way I can. That was something that really helped.

It was the hands-on. It was learning how to take on situations.

I wouldn't say 'crisis averted' because it wasn't specifically averted, however, I did get to experience the first half of an issue, where I sat with the student, and 'hey, talk to me. What's going on?'. So I did also get that quiet time with that student, that one-on-one, where you just, 'talk to me'. It didn't end the crisis. Later on in the day, apparently it blew up, but the student felt comfortable enough with me to talk about it. And I thought that was awesome.

My final act was helping Mr. R. I became a second a little bit. It was me and another student.

I got to be a second of, 'hey, can you help this, can you do this? I trust you to do this, and I'll help you do it.

	I did get a bit of that assistant teacher role which was nice because I wasn't just sitting. I was actually doing something.	
Role of friend		
Role of observer	I observed the music teacher, Mr. M., and I also observed Mr. R. I did every now and then get to see other teachers but I can't remember their names. I'd go in for that small period before lunch. For the first two weeks I sat around in a corner observing how Mr. M did it and how he talked to the students. At first I was just an observer. I was learning - that was my first part. Learning how the classroom worked.	3
Making can benefit students with EBD	Controlling emotions. Controlling how you act out, expressing yourself. That's a big one. Learning to take and to give to a certain extent. You take something that you need, but you give something back in return. I think with EBD and a lot of other learning disabilities, it's something that gives you an ability to express what's wrong, express what's right, and you learn responsibility at the same time of 'this is what I can't do, this is what I can do well. Let me learn how to contain it. And that's what a lot of people say about art. It's their way of expressing themselves when they're upset, when they're hurt, when they're angry, and they're happy, and it's a good way for EBD students to do it too, because it's not just 'I'm gonna paint'. It's 'I'm gonna build a rocket. I'm gonna make a lava volcano, I'm gonna blow something up and .. it gives them that availability to be able to do it.	5

Makerspace should be for making	I wouldn't want to change what he did. I might want to give more time for the kids to actually make stuff. Because I noticed, especially when there was a book - the book was always inspiring, but if there was a book, it took up a lot more of the time 'cause they only got, what, 30 minutes? So it took up a good portion of the time. Sometimes the kid didn't get a chance to do something. And also that library aspect, that made a little bit of an issue. But maybe making it to where one day is the book and the library time, and the rest of the week is that makerspace idea would probably be a good way to do it because I noticed sometimes that didn't always line up right. It didnt always work that way.	4

EBPs are **one of several ways** to figure out what works	In-vivo codes	strategies	total
	Cause some students will understand some things a little bit other than others. Maybe having students do the peer-to-peer connection? Versus a teacher connection? So it's 'okay then, do it this way'. Hands-on learning is one thing a lot of students say, and research has backed up to say that hands-on is the best way to do it. But say my one classroom, one semester loves watching videos and doing notes. It really depends on the atmosphere and the setting of the class. As to what strategies will need to be used to best meet the needs of the students.	EBP and knowledge of students	7

I think I am going to both (consult scholarly research and Google). I am going to go in that middle spot	EBPs and Google
And I know I am going to remember this, because this is an awesome period of time - I am going to remember going into the classrooms and seeing those (EBPs), so it's going to be stuff that I already knew, and then maybe Googling new stuff.	Course content and Google
Like 'oh, I got my roster 2 weeks before, and there is a not beside this student that says that they have a learning disability that involves dyslexia. What activities can I do that match what I need to do in my lesson plan, that the student can do that can help with his dyslexia? I have a slight dyslexia and a number problem, and I deal with that all the time. [audio deteriorates]..Figuring out ways that can make my classroom more accessible to them, fo**llowing what I already know, and what Google might say**.	
Who would be you guys. I'm hoping that - a lot of people talk about how TFs is something you stay connected to, you talk to everybody. Maybe you, Abby, or Dr. C to figure out this is what I am having a problem with.	Course instructors
But with the research and the experience that you and Dr. C. have, those are two great resources that I have, to know I'm gonna get a good answer, that could probably push me further to what I need to do for just one student.	Course instructors can guide research

Appendix G

Alex's Codebook

Category	In-vivo codes	Total
Perception of City Academy (procedures, building, faculty, staff	The security level that they had kinda stressed me out every time that we went.I understood why it was that way, but it still, when we would go down to go outside, they'd have to scan us through 3 doors. It didn't feel like a school. But I could tell that they put a lot of focus on resources like the makerspace. The library, you could tell, they put a lot into that. But the gym was not very big at all. So it made me wonder how they decide how to put resources into the school and things like that. I wish he'd (Mr. R.) focused more on student interest; it didn't seem like he did for the first semester. He seemed like he …. Being a special ed major, I get taught all the time, like "you can't do this, you can't do this, and there's a fine line where you could really upset a student". And it seemed like Mr. R. walked that line so easily. He (Mr. R.) knew what was too far and what wasn't, what would upset somebody and what wouldn't. And he did just enough to make them comfortable - the students. Like he joked with them, probably more than my teachers ever joked with me. Because they do kind of play rough, he would play rough with them.	12

	At first it was off-putting because I thought, "this is not how a teacher acts". And then I realized how comfortable it made his students. And so, I feel there is that line and he is just perfect at staying right on it. Mr R. was rougher with his students than I think I would ever be allowed to or be able to. But I think it worked for his classroom. So it made sense. But they drill into our heads that "They're fragile!" You can't joke about this, and this, and this. I mean they (students) had their sheets, their little scoresheets. And that was, I think, the only kind of self-monitoring that I observed. It was not necessarily like monitoring their own behavior, but monitoring what they were doing when the teachers were looking. Because they wanted to - they didn't want to lose their scoresheet. I would love to intern there But I actually really would love to see the classrooms. Like how they go with core curriculum and things like that. Because **I know that not every teacher is like Mr. R**, and I'd like to see what other strategies they use.	
Perception of City Academy students	The first student that I observed was J. That wasn't how it ended -- he wasn't there at the end. But when I met J I thought that he seemed very unmotivated to work. But it seemed that he was frustrated that he felt like he couldn't do it, not that he didn't want to do it. (refers to student by name) I thought he (J) was really sweet. I liked J a lot. I liked spending time with him because when he did start to focus, he really, really tried.	15

And I also remember thinking like he (J) seemed lonely. He didn't talk to the other kids the way the other kids did. And it made me sad because he knew, but he was choosing not to.

It was when we were doing global readaloud. I remember multiple times he (J) was asked to read. He said he wouldn't do it, and then when they would fill out the charts with the information, he wouldn't try. I don't think that he wasn't capable of doing it. It was just that he didn't think he could, so he wouldn't.

He (J) seemed very stressed out about it (reading out loud).

He (Z) was trying to build a catapult. He was completely the opposite of J. He knew he could do it; he wanted to do it; and he didn't want help, but he did want to tell me about it.

He (Z) explained his entire project to me. And when I asked "have you thought about this?" he was, "yep! I already know. Yep! I already figured it out. And I was like, "okay! continue please.

Until they were doing the maker project, it seemed like none of them really wanted to be there. It never seemed like any of them wanted to walk to that room. Any of them, if you asked them to do something, didn't seem super comfortable with it. Most of them didn't do all the work they were given.

I remember one time we went there was a chart on the board. While they were reading the book they would fill out all this information. I didn't see a single one do it. So it seemed like none of them wanted to be there,

and then once they started the maker projects, all of them were so excited to tell us about

what they were doing and why they chose to do it. And they were actually trying to do it. And I was like, 'okay, you guys just didn't like that stuff. That makes sense'. My view definitely changed of the students.

One of the students was trying to code his own videogame. It was very small, he only had one objective - he was trying to teach himself how to code.

The last student that I really talked to about his maker project, I don't know if he had one yet, but he wanted to build some kind of tower. He said something along those lines.

I watched J, he had ... a really hard time. He'd get angry really quickly, or he'd get frustrated, and he just wouldn't focus after that. I could tell that he wanted to not be angry, but he wouldn't do anything to stop it. The only thing I ever noticed him doing - he would write on himself when he got frustrated. He would just take a Sharpie and write on his arm. He liked writing our names; he would ask us how to spell our names and he would write our names. It seemed like that would calm him down a little bit but I only saw him do it a few times.

I think they got a good sense of pride when they got a certain number of points (on the behavior cards) or did a good job and got the points. I feel like then they really took ownership of the sheets, and "I did that" - feel good about it. But I also feel that a lot of their behavior wasn't because they wanted to behave or they were having a good day - it was that they knew what their teachers were looking for, because of the sheet. They knew what they could and couldn't get away with.

I think it's a bad thing because I don't think they (faculty) really were actually trying to change behavioral patterns. **I think they**

	(students) were just trying not to get in trouble.	
Perception of learning and teaching students with EBD (meaning what students with EBD learn and better approaches to teaching)	Z was really good at making his slideshow. He showed it to me the first day we came back in the spring. And it was amazing. It had transitions, he was working on organizing all his information, and then one of the other students who ... but he couldn't start his Powerpoint. **He didn't know how to use Google slides, and Z helped him. - He started his Powerpoint. But I think that's the only time that I can remember that we went there that I saw peer-assisted learning.**	1
Perception of make-based learning	as soon as they started making, I even felt like I was in a better mood when I went. And you could tell they (CA students) seemed a lot more interested in what they were doing. I could tell none of them (the students) were really interested in the book they were reading for global readaloud. None of them wanted to be reading it. They didn't want to write about it; they didn't want to talk about it. **But as soon as they got to pick what they wanted to do, they were all really excited to tell everyone about it.** When we got to the maker projects, I saw - not really collaboration, I just saw them kind of wanting to talk to each other about it. Well, that is collaboration, but they weren't working together on anything or getting input from anybody else, it was just like "this is what I'm building, isn't it cool?" Which is great, I mean. 'Cause that was honestly the first time I saw them talk to each other. He had diagrams and everything, explaining how he built it, and what supplies he used, it was good. He just wanted to make it	8

	Make-based learning, I would describe it as .. I'm gonna try to be really professional … "an educational strategy teaching students independence through making things". That's the best I got! A makerspace is an area with resources focused on make-based learning. (The resources are) Everything! I don't even know, umm, technological resources, artistic resources, research material, I don't know how to explain the rest of it. **I think technology is the biggest part, the broadest area.** -The little robots that draw, and all that stuff. But I really enjoyed at CA, seeing them making, like how excited they were that they got to …'Cause I don't remember a time in elementary or middle school, maybe in high school, that I got to pick what I was doing for a project. And you could see how much better the behavior in the classroom got when they were focused on something that they wanted to be focused on	
Developing a maker identity	I went once (To the SCU makerspace) without us having a meeting in there. The one time I did go, I went to one of the classes. And it was really fun. So in general, I was losing time at [university library]. [The makerspace] wasn't a huge loss for me, but I do remember I was looking at another class later in the year. I was upset I wasn't able to go to it. I think it was - something art-based. It wasn't super-techy. I can't remember what it was, but I had it in my calendar and I was very upset. (more about losing access to workshops than the collaborative space at the university during the pandemic)	5

	I was working on a blanket (during the Spring, 2020 semester) and I don't think I finished it. It wasn't too difficult to do my project outside of the makerspace **just because it's knitting**. **It didn't require any access to technology or resources.** (prefers more analog projects) I think I just lost a lot of motivation to do it when everything went down. But I'm making a new blanket right now. I haven't quit knitting. I didn't like, stop. (continues to make artifacts, but has slowed down during quarantine) I keep it under my desk so that when I'm working I can knit [shows me her technique for a blanket and the dimensions] If I wanted to make it bigger I'd probably just sew together with other pieces. (making as a hobby, diversion)	
Developing a teacher identity	But my minor is also child and family development, which focuses a lot more on trauma-based education. I think it's that that motivates me, but it definitely comes from my special education classes. I think yeah, but obviously not right now. But I think mine (teacher preparation) also comes from background too. Not just college education, but high school and some family experiences. I think the biggest difference is that people in the dual program - like when we go to schools for other classes, my priority has always been wanting to go to the special education classrooms. I want to see how they function here, whereas most of the dual programs go to the younger kids. Which is fine, and I've done it multiple times. I don't think they observe as frequently as I do because they have joint priority.	12

So I think I get to see more, of like ….. ‘Cause I remember the thing that really made me research trauma-based education was we went to a school, and I was the only person who wanted to go to the special ed room. (distinguishes her identity from others)

So I spent the entire time there. And there were two students that were siblings. Both were in the self-contained classroom. The boy, who was a little bit older, had pretty severe autism, low-functioning. And then his sister had .. a lot going on. That’s all they told me. She was non-verbal,in a wheelchair. So they took her away to go do something and he just started crying. And he was screaming that they were taking his sister and they weren’t going to bring her back. And he cried so much that he threw up. And they said he does that every day when they go for her to take her medicine. Every single day, he cries until he throws up because he thinks that they’re not going to bring her back. And I was like, is there something that made him feel that way? And he was like, “I think she was in the hospital for a long time when they were a little bit younger, and he didn’t think she was coming back. And I just realized how difficult that must be as somebody on the spectrum - like how hard it must be to come back from something like that. And I was like, “That’s a big part of how he functions in school”. - Having his sister there helps him focus because he doesn’t have to worry about it. And so, they tried really hard not to separate them. But he couldn’t come with them to get her medicine.

It was a big thing every day, but that, that really put it in perspective for me. That I was the only person in my class that got to see that.

First, it made me switch... I was going to do adapted curriculum because my initial goal was to have a self-contained classroom with students with severe disabilities. But going to CA, I realized that I wasn't sure that I wanted to do that, and I really enjoyed working with students with emotional/behavioral, or more .. I don't know how to explain it, just like higher-functioning disabilities.

I preferred that because it allowed me to get to know the student as a person, and how it affects them as a person, whereas I think with low-functioning disabilities, it seems like that has to be your priority as a teacher - the disability and not them. And I didn't like the idea of that, so I switched to general curriculum.

That was the biggest impact that CA made on me, was changing what I thought I wanted to do. Because I really enjoyed it.

So at the end of college, I won't be able to teach in a self-contained classroom, but I will be able to teach like a high school English class that had students within it with disabilities. I would be more equipped to do it than just a high school English teacher. That's what I switched to.
That was definitely the biggest thing that CA did for me. The entirety of the time that I spent on special education was with severe disabilities. It's super amazing; it's super rewarding. I loved every minute of it but it was tiring. It's hard.

I've been a big advocate for the past few years of post-secondary education opportunities for students who have disabilities. And I think I'll have more opportunity to push for that with students that have the higher cognitive ability -- if I can just push them to try.

	there is a lot of assumption that students know how to do, like, crafting things. Because you think, that's what you do, they're kids and you do crafting things when you get home. And if you don't have these resources, "I don't know how to use a stapler" - that would sound weird to me, because I had a stapler growing up. Things like that. It's hard to talk about things, especially in a maker setting, that without sounding like you would expect them to know how to do it. And that's how you end up leaving students out. (developing sense of cultural responsiveness)	
Role of helper or assistant teacher	So I never tried to be part of the actual making, but I definitely a few times showed them how to use something. I assumed the role of the teacher for a small amount of time. I also made sure to ask them questions so that they felt they were as knowledgeable as possible about what they were building. Some of them were - the student that was building a catapult -- knew when catapults were invented. Before I asked I was like 'wow, you did research, okay'. But it was mostly just me asking them questions about why they were building what they were.	2
Role of friend		0
Role of observer	I know we had talked about how we were there to observe (This was during a whole-class meeting with a City Academy admin) but we wanted to be a part of it as much as we could.	1
Making can benefit students with EBD	Like I said, the sense of independence. I think a lot of E/BD kind of take independence away from the students that it is inflicting on them.	2

	Because you feel so regulated after a certain amount of time, they have to be monitored, their behavior has to be monitored, they just feel like they're babysat to a certain degree. And even the scorecards, I think it took a lot of independence from them. I can see why the school did it. And I can see how it was effective in keeping behavior in line. **But it just didn't seem like they felt any kind of choice. I think having that time to go in and to work on something they pick, use materials that they picked, presented the way they wanted to present, that brought back that sense of independence for a lot of them.**	
Makerspace should be for making	I think I would have made global readalout a lot shorter. I also think that library time - I feel that took up much of the time they had for class. It took 20 minutes for them to turn in library books. I don't know if he was a choice in that or not, but I feel there was a better way to do that, maybe. I definitely would have introduced the maker project sooner. I mean, he did a great job with them. I would not have been able to do what he did -- how I am now. But I definitely would have introduced the maker project earlier, and I think I would have focused more on like .. discussing. But within the makerspace, I think the entirety of first semester I didn't even see them sit together. It was like one, maybe two people at a table the entire semester. There wasn't a lot (of collaboration). I remember during the global readaloud the book that they were reading, they were	8

	making fun of it. None of them wanted to read it. And I felt really bad because I tried. But if they weren't interested in it, they weren't going to be interested in it. I know they were always excited to pick out their library books for the week. They had that choice but in the actual class, I didn't see a lot of choice until we got to the maker project and they got to pick what they were wanting to make. Up until then, there wasn't a lot of choice in the classroom. I actually can't remember any instances.		
EBPs are **one of several ways** to figure out what works	In-vivo codes	strategies	total
	I think as a first-year teacher, like when I first move into teaching on my own, I'm gonna want to at least find a foundation for my practices. I want it to be evidence-based, I want to know this isn't just something that I made up or not actually working, just seems like its working. Things like that. I can say it worked for my classroom, I definitely want to be doing whatever works best for my students. But I do want to at least have some kind of foundation of scientific evidence.	EBP as a foundation	9
	I want there to at least be a foundation of evidence-based practice in my classroom. But I don't think I'd necessarily be angry if I found something that worked and it wasn't evidence-based, because I mean all practices	Whatever works	

have to come from somewhere. If I come up with something it can be evidence-based later.	
I'm hoping, based on my students' reaction to it (if a strategy works). Because I haven't had, in the grand scheme of things, that much time in the classroom, **honestly, I'm not sure what all goes into really seeing if something's working for your students. But I like to think that I will be able to tell whether or not my students are responding to what I am doing.**	intuition
my biggest resource is going to be other teachers.	Other teachers and then research
I'm all for finding ideas online and finding articles that back things up, but I get very overwhelmed by the idea of going online and having millions of options and I have to pick one. And I'm also very social, so I think going to other teachers and seeing what works for them, and then doing research on that specifically, that practice.	
I see that as a better point A to point B than just trying tojust find out of millions of things. And I also feel like other teachers are going to know better than -- teachers I know and I trust (in my mind) are gonna know better than a random person on the Internet, who could've made this up.	
I've always found that teachers that have been, obviously, doing it for a longer than I will have been doing it as the best resource in a school.	

Appendix H

Kennedy's Codebook

category	In-vivo codes	total
Perception of City Academy (procedures, building, faculty, staff	He (Mr. R.) was really nice. He kept everything on track, and if the students were going off-track, he would pull in them to something more interesting. he would get all of his lesson plan done. I thought it was different from where I went to school. I don't want to say it was hard to adjust to, but it was different. I didn't know what the school layout was or how the teachers treated the students. It was eye opening because I got to understand how the teachers knew about the childrens' disabilities I was stuck there when there was a hurricane. So I had to stay after for a long time. The teachers were trying really hard to get all the kids in order without them freaking out. The one student that was (pause) aggressive, they gave him a coloring page and Crayola markers and he was not having it. He was upset about something and he threw the markers on the ground, crumpled up his paper, and I was like, "what's going on?". And he was like, "I don't know! I don't want to sit down!". And I was like, "well, you have to for your safety". Then the teacher pulled him aside and gave him timeout, and he had to sit across the hall with another teacher. I don't really see that in my elementary school, from what I remember. I don't remember teachers doing that. Obviously, teachers pull students aside. But the way that	9

	she talked to him was so *scary*. And I didn't even want to look at them. I was like, "what is going on?" (response to my follow-up question about observing techniques that would not work with students) Just some words that the teachers would use and the students would just not care. But *I don't know*, it was just very odd. (Post-pandemic), I would definitely do clinicals, and **maybe if they do teachers' assistants**, or maybe an internship? (this is interesting because the other participants spoke at length about the paraprofessionals).	
Perception of City Academy students	I was sad because I was able to form a connection with them, the three students in my class. It was sad that I didn't get to see them. I was like, "oh, I'll see you next week!", but then I never came next week. Two of them are nice, kind, and very shy. But the other one, if it's not his way, he'll start yelling or throwing something. Or if he really doesn't like what's going on, he'll not pay attention, draw random stuff in his notebook. When "you gotta draw a pond or something", "I don't know how to draw that". I'm like, "It's okay, I can show you". So I did a little for him, and I said, "now, you make one". And he said, "oh, okay, this is not that hard" I guess because my students were so young that they had stuff they needed to complete throughout their time in the makerspace. So it's not like they had a say, unless they were working on their creations. (in response to asking if she observed teachers offering choices to their students--too young for an open-ended project?) I guess 2 out of the 3 students were (self-monitoring) cause they wanted good points on their sheets. But the 3rd one, he did not care. He was like, "can I go to the bathroom?" And the teacher was like, "You can, but if you go now, you can't go again later today" and he was like, "okay" and he just went. And I was like, "dude….".	10

	Whenever someone had a problem with their project, they would all help each other. They wouldn't let one student fall behind. They would make sure they were all making. I don't want to say mentoring, but I would say helping. Like one student would know how to draw something that the other one didn't, so they would help each other with that. Two of the students sat together, and they were like, "do you know how to draw a football?" And the other guy was like, "yeah, I know." And I was like, "You got it, because I don't know how to do it" I feel my bond is too strong to just leave them there like that. If I was a student there, and a college student said, "oh, I will see you next week," and you don't see them ever again (due to the pandemic), that makes me sad.	
Perception of learning and teaching students with EBD (meaning what students with EBD learn and better approaches to teaching)	For us, it might seem they're [the teachers] too strict on the students, but it might be the perfect way to communicate with the students even though it's not strict for them. Because they're used to it. If we came in as teachers and said (sing-songy) "you need to sit down", they're not going to listen. You have to be like (sternly), "sit down". going into college, I didn't even know what EBD was. So I learned it from your class. I feel I have a better understanding of [EBD students] because I was able to go into CA, and work hands-on with them. **And it's not that I am going to treat them any differently.** This sounds wrong, but I think I would be nervous. Emotional Disturbance? That sounds so wrong! That doesn't sit right with me. Emotional disturbances? What does that mean?!? That's so … odd. To call it like that? That doesn't sit well with me.	4
Perception of make-based learning	They were doing their daily journal stuff and then they would go over what they read last week. The last time I went over there they were making something; they could make anything they wanted, and this guy wanted to make a car.	9

	I was like, "**dude, that's not possible, you can't do that**!" So he was like, "can we make a toy version?" And I said, "**Yeah, but you can't make an actual car**". And he said, "okay". He was trying to make a Mustang, I think? He got yellow play-doh and made the shape of it, but I don't know if he finished it. I think he was **just trying to make a car out of play-doh**. I don't think he even wanted to make it move. Anything they want. And **then they would do research on it, and find the best way to make it.** I would say it's (making) like a hands-on activity that will help you learn what you need to learn, **without having to sit down and learn in a chair completing worksheets.** I mean, I had fun doing it in your class. And if I had fun I am sure they'll (future students) have fun. (How she would approach making with future students) Sewing several pieces together and figuring out math equations, like 3+2, and you can sew 3 pieces of fabric with 2. Then they have a physical copy of what that would be.	
Developing a maker identity	I was sad because (during quarantine) I would have to do my own measurements on myself and I had to get my grandma's help. "Grandma, can you help measure me?" It was upsetting because **I had to do it by myself**. And last semester I was able to do it with everyone there, which was just very different. (sees making as a social activity) First semester I didn't have a sewing machine. I'd have to go home and finish my project there, but then my grandma gave me her old one. (was able to locate tools to finish project)	3
Developing a teacher identity	I feel like now, just observing how teachers will respond to certain students. I feel I can take that in, and know how to treat my students, and whatever techniques that worked for them, I could use, and whatever techniques that didn't work I won't use obviously.	2

	(asking if she'll consider students' cultural backgrounds) I would say yes, because if a teacher were to, say like, make something for Christmas, and some students don't celebrate Christmas, or Halloween or something. There's so many holidays that students with other religious and cultural backgrounds that they don't celebrate. It's just good to be mindful of that, with holidays or any other activity based on religion. (cultural awareness/responsiveness limited to religion)	
Role of helper or assistant teacher	I felt like I was a teacher assistant every time I was there because whenever the teachers needed help and another teacher was busy, I would step in and help. In the makerspace, if they had a problem and didn't want to ask Mr. R., I would help them and help anyway I could.	2
Role of friend		
Role of observer	But I also observed, like when we were in the library. I would just sit and watch because I didn't know where everything was. In the library they were either checking out books or they were playing on the iPads, so I was sitting there. They'd play with the robots that go under everything .. *don't do that!*	2
Making can benefit students with EBD	I feel like it does, because if they're frustrated about something, they can take it out on their project. And maybe it will come out even better. Cause they're so frustrated, maybe they'll be passionate about what they are making. Maybe they'll put in more effort? Becasue they're so frustrated with whatever is going on? And if they don't want to talk to anyone they'll just focus on the project?	2
Makerspace should be for making	I feel like I wouldn't be reading a book, because I think they already do that in their core classes. I think I'd have them research about what they want to make, using the iPads, and **not just out of whatever they are**	3

thinking about at the time. And actually find ways they can make that come to life.

Most of the materials they had in the bins and drawers - no one touched it.

EBPs are **one of several ways** to figure out what works	In-vivo codes	strategies	total
	I think I would try it out (EBPs) , but obviously if it didn't work or my classroom I'd try to find something else to help my students in my classroom.	EBP first	2
	If my students are getting good grades. If they're happy and not distressed by whatever is going on. (in response to asking how she'll know if something worked)	intuition	

Appendix I

Lane's Codebook

category	In-vivo codes	total
Perception of City Academy (procedures, building, faculty, staff	I feel like the school handled most situations very well I don't think I had any perception of the school whatsoever until I actually started going there. He (Mr. R.) was going on with the lesson plan that he had. He always had the lesson plan on the board, at the beginning of class every time. And he typically followed along with it directly. Most of the time he (Mr. R.) was going through the lesson plan and occasionally having to stop to get the students back on track because **they would get distracted easily, or he would be asking them questions to see if they were paying attention to the lesson.** they were doing the Global Reading thing ... So it was a lot of reading along with the class and asking questions during the fall. But also, whenever they (students) went into the library he (Mr. R) gave them the choice to go find a book on their own, pick it out by themselves. when it came to behavioral issues, he (Mr. R.) gave them the choice of 'you can not do this, not continue to cause a problem, and **just come back and rejoin the class, or we can have one of the assistants come and deal with you and take you out of the classroom**'. One could say that's not much of a choice, but in its own way it is. (teacher offered fixed choices) Mr. R. employed choice-making very often.	12

	Okay, but they **(paraprofessionals) were very quick to administer negative points for bad behavior rather than giving them (students) a chance to improve the behavior before they docked points.** But typically when they (paraprofessionals) assigned positive points, t**hey would typically give positive points to a student who was doing the right thing when another student was acting out, on a common basis**. It seemed they typically used positive points to try to peer pressure the other students into fixing their behavior, if you get what I am saying. most of the time students were at their own separate table by themselves, and never really had the opportunity to work together much.	
Perception of City Academy students	I can't remember their names right now, because of how long it has been. But I know I worked with middle-school aged students. They were typically 7th or 8th graders, I believe. (didn't remember names) Back in the fall, it felt like, even though they were the same age students, they seemed a lot more childish. But also they seemed to get along more. When there were conflicts between them, it was more stuff that you would expect to see from elementary schoolers. But in the spring with the class I worked with, it seemed I was more in a higher middle school or high school setting, the way they interacted with each other, which may have just been, because in the spring it was like 3 or 4 boys that were about the same age, and then they kind of transitioned because of the different circumstances. But one thing I noticed that when it came down to when there was only one student left that I was working with for the last 3 weeks or so of the semester, he was a lot more focused on his work and seemed a lot more optimistic about his project, and a lot more sure of his	12

abilities than when he was around the other students, which maybe they were just distracting each other, joked around too much, but he seemed to get a lot more progress done when it was just him, and me, and the teacher.

the students, although there were problems at times ...they were good kids. They were good kids, they were nice to be around even if there were problems from time to time. But overall, **I don't believe that my perceptions changed that much over the course of the year.** (fixed perception)

I honestly don't know if I saw too much self-monitoring from the students. There were some situations where they kind of realized they were off-task and kind of found something else they were interested in to get them back on track.

But overall I did not see too much self-monitoring going on with the students.

Typically, with the goal sheets, I forget specifically what they called them. Called them like point cards? Or something like that? **Often students were losing them, or not having them when they came to class**.

So there were a lot of times when they (students) had to go back to the classroom to get them and come back, which lost a lot of class time. But t**o me it seemed the student cared less about that and more that the assistants who were attending them were either very quick to** - I don't remember if points were negative or positive

So not much group work or peer-assisted learning happened too often. I remember toward the beginning of spring, maybe, when they started figuring out what they wanted to do for their maker projects there was a little bit more collaborative learning because **they kind of bounced ideas off of each other a little bit, and kind of walked around the classroom and talked to each other about the stuff**.

	there really wasn't much collaborative learning or peer-assisted learning because **the students didn't interact much outside of joking around.**	
Perception of learning and teaching students with EBD (meaning what students with EBD learn and better approaches to teaching)	I believe that my clinical hours at CA helped me prepare for my future time as a teacher by showing me some circumstances where students can act out more often or there are often distractions in the classroom. And it gave me some tools or expertise to be able to handle these situations and figure out how to get students back on track when the discussion in the classroom kind of gets off-topic.	2
Perception of make-based learning	It was frustrating because at the time (start of pandemic) I was in the middle of one of the projects with one of the students I was seeing every week. And I never got to see how that problem - not problem but project - finished, or if he ended up finishing it. That was pretty frustrating. (sees value in finishing a make) I missed getting to work together. In my situation we only had one student in the class for the last couple of weeks before we left because others were expelled -- not expelled but on temporary leave -- due to certain circumstances. It was me and this one student. **I missed getting to see his progress on the project that he was working with, and seeing whether he finished the project or not**. (cooperative/repeats importance of finishing) And during the spring it was more of the actual maker projects, where they were actually starting to come up with ideas for what to do, and then putting them into action. So in that case, Mr. R. was kind of jumping around from table to table, helping them with each of their projects every couple of minutes. And then getting it so they could continue on their own for a little while while he could work with another one. (requires some teacher guidance)	17

Mr. R. really employed choice-making every single day **because obviously, being in the makerspace gave them the choice of what projects they wanted to pursue and what to do with that.**

I think I would describe it (making) to them (anyone who asks) as coming up with an idea for a project that you want to do

something you want to create and using different materials, whatever you can find, to try to make that project or result happen (tangible, for any purpose)

it's a process that kind of encourages failure because once you fail at trying to do it one way, it encourages you to look at it a different way, use different materials, think of different strategies for how to make it happen and try again (failure-positive)

it's a process that encourages you to learn by making. By making something with your own hands and using your own brain, and all the resources at your disposal to create something.

And with **math especially, it's kind of hard to think of creative projects** that you can do because there's not a ton of math concepts that can be visualized in a hands-on thing. It's a lot of theoretical stuff with numbers. (loosely connected to learning math)

I feel like that (students' cultural backgrounds) isn't something you really need to be thinking about making is all about just using what's at your disposal and just kind of [pause] moving forward and progress. (not grounded in culture)

I feel that considering their background doesn't play too much of a part in seeing what they can create.

But on the other hand, it's still important to think about where they come from and what experiences they have with things because that can impact their mindset when trying to think of things to do. They might look at things

	a different way - well, they *do* look at things a different way than I do, and the other students do. (honors varied perspectives) So there's always going to be a sort of disconnect, and the prior knowledge when going into a new project so that's something that you're always going to have to **deal with**. So it's kind of a yes and no. But I think the most common way that I could use it is just encouraging failure and trying again, and try to get rid of that negative stigma of failure. I see myself using the make-based learning more for the progress and creativity aspect of it. Problem-solving and encouraging failure and trying again like that, **rather than the actual like building something, just because in what I am going to be teaching, there's not going to be too many chances to build something.** But I think I will be focusing a lot more on the **problem solving and perseverance aspect** of it.	
Developing a maker identity	I didn't have much of a problem (losing access to the university makerspace) with that because most of the stuff I needed to use for my project I was able to get from [fixes audio issues]. I really didn't have much of a problem doing it on my own because most of the supplies I gathered from different stores (content to work alone, uses new materials opposed to upcycling). I didn't need the [university makerspace] stuff. I was able to do my project mostly the way I normally would.	2
Developing a teacher identity	CA experiences are a lot more beneficial to the people that are going into special ed, just because that's kind of the field they're working with. So for me, the stuff that I can take from it is mostly just classroom management. (does not identify as a teacher who will work with students with exceptional needs)	6

	especially in high school, students tend to think, “oh, I did badly on this. I’m not good at this, I’m never going to be good at this” - it’s easy for them to get into that mindset.	
	with math especially, it’s important to let them know that just because they got it wrong this one time, doesn’t mean they can’t keep trying and figuring it out, figuring out what works for them to solve the problem	
	I probably have a different teaching style, than the hypothetical teacher	
	Yeah, one thing that I’ve noticed is that with math especially, **teachers don’t encourage kids to use multiple ways to solve a problem, they usually try to force students to use this one way, and kinda give them a formula and let them just plug something into it to get a result, rather than try to help them to understand it on their own, and figure out their own way of looking at it.**	
	And one thing that I always think about **with math is for most questions, there’s infinitely many wrong answers but only one right answer. So the odds that you come up with that one right answer on the very first try is [pause] crazy, so I don’t see any reason to get discouraged, or not finding the right answer on the first try of a math problem.**	
Role of helper or assistant teacher	And then I participated more personally in the spring semester, but that is also because, fall semester there were 7 or 8 students at a time, whereas in spring semester it was like 1 to 4 for most of the time. So I would be able to work hands-on with each of them rather than just kind of watch as the teacher ran the classroom with all the normal classroom stuff.	2
Role of friend		0
Role of observer	I was more of an observer in the fall semester.	1

Making can benefit students with EBD	Yes, because I feel it's (making) going to give them (students with EBD) **an opportunity to succeed and create something in a way that they normally wouldn't be able to in a normal classroom**. Just because in a normal educational setting, they're not really given the chance to just go and make whatever they want and have the freedom to do whatever they want and pursue whatever they want, the way they want to do it. Because in a normal classroom setting, " we're sitting here, we're learning it this way. This is how we're going to do it" So I think, especially with students who have emotional/behavioral disorders, this gives them the chance to learn in their own way. I think it's definitely beneficial.	4
Makerspace should be for making	I personally would've used the vast assortment of materials they had more often. Just because he would pull the materials and work with it, I feel like he never really utilized them to their full potential also because the majority of the time I was there during the reading thing, so they didn't really have time to work with all the maker stuff. I think that's what I'd do differently.	2

EBPs are **one of several ways** to figure out what works	In-vivo codes	Strategies	Total
	I think it might be a little mix of both. (Casual Google searches and EBPs) Just because I'd like to get a variety of evidence-based practices. I think it really just depends on if I felt confident in what I already knew to employ in the classroom.	Google first, EBPs if that is not sufficient	5

I think I would, if necessary, Google some practices to use, but if I felt like what I was doing at the time wasn't working as well as it could be, then I think I would do some deeper searching and find out - do some research to find out what has positive results and what was proven to actually be effective. And then use those strategies.	
I think it's important to talk to other teachers about what strategies they use in their classrooms and what works for them.	Consult other teachers
Cause even though it might not work for me ... it's important to see what works for them.	
It's just important to get a variety of sources and figure out what works. Test out different things and see what works best. Because everyone's experience is different.	Trial and error

Appendix J

Subjectivity Statement

When the pandemic arrived in the United States in mid-March of 2020, I decided that I would need to extend the study for another semester. In January and February there was a series of weather-related school cancellations and I collected extremely limited data from the PSTs' observation forms. In July, the school superintendent for the local district announced that students would continue with remote learning into the 2020-2021 school year. I grudgingly decided to interview the PSTs individually to collect more data. I did not want to use interviews as a data source because I questioned the veracity of what the PSTs would tell me. I served as a course instructor during the study and some of the participants were students in my class the same semester, I interviewed them. I was wary that they would essentially tell me what they thought I wanted to hear, and not their genuine thoughts.

It turned out that interviews are a much richer source of data than observation forms when working with undergraduate students. I found the PSTs kept the content on the observation forms at surface level. The written reflections were not detailed either. But most of the interviews extended longer than expected and it seemed to me that the PSTs were forthcoming with their thoughts. While I will not express gratitude for the pandemic, I do appreciate how circumstances brought me to doing individual interviews with the PSTs.

All six PSTs agreed that making can benefit students with PSTs, for varying reasons. They also expressed some doubt about the importance of scholarly research. The PSTs were impressionable college students in their first and second year at Southern City

University. For this reason, I share two more reasons why findings from this study are subjective: (1) I consider myself a maker; and (2) I strongly oppose high stakes testing in schools.

I am a maker. Not in a nerdy and techy way, but in a nerdy and analog way. I am quicker to make and repurpose items before buying new ones. I was the kid who took her toys apart to see how they worked. This was before such activity was considered innovative and creative. I am now the adult who knits scarves and blankets and treats birthday cakes like art projects.

I oppose high-stakes testing and school accountability. I started teaching Spanish in the late 1990s. I loved it. I loved the students' curiosity and willingness to play with language. When standardized testing began, I was happy to receive monetary bonuses for students meeting Adequate Yearly Progress, but I felt the underlying sentiment that English and Math teachers were the ones to thank (or blame) for doing (or not doing) all the work. During my last few years in the classroom, I taught high school seniors who did not know schooling before NCLB. I found with each passing year that students increasingly resisted any activity that required critical thinking. They had been programmed to take multiple-choice tests. I stopped liking my job. It could be because when I first started, I was not competing with cellphones to keep students' attention. It could also be that after almost 20 years in a classroom I was no longer a member of the same generation as the students. I did not relate to them on the same level. I frequently offered open-ended projects but found students did not want to do any deep thinking. I longed for the days before testing. Standards-based teaching was not for me.