Supporting the Transition to Employment for Autistic Youth In Rural Communities

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A Dissertation

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by

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Conceptual Linkages Between Each Study

These three manuscripts represent a connection between my two primary research interests, behavioral interventions to support improved employment outcomes for autistic adults and preparing students for the transition to adulthood in rural settings. Manuscript one examines the current literature related to transition interventions in rural communities. We found that relatively few intervention studies (n=19) related to transition have been conducted in rural settings. Additionally, of these studies most did not include any discussion of how the rural setting influenced the design or implementation of the intervention. The community a student resides in can influence their transition to adulthood in a variety of ways (Ault et al., 2019; Lavalley, 2018; Weiss et al., 2023), so it is important that research examine best practices that address the needs and values of rural students and families and leverage available resources when designing and implementing interventions in these communities. We classified interventions found in our review as transition curricula (i.e., utilized a curriculum to teach skills such as IEP participation or technology usage), skill-based interventions (i.e., used a more flexible intervention to teach skills to individual students), or other interventions which included approaches such as inter-agency collaboration or use of related services (i.e., Occupational Therapy). Finally, we discussed recommendations for both research and practice.

Manuscript two explores the effects of a behavioral intervention to teach key employment skills to autistic youth. In this study, we used video modeling plus feedback to teach high-frequency vocational social skills to three autistic youth in a simulated work environment at a local agency serving people with autism and related neurodevelopmental disabilities in the community by providing services such as behavioral interventions and alternative school

placements. Behavioral targets were identified using an assessment first discussed by Lerman et al. (2017) and the intervention was implemented by a naturalistic agent (i.e., a Registered Behavior Technician®). The intervention was very effective during training in all but one instance, however, we had mixed results in terms of generalization and maintenance of skills. We also conducted a post-training probe in a community work setting and observed participants using some, but not all, of the skills learned during training. Using video modeling plus feedback in a simulated work environment to learn and practice important vocational social skills is a promising intervention, but more evidence is needed to determine the best methods of supporting generalization to the natural setting and of its practicality as an intervention in alternative environments such as public schools.

Manuscript three extended this research by examining the use of the behavioral intervention from manuscript two in a rural school setting including any necessary adaptations required to increase the appropriateness and contextual fit of the intervention. Manuscript three draws on the recommendations of manuscript one by using a flexible, skill-based intervention (i.e., video modeling) and attempted to make the intervention more socially valid for the participants by engaging participants, their families, and their teacher in discussions of their future and possible employment opportunities in their community post-high school. Additionally, we adapted the intervention from manuscript two to meet the needs of the classroom setting by altering operational definitions of behavior targets, creating new video models that were contextually appropriate, and adapting the tasks in the intervention to relate to tasks associated with current or likely areas of future employment. To address issues of generalization to natural work environments found in study two, participants rewatched the video models at the beginning of each community-based trial. We also conducted maintenance probes at least two months

following the intervention. I used a natural teaching agent (i.e., a teaching assistant) to conduct the intervention with the student to assess the feasibility of the intervention for use in a rural school environment. I clearly defined the rural community setting by including relevant information concerning community characteristics, school demographics, and access to employment opportunities to support a better understanding of rural transition research for the field at large as we continue to study what works best for whom.

Candidates Role in Each Manuscript and Status

Manuscript one: first author, primary investigator, writer of the entire first draft of the manuscript and managed suggested edits and revisions from the co-authors. Orchestrated responses to reviewer comments with support from the coauthors in addressing certain comments such as the connection to alternative frameworks. Managed the revision process through two iterations of peer-review incorporating feedback from co-authors into final manuscript. This manuscript is currently published in *Career Development and Transition for Exceptional Individuals*.

Manuscript two: first author, designer of the study, primary implementer and manager, primary author of the current version of the manuscript with feedback incorporated from co-authors. Supported by the second author in learning how to conduct the assessment as well as support with conducting the assessment during the intervention. The third author supported by taking IOA data and provided additional support by helping to review the final manuscript. The fourth and fifth authors helped with troubleshooting issues related to high-quality experimental design and data representation as well as providing peer-review of the data throughout the intervention and supported by providing feedback on the final manuscript prior to submission. This manuscript is currently under review at the *Journal of Behavioral Education*.

Manuscript three: first author, designer of the study, sole implementer of all study procedures, author of the current version of the manuscript with feedback from the third author. The second author supported by taking IOA data. This manuscript will undergo further revisions based on feedback from committee members prior to being submitted to a journal for publication.

References

Ault, M. J., Ferguson, B. T., Berry, A., B., Hawkins-Lear, S., & Magiera, K. (2019). The founding, evolution, and impact of the American Council on Rural Special Education. *Rural Special Education Quarterly*, *38*(2), 67-78, https://doi.org/10.1177/8756870519833916

Lavalley, M. (2018). Out of the loop: Rural school are largely left out of research and policy discussions, exacerbating poverty, inequity, and isolation. Center for Public Education.

Weiss, M. P., Rowe, D. A., Mims, P. J., & Farmer, T. W. (2023). There's no place like us: Beyond fidelity of implementation in rural contexts. *Journal of Emotional and Behavioral Disorders*¸ OnlineFirst, 1-14. https://doi.org/10.1177/10634266231155856

Secondary Transition Interventions in Rural Communities: A Systematic Literature Review

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Dissertation

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Open science practices: Materials used for this review and data collected including supplemental effect size calculations are openly available at:

https://osf.io/wu9mb/?view_only=7d3edc0dfb934014a855f9cc3fb184df

Abstract

Nearly 1 million students with individualized education programs (IEPs) live in rural communities in the U.S. and, to date, no reviews have examined the transition literature related to supporting students in rural settings. The purpose of this review was to examine transition-related functional skills interventions conducted in rural settings. We conducted a systematic review of the experimental literature and identified 19 articles. Interventions reviewed included transition curricula, skill-based interventions, or other interventions (e.g., occupational therapy, interagency collaboration). Few articles included substantive reporting on rurality or the effects of community context on intervention design and implementation. We discuss the paucity of rural transition research and provide recommendations for conducting and reporting future research. Understanding best practice for conducting transition interventions in rural settings requires a framework that considers how the multidimensional elements of a given community influence postsecondary needs and outcomes.

Secondary Transition Interventions in Rural Communities: A Systematic Literature Review

During the transition to adulthood, adolescents face tasks such as selecting and applying for postsecondary education, identifying a career of interest, learning to manage finances, and considering where they will live and how they will support themselves. While many adolescents require support to make decisions about the future, those with disabilities often require additional support to navigate this complex process (Lipscomb et al., 2017; Liu et al., 2018). For this reason, students' Individualized Education Programs (IEPs) are required to include transition-related components (IDEA, 2004), and the transition to adulthood continues to be a focus of educational research (Test & Fowler, 2018). Indeed, evidence shows that transition program participation is associated with increased educational and employment outcomes for students with disabilities (SWDs) (Test, Mazzotti et al., 2009).

Despite special education's focus on the transition to adulthood and associated benefits of career development and transition supports (Liu, 2018; Mazzotti et al., 2021), employment and postsecondary education completion rates for people with disabilities remain substantially below their non-disabled peers (Erickson et al., 2022). As a result, researchers studied the effects of transition interventions and supports aimed to increase the knowledge and skills of SWDs as well as improve postschool outcomes. Several reviews synthesize the literature and detail the current understanding of best practices in the field of transition.

Test, Fowler et al. (2009) conducted a comprehensive review of transition-related supports and interventions and identified 32 evidence-based practices (EBPs) for broadly teaching transition skills to SWDs. This work was later extended (Test et al., 2012) and updated by Rowe et al. (2021). Other reviews examined the effects of various interventions on specific

populations of SWDs. Authors investigated transition supports for populations such as autistic[1] students (Westbrook et al., 2015) and students with intellectual and developmental disabilities (Seaman & Cannella-Malone, 2016). However, no reviews examined the literature concerning how community context relates to the implementation of effective practices to teach students skills needed for postsecondary transition. Torres et al. (2014) argue that the first step to implementing effective practices is determining student, environmental, and instructor characteristics; characteristics all influenced by the greater community in which they reside. Community context is an important aspect of culturally responsive practice. As Cerna et al. (2021) note, "demographic, sociopolitical, and contextual dimensions, locations, perspectives, and characteristics of culture matter," (p. 1) especially when attempting to understand what secondary transition practices are effective for whom.

Rural settings include community contexts that significantly affect transition programming and require additional consideration. Rural communities present unique differences across all levels of the ecological system making it difficult to implement a single model for transition planning (Farmer & Hamm, 2016). According to Lipscomb et al. (2017), 38% of youth with disabilities reside in rural communities, so it is important to consider how the variability within these communities effects the design and implementation of appropriate supports for students as they transition to adulthood.

Transition in Rural Communities

[1] We acknowledge that language is important and that preferences vary among members of the autism community. We have chosen to use person-first and identity-first language interchangeably in this paper to reflect the diversity of opinion that exists concerning ASD and language.

Bronfenbrenner's (1979) ecological systems theory posits the environment and social context in which a person grows up are central to development. Additionally, Bronfenbrenner describes the importance of active engagement with individuals during *ecological transitions* (a transition between environments, e.g., school to work) because engagement with others during these times has the most immediate and potent effect on the outcomes of that transition. This applies to the transition to adulthood in rural settings. Adolescents living in a rural community within the U.S. experience the transition to adulthood differently than those living within other ecological systems, namely, suburban and urban settings. For example, a student in a small rural community likely will not have the same access to public transportation, community-based postsecondary education, or job opportunities as students in other contexts. As adolescents transition from school to adulthood, interactions with other people within their environments (e.g., school, home, work) play a key role in the outcome.

Trainor et al.'s (2020) proposed transition research framework also supports the need for further examination of transition in rural settings. The authors included community as a key feature in their framework and contend that cultural context involving community and social interaction plays a primary role in appropriately contextualizing transition planning. Additionally, the authors identified students in rural communities as a population requiring further understanding through quality research.

Rural schools experience challenges related to lack of resources and specialized services, inadequate staffing, high levels of student poverty, transportation, and under-prepared special education teachers (Ault et al., 2019; Lavalley, 2018, Weiss et al., 2023). These challenges produce barriers to successful transition to postsecondary environments for SWDs (Brendle et al., 2018; Test & Fowler, 2018). Consequently, when designing interventions and supports for

students in these communities, schools must keep in mind ways to ameliorate these challenges, such as engaging students and families in the transition process, community-based interventions, inter-agency collaboration, remote learning, and work-based learning opportunities (Test & Fowler, 2018). Transition plans that include high-leverage practices tailored to fit the community context have the greatest potential for providing students with the skills necessary to overcome environmental barriers, thus, leading to a more successful transition to adulthood (Harvey et al., 2020; McLeskey et al., 2017; Weiss et al., 2023).

While there are barriers to transition in rural communities, there are also many positive elements of life in these settings that may contribute to successful transition planning. These include strong work ethics and value for education (Wittig et al., 2014), strong personal relationships within the community (Singh et al., 2019; Stewart-Ginsburg & Kwiatek, 2020), smaller school settings (Rude & Miller, 2018), and relatively higher rates of teacher satisfaction (Berry & Gravelle, 2013). Researchers and practitioners should harness these assets when designing transition-related interventions and supports for SWDs in rural contexts.

Defining Rural

One factor contributing to the difficulty of understanding transition in rural communities is that rurality is difficult to define. There are several federal definitions of rurality (Bennett et al., 2019; South Carolina Center for Rural and Primary Health Care, n.d.) which are generally based on population size, or, in some cases, a "rural" area is just an area that is not "urban" or "suburban." Other definitions include information concerning commuting area and economic ties. For example, the U.S. Office of Management and Budget would include a county as part of a “metropolitan area” if at least 25% of the residents commute into a centralized urban county for work (United States Department of Agriculture, 2019). Rural definitions vary widely and have

implications for special education research and the allocation of resources making it important that researchers clearly indicate the parameters they are using to define a setting as “rural”.

Hawley et al. (2016) detailed the need for clearly operationalized definitions of rurality in special education research because this can affect grant funding eligibility, resource allocation, and/or research findings. However, rural communities can differ considerably, and the multi-faceted elements of a given rural community are often not adequately communicated by standard federal definitions. As noted by Bennett et al. (2019), “rurality reflects a breadth of demographic, social, economic, and health system characteristics” (p. 1987). Population threshold and density, proximity to resources or urban centers, land use, and socio-cultural context are all significant considerations when developing transition components of the IEP and can be highly variable across rural locales (Bennett, 2019; South Carlina Center for Rural and Primary Healthcare, n.d.). Thus, best practice as well as barriers to transition may differ from one community to the next. For example, Test and Fowler (2018) described common barriers to transition in rural communities, but it is possible these might not be representative, inclusive, or even accurate depending on the specific rural context in question (Bennett et al., 2019). While federal definitions are important for researchers working in tandem with federal organizations, the definitions fail on a practical level to describe other relevant social and environmental factors associated with a rural community.

Purpose

Data gathered from systematic reviews of the literature are used to inform the education community of what practices are effective (Siddaway et al., 2019). However, due to the lack of research conducted in rural settings (Madaus et al., 2013), the current research base presents equity implications for those individuals specifically living in rural communities. Community

setting plays a significant role in the ecological transition of students from school to adulthood. To design effective interventions it is important to understand the state of the evidence base including the extent to which researchers have implemented interventions designed to address the needs of students living in a rural context. Therefore, the purpose of this systematic review was to examine transition-related functional skills intervention studies conducted in rural settings, to identify the characteristics and effects of these interventions, and the extent to which authors discussed the characteristics of rural communities as they relate to the design and/or implementation of the intervention.

Three research questions guided this review:

1. What were the sample characteristics of students involved in transition intervention studies in rural settings?
2. What types of published transition intervention studies have been conducted in rural settings?
3. To what extent do researchers consider the specific needs of rural communities in their intervention designs and study reports?

Method

To ensure methodological rigor of the systematic review, we followed procedures outlined in the PRISMA guidelines for systematic reviews (Page et al., 2021). Given the focus on identifying and appraising evidence specifically related to SWDs transitioning in rural settings, we adapted methods from Rowe et al. (2021). We replicated the following inclusion criteria included in Rowe et al.: (a) involved school-age participants between the ages of 11 and 22 who were receiving special education services, (b) had a dependent variable that targeted a transition-related functional skill (i.e., social skills, life skills, employment skills, self-determination skills), and (c) utilized an experimental or quasi-experimental design (i.e., single-case, group design). To

address our research questions, we added an additional criterion that at least one of the participants was reported to reside in a rural setting, and we expanded our search to include grey literature (e.g., dissertations and theses) to capture the greatest number of studies.

Selection Procedures

Rowe et al.'s (2021) update to Test et al. (2012) included relevant studies published between 1984 to December 2018. To identify studies published after Rowe et al. (2021), we conducted an additional search of the literature published between January 2019 and December 2021. While our search terms were based off Rowe et al. (2021) we were unable to reproduce the more than 5000 different search word combinations generated in that review. To identify any additional articles published between January 2019 and December 2021, we used a keyword search in ERIC, A.P.A. PsycInfo, and Education Research Complete using the following word strings: [transition OR "vocational rehab*" OR employment OR "social skills" OR "self-determination" OR "job skills" OR workplace OR "functional skills" OR "life skills" OR postsecondary] AND [disability OR "special education" OR autism OR "learning disability" OR "intellectual disability" OR "visually impaired" OR deaf OR "traumatic brain injury"] AND ["high school" OR "middle school"]. This search yielded 7,192 results with 4,199 articles included for screening after removing duplicates. We also conducted a hand search of key journals (*Exceptional Children, Remedial and Special Education, Career Development and Transition for Exceptional Individuals,* and *Rural Special Education Quarterly*) to ensure no articles were missed in the search. Key journals were chosen based on impact factor (*Exceptional Children; Remedial and Special Education*) and content relevance (*Career Development and Transition for Exceptional Individuals*; *Rural Special Education Quarterly*). To conduct this search, we downloaded all articles published between 2019 and 2021 and searched for the

keyword “rural”. The hand search identified 126 articles resulting in 4,325 (126 from hand search plus 4,199 from database search) total articles identified for title and abstract screening.

Inclusion/Exclusion Criteria

We used a multiple phase approach to determine inclusion or exclusion of studies (see Figure 1 for PRISMA Diagram). As mentioned earlier, phase one included locating the full text of all studies included in the Rowe et al. (2021) review (*n*=53). We then conducted a keyword search using the word "rural." This generated 14 articles establishing the initial review corpus.

Phase two included title and abstract screening for the 4,325 articles identified in the electronic and hand searches. We screened each title and abstract to determine if they met initial inclusion criteria. We excluded articles if they did not include participants between the ages of 11 and 22, were not focused on a transition-related functional skill, or did not use an experimental or quasi-experimental design (e.g., qualitative, correlational). If it was unclear from the title and abstract the extent to which an article met the initial inclusion criteria, we moved it to full-text screening. As a result of reviewing the 4,325 titles and abstracts, we identified 120 articles for further review (118 from electronic search, two from hand search). To assess interrater reliability (IRR), a second reviewer screened 23% (*n*=1,000) of titles and abstracts. Reviewers agreed on 982 of 1,000 articles resulting in an IRR of 98.2%. We then obtained full-text versions of the articles from the electronic search and conducted a keyword search for “rural” resulting in 22 articles (i.e., 20 from electronic search, two from hand search) included in the full-text review.

Phase three involved the first author screening the full text of the 22 articles identified to verify the articles met inclusion criteria. Of note, one article (Lee et al., 2011) met the inclusion criteria, however, no participants from rural settings were included in the experimental group so

we excluded the article. This resulted in five articles for inclusion in the analysis. We combined these five articles with the 14 from the initial review corpus totaling 19 articles for inclusion.

Selected Feature Coding

We developed a codebook for data collection and coded the identified articles for selected features including (a) participants' characteristics, (b) research design, (c) independent and dependent variables, (d) transition focus, (e) how rurality was defined, (f) inclusion of a research question related to factors associated with rural community needs, and (g) the extent to which the intervention addressed the unique needs of a rural setting. To address how the authors defined rurality, we examined where the authors indicated the research was conducted in a rural setting and identified any additional information indicating the population size, school size, or other relevant community factors for defining a "rural" setting. To address consideration of rural needs, we identified whether the intervention included components related to (a) accessing transportation, (b) community-based interventions, (c) inter-agency collaboration, (d) remote learning, (e) student and family engagement in the transition process, (f) work-based learning experiences, (g) social capital, and/or (h) funding as these are all relevant components of supporting students in rural contexts (Test & Fowler, 2018). We measured interrater agreement by double coding all the results presented in Supplemental Table 1. We resolved discrepancies by reexamining the text and coming to a consensus between raters. We agreed on 282 of the 288 items resulting in a coding interrater agreement of 97.9%.

We also conducted an in-text search for the word "rural" and identified the context and nature of the discussion of rurality within each article. We first identified the number of times the word "rural" was used in the article, the section(s) of the article in which the authors referenced rurality (e.g., introduction, methods, or discussion), and the context of the discussion in which

the word "rural" was used. We then coded articles for a variety of indicators related to authors' consideration of rurality. These included (a) whether rurality was mentioned only in reference to the setting or in other places throughout the article, (b) whether the introduction or research questions indicated the authors sought to determine the effect of their intervention for rural students, (c) if any adaptations were made to the intervention to suit the community context, (d) if rurality was included in the analysis (e.g., as a covariate), or (e) whether the authors discussed setting in the discussion or limitations section (e.g., indicating a need for future research). All supplementary material used during the data collection process including database search results, codebook, coding results, criterion for contextual substantiality, and rural word search findings are available at: https://osf.io/wu9mb/?view_only=cd660dfd07834a7bbe7e895c736560db

Range of Effects

Consistent with Rowe et al. (2021) we calculated the range of effects for interventions included in this review. However, we chose not to include this information in the final manuscript because it was not possible to compare the effects of interventions in rural versus non-rural settings due to lack of clarity in reporting which data corresponded to which students. Thus, the effect sizes, while informative, did not describe the effects of the interventions for rural students which is the focus of this review. Unfortunately based on the available literature and due to the variety of interventions included in this review, there is little opportunity for synthesizing effect sizes across studies to assess the total effect of an intervention. For those interested in reviewing the results of our effect size calculations, our findings and an explanation of our procedures are openly available on our OSF site (see above).

Results

In this paper, our goal was to examine the types of interventions conducted in rural settings and the extent to which authors considered the environmental context when designing and implementing their interventions to understand what effective practices look like in rural communities. The following results synthesize transition-related functional skills research conducted in rural settings. We present our findings within the context of our three research questions. For a detailed description of each study see Supplemental Table 1.

Research Question 1: Sample Characteristics for Students in Transition Interventions

Across the 19 studies, the number of participants ranged from *n*=3 to *n*=877, totaling 3,136 participants, although not all the participants lived in rural settings. Many studies (*n*=12) included participants from multiple community contexts (See Supplemental Table 1); however, only six of these articles disaggregated participant demographics by setting. The six studies that did not disaggregate data included *n*=1,824 participants meaning that for 58.2% of participants across all studies it was unclear whether they were from a rural or non-rural area, thus, making it impossible to estimate the total number of participants across studies who lived in rural communities only. Fourteen articles reported gender demographics: 924 male (63.2%) and 539 female (36.8%). Fourteen articles also reported the race of participants using the following categorizations: White (*n*=1,782, 65%), Black or African American (*n*=252, 9%), Hispanic (*n*=399, 15%), Asian or Pacific Islander (*n*=30, 1%), American Indian or Alaskan Native (*n*=27, 1%), non-White, non-Hispanic (*n*=207, 8%), other (*n*=44, 2%), or missing (*n*=11, <1%). Ten studies included participants from a variety of disability categories, seven included only participants with intellectual disability (ID), two included only participants with autism spectrum disorder (ASD), and one study included only participants with learning disabilities or ASD.

Fifteen studies included high school (ages 14-22) participants, three included middle school (ages 11-13) participants, and two included both.

Research Question 2: Transition Interventions in Rural Settings

We grouped the interventions into three broad categories: transition curricula, skill-based interventions, and other interventions (e.g., occupational therapy, interagency collaboration).

Transition Curricula

Nine studies utilized a transition curriculum. Three studies (Askvig et al., 2020; Diegelmann & Test, 2018; Martin et al., 2006) used the *Self-Directed IEP* curriculum or a modified version to teach self-determination and IEP participation skills. Cease-Cook et al. (2013) used the *Self-Advocacy Strategy* and measured IEP participation, and Woods et al. (2010) used the *Student-Directed Transition Planning* curriculum to increase transition knowledge and encourage active participation during IEP meetings. Two studies (Izzo et al., 2010; Lombardi et al., 2017) utilized the EnvisionIT curriculum to teach reading skills and technological literacy and to encourage career and college exploration using the internet, among other outcomes. Lindstrom et al. (2020) used the Paths 2 the Future curriculum to increase self-awareness and build knowledge of gender identity, disability, and career and college exploration skills in young women with disabilities. Finally, Smith et al. (2021) used the Virtual Interview Training for Transition Age Youth (VIT-TAY), a virtual reality job interview intervention, to teach students with ASD how to find, prepare for, succeed in, and follow up on job interviews.

Skill-based intervention

Six studies used skill-based interventions (implemented with SCDs) to teach functional skills including money management, personal safety, and leisure skills. Ayres et al. (2006) used computer-based probes and instruction to teach the dollar plus purchasing strategy when buying

goods using cash. Similarly, Rowe and Test (2012) and Rowe et al. (2011) used simulations involving prompting and modeling to teach students to use a debit card and track their expenses. Taber et al. (2002) and Taber et al. (2003) used a least-to-most prompting procedure to teach students how to identify and respond to being lost in the community. Finally, Lo et al. (2014) used progressive video prompting to teach students how to shoot a basketball.

Other Interventions

Four studies utilized interventions that did not fall under the two categories described above. Carter et al. (2017) used peer support plans in the general education classroom to increase social interactions and academic engagement of autistic students. Flowers et al. (2018) used the Communicating Interagency Relationships and Collaborative Linkages for Exceptional Students (CIRCLES) model to increase interagency collaboration and provide a direct link between students and community agencies. McCormick et al. (2021) used a cross-domain case management model and student and family training to increase employment outcomes for youth with disabilities receiving supplemental security income. Finally, Pierce and colleagues (2020) used occupational therapy to promote SWDs' adaptive functioning and self-determination.

Research Question 3: Consideration of Rural Needs in Research Designs

Seven articles reported that participants were only from a rural setting while 12 reported participants from a variety of settings. When reporting the setting, seven articles included an indication of how rurality was defined. While not always a clear indicator of rurality, five articles included student enrollment data. One study (Askvig et al., 2020) provided an explicit definition of rurality (i.e., number of community residents) that is consistent with major federal definitions of determining rurality (South Carolina Center for Rural and Primary Health Care, n.d.) and one study (McCormick et al., 2021) provided an implicit definition by referring to the setting as

“micropolitan” which indicates a population between 10,000 and 50,000 according to the federal definition of statistical areas (Office of Management and Budget, 2010).

While most studies (*n*=14) did not indicate a substantial consideration of setting, 17 utilized strategies that supported students' needs in such communities. These include student and family engagement in the transition process (e.g., Askvig et al., 2020; Diegelmann & Test, 2018), community-based interventions (e.g., Ayres et al., 2006; Rowe & Test, 2012), inter-agency collaboration (i.e., Flowers et al. 2018), remote learning (i.e., Izzo et al. 2010; Smith et al. 2021), and work-based learning opportunities (i.e., McCormick et al. 2021; Pierce et al. 2020). No studies addressed access to transportation, social capital use, or funding access. See Supplemental Table 1 for more information.

Focus on Rurality

To investigate the extent to which the authors addressed rurality in the included articles we searched for the word “rural” in each article and noted the locations and contexts in which the word was used. While all studies in the review included students from rural settings, the discussion of rurality and its implications for the research or intervention design was limited. Eight articles only referred to rurality in relation to the setting (e.g., "this study took place in a rural high school"), while four indicated a rural setting and mentioned rurality in their implications section (e.g., need for further research in rural and/or other settings). Three studies included analysis of rurality as a covariate with little or no further discussion throughout the article. Lindstrom et al. (2020) controlled for rurality in their data analysis. Flowers et al. (2018) used rural/urban location to determine statistical differences in control and treatment samples. Izzo et al. (2010) controlled for rurality in their analysis and presented effects of their intervention disaggregated by suburban and rural students.

Five articles have substantial references to rurality, meaning that the rural setting influenced the intervention's purpose, design, or implementation. Smith et al. (2021) indicated that they "intentionally recruited participants from public, charter, and private schools set in rural, urban, and suburban communities" (p. 1548). Askvig et al. (2020) stated in the introduction that the "study specifically addressed students in rural communities and in a variety of service delivery formats typical of those communities" (p. 24). Lombardi et al. (2017) aligned their intervention with the Every Student Succeeds Act (2015) as it provided "access to online course opportunities for students in rural or remote areas" (ESSA, 21 U.S.C. 812(c)).

Woods et al. (2010) utilized setting-specific instruction as a component of their intervention. School settings included an urban high school, a rural high school, and a school for the blind. They provided student enrollment and demographic data for each school and discussed how they collaborated with teachers in each school to facilitate the implementation of the intervention based on school-specific needs. Although they did not discuss setting-specific results or implications, Woods et al. (2010) adapted their intervention to fit the contextual needs of each school, thus, demonstrating substantive consideration of school setting as it relates to the design and implementation of an intervention.

Finally, McCormick et al. (2021) discussed a subset of the PROMISE initiative designed "to inform federal policymakers on strategies for improving employment outcomes for youth with disabilities living in more rural locations" (p. 121). Although their project included students living in a variety of settings, including urban and suburban areas, they disaggregated the employment status of their sample by urban and rural participants. In the results section, they identified challenges associated with transition to employment in rural settings, including a lack of hands-on activities leading to employment, the need for training on local resources and

various agencies' involvement in the transition process, and the difficulty of accessing vocational rehabilitation services. Last, the authors discussed variations in implementation strategy and inconsistent access to services and employment opportunities as a limitation of their study.

Discussion

We reviewed the literature to identify experimental studies examining the effects of transition interventions for SWDs living in rural settings. The environment and social context in which students live influence their learning and development and, subsequently, their post-school outcomes. To better serve SWDs living in rural environments, it is important to understand what practices are effective and what (if any) adaptations are needed to support implementation in rural contexts. We identified interventions utilizing structured curricula, flexible skill-based interventions, and high levels of interagency and/or community-based collaboration to have some evidence supporting their use in rural communities, but due to lack of clarity in reporting on setting and student demographics it remains unclear just how effective some of these interventions were at supporting rural students.

This systematic review resulted in very few published intervention studies explicitly conducted in rural settings (i.e., 19). Yet, nearly one in five students in the U.S. attend a rural public school, and at least one in 10 of those students receives special education services in 48 states with some having as many as 17.8% (Massachusetts) of rural students with IEPs (Showalter et al., 2017). To assist researchers and practitioners in reducing potential inequities it is important for implementation studies to describe the current conditions of equity/inequity, measure whether interventions reduce inequities between groups (e.g., rural vs urban), and design and test interventions specifically to address inequities (Cerna et al., 2021).

Limitations and Recommendations for Research

This review should be considered with limitations. First, this review examined only functional skills interventions, and not transition-related academic skill interventions. Future reviews may want to consider all transition-related interventions, academic interventions in isolation, or delineate interventions by disability type. Another limitation of the current state of the literature is that school rurality is inconsistently defined if it is defined at all. Many articles simply indicated the setting was "rural" without providing additional information. Alternatively, four articles reported data on school size, which is a useful metric, but can be misleading as the number of students in a school is not always indicative of the community context. For example, in Carter et al. (2017), the rural school had the largest student population.

Defining Context

To best understand how the design of interventions and supports are influenced by community context the literature should accurately report the community environment to reflect the variety of needs present and inform practice. Many articles do not include a detailed report of the setting (Madaus et al., 2013) or may not use the word “rural” to describe the setting. Because of this, there were likely more studies conducted in rural settings than were included in this review. Current options for defining rurality include federal definitions based on a variety of factors centered on population size and location compared to urban centers. However, these are limited in their usefulness for special education researchers as they fail to portray other key factors related to successful transition Future research should share the understanding of an area based on the researcher interactions with the community and add additional detailed characteristics to convey the community context of the research. The details provided can be informed by “local expertise” (Hawley et al., 2016) and be based on Brown and Schafft's (2011) multidimensional approach and include a description of the (a) population and settlement

structure and landscape, (b) economy, (c) institutions, and (d) socio-cultural characteristics of the community as they relate to the context of the study. Some socio-cultural factors to consider include demographics, as rural communities often have high levels of poverty and increasingly diverse populations (Rude & Miller, 2018), and social networking community norms (Weiss et al., 2023). Rurality is difficult to define (Hawley et al., 2016), so no one definition can be used exclusively by all researchers. Researchers can use Brown and Schafft's (2011) model as a starting point and build upon this description using local expertise.

Future researchers could also consider using the Equity Framework for Career and Technical Education Research (2022) specifically by allowing community context to influence the development of research questions, develop an understanding of local context prior to designing the study (including an explicit definition of rurality), integrate community feedback during the research process, examine the implicit and explicit biases of the research team, and report on these processes in the final manuscript. Student diversity should also be considered. Studies in this review included diverse participants from relatively diverse backgrounds with percentages generally corresponding to national data (U.S. Census, 2022). Diversity in rural communities is increasing, particularly for non-English speaking students (Rude & Miller, 2018) so future research could consider how traditions and cultural values of students and families effect their engagement with the school system during the transition process.

Determining Contextual Fit

Rural special educators must teach a diverse set of SWDs, often without the benefit of specialized related services providers (e.g., school psychologists, occupational therapists) (Weiss et al., 2023). The ability of teachers to use a diverse set of EBPs with fidelity is paramount to ensure student success across all stages of learning (Torres et al., 2014). As noted in Weiss et al.

(2023), implementation of EBPs must be considered within multiple contexts (i.e., school, community, and policy context). Contextually appropriate interventions are crucial for allowing students to develop skills that will serve them into adulthood (i.e., maintenance and generalization of skills). Our review highlights a paucity of knowledge on best practice for designing and adapting interventions that are contextually appropriate.

While guidance exists for how to implement an EBP (e.g., Torres et al., 2014), research indicates a "one-size-fits-all" model cannot be effective in rural classrooms due to the significant variety present in rural communities across the U.S. (Farmer & Hamm, 2016). As a result, intervention research should examine both the direct effects of interventions in the classroom and analyze adaptations necessary for integration within a system that lacks resources and accessibility for special educators that must work with a diverse student population while also maintaining reasonable fidelity. This is not a small task and requires a framework for research that considers the complex nature of rural communities and promotes equitable access to high-quality transition-related interventions and supports.

The field of secondary transition could draw upon implementation science research conducted in health care (i.e., dynamic sustainability framework or the Consolidated Framework for Implementation Research; Damschroder et al., 2009). Rather than viewing contextual factors as interfering with the delivery of an effective intervention and needing to be controlled, Chambers et al. (2013) suggested researchers seize the opportunity to learn about the optimal fit of an intervention to different settings. They argue "harnessing the understanding of context can enable beneficial adaptation of the intervention and improve sustainability" (Chambers et al., 2013, p. 3). Transition researchers might consider the dynamic sustainability framework (DSF) as they plan for and test interventions. The DSF attempts to maximize the fit between

interventions, settings, and the broader ecological system over time, a concept also posed by Weiss et al. (2023). Chambers et al. recommended monitoring context as interventions are implemented and adapting accordingly to determine true impact. For example, in a SCD study, as researchers monitor the context and its impact, change may occur causing the researcher to create a phase change. Additionally, Damschroder et al. (2009) emphasized the need for adaptation of interventions indicating "interventions usually come to a setting as a poor fit, resisted by individuals who will be affected by the intervention, and requiring an active process to engage individuals in order to accomplish implementation" (p.3). If researchers took time to describe the essential 'core components' of an intervention and the 'adaptable components' it would allow both future researchers and practitioners to assess the relevance and fit for their instructional context more easily. Future research should consider implementation needs and discuss the relevant training, coaching, and systems-level supports (e.g., administrator support) required for success. An intentional examination of contextual fit could be included as part of the research methods as in Monzalve and Horner (2021) which discussed how the Contextual Fit Enhancement Protocol (CFEP) can be used to identify adaptations to improve contextual fit.

Understanding Effect

We chose not to report effect size data in this review due to an inability to make meaningful comparisons across settings and the challenges associated with comparison across research designs. Future research should continue to consider this challenge and how it pertains to conducting meta-analyses in the field of special education which regularly utilizes diverse research designs. Researchers should also consider reporting student data disaggregated by setting. Comparing the effects of interventions across settings can provide further information as to whether a given intervention may be relevant for a given community context.

Implications for Practice

Understanding the context in which an intervention is effective will help practitioners to choose and implement interventions in their own environments to support increased postsecondary outcomes for their students (Torres et al., 2014). Transition curricula provide detailed lessons and structure that make interventions more accessible to practitioners and curricula that are technology-based (e.g., Izzo et al., 2010; Lombardi et al., 2017) increase access in schools with consistent internet and computer access. However, transition curricula may lack flexibility and additional consideration should be made regarding adaptability for a variety of contexts, for example, indicating in the curriculum which lessons can be altered to discuss more contextually appropriate skills or needs. Skill-based interventions allow for greater adaptability and teaching in a contextually appropriate environment, but often require more training to implement with fidelity. Acquiring competence with an intervention may require support from administrators or coaches. This could present a systems-level issue for school districts with limited resources who must be selective in their allocation of those resources. However, the benefits of teaching high-quality, flexible interventions (e.g., video modeling or community-based instruction) to teachers could be substantial as they would then be able to use these types of skill-based interventions for instruction on a variety of transition-related functional skills.

Achieving contextual fit entails (a) aligning the procedures of an intervention with the values of those involved in its implementation and receipt, (b) the available resources to support it, and (c) the significance of the outcomes. Evaluating the degree of contextual fit holds significant importance within the intervention process and can serve as a predictor of its long-term sustainability (Spencer et al., 2012). Numerous variables contribute to contextual fit and are further influenced by being situated in a rural community (e.g., student characteristics, classroom

resources, funding, and administrative support; Trainor et al., 2020). Enhancing contextual fit is possible through collaboration among interdisciplinary team members, including teachers, administrators, consultants, and families. Ultimately, a high level of contextual fit is indispensable to ensure faithful implementation of the intervention and to yield positive outcomes for both students and teachers.

In addition to understanding the evidence-base, to support assessing contextual fit of secondary transition interventions, practitioners, may consider adapting the contextual fit assessment tool developed by Horner et al. (2003) for use with positive behavior intervention supports to examine fit and feasibility. Use of this tool can assist practitioners in identifying the adaptions needed to improve the contextual fit of the intervention and plan steps for implementing an adapted intervention to address student needs. While the tool considers several contextual factors, rural-specific elements to evaluate include (a) specific student/ family needs, (b) alignment with personal/professional values, and (c) resources available.

Alignment to Values

Students and families should be included in the transition process as much as possible and this review included several effective methods to increase self-determination and IEP participation. However, self-determination may function differently in the rural social context where values might be primarily family- or community-oriented. Inclusion of the student and family in the IEP process can allow practitioners to align their goals with those of the student and family and design supports that help the student meet their goals. In addition, teachers should seek to engage with their community as much as possible and provide students with opportunities to practice skills in the community or connect with support agencies or business owners. McCormick et al. (2021) demonstrated the benefits of involving community members in

the IEP process. Teachers can use their own connections within the community or collaborate with administrators or other coworkers to create opportunities for more community-engagement for their students. This may require creativity and systems-level support from administrators or special education coordinators, but small rural communities lend themselves to fostering meaningful and supportive relationships between schools and other institutions (Rowe et al., 2020).

Resources

Practitioners should leverage technology to allow students the opportunity to participate in novel experiences or research postsecondary education and working opportunities. This could be done through virtual tours of universities, exploring job postings, or identifying opportunities for online training or education. For students who have unreliable internet access, school may be the best place for them to practice important internet skills that will serve them after graduation (Rowe et al., 2020).

Creative utilization of specialists (e.g., Pierce et al., 2020) or interventions involving a high level of interagency collaboration (e.g., Flowers et al. 2018; McCormick et al., 2021) may allow students to access resources available from relevant professionals and community support agencies. While these types of interventions may be more complex and require time and stakeholder buy-in to be successful, they could have more substantial long-term effects on student outcomes as engagement with service providers, local businesses, or other prominent organizations (e.g., faith communities) could connect students to the support systems that will help them to experience success during their transition to adulthood. Practitioners should collaborate with related service providers to leverage their expertise when providing transition-related supports. While many rural schools may lack access to these professionals (Weiss et al.,

2023), where possible teachers should not hesitate to work together to design creative interventions using a variety of teaching methods.

Conclusion

Effectively transitioning to adulthood requires instruction in a variety of skills for SWDs. Transitioning to adulthood in a rural community necessitates additional considerations when designing and implementing a transition program. Little transition research has been conducted in rural communities, and the lack of clear rural definitions makes it difficult to interpret the effectiveness of interventions in particular communities. However, evidence suggests transition curricula, skill-based interventions involving community-based instruction, and interagency collaboration are potentially successful strategies for supporting rural students. Practitioners and researchers must consider adaptations and an appropriate support system for interventions to be both effective and contextually appropriate. Future research involving multi-faceted, equity-based discussion of community context and adaptable support strategies will allow us to better serve students in rural communities and increase key postsecondary outcomes for this population.

References

Ault, M. J., Ferguson, B. T., Berry, A., B., Hawkins-Lear, S., & Magiera, K. (2019). The founding, evolution, and impact of the American Council on Rural Special Education. *Rural Special Education Quarterly*, *38*(2), 67-78, https://doi.org/10.1177/8756870519833916

Bennett, K. J., Borders, T. F., Holmes, G. M., Kozhimannil, K. B., & Ziller, E. (2019). What is rural? Challenges and implications of definitions that inadequately encompass rural people and place. *Health Affairs*, *38*(12). 1985-1992. https://doi.org/10.1377/hlthaff.2019.00910

Berry, A. B., & Gravelle, M. (2013). The benefits and challenges of special education positions in rural settings: Listening to teachers. *The Rural Educator*, *34*(2). DOI: https://doi.org/10.35608/ruraled.v34i2.400

Brendle, J., Tucker, K. J., & Lock, R. H. (2018). Rural vocational and transition assessment practices for students with intellectual disabilities: What do educators really know? *The Journal of Special Education Apprenticeship*, *7*(1), 1-18.

Bronfenbrenner, U. (1979). *The ecology of human development*. Harvard University Press.

Brown, D. L., & Schafft, K. A. (2011). Rural people and communities in the 21st century. Polity Press.

Cerna, O., Condliffe, B., & Wilson, A. (2021). Guiding Questions for Supporting Culturally Responsive Evaluation Practices and an Equity-Based Perspective. MDRC. https://www.mdrc.org/sites/default/files/Equity-Guiding_Questions.pdf

Chambers, D. A., Glasgow, R. E., & Stange, K. C. (2013). The dynamic sustainability framework: Addressing the paradox of sustainment amid ongoing change. *Implementation Science*, *8*(117), 1-11. https://doi.org/10.1186/1748-5908-8-117

Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implementation Science*, *4*(50). https://doi.org/10.1186/1748-5908-4-50

Equity in CTE Workgroup. (2022). Equity framework for career and technical education research. American Institutes for Research, Career and Technical Education Research Network. https://cteresearchnetwork.org/equity-cteresearch-framework

Erickson, W., Lee, C., & von Schrader, S. (2022). Disability statistics from the American Community Survey (ACS). Cornell University Yang-Tan Institute (YTI).

Every Student Succeeds Act (ESSA), 20 U.S.C. §6641 & 7112 (2015).

Farmer, T. W., & Hamm, J. V. (2016). Promoting supportive contexts for minority youth in low-resource rural communities: The SEALS model, directed consultation, and the scouting report approach. In L. J. Crockett & G. Carlo (Eds.), *Rural ethnic minority youth and families in the United States* (pp. 247–265). Springer.

Harvey. M., Rowe, D. A., Test, D. W., Lombardi, A., Szymanski, A., Barnett, K., & Conrad, M. (2019). Promoting career and technical education for students with disabilities: A position paper of the division on Career Development and Transition and Association for Career and Technical Education. *Career Development and Transition for Exceptional Children*, *43*(2), 67-77. https://doi.org/10.1177/2165143419887839

Hawley, L. R., Koziol, N. A., Bovaird, J. A., McCormick, C. M., Welch, G. W., Arthur, A. M., & Bash, K. (2016). Defining and describing rural: Implications for rural special education research and policy. *Rural Special Education Quarterly*, *35*(3), 3-11. https://doi.org/10.1177/875687051603500302

Horner, R. H., Salentine, S., Albin, R. W. (2003). Self-assessment of contextual fit in schools. University of Oregon. https://specialed.jordandistrict.org/wp-content/uploads/sites/15/Contextual-Fit-in-Schools.pdf

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

Lavalley, M. (2018). Out of the loop: Rural school are largely left out of research and policy discussions, exacerbating poverty, inequity, and isolation. Center for Public Education.

Lee Y., Wehmeyer M., Palmer S. B., Williams-Diehm K., Davies D. K., Stock S. E. (2011). The effect of student-direct transition planning with a computer-based reading support program on the self-determination of students with disabilities. *The Journal of Special Education*, 45(2), 104-117. https://doi.org/10.1177/0022466909358916

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 1: Comparisons with other youth: Executive summary (NCEE 2017-4017). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance.

Liu, A. Y., Lacoe, J., Lipscomb, S., Haimson, J., Johnson, D. R., & Thurlow, M. L. (2018). Preparing for life after high school: The characteristics and experiences of youth in special education. Findings from the National Longitudinal Transition Study 2012. Volume 3: Comparisons over time (Executive Summary) (NCEE 2018- 4008). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance.

Madaus, J. W., Gelbar, N. W., Dukes III, L. L., Faggella-Luby, M., Lalor, A. R., & Kowitt, J. S.

(2013). Thirty-five years of transition topics: A review of CDTEI issues from 1978-2012. *Career Development and Transition for Exceptional Individuals*, *36*(1), 7-14. DOI: 10.1177/2165143413476734

Mazzotti, V. L., Rowe, D.A., Kwiatek, S., Voggt, A., Chang, W., Fowler, C. H., Poppen, M., Sinclair, J., & Test, D. W. (2021). Secondary transition predictors of post-school success: An update for the field. Career Development and Transition for Exceptional Individuals, 44(1), 47-64. https://doi.org/10.1177/2165143420959793

McLeskey, J., Barringer, M-D., Billingsley, B., Brownell, M., Jackson, D., Kennedy, M., Lewis, T., Maheady, L., Rodriguez, J., Scheeler, M. C., Winn, J., & Ziegler, D. (2017, January). High-leverage practices in special education. Arlington, VA*:* Council for Exceptional Children & CEEDAR Center. © 2017 CEC & CEEDAR

Monzalve, M., & Horner, R. H. (2021). The impact of the Contextual Fit Enhancement Protocol on behavior support plan fidelity and student behavior. *Behavioral Disorders*, *46*(4), 267-278. https://doi.org/10.1177/0198742920953497

Office of Management and Budget. (2010). 2010 standards for delineating metropolitan and micropolitan statistical areas. *Federal Register*, 75(123), 37246-37252. https://www.gpo.gov/fdsys/pkg/FR-2010-06-28/pdf/2010-15605.pdf

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brenna, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hrobjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S…Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, *372*, 1-9. https://doi.org/10.1136/bmj.n71

Rowe, D. A., Carter, E. W., Gajjar, S., Maves, E. A., & Wall, J.C. (2020). Supporting strong

transitions remotely: Considerations and complexities for rural communities. *Rural Special Education Quarterly*, *39*(4), 220-232. https://doi.org/10.1177/8756870520958199

Rowe, D. A., Mazzotti, V. L., Fowler, C. H., Test, D. W., Mitchell, V. J., Clark, K. A., Holzberg, D., Owens, T. L., Rusher, D., Seaman-Tullis, R. L., Gushanas, C. M., Castle, H., Chang, W.-H., Voggt, A., Kwiatek, S., & Dean, C. (2021). Updating the secondary transition research base: Evidence- and research-based practices in functional skills. *Career Development and Transition in Exceptional Individuals*, *44*(1), 28-46. https://doi.org/10.1177/2165143420958674

Rude, H., & Miller, K. J. (2018). Policy challenges and opportunities for rural special education. *Rural Special Education Quarterly*, *37*(1), 21-29. https://doi.org/10.1177/8756870517748662

Seaman, R. L., & Cannella-Malone, H. I. (2016). Vocational skills intervention for adults with autism spectrum disorder: A review of the literature. *Journal of Developmental and Physical Disabilities*, *28*, 479-494. https://doi.org/10.1007/s10882-016-9479-z

Showalter, D., Klein, R., Johnson, J., & Hartman, S. L. (2017). Why rural matters 2015-2016: Understanding the changing landscape. *Rural School and Community Trust.* https://www.ruraledu.org/user_uploads/file/WRM-2015-16.pdf

Siddaway, A. P., Wood, A. M., & Hedges, L. V. (2019). How to do a systematic review: A best practice guide for conducting and reporting narrative reviews, meta-analyses, and meta-syntheses. *Annual Review of Psychology*, *70*, 747–70. https://doi.org/10.1146/annurev-psych-010418-102803

Singh, R. L., Moody, E. J., Rigles, B., & Smith, E. B. (2019). What it takes to raise children with

autism in a rural state. *Advances in Nuerodevelopmental Disorders*, *3*, 17-28. https://doi.org/10.1007/s41252-018-0082-4

South Carolina Center for Rural and Primary Healthcare. (n.d.) *What is rural?* https://www.scruralhealth.org/rural-101

Spencer, T. D., Detrich, R., & Slocum, T. A. (2012). Evidence-based practice: A framework for making effective decisions. *Education and Treatment of Children*, *35*(2), 127–151. https://muse.jhu.edu/article/474310

Stewart-Ginsburg, J. H. & Kwiatek, S. M. (2020). Partnerships from the pews: Promoting interagency collaboration with religious organizations. *Career Development and Transition for Exceptional Individuals*, *43*(3), 187-192. https://doi.org/10.1177/2165143420929660

Test, D. W., & Fowler, C. H. (2018). A look at the past, present, and future of rural secondary transition. *Rural Special Education Quarterly*, *37*(2), 68-78. https://doi.org/10.1177/8756870517751607

Test, D. W., Fowler, C. H., Kohler, P. (2012). Evidence-based practices and predictors in secondary transition: What we know and what we still need to know. *National Secondary Transition Technical Assistance Center*.

Test, D. W., Fowler, C. H., Richter, S., White, J. A., Mazzotti, V. L., Walker, A. R., Kohler, P., & Kortering, L. (2009). Evidence-based practices in secondary transition. *Career Development for Exceptional Individuals*, *32*(*2*), 115–128. https://doi.org/10.1177/0885728809336859

Test, D.W., Mazzotti, V. L., Mustian, A. L., Fowler, C. H., Kortering, L., & Kohler, P. (2009)

Evidence-based secondary transition predictors for improving postschool outcomes for students with disabilities. *Career Development for Exceptional Individuals*, *32*(3), 160-181. https://doi.org/10.1177/0885728809346960

Torres, C. Farley, C. A., & Cook, B. G. (2014). A Special educator's guide to successfully implementing evidence-based practices. TEACHING Exceptional Children, 47(2), 85-93. https://doi.org/10.1177/0040059914553209

Trainor, A. A., Carter, E. W., Karpur, A., Martin, J. E., Mazzotti, V. L., Morningstar, M. E., Newman, L., & Rojewski, J. W. (2020). A framework for research in transition: Identifying important areas and intersections for future study. *Career Development and Transition for Exceptional Individuals*, *43*(1), 5-17. https://doi.org/10.1177/2165143419864551

U.S. Census Bureau (2022). *QuickFacts: United States*. https://www.census.gov/quickfacts/fact/table/US/PST045222

U.S. Department of Agriculture (2019). *What is rural? https://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural/*

Weiss, M. P., Rowe, D. A., Mims, P. J., & Farmer, T. W. (2023). There's no place like us: Beyond fidelity of implementation in rural contexts. *Journal of Emotional and Behavioral Disorders*¸ OnlineFirst, 1-14. https://doi.org/10.1177/10634266231155856

Westbrook, J. D., Fong, C. J., Nye, C., Williams, A., Wendt, O., & Cortopassi, T. (2015). Transition services for youth with autism: A systematic review. *Research on Social Work Practice*, *25*(1), 10–20. https://doi.org/10.1177/104973151452483

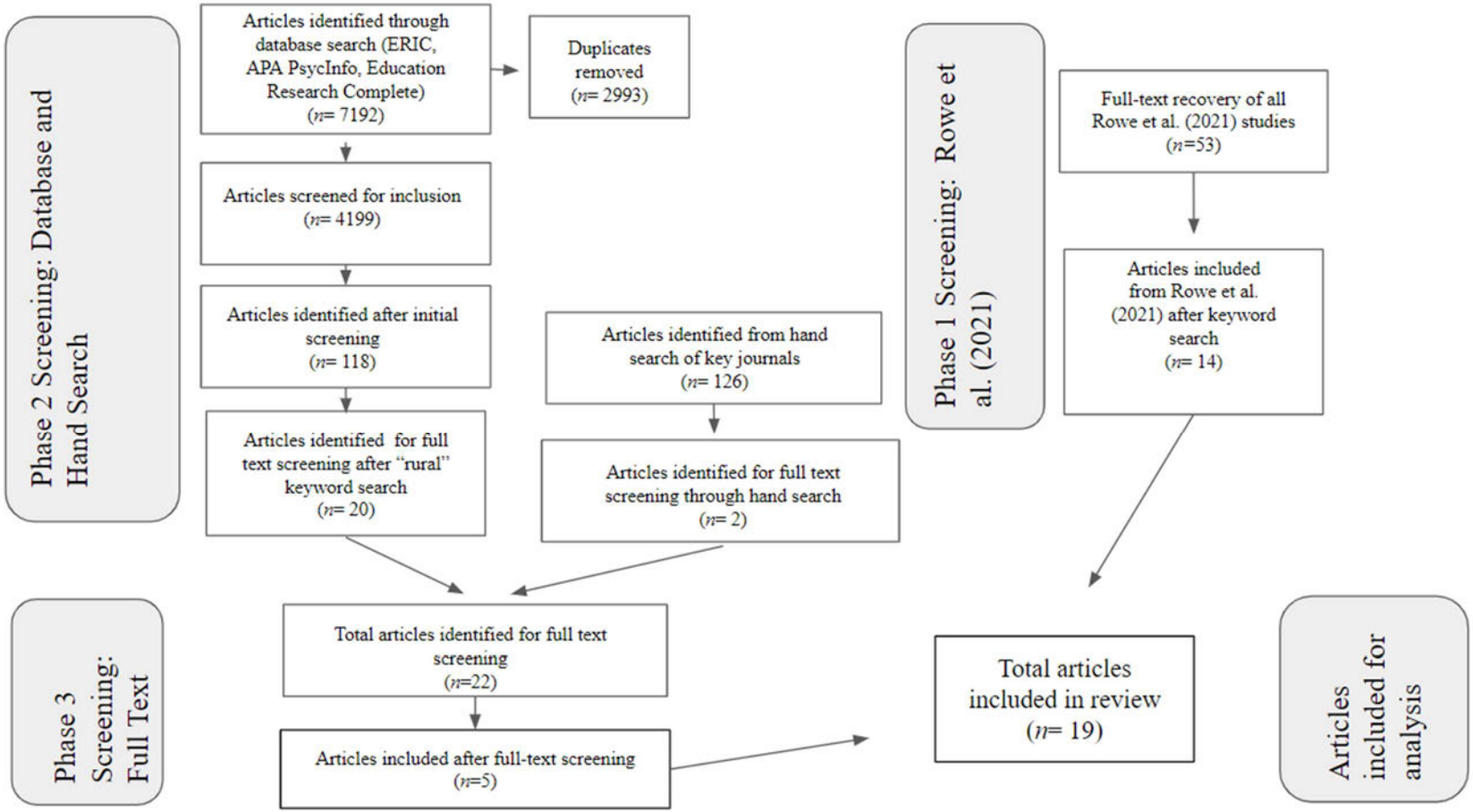
Wittig, K. M., Holland, L. D., & Dalton, A. G. (2014). Implementing Project SEARCH in rural

counties: A case study approach. *Journal of Vocational Rehabilitation*, *40*, 213-221. DOI:10.3233/JVR-140686

Tables and Figures – Manuscript 1

Figure 1A

Prisma Diagram



Using Video Modeling Plus Feedback to Teach Vocational Social Skills to Autistic Youth

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Dissertation

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This study is currently under review in the *Journal of Behavioral Education.*

Open science practices:

Data and materials are openly available at

https://osf.io/5kdf8/?view_only=da0272c8aed245589607f4b22bb3e0c3

This study was pre-registered using the REES registry, registry ID 15280.

Abstract

Youth with autism often require additional instruction in common vocational social skills to improve their employment outcomes. This study examined the effects of an assessment-based intervention involving video modeling plus feedback to teach common workplace social skills in a simulated work environment. Three transition-aged youth with autism participated in the study. We found the intervention to be highly effective at teaching the initial acquisition of skills, however, we observed mixed results regarding generalization of skills to new supervisors and to a community work setting.

Using Video Modeling Plus Feedback to Teach Vocational Social Skills to Autistic Youth

An estimated 5.4 million U.S. adults and 1 in 44 children have autism spectrum disorder (ASD; Centers for Disease Control and Prevention, 2022; Dietz et al., 2020). Data suggest that only 39.2% of people ages 21-64 with any disability in the U.S. are employed compared to 80.7% of their peers (Erickson et al., 2022). Historically, young autistic adults experience the lowest employment rates of any disability category (Newman et al., 2011). Despite increasing awareness of this discrepancy, autistic adults struggle to find and maintain competitive integrated employment. Employment is a key element of independent living, and access to sustained employment opportunities contributes to increased quality of life.

Social interaction issues in the workplace are among the most significant barriers to employment success for autistic individuals (Chen 2015; Hendricks, 2010). These skills, hereafter referred to as vocational social skills (VSS) include interactions required for adequate job performance, such as asking for help with unclear tasks, and everyday social interactions with customers or coworkers. A defining characteristic of autism is persistent difficulty with social communication (American Psychiatric Association, 2013), so it is unsurprising that VSS challenges affect autistic adults in the workplace. It follows that improved VSS are likely to lead to reduced employment barriers and increased long-term employment outcomes.

Carter et al. (2012) found that for youth with disabilities with greater support needs, those with little or no trouble communicating were three to four times more likely to be employed after high school than youth with communication difficulties. Therefore, increasing VSS in autistic youth is likely to result in improved employment outcomes. In the current study, we examine the impact of an assessment-informed intervention on autistic youth's workplace behavior. The

intervention involves video models (VM) depicting high-frequency VSS combined with immediate feedback.

Vocational Social Skills Assessment

Assessment is key to transition interventions and transition-related research (Trainor et al., 2020). Few tools exist for determining instructional targets when designing interventions to support the development of common VSS. Lerman et al. (2017) developed a clinic-based assessment to allow for the identification of key VSS for behavioral intervention. The assessment involves placing participants in common, but potentially challenging workplace situations (referred to as evocative situations) that require problem solving and interaction with supervisors to complete job tasks. The purpose of the assessment is to determine participants' current ability to engage in expected social interactions during situations that are likely to occur frequently on the job. Evocative situations include giving vague instructions, missing or broken materials, asking participants to perform a task not in their repertoire, providing multi-step instructions, time pressure, and supervisor presence in the workplace. Lerman and colleagues successfully used the assessment to identify important skills that were missing from the participants' repertoire, thus providing an objective approach to identifying behavioral targets for intervention.

Grob et al. (2019) later used this assessment to inform an intervention involving behavioral skills training plus stimulus prompts to teach identified VSS to three autistic young adults during role-play scenarios. After conducting the assessment, the researchers identified making confirming statements (e.g., "Got it. I will do it the way you showed me"), asking for a task model (e.g., "Can you show me how?"), and apologizing in response to corrective feedback as behavioral targets as these behaviors were observed infrequently during assessment and are

considered expected workplace behavior. Behavioral skills training with added prompting was effective at increasing the use of targeted skills for two of three participants (with one participant requiring additional intervention) and generalized to a new supervisor and a new setting for all three participants.

The authors identified the importance of using prompts to facilitate generalization and the need for prompts to be easily accessible and socially valid. They also suggested that future research should examine alternative interventions to behavioral skills training, such as VM. Additionally, the researcher served as the study's intervention agent; therefore, further research is needed to examine the effects of practitioner-implemented interventions. Grob et al. provided compelling evidence for using an assessment-informed intervention to support VSS acquisition for transition-age autistic youth. However, behavioral skills training requires qualified professionals and the cost of hiring these professionals can be high, resulting in the need for more efficient intervention techniques that can be easily implemented by practitioners (Pollard et al., 2014).

Video Modeling

One approach for teaching VSS to transition-aged autistic youth is VM. VM is based on social learning theory (Bandura, 1969), which suggests one way individuals learn is through observing others. Because VM relies on visual, rather than auditory presentation, it may be a better fit for autistic individuals due the differences in neurological processing for this population (Williams, 2007). Researchers have long used VM to teach autistic children and adults a variety of skills, such as social behavior, academic skills, and tasks of daily living (Green et al., 2013; O'Connor, 1969; Rausa et al., 2016), and VM has also been classified as an evidence-based practice to teach some transition-related skills (Rowe et al., 2021). In relation to employment

skills, VM has most often been used to teach job skills associated with successful completion of workplace tasks; however, some researchers have also used VM to teach VSS (Bross et al., 2021; Whittenburg, 2020).

Van Laarhoven et al. (2014) used a multiple-treatments with reversal design to compare the effects of VM and VSS with video feedback to teach job skills to four transition-age autistic youth. In the VM condition, students watched models of the skills before performing them. In the video feedback condition, they watched recordings of themselves performing the tasks and were asked to review their performance. The authors found that only one student benefited more from VM than video feedback; however, performance improved for three out of four students when the video feedback condition immediately followed the VM condition. Although carryover effects are a potential confound, their findings suggest that feedback is an important element of VSS instruction and that using VM to teach students how to perform a task followed by feedback on their performance may result the greatest improvement.

Stauch and Plavnick (2020) used VM to teach vocational skills and VSS in tandem to two transition-age autistic youth. The authors chose high frequency social behaviors, including accepting compliments and criticism and making small talk as targets for intervention. They observed increased use of both sets of skills; however, participants demonstrated higher levels of proficiency with the job skills and lower proficiency with the VSS.

Bross et al. (2020) used VM to teach customer service skills to five autistic adults in a community employment setting. Participants watched a brief video before their shift and were asked about appropriate phrases they would use during the workday, with verbal praise given for correct responses. Following intervention, all participants demonstrated increased use of appropriate greetings, service, and closing phrases, although total accuracy varied across

participants. The participants continued to show improved use of learned skills when a supervisor, job coach, or coworker implemented the VMs following training. However, target behaviors for this study were job specific. This study provides evidence of VM's effectiveness in teaching VSS in the natural environment and that social skills can generalize to other intervention agents.

VM has consistently been shown to be an effective practice for teaching autistic individuals various skills (Delano, 2007; McCoy & Hermansen, 2007); however, while promising, the evidence is somewhat mixed related to its effectiveness in teaching VSS. VSS have often been taught in combination with other job skills (Stauch & Plavnick, 2020; Van Laarhoven et al., 2014) or have been job specific (Bross et al., 2020). More evidence is needed to determine the effects of VM on the acquisition and generalization of high frequency VSS.

Feedback

Performance feedback is the presentation of a stimulus (usually verbal or written) following a person's behavior that varies as a function of that behavior and allows an individual to change their performance (Mangiapanello & Hemmes, 2015; Sleiman et al., 2020). Wisniewski et al. (2020) conducted a meta-analysis on educational feedback research and found feedback is most effective when it is corrective and contains clear information on what mistakes a student made, why they made these mistakes, and what they can change in the future to improve. Feedback is an intervention component that is regularly used in job settings and tends to be effective, including when used in concert with other interventions (Sleiman et al., 2020). It is likely that including feedback as a component of a VSS intervention will result in increased acquisition of targeted skills.

Purpose and Research Questions

The purpose of this work is to extend the literature on vocational assessment and training by using the assessment first described by Lerman et al. (2017) and later used by Grob et al. (2019) to inform behavioral targets for an intervention package involving the use of VM plus feedback to teach high-frequency VSS to transition-aged autistic youth in a simulated work environment. Additionally, we seek to understand the effectiveness of this intervention when implemented by a practitioner as opposed to a researcher and whether the intervention generalizes across supervisors and settings. We pose the following research questions:

1. What are the effects of using practitioner-implemented VM and feedback on autistic youths' performance of high frequency VSS in a simulated work environment?
2. Do VSS mastered via VM and feedback in a simulated work environment generalize across supervisors and settings?

Method

Participants and Setting

Participants were recruited from a local service provider that offers day school and outpatient behavioral services for autistic children and adults. To be eligible to participate in the study, participants had to be between the ages of 14-30 years and either (1) currently enrolled in pre-vocational or vocational services at the school; or (2) be autistic and employed in the community or have interest in employment and a high potential for independent employment (i.e., could communicate verbally and have no dangerous problem behavior). Transition services in public schools are typically provided between the ages of 14-22, however, we extended the age range to 30 to account for the adult services provided by the agency. We recruited three participants for this study based on recommendations from agency staff and word of mouth.

Dwayne was a white male aged 17 who attended the school program at the agency and was currently participating in pre-vocational services. Dwayne had never been employed. Nihil was a white 19-year-old male who self-identified as non-binary. Nihil was a student at a large, public state university and had never been employed. Troy was a Chinese male aged 23, a local high school graduate. He was currently employed as a line chef at a restaurant and had previous work experience stocking shelves at an electronics store.

The instructor was a Registered Behavior Technician® (RBT) working at the local service agency. She was a 24-year-old white female with three years of experience working in the field. She had no experience working with Nihil and Troy prior to the study and had little experience working with Dwayne, although they occasionally interacted while at the school. The study took place at the local service agency. Assessments were performed in a room set up to simulate a coffee shop, and the intervention took place in the same room for Nihil and Troy and in a classroom within the same building for Dwayne.

Dependent Measures and Data Collection

Targeted behaviors were based on the VSS assessment (Lerman et al., 2017), with priority given to behaviors with the lowest score. Potential behaviors for intervention include making confirming statements when given a task, asking for clear instructions, asking for help with a task, asking for help with missing or needed materials, responding to corrective feedback, responding to an interrupted task, returning to work when the supervisor is unavailable, and notifying the supervisor of task completion. Behavioral definitions for each behavior can be found in Table 1. We broke down each behavior into its component skills and collected data on each step in the task analysis. If a participant consistently failed to demonstrate a given step in the task analysis that step was identified as a potential target for intervention. For example, when

asking for help with missing materials, a participant may accurately perform all steps in the task analysis except for searching the area for more materials. If so, searching for missing materials would be a potential target for intervention. All materials used during data collection as well as raw data for the study is openly available at https://osf.io/5kdf8/?view_only=da0272c8aed245589607f4b22bb3e0c3.

Experimental Design

We used a multiple probe design across behaviors (Ledford & Gast, 2018) to examine the effects of VM plus feedback to teach VSS. We chose the multiple probe design because it is well suited to evaluate the acquisition and maintenance of multiple skills within participants, with a staggered introduction of intervention across skills. (Horner et al., 2005). Two participants had three behavioral targets each, and one had two based on the assessment results. This provided us with ample opportunities to demonstrate the effects of our intervention both across behaviors within each participant and across participants. Data were collected on behavioral targets and on treatment fidelity. We collected baseline data until we observed a stable, non-improving trend with at least three data points per behavior before intervening on the first behavior. We randomly chose the order of behaviors for intervention for most behaviors; however, in some cases a particular sequence was required for practical reasons and to avoid carry-over effects. For example, notifying your supervisor when you complete a task must be taught before responding to missing materials, because one of the appropriate responses to missing materials is to notify your supervisor that they are missing, which would likely result in a carry-over effect if taught first. The criterion for mastery was three consecutive instances of accurate responding. Once mastery was reached, we conducted an additional probe trial for all three behavioral targets.

Other practicing BCBAs visually analyzed the data throughout the study and provided input on whether the data clearly demonstrated experimental control over the target behavior.

Procedures

Video Models

VMs consisted of short videos depicting each situation, including the correct response. The researcher or an individual not associated with the study acted as the participant in each video and a local behavior coach working in the public school system acted as the supervisor. VMs were filmed using a cell phone, edited using iMovie on a MacBook computer, and viewed by the participant on a cell phone during training. Each VM included a depiction of the "supervisor" introducing a task, the "employee" encountering a problem, and the "employee" correctly addressing the problem through expected communication with the supervisor or using appropriate workplace problem solving. Each model included a written justification for the skill, written steps inserted during relevant segments, and a voiceover effect explaining the steps as they were shown in the video. All videos were less than two minutes long.

Training, Fidelity, and Inter-Observer Agreement (IOA)

The IOA data collector and instructor were trained by the lead author. Training occurred for the data collector during a one-hour session before the beginning of the study. The lead researcher explained the study's procedures, reviewed the data collection materials, and answered any questions. The data collector was given the opportunity to practice during the assessment phase of the study and IOA data were reviewed following each research session to ensure agreement remained high throughout the study. To assess agreement, we compared the responses of each data collector directly and calculated a percentage of agreement based on total correspondence. IOA for participant data was collected across 44% of sessions across

participants and included at least one trial from the assessment, baseline, training, and probe conditions. Agreement using total-count IOA was 96.5%.

The instructor was trained by the researcher during a one-hour session before the beginning of the study. The lead researcher explained the study goals and procedures and answered the instructor's questions. The instructor then role-played the scenarios with the researcher. Before each session, the researcher briefly met with the instructor to discuss the activities for the day. During intervention, the researcher provided immediate feedback to the instructor if they made mistakes. Instructor fidelity was assessed using an implementation checklist containing the following steps: (1) plays video model, (2) presents task to participant, (3) includes evocative situation, (4) responds to client, and (5) delivers appropriate feedback. Instructor fidelity across all trials was 95%. Implementation data were collected on the percentage of correctly completed steps for the primary instructor across all trials and IOA of implementation data was conducted during 40% of trials. Total-count IOA for treatment fidelity was 90.5%.

Assessment

We began by assessing VSS using the process described by Lerman et al. (2017). This involved setting up evocative situations in a simulated workplace to observe the extent to which participants used various VSS. The assessment took place over two or three days to provide an opportunity to establish a stable baseline. Two authors with experience conducting this assessment took turns acting as the participants' "supervisors" during the assessment. Each day began with the supervisor telling the participant that the goal of the assessment was to see how they would behave in a workplace environment and that they should treat the assessment the same way they would a real job. The supervisor presented a variety of tasks that entailed

opportunities to demonstrate several common VSS (see Table 1 for list of skills). We collected data on participant responses to the evocative situations to identify behavioral targets for intervention. The assessment took place during one-hour sessions and each trial consisted of a request to complete a task, the inclusion of an evocative situation, and the participant encountering the evocative situation allowing for an opportunity to demonstrate the targeted behavior. Each assessment included either 11 or 12 trials across two to three days.

To choose behavioral targets we prioritized the three skills with the lowest frequency of occurrence. No participants had more than three skills that required intervention. All skills related to commonly occurring workplace interactions necessary for high-quality job performance and, therefore, all were appropriately suitable intervention targets.

Baseline and Probe Trials

The assessment provided preliminary baseline data, which were followed by additional baseline and probe trials. Baseline, probe, and intervention data were collected during one-hour sessions with trials defined identically to those in the assessment. Sessions occurred either in a classroom or in the café used for the assessment.

First, participants were told that they were going to practice job skills and that they should treat the practice like a real work experience. The instructor served as the intervention agent or "supervisor". The supervisor presented a task to the participant and set up an evocative situation to evoke the target behavior. For example, if the participant was asked to pack ten envelopes, they were only given eight envelopes, providing an opportunity to search for or ask the supervisor for more materials. Each probe trial consisted of an opportunity to demonstrate one of the three target behaviors and was conducted identically to a baseline trial. We used job

tasks already in the participant's repertoire unless the target skill required otherwise (i.e., asking for help with an unfamiliar task).

Intervention

Following baseline, we intervened on the first behavior. Intervention blocks lasted approximately one hour and typically included at least three trials, each providing one opportunity for the participant to demonstrate the current behavior targeted for intervention. Before presentation of the evocative situation, the instructor asked the participant to watch the VM corresponding with that day's behavior target. The instructor then gave the participants work tasks and included the appropriate evocative situation during each task. Each VM depicted an "employee" performing the steps in the corresponding behavior chain (see Table 1). During each trial, the participant encountered an establishing operation for the given behavioral target (e.g., encountering missing materials) and had an opportunity to use the skill shown in the VM to solve the problem through an expected workplace behavior (e.g., searching for the missing materials). If the participant accurately performed the expected behavior, they were given behavior specific praise (e.g., "Great job asking me for the materials you need") and either continued working on their task until completed or were presented with a new task by the instructor to begin a new trial. If they failed to use the expected skill, the instructor provided immediate corrective feedback and asked the student to re-watch the VM before beginning the next task.

The intervention block continued until the participants demonstrated mastery, defined as three successful consecutive attempts in a row across three consecutive trials. Following mastery, we conducted an additional probe trial for each behavior. If a participant failed to meet mastery criteria across three consecutive trials, we introduced a prompt-delay procedure in which the supervisor stated the participant's name, waited for 3 seconds, and then prompted the participant

to demonstrate the target skill. If this was unsuccessful, we introduced a visual prompt in the form of a small paper tent with a written instruction that was placed directly in front of the participant. Once they successfully demonstrated the skill three times using the visual prompt, we removed the visual prompt and conducted an additional trial without prompting.

Post-assessment and Community Setting Probe

Following mastery of all three skills, the participants completed the initial assessment again, providing an opportunity to demonstrate learning, skill maintenance, and generalization to two supervisors who were not involved in the training. Post-assessment sessions were almost identical to pre-assessment sessions apart from some changes to tasks and/or minor adjustments to the number of situations presented to the participant (e.g., 10 trials during pre-assessment and 11 trials during post-assessment). Upon completion of the post-assessment, two participants (Nihil and Troy) were given the opportunity to participate in a work experience at a community business. Due to issues with scheduling and coordinating a job site, Dwayne was unable to complete a community setting probe prior to the end of the study. Participants worked directly under an employee at a large grocery store chain or thrift store and were tasked with stocking shelves or unpacking merchandise. During this time, the on-site supervisor presented tasks and included evocative situations like those the participants encountered during training. This allowed us to observe the participants' use of learned skills in a novel, realistic setting. Following the session, the researchers discussed the participants' performance with the on-site supervisor regarding any skills the researchers were unable to observe directly.

Social Validity

The participants and instructor were asked to complete a brief researcher-developed questionnaire providing feedback on the intervention. We asked participants whether they

enjoyed the experience, found it helpful, would want to continue with the intervention to learn other skills, would think others would find it useful, and for any feedback they had on the intervention. Responses were either yes or no questions or Likert-type ratings with a single open-ended question. Questions for instructors related to enjoyment of the intervention, perceived usefulness, likelihood of recommending to others, and ease of use.

Results

Assessment

Data for Dwayne are represented in Figure 1. During assessment, Dwayne consistently made confirming statements to the supervisor, responded well when given corrective feedback on a task, including correcting his mistakes, and sought help when instructions were vague or a task unfamiliar. He consistently searched for the supervisor when he finished a task and when he encountered missing materials, and he switched tasks when interrupted without arguing or demonstrating facial expressions consistent with annoyance. Dwayne did not return to work when the supervisor was not available and instead sat at the workplace and waited for further instructions. He never searched for materials within the environment when encountering missing materials and, when interrupted, did not ask the supervisor whether he should return to complete the prior task. We identified searching for missing materials, returning to work when the supervisor was unavailable, and asking about previous tasks when interrupted as behavioral targets for Dwayne.

Data for Nihil are represented in Figure 2. Nihil responded well to corrective feedback and consistently asked for help when given a vague instruction, an unfamiliar task, or when encountering missing materials. They also searched for missing materials and switched between tasks easily when interrupted. Nihil never sought out the supervisor to inform them that they

completed a task and instead stopped working and waited until the supervisor returned and asked them directly how they were doing. We were unable to assess whether they worked when the supervisor was unavailable as they never searched out the supervisor, but they did not find additional work after completing a task. Nihil was quiet throughout the assessment and only gave partial confirming statements (e.g., "OK") that were almost inaudible. Nihil also did not ask about returning to an interrupted task or continue working on the previous task after interruption. We identified making confirming statements, notifying your supervisor when you complete a task, and asking about returning to the previous task when interrupted as behavioral targets for Nihil.

Data for Troy are represented in Figure 3. Troy was the only participant with work experience and was employed during the study. He made frequent confirming statements that ranged in complexity but clearly demonstrated that he was paying attention to the supervisor's instructions. He responded well to feedback, easily switched to new tasks when interrupted, and always returned to complete the prior task. He inconsistently asked for help when given vague instructions or an unfamiliar task. With the first supervisor, he did not ask for help with an unfamiliar task and instead worked to complete it incorrectly. However, with the second supervisor, he consistently asked for help with both vague instructions and unfamiliar tasks. Troy never sought out the supervisor when finished with a task and did not search for missing materials in the environment. Instead, when the supervisor returned, he either indicated that he had completed the task or indicated that something was wrong. For example, after running out of staples he told the supervisor, "It's out of staples." Because he did not search for the supervisor, we could not assess how he responded when the supervisor was unavailable; however, he consistently returned to work on previous tasks when interrupted. We identified notifying your

supervisor that you completed a task and searching for missing materials as behavioral targets for Troy. We chose only two targets for Troy because he demonstrated other behaviors with enough consistency that they did not require intervention.

Training

Training was highly effective for all three participants, with one exception. Following intervention, Nihil immediately began using all behaviors and their use of the behaviors maintained during additional training probes. Troy never used the skills after watching the VM alone, but immediately began responding appropriately after the first instance of corrective feedback following intervention. He maintained responding during all additional training probes.

Following intervention, Dwayne immediately and consistently began searching for missing materials in the appropriate location and returned to working when the supervisor was unavailable. However, when interrupted, Dwayne struggled to consistently ask about returning to a prior task and required additional prompting to learn this behavior. He immediately demonstrated the behavior after the first instance of feedback but failed to consistently demonstrate the behavior at the appropriate time for the following 12 trials. The instructor implemented a prompt delay procedure before providing feedback. She would present the EO, wait for 3 seconds, say the participant's name, wait an additional 2-3 seconds, then provide feedback. The participant quickly began responding to the instructor saying his name, then began responding to waiting only. However, during some trials, an unfinished task was present in the environment because he had failed to ask about returning to this task during a previous trial. As a result, he would regularly ask about returning to this task when presented with a new task at the start of a trial rather than when the instructor presented the EO by interrupting his current task. It is likely that this behavior came under faulty stimulus control due to the presence of an

unfinished task in the environment immediately following feedback, as these stimuli were like those in the targeted scenario and evoked the target behavior at the wrong time. To address this, we began removing all tasks from the environment before beginning a new trial, and the instructor continued using the prompt delay procedure. Dwayne's demonstration remained inconsistent, so we introduced a visual prompt (see triangle markers in Figure 1) in the form of a small name tent that read "Ask About Prior Task" and provided explicit instructions to remember to ask about returning to the previous task. This resulted in consistent demonstration of the behavior which maintained for a single trial following removal of all prompts. During the final training probe trial, Dwayne continued to search for missing materials and asked about returning to an interrupted task but failed to return to work when the supervisor was unavailable, instead returning to the work station to wait for further instructions.

Post-Assessment

We readministered the VSS assessment following training for all participants, with the same two agents from the pre-assessment serving as supervisors. Dwayne demonstrated inconsistent generalization of skills during post-assessment. Dwayne searched for missing materials at each opportunity during post-assessment (n=2); an improvement from the pre-assessment during which he searched during only one of three opportunities. However, Dwayne never asked about returning to a prior task when interrupted, nor did he return to work when the supervisor was unavailable. Additionally, after the first instance of the supervisor being unavailable, Dwayne stopped knocking on the office door when coming to notify the supervisor of task completion and instead stood outside of the door and then returned to the workspace without interacting with the supervisor. After the assessment, he indicated that he did not see the

supervisor in the office (although he was present) and did not want to bother the other person working there, so he refrained from knocking.

Nihil demonstrated all targeted behaviors during the post-assessment. However, they failed to provide a confirmation statement during one opportunity and provided a partial statement of "Alright, can do!" during another opportunity (scored as incorrect for not being task specific). Nihil notified the supervisor when they completed each task and asked about returning to work on interrupted tasks. All targeted behaviors showed a marked improvement compared to the pre-assessment. Additionally, while not directly targeted, Nihil did return to work when the supervisor was unavailable during one of two opportunities.

Troy demonstrated generalization of all taught skills during the post-assessment. He regularly notified the supervisor when he completed a task and searched for missing materials in two out of three opportunities. During the final trial of the post-assessment, Troy was asked to cut shapes and glue them to paper cards; however, the glue was missing. He did not search for the glue and instead came to notify the supervisor that the task was complete when all shapes had been cut out and, once the supervisor pointed out this mistake, Troy immediately opened the drawer containing materials to check for the missing glue. Additional graphs comparing pre- and post-assessment data are included as Supplemental Figures.

Community Setting Probe

Nihil completed their work experience at a large grocery store chain and worked with an employee from the store to stock shelves for an hour and a half. Nihil reverted to making quiet, non-specific confirming statements (i.e., "OK") during this session, but they notified the supervisor when they completed the first task assigned to them. Partway through the session, the supervisor asked Nihil to stop stocking in one aisle and stock in a different aisle instead. Nihil

did not ask whether they should return to the first aisle to continue stocking when finished. They did, however, find work to do when they completed a task and the supervisor was unavailable. Overall, Nihil demonstrated inconsistent use of trained skills in the novel, realistic setting.

Troy completed his work experience at a large thrift store and worked alongside an employee with some additional support from a job coach who assisted with setting up the experience. Troy was tasked with unpacking boxes of donated items and setting them on a counter for the associate to price out. To gauge Troy's use of skills, we set up a scenario in which he finished unloading a box and had an opportunity to notify his supervisor that he was finished. We also asked him to break down the boxes with a box cutter or scissors but failed to provide him with any tools. Troy encountered two instances where he finished a task and had an opportunity to inform his supervisor and/or ask for more work. On the first opportunity, he stood and looked at the supervisor and waited without saying anything until the supervisor came over and opened another box for Troy to unload. He thanked the supervisor and continued working. During the second opportunity, he threw away the box and said, "Box number three is down" and the supervisor then provided him with a new box. This statement was not clearly directed at the supervisor (i.e., no eye contact, did not get the supervisor's attention first) but was functionally appropriate and clearly communicated the intended purpose to the supervisor. Troy had three opportunities to ask for scissors to tear down boxes. On the first opportunity, he made several non-directed statements indicating he needed the materials (i.e., "I should have asked for a box cutter") but did not directly search for or ask for the missing materials. On the next opportunity, he searched for the scissors, saw that the job coach was holding them, and asked her for them. Finally, he searched for the scissors, found them on the table near the supervisor, waited for an appropriate time, and asked, "Mind if I borrow those scissors?"

Social Validity

Social validity data indicated all participants in the study had a positive experience (see Table 2 for detailed results). Participants indicated that they enjoyed participating in the study (μ=4.67), found it to be useful (μ=4.67), would be interested in learning other skills using this method, and would recommend this intervention to others. The instructor indicated that she enjoyed participating in the study, found this intervention to be useful, would be interested in continuing to use this intervention and would recommend this intervention to others. She also indicated that she found this intervention much easier to implement than other interventions.

Discussion

In this study we evaluated the effects of an assessment informed VSS intervention using VM and feedback implemented by a natural intervention agent (i.e., an RBT®) in a simulated work setting. Introduction of the intervention resulted in immediate performance improvement for all three participants, except for one behavior (responding to an interrupted task) for Dwayne and Troy, which required a single instance of verbal feedback for each behavior before acquisition. Generalization and maintenance of skills varied across participants, with most skills generalizing to new supervisors during the post-assessment but only some behaviors generalized during a community setting probe involving a realistic work situation. This study provides additional evidence of the effectiveness of practitioner-implemented VM to teach common VSS to autistic youth in a simulated work environment, especially when combined with other interventions.

Findings from this study contribute to the field in several ways. First, we found that VM plus feedback was an effective method for teaching high frequency VSS to autistic youth. VM is clearly an effective intervention for teaching people with autism a variety of skills across age

ranges (Green et al., 2013; Qi et al., 2018; Rausa et al., 2016), and our findings provide further evidence of its effectiveness when teaching job-related social skills and problem-solving that may require social interaction. Social interactions are generally complex, and this intervention allowed participants to learn expected behaviors in a variety of circumstances and use them consistently. The addition of feedback and/or prompting during instruction is likely to increase the effectiveness of VSS interventions for some learners. This is consistent with findings from other studies (Grob et al., 2019; Van Laarhoven et al., 2014) and should be considered in practice to increase the efficiency of learning. As practitioners work with students, they may consider including immediate feedback when appropriate. For students with higher support needs, teachers may also include additional supports such as environmental prompts and arbitrary reinforcement (Lerman, 2023).

An additional contribution of this study is the use of an RBT® as the intervention agent during training. Previous studies have primarily used researchers to conduct the training (Bross et al., 2020; Stauch & Plavnick, 2020; Van Laarhoven et al., 2014), and we demonstrated that a novel, naturalistic agent can effectively implement this type of intervention with oversight from the researchers. The trainer in this study indicated that the intervention was easy to use and effective which is similar to positive experiences with VM in employment settings reported in other studies (Bross et al., 2020). To provide additional evidence for use in practice, future research could examine the effects of this type of intervention when conducted in a workplace setting by supervisors or job coaches or in a public school setting when implemented by teachers or teaching assistants in the classroom. Additionally, this study provides further evidence for the usefulness of the VSS assessment (Lerman et al., 2017) for reliably identifying participants' use of high-frequency VSS. We established a stable baseline for intervention targets across all three

participants and used the assessment findings to inform our intervention. This assessment is a reliable tool for informing interventions in practice to support the acquisition of valuable VSS for autistic youth.

Most participant behavior generalized to two new supervisors during the post-assessment. Nihil and Troy consistently demonstrated all learned behaviors during the post-assessment with new supervisors and Dwayne demonstrated one out of three. Dwayne's failure to demonstrate multiple skills (i.e., asking about an interrupted task and returning to work when the supervisor is unavailable) during post-assessment is likely an issue of maintenance rather than generalization, as he did not show consistent use of these two skills during training. With additional training or the addition of prompts such as re-watching the VMs or environmental prompts (such as in Grob et al., 2019) it is possible that the behaviors would have generalized to the post-assessment considering his generally quick acquisition of behavior during instruction. However, due to time constraints we were not able to test this. Future research could examine the extent to which re-watching VMs prior to applying skills in novel settings (e.g., a natural work environment) during generalization sessions results in sustained mastery of skills.

Limitations and Future Research

The current results should be considered in light of the following limitations. First, training occurred in a simulated work environment and in a clinical setting. Simulated work environments are necessary for individuals who are not yet employed but still need to acquire these skills; however, the use of simulated settings likely limited generalization of some skills to the novel, realistic environment. Work experience predicts increased post-secondary outcomes (Rowe et al., 2021) and genuine work opportunities (as opposed to simulated ones) should be included as part of a transition plan if possible. Future research could examine the effects of

interventions in the workplace or which additional components, such as prompts or aligning stimuli in the training environment more closely with the expected work environment, are required to increase the maintenance and generalization of skills. Additionally, research could examine the effects in other training settings, such as a public school, or when implemented by other intervention agents like teachers, teaching assistants, or job coaches. Second, we did not conduct a community setting probe during baseline, so we cannot make claims as to whether the intervention contributed to the use of some of the trained skills in the novel setting. It is possible the participants would have used these skills regardless of training. Nevertheless, seeing participants use learned skills in naturalistic settings was promising.

This study contained participants from a diverse range of experiences and current employment/educational statuses. One participant was a high school student attending an autism-only school program with no work experience, one was a university student with no work experience, and the final participant was a high school graduate with several years of employment history. Work history and level of support needs likely play a significant role in an individual's response to this intervention. Further research is needed to understand what types of learners benefit the most from what types of interventions and to what extent less intrusive interventions like VM are likely to be effective. Relatedly, some skills may be more easily taught using this intervention than others. Not all skills associated with the VSS assessment were taught during this study, and we observed some inconsistent outcomes across skills. Additional research could examine the potency of this type of intervention based on targeted skill.

Conclusion

Autistic youth often require additional support to experience success in the workplace due to difficulties with social interactions (Hendricks, 2010). Effective interventions that can be

implemented in applied settings are important for teaching key social skills applicable across work environments and supporting young people with autism in relating to their supervisors and fellow employees. VM plus feedback was an effective approach to teaching these skills in a simulated work environment, although some skills did not generalize to a realistic work setting. More work is needed to determine the best methods for providing instruction and training that allows autistic youth to engage in expected social behavior in the workplace, resulting in increased employment outcomes for this population.

References

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Bandura, A. (1969). Social-learning theory of identificatory processes. In D. A. Goslin (Ed.), *Handbook of socialization theory and research*, (pp. 213-262). Rand McNally.

Bross, L. A., Travers, J. C., Huffman, J. M., Davis, J. L., & Mason, R. A. (2021). A meta-analysis of video modeling interventions to enhance job skills of autistic adolescents and adults. *Autism in Adulthood*, *3*(4), 356-369. https://doi.org/10.1089/aut.2020.0038

Bross, L. A., Travers, J. C., Wills, H. P., Huffman, J. M., Watson, E. K., Morningstar, M. E., & Boyd, B. A. (2020). Effects of video modeling for young adults with autism in community employment settings. *Career Development and Transition for Exceptional Individuals*, *43*(4), 209-225. https://doi.org/10.1177/2165143420941488

Carter, E. W., Austin, D., & Trainor, A. A. (2012). Predictors of postschool employment outcomes for young adults with severe disabilities. *Journal of Disability Policy Studies*, *23*(1), 50-63. https://doi.org/10.1177/1044207311414680

Centers for Disease Control and Prevention (2022). *Data and statistics on autism spectrum disorder.* https://www.cdc.gov/ncbddd/autism/data.html

Chen, J. L., Sung, C., & Pi, S. (2015). Vocational rehabilitation service patterns and outcomes for individuals with autism of different ages. *Journal of Autism and Developmental Disorders*, *45*, 3015–3029. https://doi.org/10.1007/s10803-015-2465-y.

Delano, M. E. (2007). Video modeling interventions for individuals with autism. *Remedial and Special Education*, *28*(1). https://doi.org/10.1177/07419325070280010401

Dietz, P. M., Rose, C.E., McArthur, D., & Maenner, M. (2020). National and State Estimates of

Adults with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, *50*, 4258–4266. https://doi.org/10.1007/s10803-020-04494-4

Erickson, W., Lee, C., & von Schrader, S. (2022). Disability statistics from the American Community Survey (ACS). Cornell University Yang-Tan Institute (YTI). https://www.disabilitystatistics.org/

Green, V. A., Drysdale, H., Boelema, T., Smart, E., van der Meer, L., Achmadi, D., Prior, T., O'Reilly, M., Didden, R., & Lancioni, G. (2013). Use of video modeling to increase positive peer interactions of four preschool children with social skills difficulties. *Education & Treatment of Children (West Virginia University Press)*, *36*(2), 59–85. https://www.jstor.org/stable/42900200

Grob, C. M., Lerman, D. C., Langlinais, C. A., & Villante, N. K. (2019). Assessing and teaching job-related social skills to adults with autism spectrum disorder. *Journal of Applied Behavior Analysis*, *52*, 150-172. https://doi.org/10.1002/jaba.503

Hendricks, D. (2010). Employment and adults with autism spectrum disorder: Challenges and strategies for success. *Journal of Vocational Rehabilitation*, *32*, 125-134. https://doi.org/10.3233/JVR-2010-0502

Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children*, *71*(2), 165-179. https://doi.org/10.1177/001440290507100203

Lerman, D. C., White, B., Grob, C., & Laudont, C. (2017). A clinic-based assessment for evaluating job-related social skills in adolescents and adults with autism. *Behavior Analysis in Practice*, *10*, 323-336. https://doi.org/10.1007/s40617-017-0177-9

Mangiapanello, K. A., & Hemmes, N. S. (2015). An analysis of feedback from a behavior

analytic perspective. *The Behavior Analyst*, *38*, 51-75. https://doi.org/10.1007/s40614-014-0026-x

McCoy, K., & Hermansen, E. (2007). Video modeling for individuals with autism: A review of model types and effects. *Education and Treatment of Children*, *4*, 183-213. https://www.jstor.org/stable/42899952

Newman, L., Wagner, M., Knokey, A. M., Marder, C., Nagle, K., Shaver, D., & Wei, X. (2011). The post-high school outcomes of young adults with disabilities up to 8 years after high school: A report from the National Longitudinal Transition Study-2 (NLTS2) (NCSER 2011-3005). *National Center for Special Education Research*. http://ies.ed.gov/pubsearch/pubsinfo.asp?pubid=NCSER20113005

O'Connor, R. D. (1969). Modification of social withdrawal through symbolic modeling. *Journal of Applied Behavior Analysis*, *2*, 15-22. https://doi.org/10.1901/jaba.1969.2-15

Pollard, J. S., Higbee, T. S., Akers, J. S., & Brodhead, M. T. (2014). An evaluation of interactive computer training to teach instructors to implement discrete trials with children with autism. *Journal of Applied Behavior Analysis*, *47*(4), 765-776. https://doi.org/10.1002/jaba.152

Qi, C. H., Barton, E. E., Collier, M., Lin, Y. (2018). A systematic review of single-case research studies on using video modeling interventions to improve social communication skills for individuals with autism spectrum disorder. *Focus on Autism and Other Developmental Disabilities*, *33*(4), 249-257. https://doi.org/10.1177/1088357617741282

Rausa, V. C., Moore, D. W., & Anderson, A. (2016). Use of video modelling to teach complex and meaningful job skills to an adult with autism spectrum disorder. *Developmental Neurorehabilitation*, *19*(4), 267–274. https://doi.org/10.3109/17518423.2015.1008150

Rowe, D. A., Mazzotti, V. L., Fowler, C. H., Test, D. W., Mitchell, V. J., Clark, K. A., Holzberg, D., Owens, T. L., Rusher, D., Seaman-Tullis, R. L., Gushanas, C. M., Castle, H., Chang, W.-H., Voggt, A., Kwiatek, S., & Dean, C. (2021). Updating the secondary transition research base: Evidence- and research-based practices in functional skills. *Career Development and Transition in Exceptional Individuals*, *44*(1), 28-46. https://doi.org/10.1177/2165143420958674

Sleiman, A. A., Sigurjonsdottir, S., Elnes, A., Gage, N. A., & Gravina, N. E. (2020). A quantitative review of performance feedback in organizational settings (1998-2018). *Journal of Organizational Behavior Management*, *40*(3-4), 303-332. https://doi.org/10.1080/01608061.2020.1823300

Trainor, A. A., Carter, E. W., Karpur, A., Martin, J. E., Mazzotti, V. L., Morningstar, M. E., Newman, L., & Rojewski, J. W. (2020). A framework for research in transition: Identifying important areas and intersections for future study. *Career Development and Transition for Exceptional Individuals*, *43*(1), 5-17. https://doi.org/10.1177/2165143419864551

Stauch, T. A., & Plavnick, J. B. (2020). Teaching vocational and social skills to adolescents with autism using video modeling. *Education and Treatment of Children*, *43*, 137-151. https://doi.org/10.1007/s43494-020-00020-4

Whittenburg, H. N., Taylor, J. P., Thoma, C. A., Pickover, G. S., & Vitullo, V. E. (2020). A systematic literature review of intervention to improve work-related social skills of individuals with autism spectrum disorder. *Inclusion*, *8*(4), 320-334. https://doi.org/10.1352/2326-6988-8.4.320

Williams, D. (2007). Understanding autism and related disorders: What has imaging taught

us? *Neuroimaging Clinics of North America*, *17*(4), 495–ix. https://doi.org/10.1016/j.nic.2007.07.007

Wisniewski, B., Zierer, K., & Hattie, J. (2020). The power of feedback revisited: A meta-analysis of educational feedback research. *Frontiers in Psychology*, *10*, 1-14. https://doi.org/10.3389/fpsyg.2019.03087

Van Laarhoven, T., Kos, D., Pehlke, K., Johson, J. W., & Burgin, X. (2014) Comparison of video modeling and video feedback to increase employment-related social skills of learners with developmental disabilities. *Division on Autism and Developmental Disabilities Online Journal*, *1*(1), 69-90. http://www.daddcec.com/dadd-online-journal.html

Tables and Figures – Manuscript 2

Table 1

Operational Definitions of Behavioral Targets

Behavior	Operational Definition
Making confirming statements when given a task	Step 1: Orients towards supervisor Step 2: Indicates that they heard the instructions Step 3: Repeats parts of an instruction delivered by the supervisor Example: "Ok, I will stock the shelves"
Asking for help with missing or more materials	Step 1: Searches area for missing or more materials Step 2: Leaves to ask for materials within one minute of off-task behavior or after no more than five minutes of unsuccessful problem solving Step 3: Searches for supervisor Step 4: Knocks on door Step 5: Waits to enter Step 6: Makes a clear and specific statement about the need for materials
Notifying the supervisor of task completion	Step 1: Notifies the supervisor of completion within 1 minutes of task completion Step 2: Searches for supervisor Step 3: Knocks on door Step 4: Waits to enter Step 5: Delivers a statement indicating that the task was complete
Responding to an interrupted task	Step 1: Acknowledges supervisor's presence Step 2: Acknowledges new task Step 3: Asks supervisor if they should return to the previous task when finished Step 4: Completes new task Step 5: Notifies supervisor of task completion (if no further work is required) OR returns to work on prior task Step 6: Completes prior task Step 7: Notifies supervisor of task completion
Asking for clear instructions	Step 1: Searches for supervisor Step 2: Knocks on door Step 3: Waits before entering Step 4: Asks questions that would lead the supervisor to specify and/or model how to correctly complete a task
Working when the supervisor is unavailable	Step 1: Searches for supervisor within one minute of task completion

	Step 2: Knocks on door Step 3: Waits to enter Step 4: Does not enter if no one answers Step 5: Returns to workspace Step 6: Finds an alternative task to work on
Responding to corrective feedback	Step 1: Orients towards supervisor Step 2: Apologizes Step 3: Asks for clear feedback that would lead to accurate completion of the task Step 4: Delivers a statement indicating that the mistake will be corrected without making inappropriate comments or facial expressions Step 5: Corrects the mistake without inappropriate comments, complaints, or facial expressions

Table 2

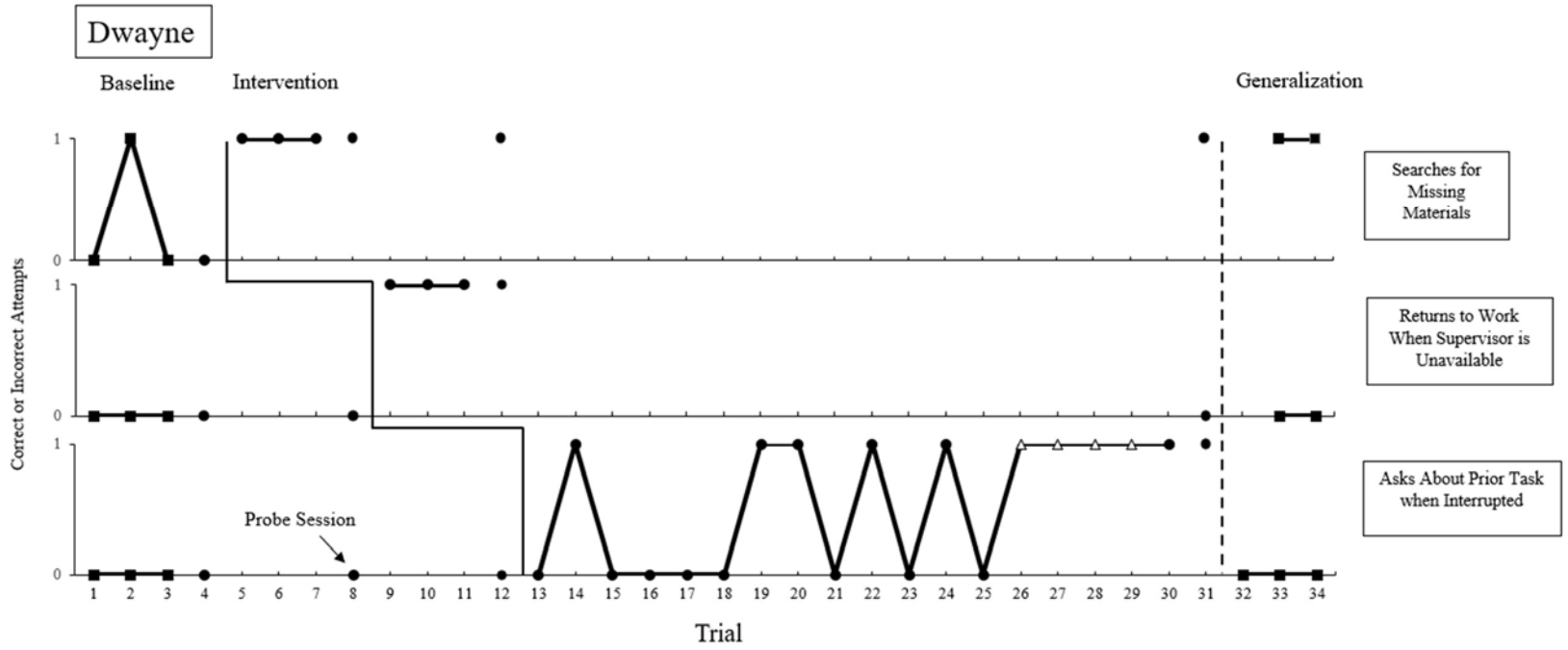
Social Validity Data

Question	Dwayne	Nihil	Troy	Instructor
Enjoyment of participation	5	4	5	5
Perception of effects	5	4	5	4
Interest in continued use	Yes	Yes	Yes	4
Recommended use for others	Yes	Yes	Yes	Yes
Likeliness of continued use	N/A	N/A	N/A	4
Ease of use	N/A	N/A	N/A	1

Likert-type responses between 1 to 5 with 1 being *did not enjoy, not helpful at all, Not interested in continued use,* and *much easier to implement than other interventions*

Figure 1

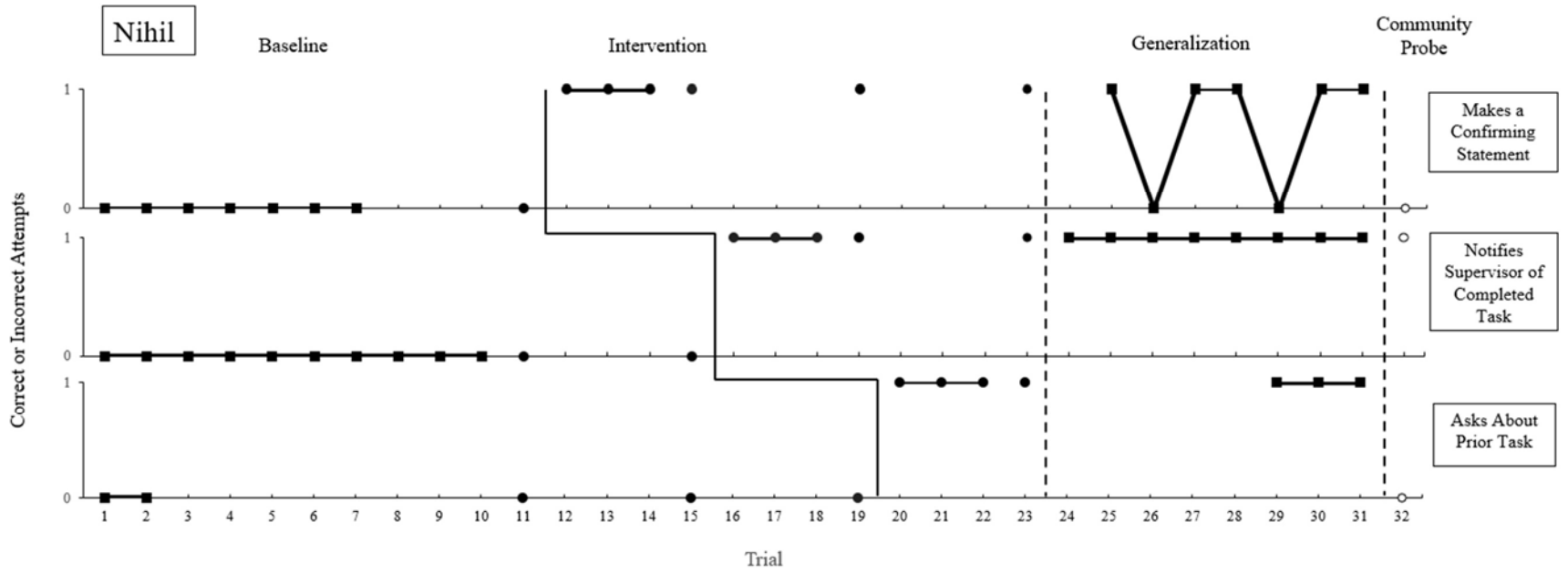
Dwayne Intervention Data



Note. Black squares represent pre- and post-assessment data. Black circles represent training data with white triangles indicating where we introduced a visual prompt during training.

Figure 2

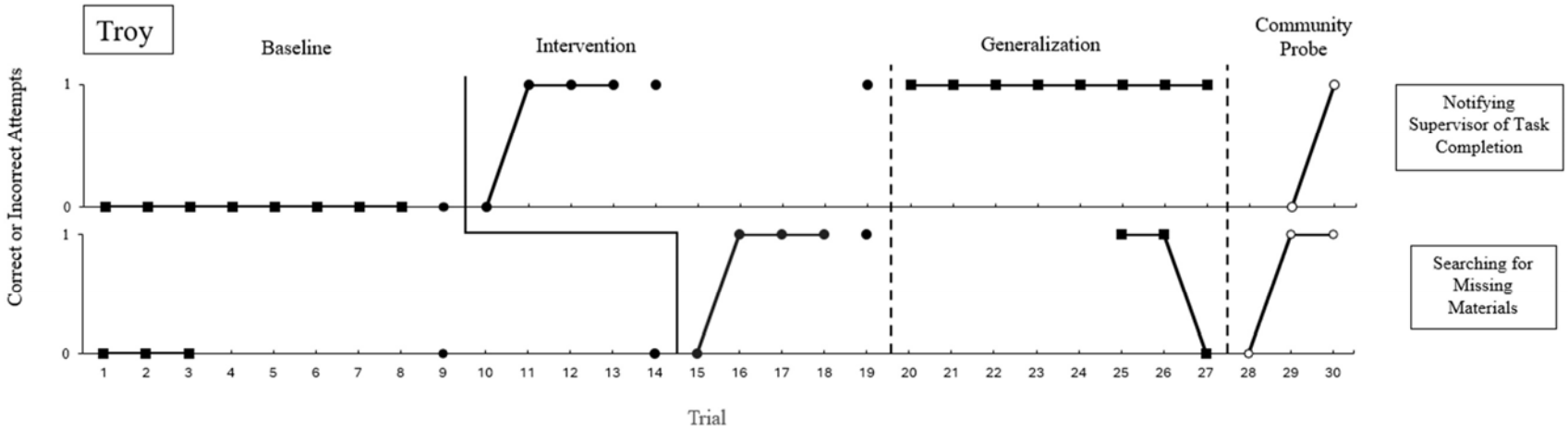
Nihil Intervention Data



Note. Black squares represent pre- and post-assessment data. Black circles represent training data and white circles represent novel setting probe data.

Figure 3

Troy Intervention Data



Note. Black squares represent pre- and post-assessment data. Black circles represent training data and white circles represent novel setting probe data.

Using Practitioner-Implemented Video Models to Teach Vocational Social Skills in a Rural Public School

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Dissertation

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Open science practices:

This study was preregistered in the REES registry (ID: 17160) and materials and data are openly accessible at https://osf.io/yh68z/?view_only=ed3dc1653ce141c684a174bc4569faff.

Abstract

Youth with autism spectrum disorder or intellectual and developmental disabilities often require additional support to learn social skills commonly used to solve problems and interact with coworkers on the job. In rural communities, students may lack access to job experiences or related service providers to support them in acquiring these skills resulting in the need for high-quality, classroom-based interventions. This study used a multiple probe across behaviors design to examine the effects of an intervention involving video modeling plus feedback to teach common vocational social skills in a rural public school classroom. Three young adults with autism or intellectual disability participated in the study. We found the intervention to be effective at increasing the use of these skills in a simulated work setting within the classroom. The participants successfully utilized the learned skills in a community-based work experience and maintained most of the skills two months following intervention. We discuss the implications of our findings and suggest areas for future research.

Using Practitioner-Implemented Video Models to Teach Vocational Social Skills in a Rural Public School

Rates of Autism Spectrum Disorder (ASD) continue to rise in the U.S. and current estimates indicate that 1 in 36 children have ASD (CDC, 2023). As a result, an increasing number of autistic[2] children are served by the public school system, often requiring specialized instruction to meet their learning and behavioral needs. A key purpose of the special education system is to prepare students to enter the job market and be successful employees (IDEA, 2004). Research indicates that employment improves self-esteem, personal dignity, and promotes improved adaptive and cognitive performance in individuals with ASD (Chen et al., 2015). Unfortunately, many autistic youth leave the school system without adequate skills to gain and maintain competitive integrated employment. Data indicate only 58% of young autistic adults were employed in their early 20s, the lowest rate in any disability category (Newman et al., 2011; Roux et al., 2015).

Why do individuals with ASD often experience low employment outcomes? ASD, as a developmental disability, primarily impacts an individual's social communication abilities and behavioral adaptability. This often leads to a heightened preference for structured environments, consistent routines, and predictable patterns, which can be both a strength and a challenge in various settings (APA, 2013). While some of these differences are strengths in the workplace (Cope & Remington, 2022), difficulties with social interactions at work cause significant barriers for autistic youth (Hendricks et al., 2010). Carter et al. (2012) found that youth with ASD or intellectual and developmental disabilities (IDD) with significant social skills difficulties are

[2] We are choosing to use a combination of person-first and identity-first language to represent the diversity of opinion around language and autism.

much less likely to be employed than youth without social skills challenges. Additionally, Roux et al. (2015) identified conversational ability as a key factor in employment outcomes, with 90% of autistic youth with high conversation skills having work experiences, compared to only 15% of those with the lowest conversation skills. Special education teachers need to provide explicit instruction in common vocational social skills (VSS) to support positive engagement with coworkers and enhance employment outcomes for autistic youth.

Video modeling (VM) is an evidence-based practice for teaching transition-related skills to autistic youth (Rowe et al., 2021; Whittenburg, 2020), including social communication skills (Qi et al., 2018). VM is an antecedent-based intervention grounded in social learning theory (Bandura, 1969). VMs demonstrate how to perform a skill accurately under certain conditions, resulting in an increase in the probability that the viewer will use that skill appropriately when they encounter those conditions in the future (McCoy & Hermansen, 2007). Once developed, VMs offer an accessible and non-stigmatizing method for learning, as watching instructional videos is a widely accepted and common practice.

Video Modeling and Vocational Social Skills

Research shows VM is an effective tool for teaching social skills; however, most studies have been conducted with children. For example, Qi et al. (2018) evaluated 18 VM studies that met *What Works Clearinghouse* design standards using a variety of non-overlapping metric scores and found between 61% and 90% of the studies to be either effective or highly effective. However, the mean age of participants in these studies was 83.75 months (7 years) (range 44 to 141 mo.; 3.6 to 11.75 years). Bross et al. (2021) examined VM interventions to teach job skills to autistic youth ages 14 and older. They identified 20 studies and found VM to be a potentially highly effective intervention for teaching job skills to autistic youth. However, only four of the

included studies examined the effects of VM to teach VSS, so more research is necessary to better understand the impact and usefulness of VM to support VSS acquisition.

VM shows great promise as an effective tool for teaching VSS to autistic youth, suggesting the need to increase its evidence base. Stauch and Plavnick (2020) demonstrated the benefits of using VM in a contrived work setting to teach job skills and VSS to two autistic youth. However, social skills were acquired slower than job skills, suggesting that VSS may require targeted instruction to be mastered. Bross et al. (2020) used VM to teach customer service skills to five young autistic adults working in various community settings. The authors successfully employed VM to instruct individuals in behaviors appropriate for specific job contexts. Additionally, the positive changes observed were sustained when the training was conducted by a naturalistic agent, such as a coworker or job coach. The behavioral targets in the study were specific to customer service jobs and may not be as helpful for individuals seeking different types of positions that do not require consistent interaction with customers.

Finally, McLucas et al. (2023) used brief VMs plus feedback to teach common VSS to three young autistic adults at a school specializing in autism services. The authors implemented immediate performance feedback to accelerate learning new behaviors. This approach is based on the well-established effectiveness of feedback as an intervention method in education, which has a long history of facilitating learning (Wisniewski et al., 2020). The researchers identified behavioral targets using a VSS assessment developed by Lerman et al. (2017). A Registered Behavior Technician® with little prior experience working with the participants served as the intervention agent. The intervention demonstrated strong effects, which were generalized to new supervisors during the post-assessment for most participants, although one participant required additional in-situ prompts to learn one of the skills during training.

Participants in the study generalized only some skills during a community setting probe conducted in a local business, indicating that additional on-site training is likely necessary to ensure successful use of skills once a person begins working. Overall, this study provides evidence that naturalistic teaching agents can use VM to teach VSS that, in turn, generalize to new supervisors and maintain to some degree in novel, naturalistic environments.

A key characteristic lacking in the aforementioned studies is that none occurred in a typical public school setting. Practitioners require evidence-based practices to teach pre-employment transition skills to students as part of their transition programming. Additional research is required to demonstrate the extent to which VM can be implemented in school settings and used by practitioners to support students preparing for their transition to adulthood.

Intervention in Rural Settings

When preparing for the transition to adulthood, it is important to consider the immediate learning context and the ecological transition that occurs when students move from using skills at school to the community in which they live (Bronfenbrenner, 1979). Community context affects a student's development and access to resources during and after matriculation. Community contexts that require additional consideration are rural settings (McLucas et al., 2024). Rural special educators face challenges that may differ from those in other settings. For example, many rural communities have fewer employment opportunities (Test & Fowler, 2018), which may require teachers to prepare students for the limited types of jobs that will be available. These teachers need practices that are easy to implement, adaptable, and capable of teaching behaviors appropriate to the specific workplace contexts where their students will likely find employment.

Considering the community context in which a student lives is essential for employment-related skills because the skills must be socially valid for the environment in which they are

likely to be used. One effective method for teaching employment skills is to utilize community-based work experiences (Rowe et al., 2021) as they allow for teaching opportunities when students encounter natural contingencies (Cooper et al., 2020) on the job. However, it is not always possible for students to access community-based experiences, particularly in rural settings that may lack the resources or personnel necessary to provide these opportunities (Ault et al., 2019; Lavalley, 2018). As a result, students may benefit from learning common VSS before beginning work. These skills can be taught as part of the students' transition programming and prepare them for work in the community. McLucas et al. (2023) demonstrated that skills learned using VM generalize across supervisors in a simulated work environment and some skills generalized to a more naturalistic setting indicating that VSS instruction in the classroom can help prepare students for novel working conditions.

Purpose

This study is a conceptual replication of McLucas et al. (2023) and the purpose is to examine the effects of VM plus feedback to teach common VSS to autistic or intellectually disabled students in a rural public school. These students often require additional instruction to learn expected social interactions due to the nature of their disability. VM offers an effective tool for teaching contextually appropriate social behavior, including VSS (Bross et al., 2021; McLucas et al., 2023). Implementing interventions in rural settings requires consideration of the goals and expectations of families, the available resources, and the ease with which special education teachers can learn and implement new methods (McLucas et al., 2024; Weiss et al., 2023). An uncomplicated, effective intervention empowers practitioners to impart crucial skills to their students, enhancing their ability to interact positively with coworkers and increasing their likelihood of maintaining employment. This study is based on the following research questions:

1. What are the effects of using VM plus feedback in a simulated work environment to teach common VSS to adolescents with ASD or ID attending a rural high school when implemented by a natural teaching agent?

2. What is the social validity of a VSS intervention for adolescents with ASD or ID living in a rural community?

Method

Participants and Setting

This study was conducted at a public high school in a rural county in a South-Atlantic (U.S. Census Bureau, n.d.) state. The county is located 20 to 30 miles north of a small city and is considered a Fringe Town by the National Center for Education Statistics (2023). In 2021-22, the high school served 955 students in grades 9-12, with 70% White, 12% Hispanic, 7% Black or African American, 2% Asian, and 9% multi-racial students, with 34% of students eligible for free or reduced-price lunch. The county has approximately 375 employer establishments compared to nearly 3,000 in the largest neighboring county, and the average work commute is 33 minutes (U.S. Census, 2023).

Participants were recruited from the local high school in collaboration with school employees. All participants were enrolled in a post-high transition program designed to teach vocational and life skills to students with disabilities who qualified for the program. To be included in the study required that participants (1) currently have an IEP and receive services under the disability category of autism or intellectual and developmental disability, (2) communicate verbally, (3) do not demonstrate any severe challenging behavior, (4) are between the ages of 14-22, and (5) are participating in a transition plan with the expectation of competitive integrated employment.

Three students and one instructional assistant participated in the study. Norman was a 17-year-old African American/White male with autism with volunteer work experience. Patrick was a 20-year-old White male with autism and was participating in a paid internship at the time of the study. Carrie was a 21-year-old White female with an intellectual disability with volunteer work experience. A 52 year-old female instructional assistant with 15 years of classroom experience worked in the post-high classroom and served as the intervention agent during the study.

Measures

Pre-Assessment Social Validity Interviews

Wolf (1978) described three levels of social validity: goals, outcomes, and procedures. We assessed social validity before the intervention to inform the social validity of the goals and potential outcomes. This involved conducting semi-structured interviews with parents, participants, and the participants' teacher. The interview included three open-ended questions concerning general goals for the participant after high school, general types of jobs the participant would be well-suited for, and any specific places in the community where they hoped the participant could work. The researcher listened and took notes while the interviewee spoke and asked follow-up questions to ensure understanding or prompted the interviewee to provide more information. Following the open-ended questions, the researcher asked the interviewee to respond to a list of statements with either “Yes”, “No”, or “Not sure”. These statements related to each potential intervention target included in the study. The interview protocol is available as a supplemental material on the project OSF site. The purpose of this assessment was to ensure the goals of the intervention aligned with the participants' goals and were perceived as useful. Based on information from the interviews we aligned job tasks used during the intervention with

employment goals as much as possible. For example, we added more housekeeping tasks for students working at or expecting to work at a hotel chain as housekeepers.

Dependent Variables

The VSS targeted for intervention were based on an assessment first outlined by Lerman et al. (2017) and used by Grob et al. (2019) and McLucas et al. (2023). Potential behaviors addressed included common VSS related to interacting with a supervisor and/or solving problems encountered in the workplace. Behavioral targets included making confirming statements, asking for clear instructions, asking for help with an unfamiliar task, asking for help with missing or broken materials, responding to corrective feedback, notifying the supervisor of task completion, responding during an interrupted task, and working when the supervisor is unavailable. Task analyses and operational definitions of behavioral targets can be found in Supplemental Table 1. We scored each step in the task analysis as either correct, incorrect, partially correct, or no opportunity based on these definitions. Correctly completed steps earned one point, incorrect steps earned zero, and partially correct steps earned half a point. These scores were totaled and divided by the total number of steps in the task analysis to determine the percentage of correctly completed steps. Additionally, some of the skills lacked independence due to overlap in some steps in the task analysis (e.g., searching for the supervisor). To address this, we included a secondary y-axis on each graph depicting data for a single key and independent step for each skill.

The first author conducted the VSS assessment to identify behavioral targets for each participant and then identified three behavioral targets based on each student's performance. Behaviors with low scores were identified as potential targets. We prioritized behaviors indicated as potential areas of improvement during the pre-assessment interviews and then conducted

baseline sessions with the intervention agent (i.e., the instructional assistant). Norman and Patrick had a single skill identified during the pre-assessment as a potential intervention target that they used successfully during the baseline sessions with the intervention agent so an alternate skill was chosen instead.

Interobserver Agreement and Treatment Fidelity

An additional researcher was trained in the data collection procedures to collect data to assess interobserver agreement (IOA). The additional data collector was a special education doctoral student and was trained by the first author during a one-hour session. The second data collector watched video recordings of baseline and intervention sessions and took data on 71% of trials across all conditions except for the community and maintenance probes. We used trial-by-trial IOA to calculate agreement by comparing scores for each trial, dividing the number of agreements for the trial by the number of possible agreements and multiplying by 100. The trial-by-trial IOA was 89.5%.

We also assessed the data collection accuracy of the instructional assistant who served as the intervention agent. The first author trained the instructional assistant on the data collection procedures, and the instructional assistant took data throughout the intervention. This provided an opportunity to examine the extent to which a natural intervention agent could collect accurate data while implementing the intervention. We calculated IOA between the first author's data and the instructional assistant's data across 67.4% of trials using the same methods as described above. Trial-by-trial IOA between the instructional assistant and researcher was 88.9%.

Additionally, we collected treatment integrity data on the fidelity of the instructor's implementation of the intervention. The operational definitions used to assess treatment fidelity can be found in Supplemental Table 2. The first author took treatment fidelity data during 52.1%

of sessions and provided feedback to the instructional assistant following any mistakes made during the intervention. The average fidelity was 96.7%. A second observer took treatment fidelity data across 100% of the trials for which the first author took data. We calculated trial-by-trial IOA for treatment fidelity using the same methods described above. Trial-by-trial IOA for treatment fidelity was 88.8%.

Social Validity

To assess the social acceptability of the procedures, a person not involved with the intervention procedures conducted brief interviews with all participants upon completion of the intervention. The purpose of the novel interviewer was to reduce the risk of social desirability bias (Ledford & Gast, 2018). Questions related to enjoyment of the intervention, perceived usefulness, ease of implementation, and likelihood to continue using the intervention or recommend it to others.

Experimental Design

We used a multiple probe across behaviors design (Ledford & Gast, 2018) to examine the effects of the intervention on student acquisition of VSS. Upon completion of the intervention, the first author conducted the VSS assessment a second time to assess generalization of learned skills to a novel "supervisor" and we conducted sessions at the participants' job sites to assess the extent to which the participants used the learned skills in a novel, realistic setting. Finally, we collected maintenance data at least two months after the completion of the intervention.

Materials

Materials required for this study include VMs addressing each of the targeted skills and materials for completing various job tasks like those the student may perform in a workplace. The VMs were filmed using a Google Pixel 6a cell phone and edited using iMovie on a Macbook

computer. The actors in the VMs were the first author, a local behavior specialist working in the public school system, and a special education doctoral student. VMs were watched by the participants either on a cell phone or laptop computer. Materials used during the study are accessible online at https://osf.io/yh68z/?view_only=ed3dc1653ce141c684a174bc4569faff.

Procedure

Assessment and Baseline

We began by conducting a behavioral assessment of students' use of common VSS. Lerman et al. (2017) first described this assessment; additional details can be found in that report. The assessment involved placing participants in a simulated work experience to closely mimic a natural work environment. During the assessment, the first author served as the "supervisor" and informed the student they were participating in a job training experience and were to treat the experience exactly as they would working at a job. The supervisor showed the student their workstation, where to find additional materials, and where in the room the supervisor's desk was located. Then, the supervisor presented a variety of tasks for the participants to complete. Tasks were based on common work tasks used in potential employment environments identified during the initial parent survey. Tasks included housekeeping tasks (e.g., cleaning a mirror, dusting, wiping surfaces), clerical skills (e.g., stuffing envelopes, organizing binders), processing or retail tasks (e.g., sorting objects, hanging shirts), food service tasks (e.g., prepping silverware, folding hand towels or napkins) and unfamiliar tasks (e.g., creating a budget, calculating sales analytics) among others.

During each task, an evocative situation was put into place by the supervisor creating an establishing operation for using a particular VSS. These involved the students encountering a problem that required problem solving or communication with the supervisor. These situations

allowed for observation of how students were likely to respond to workplace problems and generally how they communicated with their supervisor or used common courtesy behavior such as saying "excuse me" to get the supervisor's attention or acknowledge when their supervisor addressed them. See Supplemental Table 1 for behavioral targets.

The assessment occurred across two 45-minute sessions. The supervisor presented each situation at least once during the assessment period. Once the student had an opportunity to demonstrate each skill, the researcher identified which skills had not been demonstrated correctly and introduced these skills again during the following assessment day, allowing for at least three opportunities to demonstrate the skill. If the student consistently did not demonstrate a skill after three opportunities, this skill was deemed a potential target for intervention. Targets for intervention were chosen through discussion with the teacher about the relative importance for the student and comparison with potential targets identified during the parent survey.

Following selection of potential targets, we collected baseline data with the intervention agent serving as the supervisor. We proceeded to intervention if we observed a stable baseline across all behaviors that showed low performance consistent with pre-assessment data. If the student showed stable, increased performance during baseline, we excluded this behavior as a target and chose another behavior. We collected at least three baseline data points for each behavior and continued collecting baseline data until we observed stability in the data with no upward trends.

Intervention

Intervention procedures mimicked those of the assessment except that the instructional assistant served as supervisor and presented the evocative situations relevant to each targeted behavior in succession during the intervention phase. One of the three behaviors was identified

for intervention either randomly or based on the likelihood of carryover effects or practical needs of setting up the evocative situation. Each trial began with the presentation of a task, included an evocative situation, and ended when the participant either accurately used the target behavior to successfully complete the task or failed to do so and encountered a natural end to the task.

During the intervention, the student watched the VM corresponding with the target behavior at the beginning of the trial. Then the supervisor asked for any questions and presented a task and an evocative situation. If the participant successfully used the target skill during the trial, the supervisor provided feedback in the form of behavior specific praise (e.g., "good job remembering to search for materials") to reinforce the student's use of the behavior. Then, the next trial began without the introduction of the VM. If the student failed to use the target skill, the supervisor provided immediate corrective feedback specifying the skill that the student was expected to demonstrate. The trial ended, and the student rewatched the VM at the beginning of the next trial. If a student failed to demonstrate the skill after the first attempt, the student rewatched the VM and the supervisor briefly explained the expected behavior (e.g., "So when you encounter this situation you should do X"). After two successive failed attempts, the student rewatched the video followed by a brief explanation by the teacher and the student was asked to repeat the expected behavior back to the teacher.

If the student correctly demonstrated the target skill during three successive trials, they met the mastery criteria for that skill. Then we conducted a probe trial where the student had an opportunity to demonstrate all three of the targeted skills to assess the students' maintenance of the learned skill and whether there were any carryover effects to skills not yet taught. If the student correctly used the learned skill during the probe trial, we conducted the same intervention targeting the next behavior. If they failed to demonstrate the skill, we retrained the

skill until the student again demonstrated three successful attempts in a row and conducted an additional probe trial for all skills. The intervention continued in this fashion until all three skills had been mastered.

Post-Intervention Assessment, Community Probes, and Maintenance

Following intervention, the students participated in the same assessment process as occurred before intervention. This allowed each student to demonstrate generalization of learned skills to a new supervisor and allowed another opportunity to show improvement from baseline. We assessed generalization by comparing the average percent correct responding during the pre-assessment to the average percent correct responding during the post-assessment. Additionally, we conducted a probe session at each participant's community work setting. Two participants were working or volunteering at a large hotel chain doing housekeeping, and one was volunteering at a local apartment complex cleaning common areas. During these probes, the participants rewatched the VM for one of the skills learned during the intervention, and then the participant's natural supervisor (i.e., the instructional assistant or teacher) presented them with a task and an evocative situation like those used during the intervention. Participants rewatched each VM immediately prior to each trial because generalization to the natural environment was highly inconsistent in McLucas et al. (2023). By rewatching the VM we hoped to increase the likelihood of use of the skill in the novel context. We then collected data on the participant's use of the trained skill in this more natural context. We repeated this process for all three skills for each participant.

Finally, we conducted maintenance probes of all three skills for each participant in the classroom at least two months following the completion of the intervention. The instructional assistant served as supervisor. We allowed each person an initial opportunity to demonstrate a

given skill, then, if the participant demonstrated the skill with 100% mastery on the first attempt we moved on to the next skill. If they did not, the participant rewatched the VM for that skill and was given an additional opportunity to use the skill.

Results

We observed stable responding during baseline for Norman (See Figure 1), Patrick (See Figure 3), and Carrie (See Figure 5). Participants responded inconsistently and with low accuracy across all skills identified during the assessment as potential intervention targets. Following introduction of the intervention we observed a significant increase in response accuracy for all participants within the first three trials.

Norman's average correct responding increased from μ=8% during baseline to μ=75% following intervention during classroom trials and post-intervention probes for responding to vague instructions. However, Norman required three booster trials to return to meeting mastery criteria after he failed to use this skill during post-intervention probe trials. Accuracy for notifying the supervisor when finished with a task increased from μ=10% during baseline to μ=100% following intervention and accuracy for responding to missing materials increased from μ=10% during baseline to μ=89% following intervention. When observing a key, independent step in each skill (noted in Figure 1 with triangle markers) we observed a functional relationship between the intervention and the responses across all skills, although responding to missing materials required more trials before Norman mastered this skill. Norman did not generalize the use of vague instructions to a new supervisor during the post-assessment (μ=0%), but we observed increased use of skills for both responding to missing materials (μ=94%) and notifying the supervisor of task completion (μ=67%). Norman demonstrated use of all three skills during the community setting probe trials and demonstrated maintenance of both responding to vague

instructions and responding to missing materials at the two-month follow-up. He did maintain responding for notifying his supervisor of task completion, but immediately increased responding after re-watching the VM for this skill.

Patrick's average correct responding increased from μ=31% during baseline to μ=89% following intervention for notifying the supervisor of task completion. Accuracy for asking for help with an unfamiliar task increased from μ=68% during baseline to μ=100% following intervention and accuracy for working when the supervisor is unavailable increased from μ=50% during baseline to μ=98% following intervention. When observing a key, independent step in each skill (noted in Figure 3 with triangle makers) we also observed a functional relationship between the intervention and responding across all skills. We observed Patrick generalize all three skills to a new supervisor during the post assessment with responding increasing to μ=93% accuracy for notifying the supervisor of task completion μ=90% for working with the supervisor is unavailable, and μ=100% for asking for help with an unfamiliar task. Patrick demonstrated accurate use of three skills during community setting probe trials and maintained skills during the two-month follow-up.

Carrie's average correct responding increased from μ=30% during baseline to μ=91% following intervention for notifying the supervisor of task completion. Accuracy for asking for help with an unfamiliar task increased from μ=51% during baseline to μ=100% following intervention and accuracy for responding to corrective feedback increased from μ=46% during baseline to μ=90% following intervention. When observing a key, independent step in each skill (noted in Figure 5 with triangle markers) we observed a strong functional relationship between notifying the supervisor of task completion and responding to missing materials. Carrie required repeated practice to reach mastery for responding to corrective feedback but maintained

responding once mastered. During the post assessment, Carrie used all three skills with μ=100% accuracy, demonstrating strong generalization. Additionally, Carrie demonstrated use of all skills during community setting probe trials and maintained skills with high levels of accuracy at the two-month follow-up.

Social Validity

Participant responses to the social validity questionnaire can be found in Table 1. All participants indicated that they enjoyed participating in the study (μ=5), found the intervention to be helpful (μ=4.7), and indicated that they thought the intervention would be useful for others (n=3). Two of the three participants also indicated wanting to continue using this intervention to learn other skills. The teaching assistant who served as interventionist indicated that she enjoyed participating in the intervention (5 – I really enjoyed it), found it helpful for the students (5 – extremely helpful), easy to use (1 – much easier than other methods), and would recommend the intervention to other practitioners. Additionally, during the interview, she indicated several benefits of video-based instruction. For example, she said, “A lot of students today use technology to help them learn, and to be able to figure out what needs to be done by watching modules will help them a lot, and they can be more independent.” She also indicated the intervention’s usefulness by saying, “it is a great thing to have more than one option to help students learn work ethics and different things through videos” and its effectiveness by saying, “some of the ideas actually worked with some of the students in the work place…I actually was able to implement some of those skills through this process in the work place and it makes sense.”

Discussion

This study aimed to extend the findings of McLucas et al. (2023) by evaluating the effectiveness of an intervention involving the use of VM and feedback in a simulated workplace environment in a rural public school classroom. Students with ASD and/or IDD may lack common social interaction skills necessary for success in the workplace, leading to difficulty in finding and maintaining competitive integrated employment (Hendricks et al., 2010). The ability to communicate effectively in the workplace is key to vocational success (Roux et al., 2015), and this study provides additional evidence for the effectiveness of using VM plus clear feedback and practice to teach commonly used VSS and support use of those skills in both the classroom and realistic work settings in the participants' community. VM interventions have a long history of effectiveness in teaching social skills to children with ASD (Qi et al., 2018) and growing evidence of their usefulness to teach job skills to autistic adults (Bross et al., 2021). Previous studies have focused on teaching these skills in the workplace using the researcher as the intervention agent (Bross et al., 2020) or a clinical setting (McLucas et al., 2023). This is the first study that explicitly examined the effects of a VSS intervention in a rural public school when implemented by a practitioner. A comparison of similarities and differences between this study and McLucas et al. (2023) can be found in Table 4.

Transition in Rural Communities

Rural settings require additional consideration when designing and implementing interventions to ensure they are appropriate for the community context where the students live and will work (McLucas et al., 2024). Rural special educators must serve students with diverse disabilities and needs, often with minimal resources and few employment or work-based learning opportunities in the community (Test & Fowler, 2018; Weiss et al., 2023). This results in an increased need to individualize interventions based on the transition plans and goals for each

student and develop interventions that can be successful in the classroom while also supporting generalization of skills to actual work settings.

We addressed these needs in multiple ways. First, we interviewed each participant, their parent, and teacher before collecting data to better understand the students' employment goals. Schwartz and Baer (1991) recommend social validity data be collected from a variety of sources at multiple time points in a study to allow the opportunity to make adaptations. We sought to increase the social validity of our study, and therefore the contextual fit, by using information from the pre-assessment interviews to inform the selection of behavioral targets and to adapt the tasks used during training to better align with potential future employment outcomes. This increased the likelihood that learning occurred in the presence of stimuli relevant to the participants' current or future employment and increased the likelihood of generalization to the natural environment. We recommend researchers consider the use of semi-structured interviews to inform their intervention procedures and increase contextual fit, especially when working in rural communities as there are numerous community and cultural variables that warrant consideration during the design and implementation of interventions (McLucas et al., 2024). Future researchers could also consider having relevant stakeholders (i.e., parents or guardians, service providers, and participants) review and provide feedback on selected behavioral targets and/or outcomes of the study. Next, we conducted the intervention in the participants' classroom using a naturalistic teaching agent (i.e., teaching assistant in the classroom). Teachers require interventions that are effective and accessible. The instructor in this study reported that she found this intervention to be easy to use and effective, providing initial evidence that video-based interventions such as this may be contextually appropriate for rural schools. Finally, we demonstrated the ability of participants to utilize skills learned in the classroom in an actual

community workspace, with all participants demonstrating high levels of skill use in the novel, realistic setting. Having access to an effective intervention that can be used in the classroom and then extended to the workplace can help meet the needs of rural educators who may have limited access to community work experiences or related service providers (e.g., job coaches), resulting in the need for more classroom-based instructional opportunities.

We provide additional evidence that VM interventions are effective and easy to use in a variety of contexts, including rural settings. In this study, VM was effective at increasing targeted skills in the classroom and increased use of the skills in a community work setting. Skill-based interventions have evidence of effective use in rural settings (McLucas et al., 2024) and VM can serve as a flexible tool for skill-based instruction in rural settings and could support special educators in teaching a variety of skills across contexts with limited resources (Weiss et al., 2023). Skills can be practiced in the classroom and videos can be downloaded and then watched on the job site either with the teacher or independently. This requires few additional resources or personnel to provide on-site job support and does not require internet access, both common issues in rural settings (Test & Fowler, 2018).

We encountered several differences when implementing the intervention in the classroom with a naturalistic teaching agent instead of a clinical or workplace environment. Utilizing the naturalistic teaching agent proved beneficial as both Norman and Patrick accurately used one skill during baseline sessions with the teaching assistant that they did not use accurately during the pre-assessment with the researcher. Working with a familiar interventionist led to the students demonstrating skills that would have otherwise been targets for intervention, thus saving time and allowing us to choose meaningful targets during the study. Several uncontrollable variables would not be present in a more controlled research or clinical environment and resulted

in errors of commission by the participants or issues regarding implementation fidelity. For example, during the pre-assessment, Norman could find the materials he needed without searching in the designated "materials bin" by finding them in an appropriate location within the classroom. Participants were more likely to yell across the room for attention or raise their hand (a contextually appropriate behavior) rather than coming up to the supervisor directly because the supervisor was always in the same room as the participants. While the teaching assistant implementing the intervention did so successfully (fidelity = 96.7%.), she often made mistakes and required oversight and support from the researcher throughout the study. IOA between the researcher and instructor was high (IOA = 89.5%); however, there were numerous trials where the instructor had missing data. Distractions to the students and the teaching assistant may have resulted in errors in responding and implementation. Despite these challenges and uncontrollable variables, the intervention proved highly effective.

Participants in this study had diverse profiles and experiences, yet all were able to successfully learn the targeted skills during training and use these skills when watching the VM in the workplace. Work experience is associated with improved employment outcomes (Rowe et al., 2021) as it allows students to encounter naturalistic contingencies and learn skills in the environment in which they will be used. When conducting vocational interventions in a classroom, it is crucial to program for opportunities to practice the skills in naturalistic environments and prepare the students for these environments by ensuring that contingencies learned during the classroom intervention mirror those in the real world as closely as possible (Cooper et al., 2020). VM is a useful tool for this purpose as it serves as a response prompt for the expected skills and signals to the viewer that behaviors learned when watching the VM in the classroom setting are also expected in the workplace environment. By having the participants

rewatch the VMs in the community work setting, we observed high success rates in utilizing learned skills in the workplace.

Limitations and Future Research

This study should be considered with the following limitations. The instructional assistant implementing the intervention required significant support from the researcher throughout the study to plan sessions and provide feedback when she made a mistake. It remains unclear how much training naturalistic agents need to implement this type of intervention with high fidelity without researcher support. Future research could examine the training requirements and levels of instructional fidelity when implemented solely by a practitioner and/or what modifications may be required to ensure sustainability. Similarly, the pre- and post-assessments were conducted by the researcher and not a naturalistic teaching agent. Utilizing the VSS assessment (Lerman et al., 2017) requires training and expertise and may be inaccessible to many classroom teachers, particularly those in rural settings, without support from a behavior analyst or other qualified professional. Researchers could examine adapted methods or the level of training required to utilize this assessment procedure in the classroom.

One participant (Norman) did not generalize two of the three skills to a novel supervisor during the post-assessment or use one of the skills during the maintenance probe; however, he did use the skills in the workplace after rewatching the VM. Some students may require greater intervention intensity with regular viewing of VMs to ensure generalization and maintenance of skills. While we observed high usage of skills in the naturalistic setting, we cannot make claims of generalization due to the lack of baseline data in these settings. Additionally, we cannot make claims of generalization because the participants rewatched each VM prior to having the opportunity to use the skill in the natural environment. While this procedure resulted in increased

use of skills in natural contexts compared to McLucas et al. (2023), it remains unclear whether participants would have used any of the skills without first rewatching the VM. We observed carry-over effects from training on some unlearned skills during baseline probe sessions for both Patrick and Carrie. This was caused by overlap in the behavioral definitions for these skills as many skills included steps related to finding and communicating with the supervisor as part of the task analysis (See Supplemental Table 1). However, participants only demonstrated steps in a task analysis unique to a given behavior after training. We used binary representation of independent steps in our graphs to more clearly demonstrate the functional relation between the intervention and novel behaviors. Finally, we only conducted a single probe session in the community setting, so the extent to which the participants continued using the learned skills when on the job remains unclear. Future research could extend the number of observations in the workplace to assess whether additional on-site intervention sessions are necessary to ensure generalization and maintenance of skills in the natural environment.

Transition programming in rural communities is complex and involves the intersection of a variety of tiers of influence. There are community-level factors to consider such as number of employers, understanding of disability within the workplace and community, and the ability of the school system to connect with and provide access to community-based employment opportunities. Rural communities are often close-knit and put a heavy emphasis on personal relationships (Weiss et al., 2023). Addressing community-level factors to improve access may require advocacy and utilization of social capital by school staff or other service providers (Trainor et al., 2019) or utilization of non-public resources such as service-based or religious organizations that often feature prominently in these communities (Stewart-Ginsburg & Kwiatek, 2020).

There are classroom-level factors such as number of students within a class (often rural schools have smaller class sizes; (Rude & Miller, 2018), type of space available for instruction, and the ability to incorporate job-skills instruction into the students' programming throughout the day. If a classroom is understaffed and includes students with a variety of needs (Ault et al., 2019), this could present significant challenges. Finally, there are individual-level factors that require consideration. Teachers may require additional training to gain the knowledge and skills necessary to utilize evidence-based practices during transition programming (Ault et al., 2019). Each student is unique and developing a transition plan requires communication with the student and their families to understand their goals, resources, and instructional needs more fully. Future research of transition programming in rural communities should consider exploring these various tiers of influence and how to overcome barriers and utilize the many advantages that exist within a rural setting to increase access to employment for students with disabilities.

Conclusion

Students with ASD or IDD often require additional instruction to learn to utilize common VSS. Conducting these interventions in the classroom can be an accessible way for teachers in rural public schools to teach critical transition-related skills without requiring access to community work experiences. VM plus feedback is a useful tool for teaching VSS in the public school and can support the utilization of these skills on the job. This study offers an initial example of how to collaborate with teachers, students, and families to design and implement interventions that are contextually appropriate, utilize available resources, and address the transition-related goals of students living in rural settings.

References

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Ault, M. J., Ferguson, B. T., Berry, A., B., Hawkins-Lear, S., & Magiera, K. (2019). The founding, evolution, and impact of the American Council on Rural Special Education. *Rural Special Education Quarterly*, *38*(2), 67-78, https://doi.org/10.1177/8756870519833916

Bandura, A. (1969). Social-learning theory of identificatory processes. In D. A. Goslin (Ed.), *Handbook of socialization theory and research*, (pp. 213-262). Rand McNally.

Bronfenbrenner, U. (1979). *The ecology of human development*. Harvard University Press.

Bross, L. A., Travers, J. C., Huffman, J. M., Davis, J. L., & Mason, R. A. (2021). A meta-analysis of video modeling interventions to enhance job skills of autistic adolescents and adults. *Autism in Adulthood*, *3*(4), 356-369. https://doi.org/10.1089/aut.2020.0038

Bross, L. A., Travers, J. C., Wills, H. P., Huffman, J. M., Watson, E. K., Morningstar, M. E., & Boyd, B. A. (2020). Effects of video modeling for young adults with autism in community employment settings. *Career Development and Transition for Exceptional Individuals*, *43*(4), 209-225. https://doi.org/10.1177/2165143420941488

Carter, E. W., Austin, D., & Trainor, A. A. (2012). Predictors of postschool employment outcomes for young adults with severe disabilities. *Journal of Disability Policy Studies*, *23*(1), 50-63. https://doi.org/10.1177/1044207311414680

Centers for Disease Control and Prevention (2022). *Data and statistics on autism spectrum disorder.* https://www.cdc.gov/ncbddd/autism/data.html

Chen, J. L., Sung, C., & Pi, S. (2015). Vocational rehabilitation service patterns and outcomes

for individuals with autism of different ages. *Journal of Autism and Developmental Disorders*, *45*, 3015–3029. https://doi.org/10.1007/s10803-015-2465-y.

Cope, R., & Remington, A. (2022). The strengths and abilities of autistic people in the workplace. *Autism in Adulthood*, *4*(1), 22-31. https://doi.org/10.1089%2Faut.2021.0037

Cooper, J. O., Heron, T. E., & Heward, W. L. (2020). *Applied Behavior Analysis* (3rd ed.). Pearson Education, Inc.

Ferguson, J. L., Cihon, J. H., Leaf, J. B., Van Meter, S. M., McEachin, J., & Leaf, R. (2019). Assessment of social validity trends in the journal of applied behavior analysis. *European Journal of Behavior Analysis*, *20*(1), 146-157. https://doi.org/10.1080/15021149.2018.1534771

Grob, C. M., Lerman, D. C., Langlinais, C. A., & Villante, N. K. (2019). Assessing and teaching job-related social skills to adults with autism spectrum disorder. *Journal of Applied Behavior Analysis*, *52*, 150-172. https://doi.org/10.1002/jaba.503

Hendricks, D. (2010). Employment and adults with autism spectrum disorder: Challenges and strategies for success. *Journal of Vocational Rehabilitation*, *32*, 125-134. https://doi.org/10.3233/JVR-2010-0502

Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children*, *71*(2), 165-179. https://doi.org/10.1177/001440290507100203

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

Lavalley, M. (2018). Out of the loop: Rural school are largely left out of research and policy discussions, exacerbating poverty, inequity, and isolation. Center for Public Education.

Ledford, J. R., & Gast, D. L. (2018). *Single case research methodology: Applications in special*

education and behavioral sciences. (3rd ed). Routledge.

Lerman, D. C., White, B., Grob, C., & Laudont, C. (2017). A clinic-based assessment for evaluating job-related social skills in adolescents and adults with autism. *Behavior Analysis in Practice*, *10*, 323-336. https://doi.org/10.1007/s40617-017-0177-9

McCoy, K., & Hermansen, E. (2007). Video modeling for individuals with autism: A review of model types and effects. *Education and Treatment of Children, 30*(4), 183-213. https://www.jstor.org/stable/42899952

McLucas, A. S., Therrien, W. J., & Rowe, D. Secondary transition interventions in rural communities: A systematic literature review. (2024). *Career Development and Transition for Exceptional Individuals*. https://doi.org/10.1177/21651434231223435

McLucas, A. S., Som, P., Fleming, J., Ingvarsson, E., Therrien, W. (2023). *Using video modeling plus feedback to teach vocational social skills to autistic youth* [Manuscript under review]. School of Education and Human Development, University of Virginia.

National Center for Educational Statistics. (2023). *School Directory Information*.

Newman, L., Wagner, M., Knokey, A. M., Marder, C., Nagle, K., Shaver, D., & Wei, X. (2011). The post-high school outcomes of young adults with disabilities up to 8 years after high school: A report from the National Longitudinal Transition Study-2 (NLTS2) (NCSER 2011-3005). *National Center for Special Education Research*. http://ies.ed.gov/pubsearch/pubsinfo.asp?pubid=NCSER20113005

Qi, C. H., Barton, E. E., Collier, M., Lin, Y. (2018). A systematic review of single-case research studies on using video modeling interventions to improve social communication skills for individuals with autism spectrum disorder. *Focus on Autism and Other Developmental Disabilities*, *33*(4), 249-257. https://doi.org/10.1177/1088357617741282

Roux, Anne M., Shattuck, Paul T., Rast, Jessica E., Rava, Julianna A., and Anderson, Kristy, A. (2015). *National Autism Indicators Report: Transition into Young Adulthood*. Philadelphia, PA: Life Course Outcomes Research Program, A.J. Drexel Autism Institute, Drexel University. https://drexel.edu/~/media/Files/autismoutcomes/publications/LCO%20Fact%20Sheet%20Employment.ashx

Rowe, D. A., Mazzotti, V. L., Fowler, C. H., Test, D. W., Mitchell, V. J., Clark, K. A., Holzberg, D., Owens, T. L., Rusher, D., Seaman-Tullis, R. L., Gushanas, C. M., Castle, H., Chang, W.-H., Voggt, A., Kwiatek, S., & Dean, C. (2021). Updating the secondary transition research base: Evidence- and research-based practices in functional skills. *Career Development and Transition in Exceptional Individuals*, *44*(1), 28-46. https://doi.org/10.1177/2165143420958674

Schutz, M. A., & Carter, E. W. (2022). Employment interventions for youth with disabilities: A review of transition practices and partners. *Career Development and Transition for Exceptional Individuals*, *45*(3), 154-169. https://doi.org/10.1177/21651434221075810

Schwartz, I. S., & Baer, D. M. (1991). Social validity assessments: Is current practice state of the art? *Journal of Applied Behavior Analysis, 24*, 189-204. https://doi.org/10.1901/jaba.1991.24-189

Stauch, T. A., & Plavnick, J. B. (2020). Teaching vocational and social skills to adolescents with autism using video modeling. *Education and Treatment of Children*, *43*, 137-151. https://doi.org/10.1007/s43494-020-00020-4

Stewart-Ginsburg, J. H. & Kwiatek, S. M. (2020). Partnerships from the pews: Promoting

interagency collaboration with religious organizations. *Career Development and Transition for Exceptional Individuals*, *43*(3), 187-192. https://doi.org/10.1177/2165143420929660

Test, D. W., & Fowler, C. H. (2018). A look at the past, present, and future of rural secondary transition. *Rural Special Education Quarterly*, *37*(2), 68-78. https://doi.org/10.1177/8756870517751607

U.S. Census Bureau. (2023). *QuickFacts*.

U.S. Census Bureau. (n.d.). *Census regions and divisions of the United States.* https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

Weiss, M. P., Rowe, D. A., Mims, P. J., & Farmer, T. W. (2023). There's no place like us: Beyond fidelity of implementation in rural contexts. *Journal of Emotional and Behavioral Disorders*¸ OnlineFirst, 1-14. https://doi.org/10.1177/10634266231155856

Whittenburg, H. N., Taylor, J. P., Thoma, C. A., Pickover, G. S., & Vitullo, V. E. (2020). A systematic literature review of intervention to improve work-related social skills of individuals with autism spectrum disorder. *Inclusion*, *8*(4), 320-334. https://doi.org/10.1352/2326-6988-8.4.320

Wisniewski, B., Zierer, K., & Hattie, J. (2020). The power of feedback revisited: A meta-analysis of educational feedback research. *Frontiers in Psychology*, *10*, 1-14. https://doi.org/10.3389/fpsyg.2019.03087

Wolf, M. M. (1978). Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis*, *11*, 203-214. https://doi.org/10.1901/jaba.1978.11-203

Tables and Figures – Manuscript 3

Table 1

Operational Definitions of Behavioral Targets

Behavior	Operational Definition
Making confirming statements when given a task	Step 1: Orients towards supervisor Step 2: Indicates that they heard the instructions Step 3: Repeats parts of an instruction delivered by the supervisor Example: "Ok, I will stock the shelves"
Responding to missing or more materials	Step 1: Searches area for missing or more materials Step 2: Leaves to ask for materials within one minute of off-task behavior or after no more than five minutes of unsuccessful problem solving Step 3: Searches for supervisor Step 4: Approaches supervisor Step 5: Gets supervisor's attention Step 6: Makes a clear and specific statement about the need for materials
Notifying the supervisor of task completion	Step 1: Leaves to notify the supervisor within one minutes of task completion Step 2: Searches for supervisor Step 3: Approaches supervisor Step 4: Gets supervisor's attention Step 5: Delivers a statement indicating that the task was complete
Responding to an interrupted task	Step 1: Acknowledges supervisor's presence Step 2: Acknowledges new task Step 3: Asks supervisor if they should return to the previous task when finished Step 4: Completes new task Step 5: Notifies supervisor of task completion (if no further work is required) OR returns to work on prior task Step 6: Completes prior task Step 7: Notifies supervisor of task completion
Asking for clear instructions when given a vague direction	Step 1: Searches for supervisor Step 2: Approaches supervisor Step 3: Gets supervisor's attention

	Step 4: Asks questions that would lead the supervisor to specify and/or model how to correctly complete a task
Working when the supervisor is unavailable	Step 1: Searches for supervisor within one minute of task completion Step 2: Approaches supervisor or does not find supervisor Step 3: Gets supervisor's attention (if present) Step 4: Responds appropriately when supervisor indicates they are unavailable to help (e.g., say "OK") Step 5: Returns to workspace Step 6: Finds an alternative task to work on
Responding to corrective feedback	Step 1: Acknowledges the supervisor's presence by orienting towards the supervisor Step 2: Apologizes Step 3: Asks for clear feedback that would lead to accurate completion of the task Step 4: Delivers a statement indicating that the mistake will be corrected without making inappropriate comments or facial expressions Step 5: Corrects the mistake without inappropriate comments, complaints, or facial expressions
Asking for help with an unfamiliar task	Step 1: Recognizes they are unsure how to complete the task and need help Step 2: Seeks help within one minutes of off-task behavior or after no more than five minutes of problem solving without success Step 3: Searches for supervisor Step 4: Approaches supervisor Step 5: Gets supervisor's attention Step 6: Delivers a specific statement or question indicating that they need help

Table 2

Operational Definitions for Treatment Fidelity

Behavior	**Definition**
Opening Phrases	supervisor says hello and introduces the activity. “We are going to ask you to complete some work tasks. I want you to treat it just like you would an actual work placement. I will be your supervisor. Here is your work station, he is where you can find additional materials, here is my office.”
Plays Video Model	shows the participant the video model on the device and ensures that the participant is oriented towards the model. Allows the video to play all the way through. Plays the appropriate video for the target behaviors. If the participant is still in baseline, this is NA. If more than one video is shown, there are multiple opportunities in each trial.
Presents task to student	asks the participant to complete the appropriate task. Presents the task, models the task (if applicable), indicates where they will be. Responds to any questions the participant has. E.g. “Alright, today you are going to be working on folding some shirts. Here are the shirts, and I want you to fold them like this. I will be at my desk.”
Includes evocative situation	appropriate evocative situation is included for each task during the trial. E.g. not enough materials; asks them to complete an unfamiliar task, supervisor is unavailable when they search, etc.
Responds to client	once client engages the supervisor to ask for help, etc. the supervisor responds to the client by providing the requested support
Delivers appropriate feedback	praises client for correct behaviors using behavioral specific praise, corrects any incorrect behaviors using specific feedback about what should change next time

Table 3

Social Validity Data

Question	Norman	Patrick	Carrie	Instructor
Enjoyment of participation	5	5	5	5
Perception of effects	4	5	5	5
Interest in continued use	Yes	No	Yes	N/A
Recommended use for others	Yes	Yes	Yes	Yes
Likeliness of continued use	N/A	N/A	N/A	5
Ease of use	N/A	N/A	N/A	1

Likert-type responses between 1 to 5 with 1 being *did not enjoy, not helpful at all, Not interested in continued use,* and *much easier to implement than other interventions*

Table 4

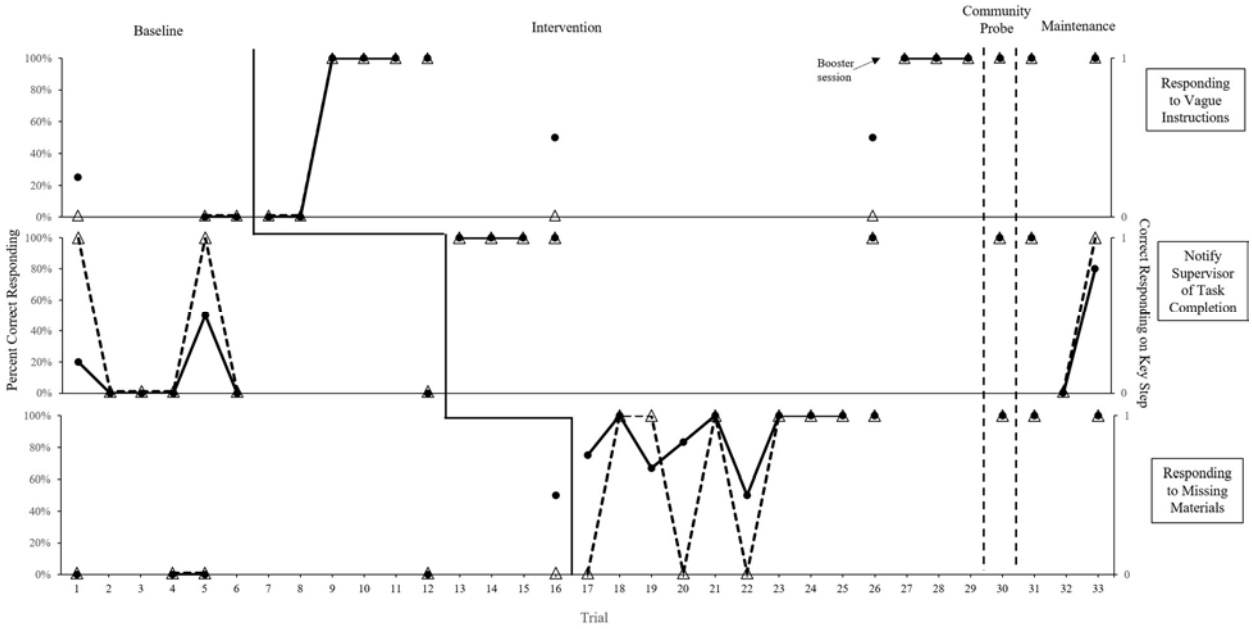
Changes Between Study Two and Study Three

Study Domains	Study Two	Study Three	Similarities
Instructional Context	Clinical Setting (Simulated Coffee Shop) Supervisor's office was outside of the workspace Community setting probe was in a novel environment RBT® as instructor	Classroom Supervisor remained in the room throughout Updated VMs to be consistent with new definitions Community setting probe was at participants' volunteer job placements Teaching assistant as instructor, had experience working with the students	
Data	Presented data as binary	Changed operational definitions to account for the new context Included percentages rather than binary data alone Instructor took data also Reported IOA between instructor and researcher	Dependent variables Procedural fidelity IOA type
Study Design	Used pre-assessment as baseline data with only one baseline probe in instructional context prior to intervention	Collected baseline data during instructional context Collected maintenance data	Multiple probe across behaviors design Assessment procedures

			Probe trials Generalization across supervisors
Procedures	Two researchers were involved in conducting pre- and post-assessments Did not rewatch the VM prior to community setting probes No maintenance data Social validity post-assessments were Likert-type responses only	Conducted social validity pre-assessment interview prior to beginning data collection and used this to inform goals and procedures Tasks were more aligned with potential future jobs Watched VM at the beginning of the community setting probe During maintenance sessions, if participant failed to utilize behavior on the first try, they rewatched the VM and tried again Social validity post-assessment involved a semi-structured interview with the instructor	Researchers conducted pre- and post-assessments Used VMs plus feedback Introduced EOs during training to evoke responding Mastery criteria was 100% accuracy across three consecutive trials Rewatched VMs following any trials with errors

Figure 1

Norman Intervention Data



Note. Primary y-axis depicts percent correct responding across the entire task analysis for each skill using closed circles. Secondary y-axis corresponds with open triangle markers and depicts binary data for correct responding on key steps.

Figure 2

Norman Generalization Data

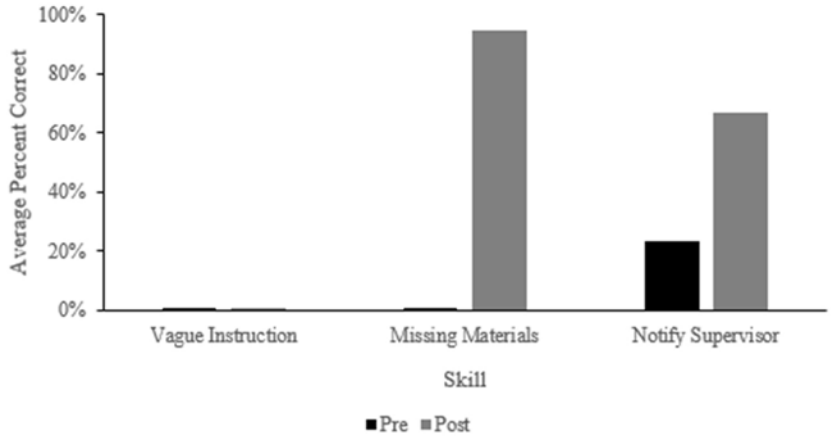
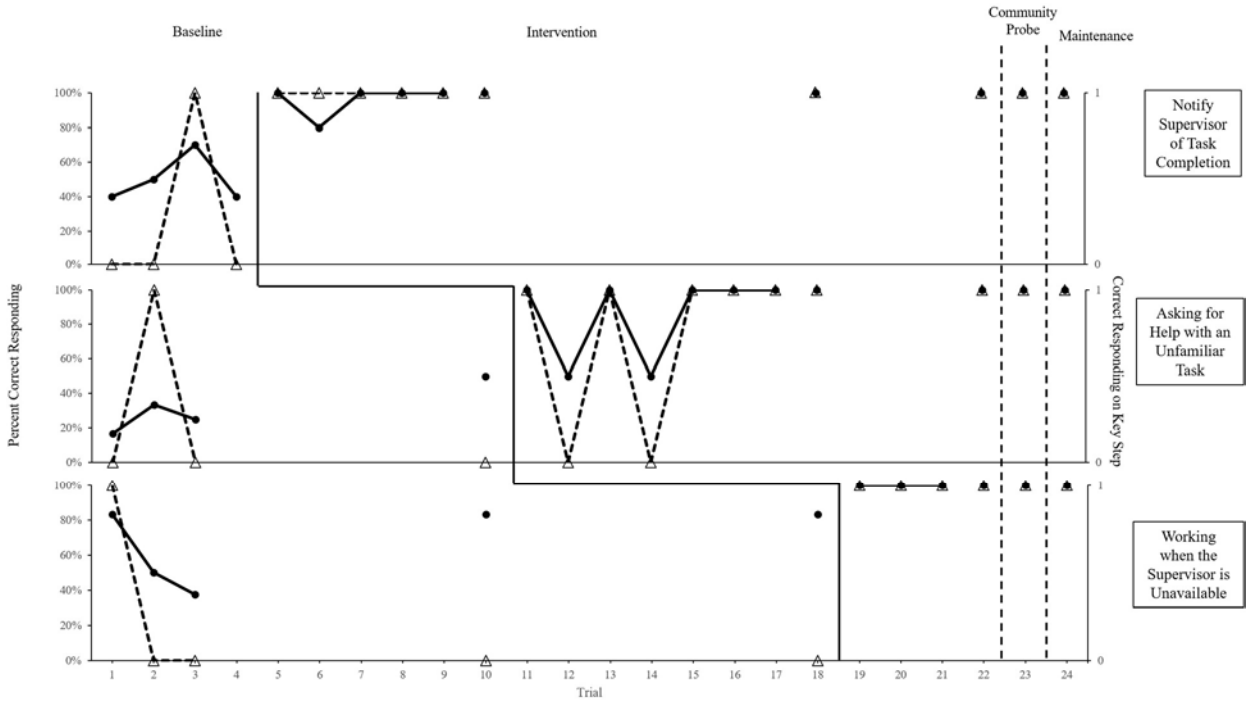


Figure 3

Patrick Intervention Data



Note. Primary y-axis depicts percent correct responding across the entire task analysis for each skill using closed circles. Secondary y-axis corresponds with open triangle markers and depicts binary data for correct responding on key steps.

Figure 4

Patrick Generalization Data

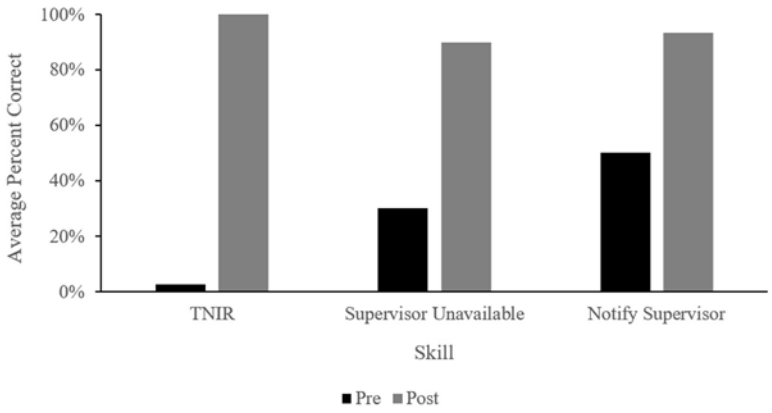
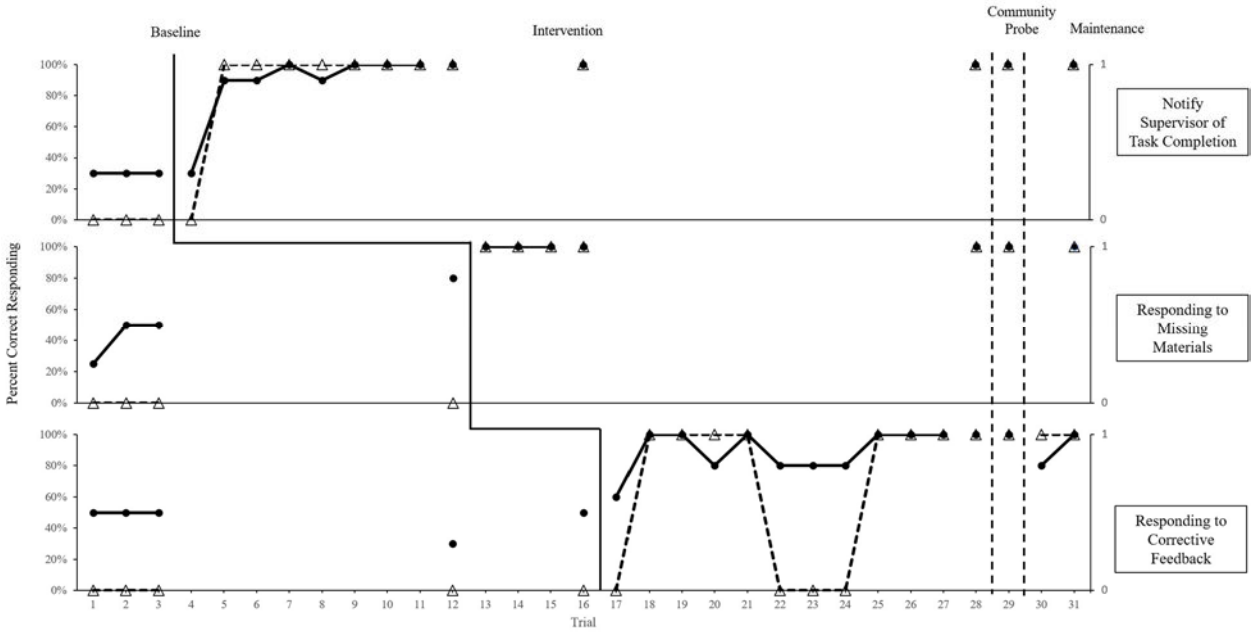


Figure 5

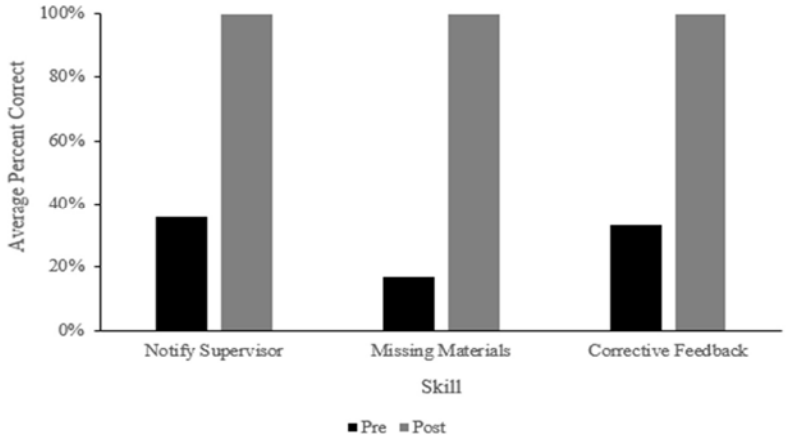
Carrie Intervention Data



Note. Primary y-axis depicts percent correct responding across the entire task analysis for each skill using closed circles. Secondary y-axis corresponds with open triangle markers and depicts binary data for correct responding on key steps.

Figure 6

Carrie Generalization Data



Appendix

Supplemental Table 1

Descriptive Characteristics of Studies Conducted in Rural Settings

Study name	*Number of Part.*	*Age range*	*Disability Categories*	*Type of Report*	*Rural setting only*	*Description of Rural Setting*	*Part of the U.S.*	*Study Design*	*IV*	*Transition Area Targeted*	*Research question related to rurality*	*Rural Friendly Strategies*
Askvig et al. (2020)	9	High School	Multicat	Journal Article (JA)	Yes	Community residents	Central Plains	Pre/Post single group design (GQED)	Self-Directed IEP	SD, IEP	No	SFE
Ayres et al. (2006)	4	Middle School	ID	JA	Yes	None	NR	Multiple Probe across Participants (SCD)	Dollar plus strategy	PF	No	CBI
Carter et al. (2017)	4	High School	ASD	JA	No	Student enrollment	NR	Nonconcurrent Multiple Baseline (SCD)	Peer support intervention	SS, AS	No	NA
Cease-Cook et al. (2013)	5	High School	ID	JA	Yes	None	SE	Multiple Probe across	CD-Rom version of	SD, IEP	No	NA

Study name	*Number of Part.*	*Age range*	*Disability Categories*	*Type of Report*	*Rural setting only*	*Description of Rural Setting*	*Part of the U.S.*	*Study Design*	*IV*	*Transition Area Targeted*	*Research question related to rurality*	*Rural Friendly Strategies*
								Participants (SCD)	Self-Advocacy Strategy			
Diegelmann & Test (2018)	4	High School & Middle School	ID	JA	Yes	Student enrollment	SE	Multiple Probe across Participants (SCD)	Student Self-monitoring IEP checklist	IEP	No	SFE
Flowers et al. (2018)	877	High School	Multicat	JA	No	Student enrollment	SE	RCT (GED)	CIRCLES	SD, IEP	No	CBI, IAC, SFE
Izzo et al. (2010)	287	High School	Multicat	JA	No	None	MW	Pre/Post control group (GED)	EnvisionIT	SD, GT, ES, TL, AS	No	RL

Study name	*Number of Part.*	*Age range*	*Disability Categories*	*Type of Report*	*Rural setting only*	*Description of Rural Setting*	*Part of the U.S.*	*Study Design*	*IV*	*Transition Area Targeted*	*Research question related to rurality*	*Rural Friendly Strategies*
Lindstrom et al. (2020)	366	High School	Multicat	JA	No	None	NW	RCT (GED)	Paths 2 the Future	GT, ES	No	SFE
Lo et al. (2014)	3	High School	ID	JA	Yes	Student enrollment	SE	Multiple Probe across Participants (SCD)	Progressive video prompts	LS	No	NA
Lombardi et al. (2017)	338	High School	Multicat	JA	No	None	NR	Comparison Group Design (GQED)	EnvisionIT	GT, AS, ES	No	SFE
Martin et al. (2006)	130	High School & Middle school	Multicat	JA	No	None	SW	Pre/Post control group (GED)	Self-Directed IEP instruction	SD, IEP	No	SFE

Study name	*Number of Part.*	*Age range*	*Disability Categories*	*Type of Report*	*Rural setting only*	*Description of Rural Setting*	*Part of the U.S.*	*Study Design*	*IV*	*Transition Area Targeted*	*Research question related to rurality*	*Rural Friendly Strategies*
McCormick et al. (2021)	876	14-16	Multicat	JA	No	Community Residents (Micropolitan)	NW, SW, MW	RCT (GED)	Case management	SD, ES, LS, PF	No*	WBL, SFE
Pierce et al. (2020)	42	14-16	Multicat	JA	No	Non	MW	Uncontrolled one-group Pre/Post (GQED)	Occupational Therapy	GT	No	WBL
Rowe & Test (2012)	4	High School	LD ASD ED	JA	Yes	None	NW	Multiple Probe across Participants (SCD)	Simulation training	PF, CB	No	CBI
Rowe et al. (2011)	3	High School	ID, OHI	JA	Yes	None	SE	Multiple Probe across Participants (SCD)	Simulation training	PF, CB, LS	No	CBI

Study name	*Number of Part.*	*Age range*	*Disability Categories*	*Type of Report*	*Rural setting only*	*Description of Rural Setting*	*Part of the U.S.*	*Study Design*	*IV*	*Transition Area Targeted*	*Research question related to rurality*	*Rural Friendly Strategies*
Smith et al. (2021)	71	High School	ASD	JA	No	None	MW	Intent-to-treat RCT	Virtual Interview Training for Transition Age Youth	ES	No	RL
Taber et al. (2002)	14	Middle School	ID	JA	No	None	NR	Multiple Probe across Groups (SCD)	Task analysis, role-play, and prompting across different settings	CB, LS, PS	No	CBI
Taber et al. (2003)	6	14-18	ID	JA	No	None	NR	Multiple Probe across	Least-to-most prompting	CB, LS	No	CBI

Study name	*Number of Part.*	*Age range*	*Disability Categories*	*Type of Report*	*Rural setting only*	*Description of Rural Setting*	*Part of the U.S.*	*Study Design*	*IV*	*Transition Area Targeted*	*Research question related to rurality*	*Rural Friendly Strategies*
								Participants (SCD)	system to teach task analysis steps			
Woods et al. (2010)	35	14-20	Multicat	JA	No	Student enrolment	SW	Pre/Post control group (GED)	Student-directed transition planning lessons	SD, IEP	No	SFE

SD=self determination, IEP=IEP participation, CB=community-based skills, LS=life or leisure skills, PS=personal safety, PF=personal finance, GT=general transition skills, ES=employment skills, TL=technological literacy, AS=academic skills, SS=social skills

CBI=community-based interventions, IAC=inter-agency collaboration, SFE=student and family engagement in the transition process, RL=remote learning, WBL=work-based learning

*McCormick et al. (2021) did not have formal research questions but did indicate a focus on rurality in their purpose statement

Supplemental References

Articles Included in Manuscript 1 Review

*Askvig., B. A., Naslund, M., Borisinkoff, E. D., & Daigneault, R. (2020). A pilot study of a self-determination curriculum on secondary students. *Journal of the American Academy of Special Education Professionals*. Spring Summer, 21-40. https://www.naset.org/index.php?id=5507

*Ayres, K. M., Langone, J., Boon, R. T., & Norman, A. (2006). Computer-based instruction for purchasing skills. *Education and Training in Developmental Disabilities*, *41*(3), 253-263. https://www.jstor.org/stable/23880199

*Carter, E. W., Gustafson, J. R., Sreckovic, M. A., Dykstra Steinbrenner, J. R., Pierce, N. P., Bord, A., Stable, A., Rogers, S., Czerw, A. & Mullins, T. (2017). Efficacy of peer support interventions in general education classrooms for high school students with autism spectrum disorder. *Remedial and Special Education*, *38*(4), 207-221. https://doi.org/10.1177/0741932516672067

*Cease-Cook, J., Test, D. W., & Scroggins, L. (2013). Effects of the CD-Rom version of the Self-Advocacy Strategy on quality of contributions in I.E.P. meetings of high school students with intellectual disability. *Education and Training in Autism and Developmental Disabilities*. *48*(2), 258-268. https://www.jstor.org/stable/23880644

*Diegelmann, K. M. & Test, D. W. (2018). Effects of a self-monitoring checklist as a component of the Self-Directed I.E.P. *Education and Training in Autism and Developmental Disabilities*, *52*(1), 73-83. https://www.jstor.org/stable/10.2307/26420428

*Flowers, C., Test, D. W., Povenmire-Kirk, T. C., Diegelmann, K. M., Bunch-Crump, K. R.,

Kemp-Inmna, A., & Goodnight, C. I. (2018). A demonstration model of interagency collaboration for students with disabilities: A multilevel approach. *The Journal of Special Education*, *51*(4), 211-221. https://doi.org/10.1177/0022466917720

*Izzo, M. V., Yurick, A., Nagaraja, H. N., & Novak, J. A. (2010). Effects of a 21st-century curriculum on students' information technology and transition skills. *Career Development for Exceptional Individuals*, *33*(2), 95-105. https://doi.org/10.1177/0885728810369348

*Lindstrom, L., DeGarmo, D., Khurana, A., Hirano, K., & Leve, L. (2020). Paths 2 the Future: Evidence for the efficacy of a career development intervention for young women with disabilities. *Exceptional Children*, *87*(1), 54-73. https://doi.org/10.1177/0014402920924851

*Lo, Y., Burk, B., & Anderson, A. L. (2014). Using progressive video prompting to teach students with moderate intellectual disability to shoot a basketball. *Education and Training in Autism and Developmental Disabilities*, *49*(3), 354-367. https://www.jstor.org/stable/23881254

*Lombardi, A. R., Izzo, M. V., Rifenbark, G. G., Murray, A., Buck, A., Monahan, J., & Gelbar, N. (2017). The impact of an online transition curriculum on secondary student reading: A multilevel examination. *Career Development and Transition for Exceptional Individuals*, *40*(1), 15-24. https://doi.org/10.1177/2165143416681287

*Martin, J. E., Van Dycke, J. L., Christensen, W. R., Greene, B. A., Gardner, J. E., & Lovett, D. L. (2006). Increasing student participation in I.E.P. meetings: Establishing the Self-Directed I.E.P. as an evidence-based practice. *Exceptional Children*, *72*(3), 299-316. https://doi.org/10.1177/001440290607200303

*McCormick, S. T., Kurth, N. K., Chambless, C. E., Ipsen, C., & Hall, J. P. (2021). Case

management strategies to promote employment for transition-age youth with disabilities. *Career Development and Transition for Exceptional Individuals*, *44*(2), 120-131. https://doi.org/10.1177/2165143421991826

*Pierce, D., Sakemiller, L., Spence, A., & LoBianco, T. (2020). Effectiveness of transition readiness interventions by school-based occupational therapy personnel. *OTJR: Occupation, Participation, and Health*, *40*(1), 27-35. https://doi.org/10.1177/15394492198501

*Rowe, D. A., Cease-Cook, J., & Test, D. W. (2011). Effects of simulation training on making purchases with a debit card and tracking expenses. *Career Development for Exceptional Individuals*, *34*(2), 107-114. https://doi.org/10.1177/0885728810395744

*Rowe, D. A. & Test, D. W. (2012). Effects of simulation to teach students with disabilities basic finance skills. *Remedial and Special Education*, *34*(4), 237-248. https://doi.org/10.1177/0741932512448218

*Smith, M. J., Sherwood, K., Ross, B., Smith, J. D., DaWalt, L., Bishop, L., Humm, L., Elkins, J., & Steach, C. (2021). Virtual interview training for autistic transition age youth: A randomized controlled feasibility and effectiveness trial. *Autism*, *25*(6), 1536-1552. https://doi.org/10.1177%2F1362361321989928

*Taber, T. A., Alberto, P. A., Hughes, M., & Seltzer, A. (2002). A strategy for students with moderate disabilities when lost in the community. *Research & Practice for Persons with Severe Disabilities*, *27*(2), 141-152. https://doi.org/10.2511/rpsd.27.2.141

*Taber, T.A., Alberto, P. A., Seltzer, A., & Hughes, M. (2003). Obtaining assistance when lost in the community using cell phones. *Research & Practice for Persons with Severe Disabilities*, *28*(3), 105-116. https://doi.org/10.2511/rpsd.28.3.105

*Woods, L. L., Sylvester, L., & Martin, J. E. (2010). Student-directed transition planning: Increasing student knowledge and self-efficacy in the transition planning process. *Career Development for Exceptional Individuals*, *33*(2), 106-114. https://doi.org/10.1177/0885728810368056