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Growing Independence Through the Use of Structured Work Systems

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Capstone Project: An Action Research Project

Northwestern College, Orange City, Iowa

Abstract

Young children with autism spectrum disorder (ASD) and related disabilities struggle to manage daily activities and routines with independence. They often rely on adult prompts and cues, even when a skill has been previously mastered. This action research study aimed to determine the effects of structured work systems (SWS) in the inclusive pre-k classroom on the overall independence of students with ASD or related disabilities. TEACCH modeled structured work systems were implemented with four preschool students a minimum of twice daily. Three areas were observed for the purpose of this research: (1) student completion of the structured work system; (2) student independence in daily routines; (3) growth in correlating objectives on the GOLD assessment. Biweekly data points revealed a strong correlation between independence in the structured work system and independence in daily routines. A comparison of GOLD checkpoints before and after intervention showed little to no change. This action research study supports using structured work systems as a low-intensity intervention in the inclusive preschool classroom.

Keywords: autism spectrum disorder, structured work system, TEACCH, prompt dependency, independence

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Growing Independence Through the Use of Structured Work Systems

An increasing number of children display signs and symptoms of Autism Spectrum Disorder (ASD) early in life. It is estimated to affect 1 in 44 individuals in the United States, an increase since 2012, when ASD was said to affect 1 in 68 individuals (*Centers for Disease Control and Prevention, 2022*). Diagnosis can be challenging due to the spectrum of individual qualities associated with ASD. While signs and symptoms are present as early as 18 months, many do not receive a diagnosis until much later. The unique needs of students put pressure on teachers to provide quality early education in the least restrictive environment. The American Psychiatric Association (2013) states that independence for individuals with autism can be challenging due to difficulty planning, organizing, and coping with change (APA, 2013). There is substantial evidence to support early intervention strategies to improve outcomes for these children and their families (D'Elia et al., 2013; Turner-Brown et al., 2019). The issue lies in finding a model of intervention that provides the optimal learning environment to encourage independence and engagement in students with diverse needs. Unfortunately, studies of these models primarily focus on high-intensity intervention on school-age students. Teachers must bring accessibility considerations to the forefront to meet the needs of students with ASD or related disabilities.

Considering the increase in students receiving special education services, we must also consider a rise in the need for paraeducator services. Many paraprofessionals spend 100% of their working day with a student on a one-to-one basis. Paraeducators are a necessary resource for our inclusive classrooms. Still, past studies have shown that the interactions between students and instructional assistants can lead to dependency on the adult and a lack of independence (Gorgan & Kodak, 2019; Cividini-Motta & Ahearn, 2013). We see this dependency in students

who rely on prompts to complete tasks despite learning the skill (Grogan & Kodak, 2019). Other examples include difficulty playing and interacting with peers without an adult nearby and an inability to work with other adults when the paraeducator is not present. Studies of structured teaching have shown promise in extinguishing this dependency. A study at San Diego State University resulted in the use of structured work systems (SWS) as a viable option for increasing engagement while decreasing prompting for students during recess (O'Hara & Hall, 2014). Another study used SWS to improve the independent work skills of individuals with disabilities (Park & Kim, 2018). Research on the effects of SWS on independence in the inclusive preschool environment is limited.

This research study aims to determine the effects of SWS in the inclusive pre-k classroom on the overall independence of students with ASD or related disabilities in the school. We consider independence to be the ability to take control of one's own learning and actions (Park & Kim, 2018). Motivation and confidence are two vital elements of autonomy that should be encouraged in early childhood. The ability to develop autonomy and learn independence will teach children how to conduct themselves later in life as they take on more responsibilities. I hope that the knowledge gained from reading this study will equip early childhood special educators with the ability to foster this sense of independence in students with unique needs and, in doing so, reduce the dependency on adult intervention.

Much research is available on autism education, intervention strategies, and characteristics of individuals with ASD. The latest inquiry is generated from a collection of current, peer-reviewed resources, using trusted sites such as Google Scholar and the DeWitt Library at Northwestern College in Orange City, Iowa. Relevant information improved understanding of SWS compared to other comprehensive treatment models. Articles also

expanded on the unique characteristics of students with ASD, prompting, and the importance of early intervention.

Since its establishment in 1972, Division TEACCH (Treatment and Education of Autistic and related Communication-handicapped Children) has influenced the special education community with the concept of structured teaching. Components of structured teaching include the physical structure, schedule, work system, and task organization. Evidence suggests that SWS can positively affect the independence and work skills of students with ASD. While some focus on reducing the characteristics of autism that interfere with learning, structured work systems can improve independence in students with ASD because these accommodations to the environment promote the child's engagement and education. Work routines promote a behavior chain that can be generalized to various activities and settings, and visuals replace reliance on adult prompting (Boyd et al., 2013).

Overall findings from studies relevant to the topic will cover five areas beginning with the unique characteristics and needs of individuals with autism and related disabilities. Further information will delve into the predictors of early learning, such as social functioning, active engagement, and motivation concerning ASD. Another point of focus will be on the importance and intensity of early intervention to improve the prognosis of these students. Are low-intensity interventions enough to make a real impact? The research looks at interventions to treat prompt dependency and proper prompting procedures. In conclusion, the review of literature will focus on the components of SWS and the findings of previous studies on TEACCH modeled interventions within different environments.

Review of the Literature

Students with cognitive or intellectual disabilities such as ASD face many challenges in a world that, unfortunately, leans towards a one-size-fits-all approach. Challenges related to independent functioning or the ability to perform daily or work-related tasks are high on the list. Although the literature covers a wide variety of ASD-related topics, this review is going to focus on the unique characteristics of ASD and issues that may occur, such as prompt dependency. There are vast quantities of research pinpointing evidence-based practices to promote independence and engagement for students with ASD. The information found in this review will center around one evidence-based model, the TEACCH model of intervention.

Unique Characteristics and Learning Outcomes of ASD

Autism spectrum disorder is a complex developmental disorder that affects the brain's functioning. Deficits in social and communication skills characterize it along with differences in thinking, feeling, language, and relating to others (Ruhela & Parween, 2018). These differences in the way individuals with ASD or related disabilities develop or process information may significantly interfere with everyday tasks, but the severity is different for every person. The effects of ASD are not one size fits all, and educators must be knowledgeable so that we may strive for positive educational outcomes for these students.

Students' ability to function independently throughout the school day is one of our priority goals in the classroom. Some skills required for independence are attention, organization, sequencing, initiation, and generalization, all of which are skills that someone identified with ASD may struggle with immensely. In a study by Benton et al. (2014), researchers implemented the IDEAS approach to participatory design (PD) with four groups of students; two groups had a diagnosis of ASD. This approach aimed to combine novel features of several other PD techniques and TEACCH-based criteria to best target the needs of students with

ASD and mainstream students. The qualities associated with ASD that they were looking to overcome included concrete thinking, difficulties combining ideas, excessive anxiety, difficulty with initiation, and distractibility. According to the findings, adding structure and support in a targeted manner was beneficial in having a successful outcome for all involved. Of the four teams, no two had the same results. While some groups had few problems working as a team to complete the project, others struggled with challenging behavior, low confidence, and creative thinking. Benton et al. (2012) recommend future research on tailoring support for children with and without exceptional needs. And so, it seems that teachers need to find ways to customize the support to assist students in the areas in which they struggle.

While focusing on the association between social functioning and emergent academic skills, Arnold et al. (2012) observed that attention problems, aggression, and prosocial skills were related to intellectual development. In this study, 467 preschool children were given ratings by their teachers in these areas and assessed in preliteracy, language, and math. The findings suggest significant relationships between social functioning and academic development. Some areas had a minor connection for early childhood students, such as aggression and prosocial behavior. The significance of attention in these relations was even more so, with attention directly interfering with learning. Supporting the idea that these relationships begin early in development, I am hopeful that early intervention in social functioning may also impact future academics. From this information, I can attest that educators must take steps to provide interventions for students struggling with attention and social functioning to encourage learning. The key to increased engagement, focus, and prosocial behavior may be in a structured, consistent environment where these students can thrive.

Active engagement is a significant predictor of learning outcomes. In a study by McCollum et al. (2016), 24 young adults with ASD and their caregivers sorted through cards depicting daily activities. They placed them into yes or no piles referring to participation. Common barriers to participation were fear, lack of knowledge, and others willing to do it for them. The researcher states that one in 68 individuals in the US is affected by autism. These young people struggle to assume adult roles (McCollum et al., 2016). "This time of change and advancing into adult roles include a loss of structured support of the school system, familiar peers, and teachers" (McCollum et al., 2016, p. 987). This study relates success to the support systems that an individual has in place. Once these supports are gone, they are left with a gap to be filled. Barriers reported by the individuals in this study are a helpful guide in program planning. Fear and a lack of knowledge of what to do can show us that a clear and consistent plan for students to follow is required to complete tasks. Lack of participation because someone is willing to do it for them shows the importance of independence and autonomy in a child's schedule and routine.

Similarly, in a study by Sparapani et al. (2015), the active engagement and emotional state of 196 students with ASD were measured using the CMAE (classroom measure of active engagement). The concept of active engagement consists of nine variables; emotional regulation, productivity, independence, responding, eye gaze, directed communication, generative language, flexible behavior, and flexible attention. These are all identified as core learning challenges for students with ASD. This study found that students with ASD spent less than half of the observed time productively and independently participating in classroom activities and less than half of the observed time in a regulated state. As in McCollum et al. (2016) study, barriers to engagement included limited ability to understand classroom directions. Social connectedness and initiating

communication resulted in responses to only about half of the verbal bids for interaction. With core deficits in social communication, this was not a surprise, yet teachers continue to attempt to communicate with all students in the same manner. The results of both studies suggest a need for improved active engagement in students with ASD. These efforts to increase engagement must go beyond the classroom routine and verbal directions.

A pattern can be seen throughout these research studies. Core predictors of learning appear to be active engagement, attention, self-efficacy, independence skills, and communication. Knowing that these are all areas of potential difficulty for a student with autism highlights the need to provide better support for students with ASD in the classroom. What can we put in place to combat the deficits of our students? How can we promote these predictors of learning in a way that fits the different ways our students' process and develop information? In getting to know our students and what motivates them, we can create developmentally appropriate support systems to increase engagement, decrease challenging behavior, and promote positive educational outcomes.

Importance and Intensity of Intervention

Intervention is likely to be more effective if offered earlier in life rather than later. The first five years are a critical developmental period in a child's life. Intervention at this stage can potentially change the developmental pathways for students with exceptionalities and improve outcomes. Intervention varies greatly by model and by intensity. Interventions can range from highly structured models to social approaches embedded into the child's natural environment (D'elia et al., 2014). Intensity may be considered high at 20-30 hours per week or implemented in smaller doses over a shorter period.

In a study of stimulus overselectivity in children with ASD by Rieth et al. (2015), the researchers set out to determine the extent to which children who receive intervention services display stimulus overselectivity. Compared to studies done decades earlier, the results were not expected, with only 19% of children showing what had previously been considered a core quality of ASD. Another study by Dube et al. (2016) had similar results. When compared, overselectivity was not more severe in the ASD groups than in groups with down syndrome or typically developing peer groups. Rieth (2015) suggests that the causes for these unexpected results may be the type, quality, and timing of intervention available to children with ASD today. Dube (2016) also considers the years of experience in special education settings using similar procedures to be a possible explanation. "Children are being diagnosed and receiving treatment at increasingly younger ages" (Rieth et al., 2015, p. 81). These results clearly show that intervention can decrease symptoms of ASD when delivered appropriately. There are still questions concerning what models of intervention and how much or the intensity of intervention qualify as appropriate.

D'elia et al. (2014) defined intensity as the number of hours of treatment a child receives per week and the intensity of the intervention's training, curriculum, and planning. Their study investigates the potential benefits of low-intensity TEACCH-based intervention in natural settings for preschool children with ASD. Students were divided into two groups, one receiving TEACCH-based treatment for 4 hours per week (2 at home and 2 in the classroom) while the other group received the same amount of the usual treatment (2 h of psychomotor therapy and 2 of speech therapy). Autism Severity or ADOS scores decreased significantly for both groups but more in the TEACCH group. Language skills for both groups improved substantially over time, again with more improvement from the TEACCH group. The TEACCH group also showed

statistically significant differences in skills and behavior. Results between the two groups were very similar, and both showed improvement. This data may suggest the need for higher intensity intervention to see statistically relevant differences. Despite the comparable comparisons of the two groups, the TEACCH group did improve in almost all skills and behaviors measured over time. This fact tells me that it may be an appropriate intervention, while not the only intervention to consider.

However, Turner-Brown et al. (2019) found only modest effects from treatment in a study of family implemented TEACCH for toddlers with ASD. Once again, children were placed into two groups. One group would receive low-intensity TEACCH-based services while the other received services as usual. Results showed that the most significant indicator in favor of the TEACCH group was measured parent stress levels. TEACCH parents reported less parental and total stress than parents in the services as usual group. Still, findings demonstrate satisfaction with the TEACCH-based intervention while showing the possible need for increased intensity. While child outcomes seem less robust, outlooks and adherence to the program may make future progress more significant. The 24-week timeline of this study does not show future progress, as seen in the research by D'elia et al. (2014) and the 24-month timeline used.

Research is plentiful to support the use of intervention at a young age to improve child outcomes for children with ASD. There is also substantial evidence to support the use of high-intensity intervention as best practice in education. Is a low-intensity approach worth the time and effort? According to Turner-Brown et al. (2019), "While intensive approaches are effective for many children, there is often a period when a family learns that their child has ASD, and early intervention at a lower intensity begins" (Turner-Brown et al., 2019, p. 2685). The low

intensity may be due to not having the resources available for a more intense intervention or not yet knowing the complex needs of the child receiving services.

Prompt Dependency

Often used in conjunction with intervention strategies, prompting is a valuable tool to assist students in using a skill. Many prompting procedures support the learning and development of young children. Effective prompting will use added stimuli such as sound, visuals, or gestures to indicate an expected action or response. The issue occurs when a child will not initiate a task because they are waiting for a prompt. We refer to this phenomenon as prompt dependency. Prompt dependency is an often referenced problem encountered in inclusive and special education classrooms (Cividini-Motta & Ahearn, 2013).

Various levels of prompting, beginning with the least intrusive and gaining support from there, is referred to as a prompting hierarchy. Just a step past independence are visual cues or prompts followed by verbal prompts and gestures. Next in the order would be the more intrusive strategies such as modeling, partial physical, and full physical prompts. In a study by Wicks et al. (2020), students with ASD participated in shared book reading with parents. Wicks (2020) states that children with ASD often have difficulty learning to talk and read. The researchers credit some of this difficulty to lower attention and engagement. In this study, researchers explored different aspects of visual awareness and verbal engagement during shared book reading for preschoolers with ASD. Through observations, they could see that parents of preschoolers on the spectrum could facilitate their child's attention and engagement using prompting strategies such as questioning or verbal prompts, props as visual cues, and other prompting methods depending on the child's needs. The most verbal engagement came in response to parent questions and

prompts. This discovery may indicate that children on the spectrum rely more on this behavior by adults than other children to maintain attention and facilitate active participation.

Much like the previous study, Kern et al. (2007) used songs as a verbal prompt to promote routine independence for young children on the spectrum. These transition songs served as a cue to the intended steps during transition times. As a preschool teacher, this is a common strategy for classroom transitions. I have songs for handwashing steps, songs to cue cleanup, and songs for initiating large group activities. The data supported using songs to facilitate independent entry into the classroom and during transition times. I now question whether or not my students would transition with independence if I were to cease using these songs suddenly. A study by Sabielny et al. (2014) suggests that a most to least prompting with a delay can be considered a default prompting procedure for students with more significant disabilities. These findings align with the process used by Kern et al. (2007), which began with visual and verbal prompting and transitioned to verbal only to target the skill. A most to least prompt fading technique may be a viable option to avoid prompt dependency in the classroom.

Grogan and Kodak (2019) tested this technique in a study of three intervention strategies for prompt dependency. Three students with ASD who consistently engaged in correct responses following prompts but did not perform independently took part in this study. The interventions tested include prompt fading, extended response (waited for 10s for correct independent response), and differential reinforcement (token, edible, or tangible item following correct independent response). Interestingly, all three participants had very different reactions to the three interventions. These results further support the idea that I must assess and use data-driven procedures to individualize for my students efficiently.

Further study on prompt dependency looks closely at differential reinforcement as an intervention option. Cividini-Motta and Ahearn (2013) acknowledge prompt fading as a standard teaching strategy but question what to do when these attempts at fading are unsuccessful. The researchers state that in the case of differential reinforcement, providing the same reinforcer for both correct prompted and independent responses is a common technique and may lead to prompt dependency. In this study, four individuals with ASD participated in tasks or behavior chains such as shirt folding. The team manipulated the quality of reinforcers rather than the rate of reinforcement to facilitate the acquisition of skills. Based on the participants' performance, researchers suggest that differential reinforcement favoring independent response may decrease prompt dependency. Once again, the outcomes differed for all involved, and response to intervention depended on the individual. The interventions we put into place must be research-based and individualized. This is imperative for the effectiveness of strategies as they differ across learners.

Both parties suggest future research on prompt dependency and the variables responsible for its development and prevention (Cividini-Motta & Ahearn, 2013; Grogan & Kodak, 2019). When natural cues are not enough, prompting is essential for knowledge acquisition. An issue seen in the classroom is a reliance on prompts for students, and prompting is becoming a habit for educators. Prompting should be planned out from the start, and staff should receive training on introducing and later fading prompts to avoid dependency. This plan may be put into place using a structured system for teaching.

TEACCH Modeled Structured Work Systems

Developed by Division TEACCH, work systems are an element of structured teaching. The TEACCH model has been researched in various environments with diverse skill levels and

age groups. Most data points to this method as an excellent intervention strategy candidate. With a growing number of interventions available to increase independence and functioning for individuals with autism, we must look closely at the evidence available to make an informed decision (Welterlin et al., 2012). The following studies will examine TEACCH modeled practices across age groups and the comparative efficacy of TEACCH and other special education programs.

A study by Boyd et al. (2014) compared the effects of TEACCH to other comprehensive treatment models, specifically LEAP (Learning Experiences and Alternate Program for Preschoolers and their Parents) and non-model-specific programs. TEACCH aims to accommodate the environment rather than the individual through visual schedules and work systems (Boyd et al., 2014). LEAP uses applied behavior analysis in an attempt to reduce characteristics of autism that may interfere with learning and independence. The results showed all three models produced statistically significant changes in child outcomes. Boyd et al. (2014) suggests that the products may be due partly to similarities across programs (classroom organization and home-school interactions) more than the unique qualities of the programs. The lack of differential effects suggests that further exploration of these programs and the variables encouraging positive outcomes is needed. This particular study found positive effects for the LEAP and TEACCH methodology. The TEACCH classrooms with lower cognitive ability showed more improvement in the severity of autism. This result is believed to be because the environmental supports were particularly beneficial to those with cognitive deficits. I think the benefits of environmental support are not limited to those with cognitive impairments but to individuals with challenging behavior, language deficits, and typically developing peers.

A study by Sandbank et al. (2020) also compared various comprehensive treatment models, including TEACCH. However, this study found little evidence to support the effectiveness of TEACCH. Behavioral and developmental approaches held the most promise, according to the findings. The researchers state that although TEACCH was among the first interventions designed for individuals with ASD, it remains relatively understudied (Sandbank et al., 2020). This lack of research is thought to be because TEACCH is often used as a classroom-wide approach and would require more expense to implement studies of this size. Smaller studies have concluded that TEACCH successfully facilitates increases in on-task behavior, independence, and engagement in activities. TEACCH was successful in this in a study of a home TEACCHing program for toddlers by Welterlin et al. (2012). This approach resulted in increased effective prompting from parents, less parent stress, and increased independent play from toddlers participating. Alternately, another study by Park & Kim (2018) used this strategy to improve the independent work skills of young adults by teaching work-related behavior chains. I can see the versatility of this intervention and its ability to promote generalization across settings.

Similarly, a study by O'Hara et al. (2014) also resulted in positive outcomes due to TEACCH modeled systems. Students used structured work systems to facilitate play during recess. All three participants could complete the system independently and without adult prompts while displaying higher engagement percentages. This researcher notes that students may initially show an increase in challenging behaviors during the training stage due to the new task demands (Park & Kim, 2014). To combat this, the team began using reinforcers during this training phase and fading them out as they progressed. And so, it seems that techniques such as

work systems, prompt fading, and differential reinforcement used in conjunction with one another may be a solution worth considering.

These visually organized systems promote clarity and understanding for individuals with ASD. As I think about fostering independence, I want to look at reducing behaviors that impede independent functioning and facilitate overreliance on adult prompting. Difficulties in generalizing behaviors across environments are decreased by offering opportunities for students to practice previously mastered skills. Individual work areas encourage focus and attention to tasks, and visual schedules provide concrete cues and promote independence (Park & Kim, 2014). Past and recent research has shown that successfully implemented structured work systems can be successful in reducing dependent behaviors and promoting on-task behaviors. Research is still needed to document connections between structured work systems, general independence in classroom routines, and prompt dependency in early childhood settings.

Summary

Examining this research, I can better identify areas of need in my classroom and prepare a plan in response to those needs. Prompting is a necessary tool that may help students minimize errors and gain knowledge acquisition (Grogan & Kodak, 2019). However, prompting should be a planned intervention to avoid overuse that may lead to a reliance on prompts to accomplish tasks. The unique needs of my students require unique learning techniques and tools. Visual and physical structure and good prompt fading may be the intervention needed to encourage much-needed independence throughout the classroom.

Methods

Participants and Setting

The study took place at a low-income public elementary school in rural Iowa. Research staff completed sessions within two inclusive preschool classrooms. The preschool runs a full-time, Monday-Thursday program. Preschool class sizes are approximately 13-14 students with 3-4 adults per classroom. Of the current 27 preschool students, 10 have Individual Education Programs or IEPs. According to Iowa state regulations, teachers are licensed and hold dual endorsements of early childhood and special education.

Five students were initially considered for this research project. The common criteria for participation are as follows:

- The student has a diagnosis of autism or displays many of the unique characteristics of autism.
- The student displays difficulties with executive functioning, affecting their ability to independently complete tasks and remain engaged with work or play tasks.
- The student spends at least 35% of their day with paraeducator support.
- Participants are between the ages of three and four years old.

One student was later removed from the study due to inconsistencies in research criteria.

Permission to conduct this four-month-long study was granted by the Northwestern College Institutional Review Board (IRB) at Northwestern College in Orange City, Iowa, following approval of an application for exemption for the action research project. Structured work systems are a common educational practice in special education, and the researcher recognizes the importance of student safety and confidentiality.

Student A is a three-year-old male with an educational diagnosis of autism. He has IEP goals related to independence in routines that had plateaued mid-year. After an increase in his paraeducator minutes from 3,000 minutes per month to 5,720 minutes per month, student A

began to rely on prompts to complete daily routines, despite previously taught practices and offering multiple practice opportunities daily. While communication has been a focus, student A regularly displays echolalia, or repetition of another person's spoken words, in trying to communicate. Accommodations for this student include preferred seating options, visual behavior cards indicating expected behavior (sit, walk, hands to self, etc.), and first/then boards or five-point timers to assist in transitions.

Student B is a four-year-old male with a medical diagnosis of autism. IEP goals for this student focus on social skills and communication. The student speaks primarily using memorized or rote phrases. The 2021-2022 school year was his second year in the preschool classroom, and while routines remained the same from the previous year, the child required constant prompting to complete tasks. Accommodations based on IEP guidelines for this student include: visual schedules, cube chair seating, social stories, a quiet break space for self-regulation, and sensory breaks throughout the day. Outbursts due to frustration from lack of communication or boredom with the curriculum are a common occurrence. The student has a history of rigidity in his routines, non-completion of tasks, and lacking participation in classroom activities.

Student C is a three-year-old girl who displays characteristics of developmental disability such as delayed language, difficulty following verbal directions, difficulty coping with change, and unique sensory needs. She has an IEP goal that focuses on completing classroom routines. The student picked up on routines quickly but would look toward an adult for a cue before carrying out practices. Student C speaks in one or two-word phrases, babbling, or pointing/facial expression. She began preschool mid-year immediately following her third birthday.

Student D is the identical twin sister of student C and has very similar patterns for behavior and learning. She began preschool with her sister in January following her third

birthday. Student D speaks in one or two-word phrases, using many gestures and expressions to get her point across. Her IEP goals focus on independence in routines. The child often depended on her sister to accomplish tasks or waited for adult assistance or prompts. She became quickly overwhelmed and would often leave classroom activities and walk away when overstimulated. Due to age and development, many accommodations were made to the curriculum to differentiate for the individual needs of both girls. Other accommodations included cube chair seating, visual schedules, and using five-point-timers for transitions.

Measures

This study was designed to determine the effects of a structured work system on the independent skills of students with ASD or related disabilities. This study addressed the following research questions:

1. Does a structured work system increase on-task behavior and work completion in students with ASD and related disabilities?
2. Does a structured work system result in a decrease in reliance on adult prompting to complete routine tasks?

The independent variable of this study was the implementation of structured work systems into the daily schedules of preschool students with ASD or related disabilities. The dependent variable was the levels of independence measured by bi-weekly data collection and growth on the statewide GOLD assessment's correlating objectives.

Data sheets were created to record progress using the structured work system and the independence in daily routines. Work system data sheets documented the levels of prompting required to complete each step in the system. These steps include coming to the work station, initiation, putting work on the desk, completing a task, moving to "done," and retrieving the

reinforcer. Data was collected each time the student used the system (at least twice daily during a four-day school week). The mean score was calculated bi-weekly and documented in a Google sheet to be updated as needed.

Expectations for independence in daily routines rubrics (see Appendix A) were based on Iowa Early Learning Standards (see Appendix B). These standards describe skills and behaviors typically demonstrated by children from birth to age five and are aligned with Iowa CORE standards. Bi-weekly data was collected measuring levels of prompting required to complete two classroom transition routines, including the morning arrival routine and transition from free choice to large group routine. Both data collection sheets measure task performance by indicating prompting levels, including full physical, partial physical, verbal/gestural, or independent task completion. The criterion for prompting levels is as follows.

- Full Physical prompting- an adult offers hand-over-hand manipulation of the student to direct or control motor movements.
- Partial Physical prompting- an adult moves the student's body in the direction they need to go or towards a targeted object.
- Verbal/ Gesture- a spoken narrative is used to state the steps required for task completion, or an adult points or makes an action to indicate the next step in the task.
- Independent- the student completes the task on their own using only the visual cues offered in the system setup or visual schedule.

Because funding comes from Statewide Voluntary Preschool Program (SWVPP) and Early Childhood Special Education (ECSE) funds, the GOLD assessment is the required early childhood assessment according to Iowa code 29.60. Teachers or early childhood professionals administering this assessment must complete adequate assessment administration training. The

Interrater Reliability test must be taken and passed to ensure valid, consistent results.

Professionals use observation and anecdotal notes to determine placement on the assessment.

The objectives of concentration for this study were as follows.

- Social-Emotional: 1. Regulates own emotions and behaviors
 - 1b. Follows limits and expectations
 - 1c. Takes care of own needs properly
- Language: 8. Listens to and understands increasingly complex language
 - 8a. Comprehends language
 - 8b. Follows directions
- Cognitive: 11. Demonstrates positive approaches to learning
 - 11a. Attends and engages
 - 11b. persists
 - 11d. Shows curiosity and motivation
 - 11e. Shows flexibility and inventiveness in thinking

The program aims to embed authentic, observation-based assessment into each part of the day. Assessment data is entered and used to inform checkpoint ratings daily. Finalized checkpoints require a minimum of three pieces of data to support ratings in each objective. If available, previous checkpoint data shows the growth and progression of skills over time.

This study uses a mixed-methods approach to data collection. Qualitative data is collected through observations and anecdotal notes to determine early childhood needs and best practices accurately. Bias is avoided by using multiple observers and documenting descriptions of what is seen and heard rather than interpretations. Quantitative data was collected from numerical ratings on levels of prompting required to complete tasks. A Pearson product-moment

correlation coefficient was computed to assess the relationship between the levels of independence in using the structured work system and the independent skills in other classroom routines.

Procedures

Students were each provided a structured work system based on their needs and abilities. Students A and B used a top to bottom model. The student would match a visual to a task box, complete the task inside, and place the finished task in a bin on the floor labeled "done." Students C and D used a two-basket left-to-right system. Items in the "to-do" basket on the left were completed and placed in the "done" basket on the right. The staff created visuals for individual schedules labeled "work-space." All students in the classroom have access to a visual schedule for the day and warnings before transitions.

During December 9-22, 2021, the team dedicated two weeks to training staff on how and when to implement the structured work system and teach the system to the students in preparation to begin in January. Students were given familiar tasks to complete within the system that had previously been taught and could be done with independence. The structured work systems could be used as needed, but students' schedules required them to be accessed a minimum of twice daily at pre-determined times of the day. Support staff remained in proximity to students using the system and intervened as needed when prompting was required or behavior necessitated facilitation from an adult. Prompts were given using a least to most prompt fading model.

Data Collection

This action research project uses a combination of qualitative and quantitative data. The researchers used data collection forms to assign a numerical score to levels of prompting

observed when using the structured work system and during familiar classroom routines. Work system data was collected a minimum of twice daily during a four-day school week. The researcher calculated the mean total score of work system data over two weeks. Scores for this data range from zero points (complete independence) to 72 points for full physical prompts in all areas.

The same numerical values were used to score routine independence data biweekly. Students were observed during a morning routine that included entering the classroom, hanging up items, washing hands, signing in, completing a work box, and putting the work box away. The second observation of routine independence occurred during the transition from free choice to large group. It included cleaning up toys, lining up for the restroom, walking in the hallway, washing hands, transitioning to the carpet area, and completing a greeting activity. Again, the data range was 0-72 points possible, with the higher score indicating higher levels of prompting needed. Data was collected using pen and paper forms, and biweekly scores were updated on a Google spreadsheet. The collection period occurred over approximately four months, from the beginning of January until preschool graduation in early May.

I used qualitative data from Teaching Strategies GOLD assessment to measure growth in correlating GOLD objectives. Multiple staff members qualified to administer the GOLD assessment took data from anecdotal notes, checklists, photos, and video observations covering all objectives. Teaching Strategies GOLD uses a subjective decision-making process to determine finalized assessment levels. Prior scores for the fall and winter checkpoints were compared to spring checkpoint data to assess growth.

Findings

Data Analysis

This study aimed to determine whether a correlation exists between the levels of independence reported in a newly implemented structured work system and the levels reported in completing routine tasks. The presence of a relationship may show an ability to generalize independence skills learned into other environments. However, it is essential to note that correlation does not imply causation. Further study would be needed to determine why or how structured work systems impact independence in the classroom. A Pearson product-moment correlation coefficient was computed to assess the linear relationship between these two variables.

The researcher collected data biweekly over approximately four months for 11 data points for students A and B. Due to their January start date, students C and D had 9 data points. Data points were organized in an Excel spreadsheet to examine the relationship between structured work system independence and routine independence. Students could receive a rating of 0-72 points for independence in each area, with lower scores demonstrating more independence. Areas assessed include steps in the morning routine and the transition from free choice time to large group (see appendix A). The individual measures using the structured work system were also assessed, such as transitioning to the system, initiating the system, and completing tasks (see appendix C). Levels of independence using the structured work system were found to be strongly positively correlated, $r(38) = .91$, $p < .00001$. This significant p-value of .00001 implies that as students gained independence in using the structured work system, students also gained independence in completing classroom routines.

Using the structured work system effectively increased independent work completion for all four students. A gradual increase in independence can be seen in charts 1-4, with growth in using the work system coinciding with the growth in independent routines.

Chart 1

Student A Correlation Analysis

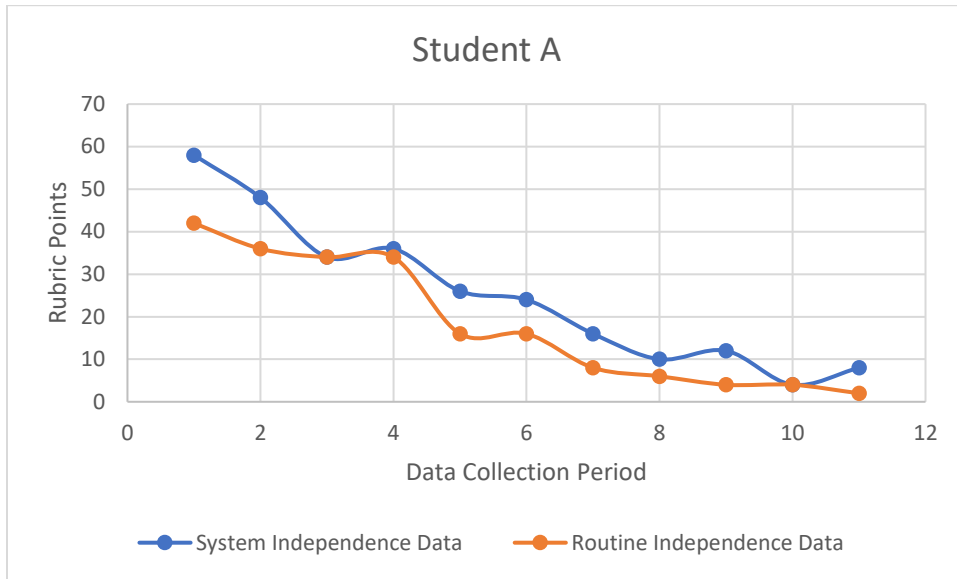


Chart 2

Student B Correlation Analysis

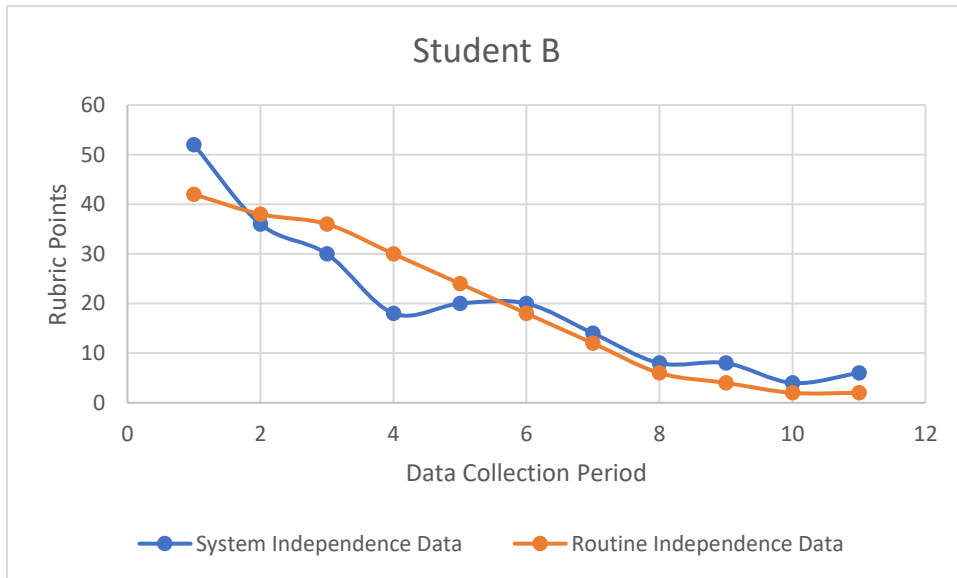


Chart 3

Student C Correlation Analysis

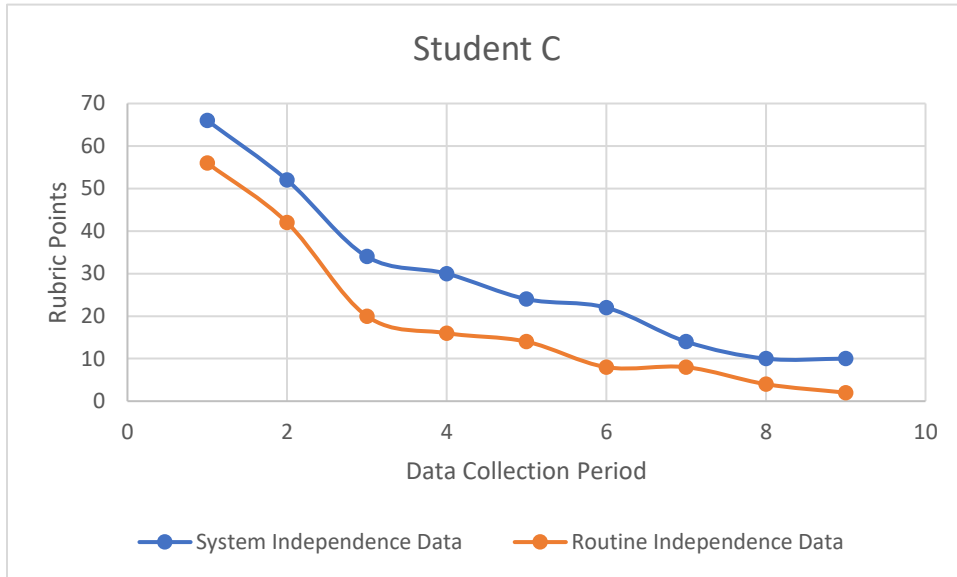
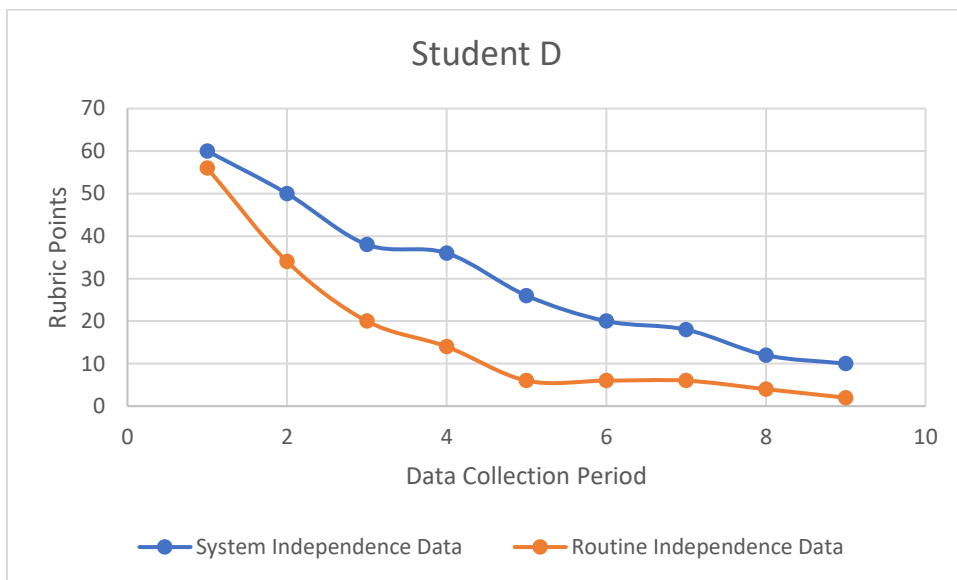


Chart 4

Student D Correlation Analysis



Gold Data

Qualitative data used to assess GOLD objectives related to the study was collected by multiple qualified staff in the form of anecdotal notes, photos, videos, checklists, and observations. Charts 5-8 show the change in assessment scores from one checkpoint to the next. The data graphed

shows student scores on GOLD Objectives related to independence, on-task behavior, following directives, and engagement during the fall and winter pre-intervention checkpoints and the spring post-intervention checkpoint. Between winter and spring, increases in only two related objectives could be seen amongst all four participants. These include objective 1b. follows limits and expectations, and 11b. persists. Students C and D also demonstrated increases in objectives 1c. Takes care of own needs appropriately, and 11 d. shows curiosity and motivation.

Chart 5

Student A Gold Assessment

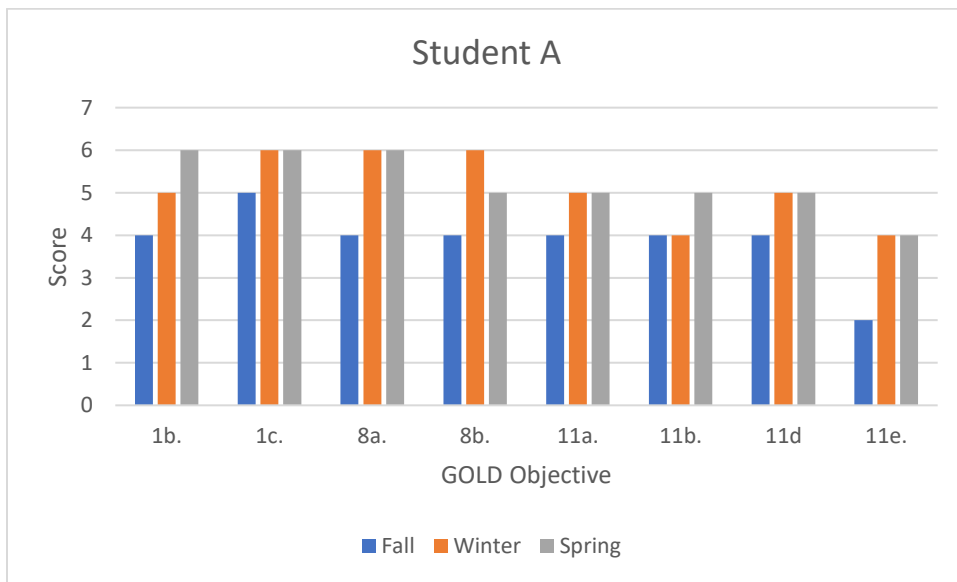


Chart 6

Student B Gold Assessment

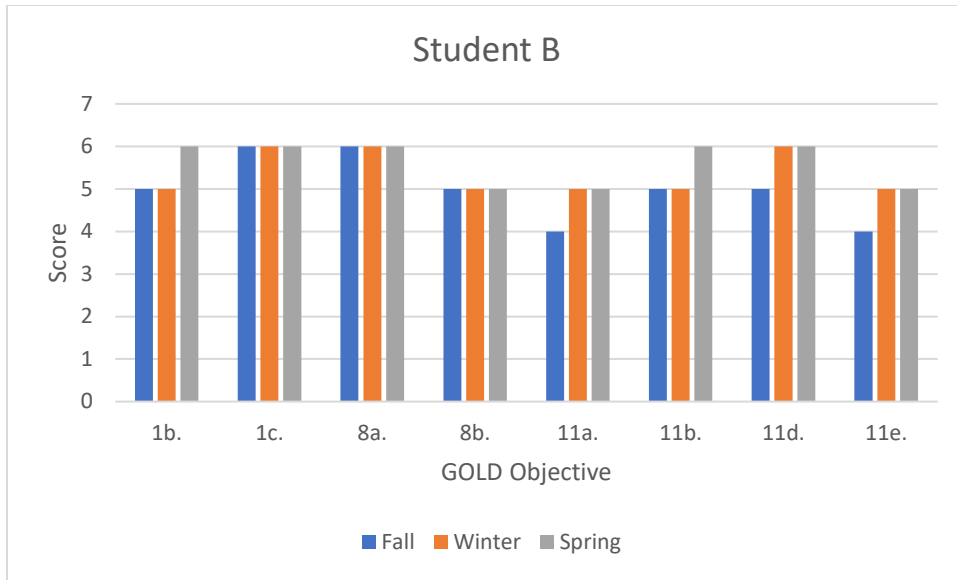


Chart 7

Student C Gold Assessment

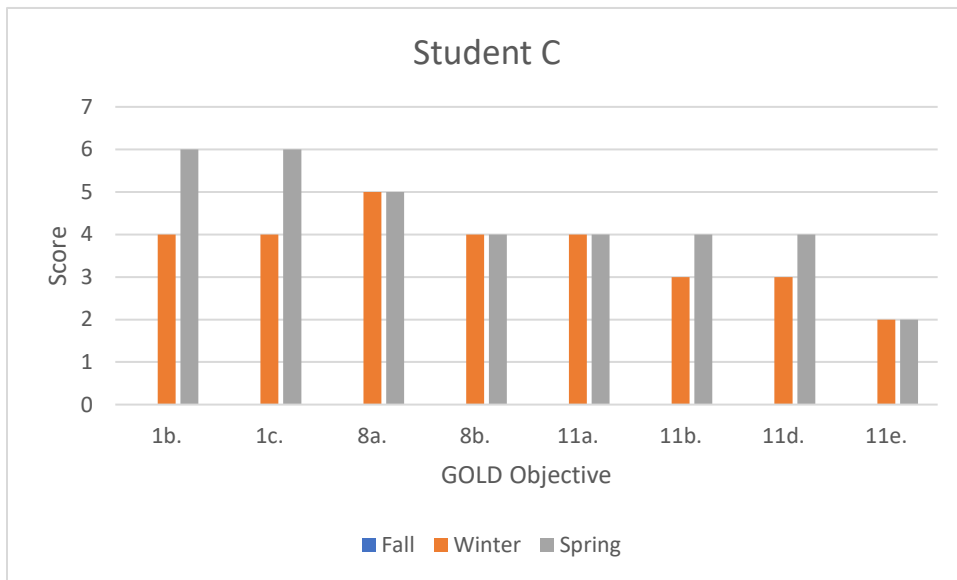
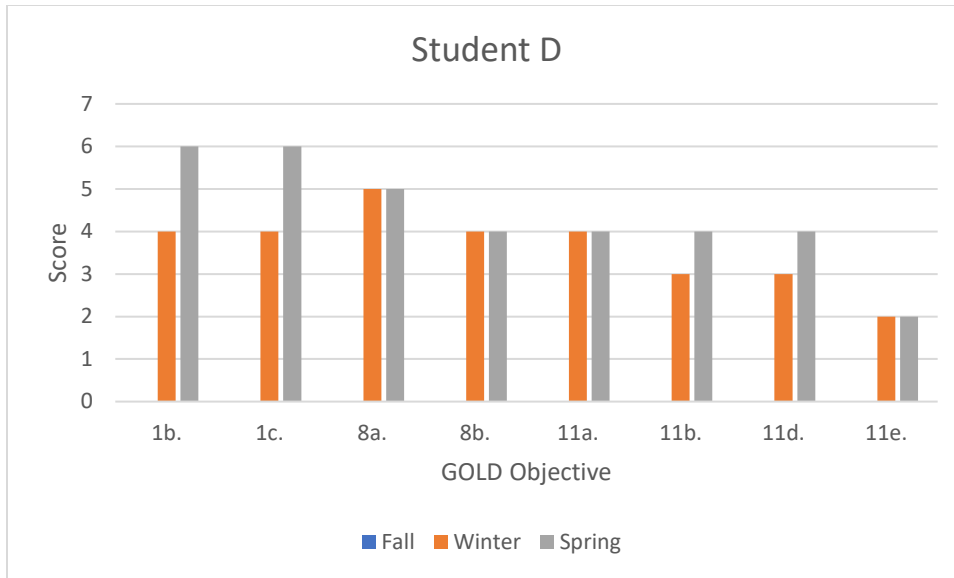


Chart 8

Student D Gold Assessment



While independence in everyday routines changed drastically in the four months of study, the GOLD checkpoint levels remained unchanged or showed growth which would be considered typical between checkpoints. All four participants met widely held expectations determined by the GOLD assessment in these particular objectives. This result was unexpected, and researchers hypothesized that the structured work system's impact was more significant, particularly in objective 1c. Takes care of own needs appropriately. The benchmarks of this objective relate entirely to independence, seeking to do things for oneself, and displaying confidence in meeting one's own needs.

Discussion

Summary of Major Findings

This action research study demonstrated that using a structured work system in the inclusive pre-k classroom positively affects work completion, engagement, and on-task behavior. Levels of adult prompting required to complete work system tasks decreased substantially during the four months of using the system. The most dramatic change was student C. Her system

independence scores decreased by 91% from the first to the final data point, with lower scores representing more independence. The remaining three participants also saw a significant change, with student A displaying a 86% decrease, student B at 88%, and student D at 83%.

The team gave work system materials and task selection great consideration before use. Anecdotal notes and video footage of daily work system use show that tasks that interest the student, are familiar, and fit within the student's skill level were vital in promoting independent work. A reinforcer that considered student preferences motivated students to complete work. Popular selections include an iPad, pop-beads, and trampoline time. Poor selections often result in poor results.

Similar results can be seen in routine independence data. All four participants displayed rubric scores decreased by as much as 95%. These results implicate that using a structured work system in the classroom may impact overall independence in classroom routines. As skills are taught, and students are provided opportunities to practice, educators expect to see growth. This expectation may partially explain the rate of change in student scores. The correlation between system and routine independence data can be seen more clearly when considering the students' start date and baseline scores—particularly those of students A and B. Both participants started the 2021 school year on August 25. Routines and procedures were immediately put into place and practiced. Peers in the classroom had learned all classroom routines and completed them with autonomy by the start of this study. Students A and B continued to require significant adult prompting and only saw real growth in routine completion post-intervention. Students C and D did not begin the preschool year until January 25. Growth seen for the girls may be a more natural progression.

While the structured work systems clearly had positive effects on engagement and task completion, growth in independence may be explained by increased awareness on the part of the staff. Staff received training on system implementation, data collection, and prompt fading techniques. A study by Grogan and Kodak (2019) spoke of prompting and prompt fading as standard teaching practices while comparing intervention and prevention techniques. Before training, standard prompt fading techniques such as unlimited delay and differential reinforcement were not familiar to staff. This increased awareness of the levels of prompts they were delivering, perhaps without need, and efficient techniques to fade these out could have resulted in fewer prompts given or needed to complete tasks.

Interestingly enough, related GOLD objectives saw little to no change as a result of this study. This information may imply an inability to generalize independence skills across settings. The growth in independence was seen primarily within highly structured activities with a natural step-by-step progression. Students continued to require adult assistance in situations that rely more on student discretion, such as independence in play or open-ended art tasks. These are areas that may need specific work systems put into place to facilitate independent decisions and activity.

Limitations of the Study

This action research study has several limitations to be addressed. First, this study was limited to four participants, and only two had previous data to indicate past and present levels of performance for comparison. Students C and D had no prior records, nor did the teacher have a solid knowledge of student preferences or learning styles. A more significant participant population would have resulted in a more accurate view of the effects of structured work systems on overall independence in the classroom. This study was based on a low-intensity intervention

rather than the high-intensity, considered best practice. Finally, the attendance of staff and students could affect the system's success or failure. Attendance was an issue with the prevalence of illness and current covid restrictions. The staff member working with them often influenced student responses. The impacts of student behavior could also be seen throughout the research period. Some antecedents included sleep patterns, illness, diet, changes in home life, and sensory needs.

Further Study

Future research should continue investigating strategies to promote and encourage classroom independence. Areas of independence should branch out from daily routines to independence in play, language, and decision-making skills. Based on the results seen in this study, I would recommend further research on the generalization of learned skills into other environments and scenarios. A parent and staff education component would benefit all involved and promote fidelity in implementing the intervention.

This particular research found a distinct correlation between work system independence and routine independence. Further research is needed to discover the causation of this growth. Does the learned behavior chain in completing the work system lead to change? Is it an increase in self-confidence when finding success at completing tasks independently? In discovering this, educators could develop an intentionally and carefully designed plan for intervention and assessment.

Finally, prompt dependency is a well-known but little-studied phenomenon. The extent of literature on this topic focuses primarily on treating prompt dependency and prompt fading techniques. More research on preventing prompt dependency and what educators can do to change outcomes would be beneficial. What is the cause of this dependency? There is a need to

understand the relationships between prompting models used by educators and the development of prompt dependency.

Conclusion

The importance of establishing independence in students and encouraging them to complete life's tasks with minimal support is the primary ambition of any educator. This action research study sought to determine whether or not structured work systems would increase on-task behavior, work completion, and engagement for students with ASD and related disabilities. The study also approached the question of the impacts of the work system implementation on prompt reliance on other classroom routines. The findings offer further support for using TEACCH-based work systems in the inclusive classroom and acknowledge the potential benefits of doing so. While our instincts may lead us to want to protect and nurture exceptional students, we must refrain and hold them to high expectations. According to Carnahan et al. (2009), although the ability to function independently throughout the day is a goal for all students, it is even more critical for students with ASD, as independence is the key to successful community inclusion. I hope that the information in this research will provide proper tools, techniques, and skillsets to make such high expectations fully attainable for all students.

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Appendix A

Daily Routines Rubric

Routine Independence Data

Name _____

Week _____

Walk to Cubby	Hang Up Items	Wash Hands	Sign In	Work Box	Put Work Box Away	Total Points

Notes:

Clean-up	Line-up for Restroom	Walk in the Hallway	Wash Hands	Transition to Lg. Group	Greeting Activity	Total Points

Notes:

Points: Full Physical=6, Partial Physical= 4, Gesture/Verbal= 2, Independent= 0

Appendix B

Iowa Early Learning Standards

(Iowa early learning standards - 3rd edition 2018)

- Standard 1.1.PS Self Children express a positive awareness of self in terms of specific abilities, characteristics, and preferences.
 - Expresses a positive sense of self in terms of specific abilities.
 - Expresses needs, wants, opinions, and feelings in socially appropriate ways.
 - Demonstrates increasing confidence and independence in a variety of tasks and routines, and expresses pride in accomplishments.
 - Recognizes own power to make choices.
- Standard 1.2.PS Self-Regulation Children show increasing ability to regulate their behavior and express their emotions in appropriate ways.
 - Persists with difficult tasks without becoming overly frustrated.
 - .manages transitions and changes to routines.
- Standard 1.3.PS Relationships with Adults Children relate positively with significant adults.
 - Accepts guidance, comfort, and directions from a range of familiar adults in a variety of environments.
 - Seeks help, as needed, from familiar adults.
- Standard 3.1.PS Curiosity and Initiative Children express curiosity, interest, and initiative in exploring the environment, engaging in experiences, and learning new skills.

- Participates in experiences with eagerness, flexibility, imagination, independence, and inventiveness.
- Standard 4.1.PS Awareness of Family and Community Children demonstrate an increasing awareness of belonging to a family and community.
 - Participates in creating and following rules and routines.

Appendix C

Independent Work System Data

Student: _____ Week Of: _____ Staff: _____

Came to work station	# of tasks	Task	Initiated Work System	Put work on Desk	Completed Task	Moved task to All Done	Retrieved Reinforcer	Notes
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	
FP PP G I		<input type="checkbox"/> correct <input type="checkbox"/> incorrect	FP PP G I	FP PP G I	FP PP G I	FP PP G I	FP PP G I	

Circle the prompt that was required for the student to complete the task sequence.
 Prompt Hierarchy - Independent (I), Gesture (G), Partial Physical (PP), Full Physical (FP)