



WWC Intervention Report

A summary of findings from a systematic review of the evidence



Children and Students with Intellectual Disability

January 2018 Revised*

System of Least Prompts

This intervention report presents findings from a systematic review of the *System of Least Prompts (SLP)* conducted using the WWC Procedures and Standards Handbook (version 3.0) and the Children and Students with Intellectual Disability review protocol (version 3.1). No studies of *SLP* that fall within the scope of the Children and Students with Intellectual Disability review protocol meet What Works Clearinghouse (WWC) group design standards. No studies meet pilot single-case design standards without reservations, and seven studies meet pilot single-case design standards with reservations. Together, these studies included 19 children and students ages 6 to 20 with intellectual disability.

The results from single-case design studies affect the WWC effectiveness rating for an outcome domain only if the studies with outcomes in that domain collectively meet a set of threshold criteria. (The following text box describes these criteria.) The evidence from single-case design studies of *SLP* on children and students with intellectual disability does not reach the threshold to include single-case design evidence in the effectiveness ratings for four outcome domain(s)—communication/language competencies, comprehension, independent living skills, and math achievement.¹ No studies meet standards in the 10 other eligible domains, so this intervention report does not report on the effectiveness of *SLP* for any domains.²

Because no studies meet WWC group design standards, and no studies meet the threshold to include single-case design evidence in the effectiveness ratings for any domains, the WWC is unable to draw any conclusions based on research about the effectiveness or ineffectiveness of *SLP* on children and students with intellectual disability at this time.

Threshold to include single-case design evidence in WWC effectiveness ratings

All single-case design experiments presented in the same research article are considered as one study. Results from single-case design studies contribute to the WWC effectiveness rating for an outcome domain only if the studies with outcomes in that domain meet a set of threshold criteria, reflecting replication across different studies, research teams, and cases.

Specifically, these criteria include the following: (1) at least five studies that examine the intervention must meet WWC pilot single-case design standards without reservations or meet WWC pilot single-case design standards with reservations; (2) the single-case design studies must be conducted by at least three different research teams with no overlapping authorship at three different institutions; and (3) the combined number of cases (that is, participants or classrooms) must total at least 20.

For more information, please refer to the Pilot Single-Case Design Standards in Appendix E of the WWC Procedures and Standards Handbook (version 3.0).

Intervention Description³

SLP is a practice that involves defining and implementing a hierarchy of prompts to assist students in learning a skill. A prompt is an action by the teacher or other practitioner—such as a verbal instruction to complete a task—that helps a student respond correctly during a learning activity. To use the procedure, the teacher or other practitioner systematically delivers the prompts to students in order, starting with the prompt that provides the least amount of assistance, and providing additional prompts with increasing levels of assistance until the student can correctly perform the task independently. For example, if a student does not independently complete a task following the initial instruction, a teacher may help the student by providing the least-intrusive prompt, such as

restating the instruction. If the response still does not occur, the teacher may present the next most intrusive prompt, such as rephrasing the instruction. The teacher continues with more intrusive prompts, such as modeling how to do the task, until the desired response occurs reliably or all the prompts in the sequence have been used. The last prompt, often called the controlling prompt, should result in the student responding correctly. *SLP* is also known as “least-to-most prompting” or “least intrusive prompts.” *SLP* does not have a single developer that provides guidance or materials.

Research⁴

The WWC identified no group design studies and 33 single-case design studies that investigated the effects of *SLP* on children and students with intellectual disability that were published or released from 1990 to 2017. The WWC identified an additional 72 studies that do not meet WWC eligibility criteria (see the Glossary of Terms in this document for a definition of this term and other commonly used research terms) for review in this topic area.

The WWC reviewed the 33 single-case design studies against pilot single-case design standards. No studies meet pilot single-case design standards without reservations, and seven studies meet pilot single-case design standards with reservations. This report summarizes those seven studies. The remaining 26 studies do not meet pilot single-case design standards.

The studies that meet WWC pilot single-case design standards with or without reservations have outcomes only in domains that do not reach the threshold for including single-case design evidence in the effectiveness ratings in this report; details on these studies are available in Appendices A, B, and C.⁵

References

Studies that meet WWC group design standards without reservations

None.

Studies that meet WWC group design standards with reservations

None.

Studies that meet WWC pilot single-case design standards without reservations

None.

Studies that meet WWC pilot single-case design standards with reservations

- Browder, D. M., Lee, A., & Mims, P. (2011). Using shared stories and individual response modes to promote comprehension and engagement in literacy for students with multiple, severe disabilities. *Education and Training in Autism and Developmental Disabilities, 46*(3), 339–351. Retrieved from <https://eric.ed.gov/?id=EJ942502>
- Manley, K., Collins, B. C., Stenhoff, D. M., & Kleinert, H. (2008). Using a system of least prompts procedure to teach telephone skills to elementary students with cognitive disabilities. *Journal of Behavioral Education, 17*(3), 221–236. Retrieved from <https://eric.ed.gov/?id=EJ802214>
- Mims, P. J. (2009). *The effects of the system of least prompts on teaching comprehension skills during a shared story to students with significant intellectual disabilities* (Doctoral dissertation). Retrieved from <https://eric.ed.gov/?id=ED513255>
- Mims, P. J., Browder, D. M., Baker, J. N., Lee, A., & Spooner, F. (2009). Increasing comprehension of students with significant intellectual disabilities and visual impairments during shared stories. *Education and Training in Developmental Disabilities, 44*(3), 409–420. Retrieved from <https://eric.ed.gov/?id=EJ853162>
- Skibo, H., Mims, P., & Spooner, F. (2011). Teaching number identification to students with severe disabilities using response cards. *Education and Training in Autism & Developmental Disabilities, 46*(1), 124–133. Retrieved from <https://eric.ed.gov/?id=EJ915099>
- Smith, K. A., Ayres, K. M., Mechling, L. C., Alexander, J. L., Mataras, T. K., & Shepley, S. B. (2013). Evaluating the effects of a video prompt in a system of least prompts procedure. *Career Development and Transition for Exceptional Individuals, 38*, 39–49. Retrieved from <https://eric.ed.gov/?id=EJ1055928>
- Taber, T. A., Alberto, P. A., Seltzer, A., & Hughes, M. (2003). Obtaining assistance when lost in the community using cell phones. *Research and Practice for Persons with Severe Disabilities, 28*(3), 105–116.

Studies that do not meet WWC group design standards

None.

Studies that do not meet WWC pilot single-case design standards⁶

- Allgood, M. H., Heller, K. W., Easterbrooks, S. R., & Fredrick, L. D. (2009). Use of picture dictionaries to promote functional communication in students with deafness and intellectual disabilities. *Communication Disorders Quarterly, 31*(1), 53–64. Retrieved from <https://eric.ed.gov/?id=EJ860388> The study does not meet WWC pilot single-case design standards because the eligible outcomes do not meet WWC requirements.

Additional source:

- Allgood, M. H. (2005). *Use of picture/word dictionaries to promote communication by students with hearing and cognitive impairments* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3221699)

- Browder, D. M., Hudson, M. E., & Wood, A. L. (2013). Teaching students with moderate intellectual disability who are emergent readers to comprehend passages of text. *Exceptionality*, 21(4), 191–206. Retrieved from <https://eric.ed.gov/?id=EJ1025173> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.
- Cannella-Malone, H. I., Wheaton, J. E., Wu, P., Tullis, C. A., & Park, J. H. (2012). Comparing the effects of video prompting with and without error correction on skill acquisition for students with intellectual disability. *Education and Training in Autism and Developmental Disabilities*, 47(3), 332–344. Retrieved from <https://eric.ed.gov/?id=EJ986319> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.
- Carp, C. L., Peterson, S. P., Arkel, A. J., Petursdottir, A. I., & Ingvarsson, E. T. (2012). A further evaluation of picture prompts during auditory-visual conditional discrimination training. *Journal of Applied Behavior Analysis*, 45(4), 737–751. Retrieved from <https://eric.ed.gov/?id=EJ994509> The study does not meet WWC pilot single-case design standards because there are insufficient data to evaluate the attempts to demonstrate an intervention effect.
- Chiplin-Williams, G. J. (1997). *The effects of peer-mediated versus adult-mediated intervention on learning community and domestic skills* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Database. (UMI No. 9812333) The study does not meet WWC pilot single-case design standards because there are insufficient data to evaluate the attempts to demonstrate an intervention effect.
- Collins, B. C., Branson, T. A., Hall, M., & Rankin, S. W. (2001). Teaching secondary students with moderate disabilities in an inclusive academic classroom setting. *Journal of Developmental and Physical Disabilities*, 13(1), 41–59. The study does not meet WWC pilot single-case design standards because the eligible outcomes do not meet WWC requirements.
- Collins, B. C., & Hall, M. (1997). Teaching leisure skills to adolescents with moderate disabilities. *Exceptional Children*, 63(4), 499–512. Retrieved from <https://eric.ed.gov/?id=EJ549115> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.
- Colyer, S. P., & Collins, B. C. (1996). Using natural cues within prompt levels to teach the next dollar strategy to students with disabilities. *Journal of Special Education*, 30(3), 305–318. Retrieved from <https://eric.ed.gov/?id=EJ539186> The study does not meet WWC pilot single-case design standards because the eligible outcomes do not meet WWC requirements.
- Doyle, P. M., Gast, D. L., Wolery, M., Ault, M. J., & Meyer, S. (1992). Teaching discrete skills to students with moderate mental retardation in small-group instructional arrangements. *Exceptionality*, 3, 233–253. Retrieved from <https://eric.ed.gov/?id=EJ457431> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.
- Additional source:**
- Doyle, P. M., Gast, D. L., Wolery, M., & Ault, M. J. *System of least prompts and incidental learning in a small group instructional arrangement*. Lexington: Group Errorless Teaching Strategies Research Project, Department of Special Education, University of Kentucky.
- Doyle, P. M., Wolery, M., Gast, D. L., & Ault, M. J. (1990). Comparison of constant time delay and the system of least prompts in teaching preschoolers with developmental delays. *Research in Developmental Disabilities*, 11(1), 1–22. Retrieved from <https://eric.ed.gov/?id=EJ403859> The study does not meet WWC pilot single-case design standards because no graphical illustration of evidence is provided.
- Gast, D. L., Doyle, P. M., Wolery, M., Ault, M. J., & Farmer, J. A. (1991). Assessing the acquisition of incidental information by secondary-age students with mental retardation: Comparison of response prompting strategies. *American Journal on Mental Retardation*, 96(1), 63–80. Retrieved from <https://eric.ed.gov/?id=EJ432869> The study does not meet WWC pilot single-case design standards because no graphical illustration of evidence is provided.

Heckaman, K. A., Alber, S., Hooper, S., & Heward, W. L. (1998). A comparison of least-to-most prompts and progressive time delay on the disruptive behavior of students with autism. *Journal of Behavioral Education*, 8(2), 171–201. The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Additional source:

Heckaman, K. A. (1996). *Effects of two response prompting procedures on disruptive behavior by students with moderate to severe disabilities during instruction on difficult tasks* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Database. (UMI No. 9544583)

Hudson, M. E., & Browder, D. M. (2014). Improving listening comprehension responses for students with moderate intellectual disability during literacy class. *Research and Practice for Persons with Severe Disabilities*, 39(1), 11–29. Retrieved from <https://eric.ed.gov/?id=EJ1032404> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Additional source:

Hudson, M. E. (2013). *Effects of a peer-delivered system of least prompts intervention package and academic read-alouds on listening comprehension for students with moderate intellectual disability* (Doctoral dissertation). Retrieved from <https://eric.ed.gov/?id=ED548161>

Hudson, M. E., Browder, D. M., & Jimenez, B. A. (2014). Effects of a peer-delivered system of least prompts intervention and adapted science read-alouds on listening comprehension for participants with moderate intellectual disability. *Education and Training in Autism and Developmental Disabilities*, 49(1), 60–77. Retrieved from <https://eric.ed.gov/?id=EJ1016614> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Kana, T. G. (1997). *An analysis of the efficiency of instruction using the system of least prompts with and without verbal prompts and cues* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Database. (UMI No. 9804389) The study does not meet WWC pilot single-case design standards because the eligible outcomes do not meet WWC requirements.

McConville, M. L., Hantula, D. A., & Axelrod, S. (1998). Matching training procedures to outcomes: A behavioral and quantitative analysis. *Behavior Modification*, 22(3), 391–414. Retrieved from <https://eric.ed.gov/?id=EJ581207> The study does not meet WWC pilot single-case design standards because there are insufficient data to evaluate the attempts to demonstrate an intervention effect.

Mims, P. J., Hudson, M. E., & Browder, D. M. (2012). Using read-alouds of grade-level biographies and systematic prompting to promote comprehension for students with moderate and severe developmental disabilities. *Focus on Autism and Other Developmental Disabilities*, 27(2), 67–80. Retrieved from <https://eric.ed.gov/?id=EJ969709> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Richardson, A. R., Lerman, D. C., Nissen, M. A., Luck, K. M., Neal, A. E., Bao, S., & Tsami, L. (2017). Can pictures promote the acquisition of sight-word reading? An evaluation of two potential instructional strategies. *Journal of Applied Behavior Analysis*, 50(1), 67–86. Retrieved from <https://eric.ed.gov/?id=EJ1126059> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Sigafoos, J., O'Reilly, M., Seely-York, S., & Edrisinha, C. (2004). Teaching students with developmental disabilities to locate their AAC device. *Research in Developmental Disabilities*, 25(4), 371–383. Retrieved from <https://eric.ed.gov/?id=EJ731075> The study does not meet WWC pilot single-case design standards because there are insufficient data to evaluate the attempts to demonstrate an intervention effect.

Smith, R. L., Collins, B. C., Schuster, J. W., & Kleinert, H. (1999). Teaching table cleaning skills to secondary students with moderate/severe disabilities: Facilitating observational learning during instructional downtime. *Education and Training in Mental Retardation and Developmental Disabilities*, 34(3), 342–353. Retrieved from

- <https://eric.ed.gov/?id=EJ593143> The study does not meet WWC pilot single-case design standards because the eligible outcomes do not meet WWC requirements.
- Taber, T. A., Alberto, P. A., Hughes, M., & Seltzer, A. (2002). A strategy for students with moderate disabilities when lost in the community. *Journal of the Association for Persons with Severe Handicaps (JASH)*, 27(2), 141–152. Retrieved from <https://eric.ed.gov/?id=EJ657428> The study does not meet WWC pilot single-case design standards because the eligible outcomes do not meet WWC requirements.
- Taber-Doughty, T. (2005). Considering student choice when selecting instructional strategies: A comparison of three prompting systems. *Research in Developmental Disabilities: A Multidisciplinary Journal*, 26(5), 411–432. Retrieved from <https://eric.ed.gov/?id=EJ723943> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.
- Taylor, J. C., McKelvey, J. L., & Sisson, L. A. (1993). Community-referenced leisure skill clusters for adolescents with multiple disabilities. *Journal of Behavioral Education*, 3(4), 363–386. The study does not meet WWC pilot single-case design standards because there are insufficient data to evaluate the attempts to demonstrate an intervention effect.
- Taylor, P., Collins, B. C., Schuster, J. W., & Kleinert, H. (2002). Teaching laundry skills to high school students with disabilities: Generalization of targeted skills and nontargeted information. *Education and Training in Mental Retardation and Developmental Disabilities*, 37(2), 172–183. Retrieved from <https://eric.ed.gov/?id=EJ647197> The study does not meet WWC pilot single-case design standards because the eligible outcomes do not meet WWC requirements.
- Test, D., Spooner, F., Keul, P. K., & Grossi, T. (1990). Teaching adolescents with severe disabilities to use the public telephone. *Behavior Modification*, 14(2), 157–171. The study does not meet WWC pilot single-case design standards because there are insufficient data to evaluate the attempts to demonstrate an intervention effect.
- Wolery, M., Ault, M. J., Doyle, P. M., Gast, D. L., & Griffen, A. K. (1990). Comparison of constant time delay and the system of least prompts in teaching chained tasks. *Education and Training in Mental Retardation*, 25(3), 243–257. Retrieved from <https://eric.ed.gov/?id=EJ419988> The study does not meet WWC pilot single-case design standards because the measures of effectiveness cannot be attributed solely to the intervention.

Studies that are ineligible for review using the Children and Students with Intellectual Disability Evidence Review Protocol

- Alexander, J. L., Smith, K. A., Mataras, T., Shepley, S. B., & Ayres, K. M. (2015). A meta-analysis and systematic review of the literature to evaluate potential threats to internal validity in probe procedures for chained tasks. *The Journal of Special Education*, 49(3), 135–145. Retrieved from <https://eric.ed.gov/?id=EJ1075581> This study is ineligible for review because it does not use an eligible design.
- Alquraini, T. (2012). Critical components of successful inclusion of students with severe disabilities: Literature review. *International Journal of Special Education*, 27(1), 42–59. Retrieved from <https://eric.ed.gov/?id=EJ979712> This study is ineligible for review because it does not use an eligible design.
- Barton, E. E., & Wolery, M. (2010). Training teachers to promote pretend play in young children with disabilities. *Exceptional Children*, 77(1), 85–106. Retrieved from <https://eric.ed.gov/?id=EJ898542> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Barton, E. E., & Harn, B. (2012). *Educating young children with autism spectrum disorders*. Washington, DC: Corwin Press and The National Association of School Psychologists. Retrieved from <https://eric.ed.gov/?id=ED533313> This study is ineligible for review because it does not use an eligible design.
- Barton, E. E., Lawrence, K., & Deurloo, F. (2012). Individualizing interventions for young children with autism in preschool. *Journal of Autism and Developmental Disorders*, 42(6), 1205–1217. Retrieved from <https://eric.ed.gov/?id=EJ967922> This study is ineligible for review because it does not use an eligible design.
- Bosner, S. M., & Belfiore, P. J. (2001). Strategies and considerations for teaching an adolescent with Down syndrome and type I diabetes to self-administer insulin. *Education and Training in Mental Retardation and*

- Developmental Disabilities*, 36(1), 94–102. Retrieved from <https://eric.ed.gov/?id=EJ626349> This study is ineligible for review because it is out of scope of the protocol.
- Browder, D. M., & Grasso, E. (1999). Teaching money skills to individuals with mental retardation: A research review with practical applications. *Remedial and Special Education*, 20(5), 297–308. Retrieved from <https://eric.ed.gov/?id=EJ594960> This study is ineligible for review because it does not use an eligible design.
- Browder, D. M., & Yan, P. X. (1998). A meta-analysis and review of sight word research and its implications for teaching functional reading to individuals with moderate and severe disabilities. *Journal of Special Education*, 32(3), 130–153. Retrieved from <https://eric.ed.gov/?id=EJ577336> This study is ineligible for review because it does not use an eligible design.
- Carnahan, C. R. (2007). *Teaching students with autism in group settings: Increasing teacher efficiency and student learning* (Doctoral dissertation). Retrieved from <https://etd.ohiolink.edu/> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Cengher, M., Shamoun, K., Moss, P., Roll, D., Feliciano, G., & Fienup, D. M. (2016). A comparison of the effects of two prompt-fading strategies on skill acquisition in children with autism spectrum disorders. *Behavior Analysis in Practice*, 9(2), 115–125. doi: <http://dx.doi.org/10.1007/s40617-015-0096-6> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Chan, J. M., Lambdin, L., van Laarhoven, T., & Johnson, J. W. (2013). Teaching leisure skills to an adult with developmental disabilities using a video prompting intervention package. *Education and Training in Autism and Developmental Disabilities*, 48(3), 412–420. Retrieved from <https://eric.ed.gov/?id=EJ1016450> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Cihak, D., Fahrenkrog, C., Ayres, K. M., & Smith, C. (2010). The use of video modelling via a video iPod and a system of least prompts to improve transitional behaviors for students with autism spectrum disorders in the general education classroom. *Journal of Positive Behavior Interventions*, 12(2), 103–115. This study is ineligible for review because it is out of scope of the protocol.
- Cobb, R. B., Lipscomb, S., Wolgemuth, J., Schulte, T., Veliquette, A., Alwell, M., ... Weinberg, A. (2013). *Improving post-high school outcomes for transition-age students with disabilities: An evidence review* (NCEE 2013-4011). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from <https://eric.ed.gov/?id=ED544172> This study is ineligible for review because it does not use an eligible design.
- de Bruin, C. L., Deppeler, J. M., Moore, D. W., & Diamond, N. T. (2013). Public school based interventions for adolescents and young adults with an autism spectrum disorder: A meta-analysis. *Review of Educational Research*, 83(4), 521–550. Retrieved from <https://eric.ed.gov/?id=EJ1019708> This study is ineligible for review because it does not use an eligible design.
- Engelman, K. K. (1999). *Using graduated prompts to increase dressing independence by older adults with dementia* (Unpublished doctoral dissertation). University of Kansas. This study is ineligible for review because it does not use a sample aligned with the protocol.
- Fisher, W. W., Kodak, T., & Moore, J. W. (2007). Embedding an identity-matching task within a prompting hierarchy to facilitate acquisition of conditional discriminations in children with autism. *Journal of Applied Behavior Analysis*, 40(3), 489–499. Retrieved from <https://eric.ed.gov/?id=EJ776884> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Fleury, V. P., Hedges, S., Hume, K., Browder, D. M., Thompson, J. L., Fallin, K., ... Vaughn, S. (2014). Addressing the academic needs of adolescents with autism spectrum disorder in secondary education. *Remedial and Special Education*, 35(2), 68–79. Retrieved from <https://eric.ed.gov/?id=EJ1021012> This study is ineligible for review because it does not use an eligible design.
- Ganz, J. B., Boles, M. B., Goodwyn, F. D., & Flores, M. M. (2014). Efficacy of handheld electronic visual supports to enhance vocabulary in children with ASD. *Focus on Autism and Other Developmental Disabilities*, 29(1), 3–12.

- Retrieved from <https://eric.ed.gov/?id=EJ1019287> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Gast, D. L., & Wolery, M. (1990). *Group errorless teaching strategies (GETS)*. Final report. Lexington: University of Kentucky, Department of Special Education. Retrieved from <https://eric.ed.gov/?id=ED334763> This study is ineligible for review because it does not use an eligible design.
- Gevarter, C., O'Reilly, M. F., Rojeski, L., Sammarco, N., Lang, R., Lancioni, G. E., & Sigafoos, J. (2013). Comparisons of intervention components within augmentative and alternative communication systems for individuals with developmental disabilities: A review of the literature. *Research in Developmental Disabilities, 34*(12), 4404–4414. This study is ineligible for review because it does not use an eligible design.
- Gianoumis, S., & Sturmey, P. (2012). Generalization procedures in training interventionists for individuals with developmental disabilities. *Behavior Modification, 36*(5), 619–629. Retrieved from <https://eric.ed.gov/?id=EJ979353> This study is ineligible for review because it does not use an eligible design.
- Gies, M. L. (2012). *The use of video prompting on the acquisition, maintenance, and generalization of a line dance by adolescents with autism spectrum disorders* (Doctoral dissertation). Retrieved from <https://eric.ed.gov/?id=ED545845> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Gillies, A. (2013). *A multi-perspective exploration of a cross-age tutoring initiative: An analysis of the responses of all students* (Doctoral dissertation). Retrieved from <https://eric.ed.gov/?id=ED551477> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Goh, A. E., & Bambara, L. M. (2013). Video self-modeling: A job skills intervention with individuals with intellectual disability in employment settings. *Education and Training in Autism and Developmental Disabilities, 48*(1), 103–119. Retrieved from <https://eric.ed.gov/?id=EJ1016430> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Grow, L., Carr, J., Gunby, K., Charania, S., Gonsalves, L., Ktaech, I., & Kisamore, A. (2009). Deviations from prescribed prompting procedures: Implications for treatment integrity. *Journal of Behavioral Education, 18*(2), 142–156. Retrieved from <https://eric.ed.gov/?id=EJ839380> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Haring, T. G., Breen, C. G., Weiner, J., Kennedy, C. H., & Bednersh, F. (1995). Using videotape modeling to facilitate generalized purchasing skills. *Journal of Behavioral Education, 5*(1), 29–53. This study is ineligible for review because it is out of scope of the protocol.
- Hilton, A., & Ringlaben, R. (1998). *Best and promising practices in developmental disabilities*. Austin, TX: PRO-ED. Retrieved from <https://eric.ed.gov/?id=ED417553> This study is ineligible for review because it does not use an eligible design.
- Houston, D., & Thomas, J. (April, 2003). *Translating research into practice for instruction of students with moderate disabilities*. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL. Retrieved from <https://eric.ed.gov/?id=ED480288> This study is ineligible for review because it does not use an eligible design.
- Humphreys, T., Polick, A. S., Howk, L. L., Thaxton, J. R., & Ivancic, A. P. (2013). An evaluation of repeating the discriminative stimulus when using least-to-most prompting to teach intraverbal behavior to children with autism. *Journal of Applied Behavior Analysis, 46*(2), 534–538. Retrieved from <https://eric.ed.gov/?id=EJ1034063> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Hunt, P., McDonnell, J., & Crockett, M. A. (2012). Reconciling an ecological curricular framework focusing on quality of life outcomes with the development and instruction of standards-based academic goals. *Research and Practice for Persons with Severe Disabilities, 37*(3), 139–152. Retrieved from <https://eric.ed.gov/?id=EJ994292> This study is ineligible for review because it does not use an eligible design.
- Jerome, J., Frantino, E. P., & Sturmey, P. (2007). The effects of errorless learning and backward chaining on the acquisition of internet skills in adults with developmental disabilities. *Journal of Applied Behavior Analysis,*

- 40(1), 185–189. Retrieved from <https://eric.ed.gov/?id=EJ798636> This study is ineligible for review because it does not use a sample aligned with the protocol.
- Jimenez, B. A., & Kemmery, M. (2013). Building the early numeracy skills of students with moderate intellectual disability. *Education and Training in Autism and Developmental Disabilities, 48*(4), 479–490. Retrieved from <https://eric.ed.gov/?id=EJ1016486> This study is ineligible for review because it does not use an eligible design.
- Johnston, S., Nelson, C., Evans, J., & Palazolo, K. (2003). The use of visual supports in teaching young children with autism spectrum disorder to initiate interactions. *AAC: Augmentative & Alternative Communication, 19*(2), 86–103. This study is ineligible for review because it does not use a sample aligned with the protocol.
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Appendix A: Single-case design findings for domains that do not reach the threshold required to report effectiveness ratings⁷

Table A.1. Research details for single-case design studies with outcomes in the communication/language competencies domain

Study	Study sample, setting, comparison sessions, and intervention sessions
<p>Manley et al. (2008), Meets WWC Pilot Single-Case Design Standards with Reservations</p>	<p>This study included three fourth-grade students (Bea, Chip, and Max) with intellectual disability.⁸ Bea was a 9-year-old girl with an IQ of 60 measured with the Wechsler Intelligence Scale for Children-4th Ed. (WISC-IV; Kaplan et al., 2004)⁹ and was diagnosed with “mild mental disability and a communication deficit in receptive language and expressive language.” Chip was a 10-year-old boy with an IQ of 61 on the WISC-IV, and had a diagnosis of “mild mental disability, cerebral palsy, epilepsy, and communication deficits in articulation, fluency, receptive language, and expressive language.” Max was a 9-year-old boy with an IQ of 45 on the WISC-IV, and had a diagnosis of “a moderate disability, a congenital heart condition, Down syndrome, and communication delays in expressive and receptive language and articulation.” The study took place in a special education resource room for students with “functional mental disabilities” in a rural elementary school in the United States.</p> <p>The study used two multiple probe design experiments across participants to assess the effectiveness of the <i>System of Least Prompts (SLP)</i> on two separate outcomes.¹⁰ <i>SLP</i> was used to teach students to make two types of phone calls: live calls and recorded calls. The live call task involved 12 steps (such as stating a greeting and asking a question), and the recorded call task involved 11 steps (such as identifying the person being called and stating where the caller could be reached). The interventionist in the study was the resource room teacher. During the <i>SLP</i> sessions, the teacher provided a hierarchy of prompts to help students complete the steps correctly. This hierarchy included a (1) direct verbal prompt, (2) direct verbal prompt plus a model prompt, and (3) direct verbal prompt plus a physical prompt, if appropriate. At each prompt level, the participant had 3 seconds to initiate a response before the teacher would apply the next prompt. The teacher used this instructional practice twice a day (after breakfast and after lunch), working one-on-one with participants in the special education resource room. For each participant, instruction continued until the student was able to complete 100% of the steps independently for 3 days. The number of intervention sessions required to reach this criterion varied from 10 to 16. At the end of each session, regardless of performance, students would receive a stamp that could be traded for a reward once five stamps were accumulated. (This practice of giving students stamps to trade in for rewards was part of the standard classroom behavior management process used by the resource room teacher.)</p> <p>Baseline sessions took place in the same special education resource room as the intervention, after breakfast and after lunch, and required the students to complete the same steps as in the intervention phases. The teacher gave a cue to the participant such as, “It’s time to make phone calls,” and then presented the phone book to the student with the direction, “Who are you calling?” or “Let’s call (person’s name).” The teacher did not provide assistance or prompting. Students had 3 seconds to initiate a response but only one opportunity to complete each step. If a correct response was not provided by the student in that timeframe, the teacher prepared the student for the next step in the task. If the next step in the sequence was not performed correctly, the teacher ended the session.</p> <p>For all three students, the outcomes included the percentage of steps completed correctly in placing a live phone call and the percentage of steps completed correctly in placing a phone call and leaving a recorded message. These outcomes both fall under the communication/language competencies domain. For a more detailed description of these outcome measures, see Appendix B.</p> <p>The study authors found that <i>SLP</i> was effective in teaching students to place telephone calls and leave recorded messages. In the majority of sessions, students performed live calls with greater accuracy than leaving recorded messages. The results of WWC’s corresponding visual analysis are presented in Appendix C.</p> <p>In the experiments for both outcomes, one student had fewer than five data points in the baseline phase, and two students had fewer than three data points within the first three sessions. In addition, students not yet receiving the intervention did not have baseline probe points in the sessions where earlier cases first received the intervention or reached a prespecified intervention criterion.¹¹ Therefore, both experiments meet WWC pilot single-case design standards with reservations.</p>

Study	Study sample, setting, comparison sessions, and intervention sessions
<p>Taber et al. (2003), Meets WWC Pilot Single-Case Design Standards with Reservations</p>	<p>This study included three students (Natalie, Jennifer, and Doug), described as Group A in the original study, with intellectual disability. Natalie was a 14-year-old girl with an IQ of 44 measured with the Wechsler Intelligence Scale for Children—Revised (WISC-R). She was able to interact with peers and adults, read sight words, and perform daily living skills. Jennifer was a 16-year-old girl with an IQ of 45 on the WISC-R. She was “very vocal” and took part in general education science and physical education classes. Doug was a 15-year-old boy with an IQ of 41 on the WISC-R. He was able to have conversations with others, read sight words, and follow directions, including verbal and visual prompts and recipes. The study took place in a rural secondary school and a suburban secondary school in the United States, within students’ classrooms and other parts of their schools. The study also included a single-case design experiment for another group of students, described as Group B, but their experiment did not meet WWC pilot single-case design standards because the measure of effectiveness cannot be attributed solely to the <i>SLP</i> intervention.</p> <p>The study used one multiple probe design experiment across participants to teach students to answer a ringing phone, pretend they were lost, and use the phone to report their location. This task involved 10 specific steps, such as turning on the phone and describing one’s location and surroundings. The interventionists for the study included a university faculty member and a graduate student who were familiar with the classroom teachers and students. In order to help students move through the steps, the interventionists used an <i>SLP</i> intervention, referred to as “least to most prompting” by study authors, which consisted of five levels of prompting (independent, verbal, verbal plus gesture, verbal plus model, and verbal plus physical guidance). For each student, the intervention continued until he or she completed at least 80% of the tasks correctly for three sessions in a row.</p> <p>Prior to the baseline phase, students were taught how to identify that they were lost. During the baseline sessions, students were asked to answer a ringing phone, pretend they were lost, and use the phone to report their location. No teacher prompting was provided.</p> <p>For all three students, the outcome was the percentage of steps completed correctly in answering a phone and providing information, which falls under the communication/language competencies domain. For a more detailed description of this outcome measure, see Appendix B.</p> <p>The study authors found that <i>SLP</i> was effective in teaching students to answer a ringing phone and provide the caller with detailed information about their physical location. The results of WWC’s corresponding visual analysis are presented in Appendix C.</p> <p>The multiple probe design experiment across participants had only one baseline probe point that overlapped vertically across students within the first three sessions, and the students not receiving the intervention did not have a data point when prior cases either first received the intervention or reached a prespecified level.¹¹ Therefore, this experiment meets WWC pilot single-case design standards with reservations.</p>

Table A.2. Research details for single-case design studies with outcomes in the comprehension domain

Study	Study sample, setting, comparison sessions, and intervention sessions
<p>Browder et al. (2011), Meets WWC Pilot Single-Case Design Standards with Reservations</p>	<p>This study included three elementary school students (Donna, Denise, and Ralph) with severe intellectual disability and a physical or sensory impairment. Donna was an 8-year-old girl with severe intellectual disability and cerebral palsy. She communicated through eye gazes and used a wheelchair. Denise was a 9-year-old girl with severe intellectual disability and was legally blind. She communicated through vocalization and facial expressions and was able to move around but needed help finding different locations in the school. Ralph was a 6-year-old boy with severe intellectual disability and cerebral palsy. Ralph communicated through facial expressions and used a wheelchair. The study took place in three self-contained classes for students with disabilities in a large urban school district in the United States.</p> <p>The study used two separate multiple probe design experiments across participants to measure the effect of <i>SLP</i> on two outcomes during a shared reading activity. The interventionists were special education teachers who provided one-on-one instruction to study students, while the other students in the classroom worked with paraprofessionals. The teachers read two picture story books to each student individually and used selected objects from the book to convey key ideas or storylines. During the intervention, teachers followed scripts that included a “least-to-most prompting system.” Specific scripts were designed for each task and student, as the students all used different forms of communication to respond, such as eye gazes or facial expressions. Each script covered what the teachers should say and do, the materials teachers would use (laminated copies of two story books with summaries, objects related to the stories, and voice output devices or an eye gaze board from the classroom), how students could respond, and the prompting procedures. For example, prompts included verbal cues (such as re-reading text and questions), modeling the correct answer, and physically guiding the student to the correct answer. The teachers gave the students 5 seconds to respond before introducing a prompt. They also praised any independent, correct answers.</p>

Study	Study sample, setting, comparison sessions, and intervention sessions
<p>Browder et al. (2011), Meets WWC Pilot Single-Case Design Standards with Reservations (continued)</p>	<p>During the baseline phase, teachers used the same materials (laminated copies of two story books with summaries, objects related to the stories, and voice output devices or an eye gaze board from the classroom) and script, but did not prompt students or reinforce correct answers. The teachers read the book and asked the questions, but otherwise did not comment or respond. The teachers did randomly provide praise for good behavior (e.g., sitting) to keep the students participating in the assessment.</p> <p>For all three students, the outcomes included engagement in a literacy activity and a measure of listening comprehension, both of which fall under the comprehension domain. For a more detailed description of these outcome measures, see Appendix B.</p> <p>The study authors found that <i>SLP</i> increased all three students' levels of engagement in literacy activities and the number of listening comprehension questions answered correctly and independently during the shared reading activity. The results of WWC's corresponding visual analysis are presented in Appendix C.</p> <p>In the experiments for both outcomes, Donna had only four data points in the baseline phase, and Denise and Ralph had just one probe point immediately before the intervention was introduced. Therefore, both experiments meet WWC pilot single-case design standards with reservations.</p>
<p>Mims (2009), Meets WWC Pilot Single-Case Design Standards with Reservations</p>	<p>This study included two 11-year-old boys (Fred and Richard) with moderate intellectual disability. Fred had an IQ of 44 on the Wechsler Intelligence Scale for Children (WISC), was nonverbal, and used visual supports to communicate. Richard had an IQ of 42 on the WISC, possessed minimal sight word vocabulary, and communicated through visual supports. The study took place in a self-contained special education elementary school classroom within a large, urban school district in the southeastern United States. The study included two additional students, Charlie and Dave, whose experiments did not meet WWC pilot single-case design standards. Charlie's experiment did not include at least three attempts to demonstrate an intervention effect at three points in time, and Dave's experiment had a confounding factor, and thus, the measure of effectiveness cannot be attributed solely to the <i>SLP</i> intervention.</p> <p>Two separate multiple probe design experiments (one for each student) were used to measure the effect of <i>SLP</i> on listening comprehension across three adapted books (<i>Jamaica's Find</i>; <i>Don't Wake Up the Bear!</i>; and <i>Alexander and the Terrible, Horrible, No Good, Very Bad Day</i>). Prior to the study, the books were shortened, pictures were added, story lines were repeated, and comprehension questions were inserted throughout the stories. The interventionists in the study included a teacher and two paraprofessionals. During the intervention sessions, the interventionist read aloud the three books and used <i>SLP</i> to help students answer the comprehension questions. First, the interventionist would ask the question and wait 3 seconds for the students to respond. If the student did not respond, the interventionist would reread the sentence in the story that contained the answer to the question, and would re-read the question and response options. If the student did not respond in 3 seconds, the interventionist moved to the second level prompt, which was re-reading the specific target information and then modeling the response by pointing to the correct picture answer. If the student did not independently answer the question in 3 seconds, the interventionist used the third level prompt, which was a physical prompt of guiding the student's hand to the correct picture. The interventionist reinforced correct independent and prompted answers throughout this process. Intervention sessions typically lasted 30 minutes. Students continued to receive the intervention for a given book until they answered eight out of 10 questions correctly in three consecutive sessions.</p> <p>During the baseline phase, the interventionist read aloud the same adapted books to the students and asked the 10 comprehension questions as they came up in each book. The interventionist did not prompt student responses or provide positive reinforcement of correct answers.</p> <p>For both students, the outcome was the number of independent correct listening comprehension responses, which falls under the comprehension domain. For a more detailed description of this outcome measure, see Appendix B.</p> <p>The study authors found that <i>SLP</i> had a positive impact on listening comprehension for both students. The results of WWC's corresponding visual analysis are presented in Appendix C.</p> <p>In the experiments for both students, at least one phase had fewer than five data points, and neither student had baseline points in the sessions when the intervention was first introduced with earlier books or a prespecified intervention criterion was reached.¹¹ Therefore, these experiments meet WWC pilot single-case design standards with reservations.</p>

Study	Study sample, setting, comparison sessions, and intervention sessions
<p>Mims et al. (2009), Meets WWC Pilot Single-Case Design Standards with Reservations</p>	<p>This study included two students who were identified by their school district as having a severe or profound intellectual disability, with IQs below 55 and development levels below one year. Student 1 was a 6-year-old boy who had the following diagnoses: developmental delay, multi-handicap, cortical visual impairment, cerebral palsy, and bronchopulmonary dysplasia. He used a wheelchair and received occupational therapy, physical therapy, speech therapy, and vision services. Student 2 was a 9-year-old girl who had the following diagnoses: developmental delay, multi-handicap, severe visual impairment in each eye, cerebral palsy, microcephaly, and seizures. She used a wheelchair and received occupational therapy, physical therapy, speech therapy, and vision services. The study took place in two schools in a large urban school district in southeastern United States. Student 1 received the intervention in a separate room for individualized literacy instruction. Student 2 received the intervention in her school’s special education room.</p> <p>Two separate multiple probe design experiments (one for each student) were used to measure the effect of <i>SLP</i> on listening comprehension across three adapted books (<i>Dirty Bertie; Alexander and the Terrible, Horrible, No Good, Very Bad Day; Miss You Every Day</i>). Prior to the study, the books were shortened, target objects were inserted into the books, story lines were repeated, and comprehension questions were included throughout the stories. The interventionist for the study was a doctoral student in special education who had previously served as a special education teacher. The interventionist read each book aloud and asked students to answer comprehension questions by touching correct target objects. The interventionist placed two objects in front of the child: one relevant to the question and one from another book. In the <i>SLP</i> sessions, the interventionist waited 5 seconds for the student to select the correct object; if the student did not select the object in that timeframe, the interventionist prompted the student to answer by placing the students’ hand on the page of the book with the object in the text. If the student answered after the first level prompt, the interventionist provided praise; if the student did not answer, the interventionist would give a second level prompt, which involved placing the students’ hand directly on the correct object on the page of the book. A third level prompt, in which the interventionist would place the child’s hand first on the object in the book and then on the correct object in front of them, would follow, if necessary.</p> <p>During the baseline phase, the interventionist read aloud the same adapted books to the students, asked the comprehension questions as they came up in each book, and placed the objects by the student’s hands on the table. The interventionist waited 5 seconds for the child to respond by touching the correct object on the table, but did not prompt the student.</p> <p>For both students, the outcome was the number of independent correct listening comprehension responses, which falls under the comprehension domain. For a more detailed description of this outcome measure, see Appendix B.</p> <p>The study authors found that <i>SLP</i> led to improvements in comprehension across all three books for both students. The results of WWC’s corresponding visual analysis are presented in Appendix C.</p> <p>In both experiments, at least one phase had fewer than five data points and there was only one baseline point immediately before introducing the intervention for the second and third books. In addition, students did not have baseline points in the sessions when the intervention was first introduced with earlier books or when a prespecified intervention criterion was reached.¹¹ Therefore, these experiments meet WWC pilot single-case design standards with reservations.</p>

Table A.3. Research details for single-case design studies with outcomes in the independent living skills domain

Study	Study sample, setting, comparison sessions, and intervention sessions
<p>Smith et al. (2013), Meets WWC Pilot Single-Case Design Standards with Reservations</p>	<p>This study included three students (Daniel, Karen, and Teresa)¹² with intellectual disability. Daniel, a 20-year-old male, had Down syndrome and moderate intellectual disability; his IQ was not provided by the study authors. Karen, an 18-year-old female, had moderate intellectual disability and an IQ of 41, according to the Universal Nonverbal Intelligence Test (Bracken & McCallum, 1998).¹³ Teresa, an 18-year-old female, had severe intellectual disability and an IQ of 30, according to the Leiter International Performance Scale–Revised (Roid & Miller, 1997).¹⁴ The study took place in an office on the campus of a public high school in the United States.</p>

Study	Study sample, setting, comparison sessions, and intervention sessions
<p>Smith et al. (2013), Meets WWC Pilot Single-Case Design Standards with Reservations (continued)</p>	<p>Three separate multiple probe design experiments (one for each student) were used to measure the effectiveness of <i>SLP</i> across three office-related tasks: organizing a binder, collating and stapling papers, and preparing a letter. To assist students to successfully complete these tasks, the <i>SLP</i> intervention used a series of three prompts: 1) a verbal prompt; 2) a video prompt, which involved visual modeling of the task on an iPhone; and 3) a physical prompt. The interventionist for the study was a researcher who had visited the students' classroom several times prior to the study. The researcher gave the instruction to begin the task and waited 5 seconds. If the participant did not begin the step, completed the step incorrectly, or took more than 10 seconds to complete the step, the researcher gave a prompt. The researcher provided verbal praise after each independent correct response. Once the participant had achieved 100% correct independent responses for one session, praise was "thinned" and given on an average of every third independent correct response during each session. Then it was further thinned and only provided at the end of the task. The intervention sessions took place in the morning for 10 to 20 minutes for each student. The number of intervention sessions ranged from 5 to 11, depending on the time that the students took to reach the criteria.</p> <p>During baseline sessions, students were directed to complete each specific step required to organize a binder, collate and staple papers, or prepare a letter.¹⁵ If a student did not begin the step within 5 seconds, incorrectly completed a step, or did not complete the step within 10 seconds, the researcher would block the student's view of the task with a divider and complete that step, then remove the divider and instruct the student to complete the next step. The researcher gave verbal praise for each independent correct response, but no prompts were provided during these sessions.</p> <p>For all three students, the outcome was the percentage of steps completed correctly for office tasks, which falls under the independent living skills domain. For a more detailed description of this outcome measure, see Appendix B.</p> <p>The study authors found that all three students acquired and maintained the target skills after receiving <i>SLP</i>. The results of WWC's corresponding visual analysis are presented in Appendix C.</p> <p>In the experiments for all three students, at least one phase had fewer than five data points. In addition, in Daniel's and Karen's experiments, there were only one or two baseline points immediately before introducing the intervention for the second and third tasks. Also, in Teresa's experiment, there were no baseline data points for the other tasks when she first received the intervention or reached criterion on previous tasks.¹¹ Therefore, these experiments meet WWC pilot single-case design standards with reservations.</p>

Table A.4. Research details for single-case design studies with outcomes in the math achievement domain

Study	Study sample, setting, comparison sessions, and intervention sessions
<p>Skibo et al. (2011), Meets WWC Pilot Single-Case Design Standards with Reservations</p>	<p>This study included three students (Allison, Josh, and Vicki) with severe disabilities. Allison was a 10-year-old girl with severe intellectual disability and an IQ of less than 20. Josh was a 7-year-old boy described as having "multiple disabilities" and an IQ of 44. Vicki was an 8-year-old girl described as having "multiple disabilities" and an IQ of less than 20. The study took place in two classrooms for students with severe disabilities in an urban public school in the southeastern United States. Allison and Vicki were in one classroom together, and Josh was in another classroom.</p> <p>The study used one multiple probe design experiment across participants to teach number identification skills. The interventionists in the study included two classroom teachers. Within each classroom, the teacher asked students in a small group to identify numbers between one and five. The target student (within the group) was given 5 seconds to make an attempt to answer the question by raising the correct card with the number the teacher requested. When a student answered the question correctly, the teacher would praise the student. Each session consisted of 15 trials offering numerals 1–5 three times each to the targeted student. In the intervention sessions, the teacher used <i>SLP</i>, which was called "the least-to-most prompting system" by study authors, to help the students when they did not provide a correct independent response. If the student started to lift an incorrect response card, the teacher would block the student's response and redirect the student to the correct answer. If the student offered no response within 5 seconds, the teacher would move to a verbal prompt of "find the number that matches mine" and again wait another 5 seconds. If there was still no answer, the teacher would ask the question again, point to the correct answer, and wait 5 seconds for the student to respond. If there was still no correct answer, the teacher would point again to the correct number, tell the student that the number matched the teacher's number, and provide a descriptive response about the correct answer, such as "My card has two balloons, one, two, and this card that you have has the number two, so this is the correct answer." The intervention condition included 22, 11, and 10 sessions for Allison, Josh, and Vicki, respectively. The intervention continued until the students provided 11 out of 15 correct responses for four consecutive sessions.</p>

Study	Study sample, setting, comparison sessions, and intervention sessions
Skibo et al. (2011), Meets WWC Pilot Single-Case Design Standards with Reservations (continued)	<p>During baseline sessions, the teacher asked students in a small group to identify numbers between one and five. The target student was given 5 seconds to answer the question by raising the correct card without any assistance. Praise was offered after 5 seconds for any effort made. Baseline sessions continued for all students until the first student in the experiment had stable data for three consecutive sessions.</p> <p>For all three students, the outcome was number identification, which falls under the math achievement domain. For a more detailed description of this outcome measure, see Appendix B.</p> <p>The study authors found that <i>SLP</i> increased number identification skills among all three students. The results of WWC's corresponding visual analysis are presented in Appendix C.</p> <p>In the multiple probe design experiment across participants, Allison and Josh had fewer than five data points in their baseline phases, and Josh and Vicki had only one data point immediately prior to the introduction of the intervention. In addition, the cases not yet receiving the intervention did not have baseline data points when the previous cases either first received the intervention or reached a prespecified criterion.¹¹ Therefore, these experiments meet WWC pilot single-case design standards with reservations.</p>

Appendix B: Outcome measures in domains that do not reach the threshold required to report effectiveness ratings⁷

Communication/language competencies	
<i>Percentage of steps completed correctly: Answering a phone and providing information</i>	This outcome measured the percentage of total steps students correctly and independently completed when following 10 steps to answer a cell phone and provide information to get help when lost. For each of the 10 steps in the process, the instructor scored whether the student correctly completed the step without prompts, meaning the outcome was measured on a scale of 0 (no steps completed correctly) to 10 (all steps completed correctly) (as cited in Taber, Alberto, Seltzer, & Hughes, 2003).
<i>Percentage of steps completed correctly: Placing a live phone call</i>	This outcome assessed the percentage of total steps students correctly and independently completed when following 12 steps to make a phone call. For each of the 12 steps, the instructor scored whether the student completed the step without prompts and then computed the percentage of correct independent steps (as cited in Manley, Collins, Stenhoff, & Kleinert, 2008). ^a
<i>Percentage of steps completed correctly: Placing a phone call and leaving a recorded message</i>	This outcome assessed the percentage of total steps students correctly and independently completed when following 11 steps to place a phone call and leave a recorded message. For each of the 11 steps, the instructor scored whether the student completed the step without prompts and then computed the percentage of correct independent steps (as cited in Manley, Collins, Stenhoff, & Kleinert, 2008). ^a
Comprehension	
<i>Engagement in a literacy activity</i>	This outcome measured a student's ability to understand and interpret spoken language during a shared reading activity and then engage with the book. For example, the teacher would say "Feel the hat; that is what I will be reading about" and the student was then scored on whether they touched the correct object in the book. The measure included 10 questions, each with a score ranging from 0–3, resulting in a possible maximum score of 30. The scoring rubric for this measure was operationally defined for each student. For example, if the step involved looking at a target object in the book, a student received a score of 0 if there was no response, and a score of 3 if they were able to hold their gaze on the target object in the book for 3 seconds (as cited in Browder, Lee, & Mims, 2011). ^a
<i>Listening comprehension</i>	<p>Listening comprehension was measured in three studies, but measurement of the outcome varied slightly across the studies.</p> <p>In Browder, Lee, and Mims (2011), this outcome measured the number of listening comprehension questions answered correctly and independently during a shared reading activity. The measure included seven questions, resulting in a possible maximum score of 7. Three questions asked students to identify specific objects (such as, "What flew off of Dewey's head? A dog or a hat?"). Three questions asked the student to complete a repeated story line using a voice output device, and one question required the student to answer a summary question at the end of the book (e.g., "What is this story about? A baseball or a skateboard?"). To be scored as an independent correct answer, the response had to occur within 5 seconds of the teacher's instruction or question (as cited in Browder, Lee, & Mims, 2011).^a</p> <p>In Mims (2009), this outcome assessed the number of correct independent responses on listening comprehension questions from three books (<i>Jamaica's Find; Don't Wake Up the Bear; and Alexander and the Terrible, Horrible, No Good, Very Bad Day</i>). The scores ranged from 0 to 10 correct responses for each book. The same books and questions were used in baseline and intervention phases. While the teacher was reading each story, students were asked to respond to 10 questions by identifying the correct picture symbol from a group of three pictures. The questions, which were reviewed by two reading experts prior to the study, appeared at the same point in the story each time the book was read. The questions measured students' abilities to comprehend what they heard, recall facts, predict what would come next, and apply, analyze, and synthesize information from the books (as cited in Mims, 2009).</p> <p>In Mims, Browder, Baker, Lee, and Spooner (2009), this outcome measured the number of correct independent responses on listening comprehension questions from three books (<i>Dirty Bertie; Alexander and the Terrible, Horrible, No Good, Very Bad Day; and Miss You Every Day</i>). While the teacher was reading each story, students were asked to respond to 10 comprehension questions by identifying the correct answer from a pair of objects placed in front of the child. Five objects appeared twice in each book. The possible number of correct responses ranged from 0 to 10 for each book (as cited in Mims, Browder, Baker, Lee, & Spooner 2009).</p>

Independent living skills

Percentage of steps completed correctly: Office tasks

This outcome measured the percentage of total steps completed correctly and independently by the student for three office tasks: organizing a binder, collating and stapling papers, and preparing a letter. All three tasks were part of the same single-case design experiment. A step was considered independently completed if the student initiated the step within 5 seconds of the instruction or completion of the previous step, and took no longer than 10 seconds to complete the step. The binder organization task included 13 steps that involved hole-punching three numbered sheets of paper with an electric hole punch, organizing the sheets, and then placing them in a binder. For the collating and stapling task, which included 12 steps, students were given three stacks of flyers in different colors and an automatic stapler; they were asked to collate the flyers and staple them. For the letter task, which included 12 steps, the students were asked to fold a letter, seal it in an envelope, apply two address labels and a stamp, and then place the prepared letter in a basket (as cited in Smith, Ayres, Mechling, Alexander, Mataras, & Shepley, 2013).

Math achievement

Number identification

This outcome measured the number of correct independent responses made by students on number identification questions for numerals 1–5. Students were given three numbered response cards that included symbols to represent numbers (such as three balloons) in addition to the number, and were asked to hold up the card that corresponded to the teacher's prompt. Students' responses were counted as correct if the student chose the right number without any prompting. Students' responses were counted as incorrect if the student did not make a choice or picked the wrong number (as cited in Skibo, Mims, & Spooner, 2011).

^a The authors collected inter-assessor agreement (IAA) data in each phase and on at least 20% of all sessions, but it is not clear whether IAA data were collected during 20% of the data points in each condition.

Appendix C: Single-case design findings in domains that do not reach the threshold required to report effectiveness ratings⁷

Table C.1: Single-case design findings for the communication/language competencies domain

Outcome measure	Study characteristics			WWC summary
	Sample size (case)	Age(s)	Design type	Evidence level
Manley, Collins, Stenhoff, & Kleinert (2008)				
<i>Percentage of steps completed correctly: Placing a live phone call</i>	3 (Bea, Chip, and Max)	9–10	Multiple probe across participants	Strong (+)
<i>Percentage of steps completed correctly: Placing a phone call and leaving a recorded message</i>	3 (Bea, Chip, and Max)	9–10	Multiple probe across participants	Strong (+)
Taber, Alberto, Seltzer, & Hughes (2003)^a				
<i>Percentage of steps completed correctly: Answering a phone and providing information</i>	3 (Natalie, Jennifer, and Doug)	14–16	Multiple probe across participants	Strong (+)

Table Notes: The WWC does not calculate effect sizes for single-case design research. Characterizations of Strong and Moderate evidence, based on WWC visual analysis, indicate that the experiment demonstrated an effect of the intervention. Characterizations of No evidence indicate that the experiment did not provide at least three demonstrations of an intervention effect in the same direction. The evidence from the single-case design studies on *SLP* does not reach the threshold to include single-case design evidence in the effectiveness ratings for the communication/language competencies domain.

^a For Taber, Alberto, Seltzer, and Hughes (2003), the single-case design experiment for another group of students, described as Group B in the original study, does not meet WWC pilot single-case design standards because the measure of effectiveness cannot be attributed solely to the *SLP* intervention. This experiment is not described in this report.

Table C.2: Single-case design findings for the comprehension domain

Outcome measure	Study characteristics			WWC summary
	Sample size (case)	Age(s)	Design type	Evidence level
Browder, Lee, & Mims (2011)^a				
<i>Engagement in a literacy activity</i>	3 (Donna, Denise, and Ralph)	6–9	Multiple probe across participants	Strong (+)
<i>Listening comprehension</i>	3 (Donna, Denise, and Ralph)	6–9	Multiple probe across participants	No evidence
Mims (2009)^b				
<i>Listening comprehension</i>	1 (Fred)	11	Multiple probe across settings	Strong (+)
<i>Listening comprehension</i>	1 (Richard)	11	Multiple probe across settings	No evidence
Mims, Browder, Baker, Lee, & Spooner (2009)^c				
<i>Listening comprehension</i>	1 (Student 1)	6	Multiple probe across settings	Strong (+)
<i>Listening comprehension</i>	1 (Student 2)	9	Multiple probe across settings	No evidence

Table Notes: The WWC does not calculate effect sizes for single-case design research. Characterizations of Strong and Moderate evidence, based on WWC visual analysis indicate that the experiment demonstrated an effect of the intervention. Characterizations of No evidence indicate that the experiment did not provide at least three demonstrations of an intervention effect in the same direction. The evidence from the single-case design studies on *SLP* does not reach the threshold to include single-case design evidence in the effectiveness ratings for the comprehension domain.

^a For Browder, Lee, and Mims (2011), the figures in the original study do not include the students’ pseudonyms, but instead refer to Donna’s data as “eye gaze response,” Denise’s data as “object response,” and Ralph’s data as “touch response.”

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^b For Mims (2009), the single-case design experiments for two additional students, Charlie and Dave, do not meet WWC pilot single-case designs standards, so these experiments are not described in this report. Charlie's experiment does not include at least three attempts to demonstrate an intervention effect at three points in time, and Dave's experiment has a confounding factor.

^c For Mims, Browder, Baker, Lee, and Spooner (2009), an author query confirmed that inter-assessor agreement was measured in 37% of all sessions for Student 1 and 34% of all sessions for Student 2 for the listening comprehension outcome.

Table C.3: Single-case design findings for the independent living skills domain

Outcome measure	Study characteristics			WWC summary
	Sample size (case)	Age(s)	Design type	Evidence level
Smith, Ayres, Mechling, Alexander, Mataras, & Shepley (2013)^a				
<i>Percentage of independent correct responses: Office tasks</i>	1 (Daniel)	20	Multiple probe across settings	Strong (+)
<i>Percentage of independent correct responses: Office tasks</i>	1 (Karen)	18	Multiple probe across settings	Strong (+)
<i>Percentage of independent correct responses: Office tasks</i>	1 (Teresa)	18	Multiple probe across settings	Strong (+)

Table Notes: The WWC does not calculate effect sizes for single-case design research. Characterizations of Strong and Moderate evidence, based on WWC visual analysis indicate that the experiment demonstrated an effect of the intervention. Characterizations of No evidence indicate that the experiment did not provide at least three demonstrations of an intervention effect in the same direction. The evidence from the single-case design studies on *SLP* does not reach the threshold to include single-case design evidence in the effectiveness ratings for the independent living skills domain.

^a For Smith, Ayers, Mechling, Alexander, Mataras, and Shepley (2013), the study authors also referred to Teresa as Tracy in the original study.

Table C.4: Single-case design findings for the math achievement domain

Outcome measure	Study characteristics			WWC summary
	Sample size (case)	Age(s)	Design type	Evidence level
Skibo, Mims, & Spooner (2011)				
<i>Number identification</i>	3 (Allison, Josh, and Vicki)	8–10	Multiple probe across participants	Strong (+)

Table Notes: The WWC does not calculate effect sizes for single-case design research. Characterizations of Strong and Moderate evidence, based on WWC visual analysis indicate that the experiment demonstrated an effect of the intervention. Characterizations of No evidence indicate that the experiment did not provide at least three demonstrations of an intervention effect in the same direction. The evidence from the single-case design studies on *SLP* does not reach the threshold to include single-case design evidence in the effectiveness ratings for the math achievement domain.

Endnotes

* On October 18, 2018 the WWC modified this report to correct an error in the evidence level listed for the percentage of independent correct responses: office tasks outcome measure in Smith et al. (2013). The evidence level in Table C.3 was corrected from no evidence to strong (+). The WWC has not added studies to the evidence base included in the reference list or updated the literature search since the January 2018 report. This revised report replaces the original January 2018 report.

¹ For the communication/language competencies domain, there are two studies (fewer than the five required), two different research teams with no overlapping authorship (fewer than the three required), and six cases (fewer than the 20 required). For the comprehension domain, there are three studies, one research team, and seven cases. For both the independent living skills and math achievement domains, there is one study, one research team, and three cases.

² Please see the Children and Students with Intellectual Disability review protocol (version 3.1) for a list of all outcome domains.

³ The descriptive information for this intervention comes from Doyle, Wolery, Ault, and Gast (1988); Ault and Griffen (2013); Ledford and Chazin (2016); and Neitzel and Wolery (2009). Further verification of the accuracy of the descriptive information for this intervention is beyond the scope of this review. Full citations: Doyle, P., Wolery, M., Ault, M., & Gast, D. L. (1988). System of least prompts: A literature review of procedural parameters. *The Journal of the Association for Persons With Severe Handicaps*, 13, 28–40.; Ault, M. J., & Griffen, A. K. (2013). Teaching with the system of least prompts an easy method for monitoring progress. *Teaching Exceptional Children*, 45, 46–53.; Ledford, J. R., & Chazin, K. T. (2016). System of least prompts. In *Evidence-based instructional practices for young children with autism and other disabilities*. Retrieved from <http://vkc.mc.vanderbilt.edu/>; Neitzel, J., & Wolery, M. (2009). *Steps for implementation: Least-to-most prompts*. Chapel Hill: National Professional Development Center on Autism Spectrum Disorders, Frank Porter Graham Child Development Institute, The University of North Carolina. Retrieved from <http://autismpdc.fpg.unc.edu/>

⁴ The literature search reflects documents publicly available by February 2017. Reviews of studies in this report used the standards from the WWC Procedures and Standards Handbook (version 3.0) and the Children and Students with Intellectual Disability review protocol (version 3.1). The evidence presented in this report is based on available research. Findings and conclusions could change as new research becomes available.

⁵ The results from single-case design studies are not used to report an intervention effectiveness rating for an outcome domain unless the studies collectively meet the threshold criteria described on p.1. The evidence from the single-case design studies on *SLP* does not reach the threshold to include single-case design evidence in the effectiveness ratings for the communication/language competencies, comprehension, independent living skills, and math achievement domains.

⁶ When there is more than one single-case design experiment in a publication that does not meet WWC pilot single-case design standards, the citation list reports the disposition code that applies to the majority of single-case designs in that publication. Some single-case design experiments within a given publication might not meet WWC pilot single-case design standards for reasons other than the one listed in the citation list.

⁷ The results from single-case design studies are not used to report an intervention effectiveness rating for an outcome domain unless the studies collectively meet the threshold criteria described on p.1. The evidence from the single-case design studies on *SLP* does not reach the threshold to include single-case design evidence in the effectiveness ratings for any domains.

⁸ Single-case design studies typically assign participants a pseudonym; we use the pseudonyms provided by study authors in this report so that WWC ratings can be easily mapped to the correct single-case design in the original study.

⁹ Kaplan, E., Fein, D., Kramer, J., Delic, D., & Morris, R. (2004). *Weschler Intelligence Scale for Children, fourth edition (WISC-IV)*. San Antonio, TX: Psychological Corporation.

¹⁰ A single-case design experiment has all of the design elements required to meet WWC standards with or without reservations (such as three attempts to demonstrate an effect) and is presented as one experiment in a study. The WWC characterizes all single-case design experiments in the same research article as one study, and thus one study can have multiple single-case design experiments. For example, a study could include three separate ABAB design experiments for one student (across three different eligible outcomes) or could include three separate ABAB design experiments for three separate eligible students. If a study presents data for more than one outcome, the WWC classifies the single-case design for each outcome as a separate experiment.

¹¹ The WWC Procedures and Standards Handbook includes three criteria that multiple probe designs must meet in order to meet WWC pilot single-case design standards with or without reservations. These additional criteria are required because some baseline data points are intentionally missing in multiple probe designs. One of these criteria requires that each case not receiving the intervention must have a probe point in a session where another case either (a) first receives the intervention or (b) reaches the prespecified intervention criterion. However, studies reviewed under the Children and Students with Intellectual Disability topic area can meet WWC pilot single-case design standards with reservations, even if they do not meet this requirement. Cases must still

continue to have baseline data for at least one session after the intervention is administered to preceding cases, as this is a requirement for all multiple baseline designs, and must meet the other two multiple probe criteria specified in the Handbook.

¹² Teresa is also referred to as “Tracy” by the authors in the original study.

¹³ Bracken, B. A., & McCallum, R. A. (1998). *Universal nonverbal intelligence test*. Itasca, IL: Riverside.

¹⁴ Roid, G., & Miller, L. (1997). *Leiter International Performance Scale-Revised*. Wood Dale, IL: Stoelting.

¹⁵ The response to an author query confirmed that students were aware of the steps required, even though prompts were not provided during the baseline sessions.

Recommended Citation

U.S. Department of Education, Institute of Education Sciences, What Works Clearinghouse. (2018, January). *Children and Students With Intellectual Disability intervention report: System of Least Prompts*. Retrieved from <https://whatworks.ed.gov>

WWC Rating Criteria

Criteria used to determine the rating of a study that includes single-case experiments

Study rating	Criteria
Meets WWC pilot single-case design standards without reservations	A single-case design study that provides the highest degree of confidence for assessing an intervention's effectiveness.
Meets WWC pilot single-case design standards with reservations	A study that provides a lower degree of confidence for assessing an intervention's effectiveness, such as a reversal-withdrawal design with three or four data points per phase, rather than five.

Criteria used to determine evidence of a causal relation in a single-case design experiment

Evidence level	Criteria
Strong evidence of a causal relationship	A single-case design study with at least three demonstrations of the intervention effect and no non-effects.
Moderate evidence of a causal relationship	A single-case design study with at least three demonstrations of the intervention effect and at least one non-effect.
No evidence of a causal relationship	A single-case design study with fewer than three demonstrations of the intervention effect.

Criteria used to determine whether there is enough research for single-case design evidence to contribute to a WWC effectiveness rating for a given domain

Threshold to include single-case design evidence	Criteria
Threshold met	<p>At least five studies examining the intervention meet <i>WWC pilot single-case design standards without reservations</i> or <i>meet WWC pilot single-case design standards with reservations</i>, AND</p> <p>The single-case design studies are conducted by at least three different research teams with no overlapping authorship at three different institutions, AND</p> <p>The combined number of cases (i.e., participants, classrooms, etc.) totals at least 20.</p>

Glossary of Terms

ABAB design This is an example of a reversal-withdrawal single-case design in which there are four phases: a baseline (A) followed by an introduction of the intervention (B), a withdrawal of the intervention to return to the baseline condition (A), and a second introduction of the intervention (B).

Alternating treatment design A single-case design experiment that rapidly alternates between two or more interventions to examine how outcomes change; outcomes are measured with only one or two data points within each phase.

Attrition Attrition occurs when an outcome variable is not available for all subjects initially assigned to the intervention and comparison groups. If a randomized controlled trial (RCT) or regression discontinuity design (RDD) study has high levels of attrition, the validity of the study results can be called into question. An RCT with high attrition cannot receive the highest rating of *Meets WWC Group Design Standards Without Reservations*, but can receive a rating of *Meets WWC Group Design Standards With Reservations* if it establishes baseline equivalence of the analytic sample. Similarly, the highest rating an RDD with high attrition can receive is *Meets WWC RDD Standards With Reservations*.

For single-case design research, attrition occurs when an individual fails to complete all required phases or data points in an experiment, or when the case is a group and individuals leave the group. If a single-case design does not meet minimum requirements for phases and data points within phases, the study cannot receive the highest rating of *Meets WWC Pilot Single-Case Design Standards Without Reservations*.

Baseline A point in time before the intervention was implemented in group design research and in regression discontinuity design studies. When a study is required to satisfy the baseline equivalence requirement, it must be done with characteristics of the analytic sample at baseline. In a single-case design experiment, the baseline condition is a period during which participants are not receiving the intervention.

Case A case is the unit of intervention administration and data analysis in a single-case design experiment. A case may be a single participant or a group of participants, such as a classroom.

Confounding factor A confounding factor is a component of a study that is completely aligned with one of the study conditions, making it impossible to separate how much of the observed effect was due to the intervention and how much was due to the factor.

Demonstration of an intervention effect In single-case design research, an effect is demonstrated when the data pattern in one phase (e.g., an intervention phase) differs more than would be expected from the data pattern observed in a previous phase (e.g., a baseline phase).

Design The method by which intervention and comparison groups are assigned (group design and regression discontinuity design) or the method by which an outcome measure is assessed repeatedly within and across different phases that are defined by the presence or absence of an intervention (single-case design). Designs eligible for WWC review are randomized controlled trials, quasi-experimental designs, regression discontinuity designs, and single-case designs.

Effect size The effect size is a measure of the magnitude of an effect. The WWC uses a standardized measure to facilitate comparisons across studies and outcomes.

Eligibility	A study is eligible for review and inclusion in this report if it falls within the scope of the review protocol and uses either an experimental or matched comparison group design.
Group design	A study design in which outcomes for a group receiving an intervention are compared to those for a group not receiving the intervention. Comparison group designs eligible for WWC review are randomized controlled trials and quasi-experimental designs.
Intervention	An educational program, product, practice, or policy aimed at improving student outcomes.
Intervention Report	A summary of the findings of the highest-quality research on a given program, product, practice, or policy in education. The WWC searches for all research studies on an intervention, reviews each against design standards, and summarizes the findings of those that meet WWC design standards.
Maintenance probes	In single-case design research, maintenance probes measure outcomes to understand if desired effects are retained after the intervention has ended.
Multiple baseline design	A single-case design that introduces the intervention at different times to different cases or to the same case in different settings.
Outcome domain	A group of closely-related outcomes. A domain is the organizing construct for a set of related outcomes through which studies claim effectiveness.
Phase	In single-case design research, phases are the different conditions or varying levels of the intervention under which an outcome variable is measured.
Quasi-experimental design (QED)	A quasi-experimental design (QED) is a research design in which study participants are assigned to intervention and comparison groups through a process that is not random.
Randomized controlled trial (RCT)	A randomized controlled trial (RCT) is an experiment in which eligible study participants are randomly assigned to intervention and comparison groups.
Rating of effectiveness	For group design research, the WWC rates the effectiveness of an intervention in each domain based on the quality of the research design and the magnitude, statistical significance, and consistency in findings. For single-case design research, the WWC rates the effectiveness of an intervention in each domain based on the quality of the research design and the consistency of demonstrated effects. The criteria for the ratings of effectiveness are given in the WWC Rating Criteria on p. 25.
Regression discontinuity design (RDD)	A design in which groups are created using a continuous scoring rule. For example, students may be assigned to a summer school program if they score below a preset point on a standardized test, or schools may be awarded a grant based on their score on an application. A regression line or curve is estimated for the intervention group and similarly for the comparison group, and an effect occurs if there is a discontinuity in the two regression lines at the cutoff.
Reversal/withdrawal design	A single-case design that introduces the intervention and withdraws the intervention. The design may be extended by adding additional baseline and/or intervention phases.
Single-case design	A research approach in which an outcome variable is measured repeatedly within and across different conditions that are defined by the presence or absence of an intervention.

Study rating The result of the WWC assessment of a study. The rating is based on the strength of the evidence of the effectiveness of the educational intervention. Studies are given a rating of *Meets WWC Design Standards Without Reservations*, *Meets WWC Design Standards With Reservations*, or *Does Not Meet WWC Design Standards*, based on the assessment of the study against the appropriate design standards. The WWC has design standards for group design, single-case design, and regression discontinuity design studies.

Systematic review A review of existing literature on a topic that is identified and reviewed using explicit methods. A WWC systematic review has five steps: 1) developing a review protocol; 2) searching the literature; 3) reviewing studies, including screening studies for eligibility, reviewing the methodological quality of each study, and reporting on high quality studies and their findings; 4) combining findings within and across studies; and, 5) summarizing the review.

Visual analysis A visual analysis reviews the pattern of outcome data in a single-case design experiment to determine whether the intervention led to a positive (favorable) effect, a negative (unfavorable) effect, or no effect is demonstrated.

Please see the [WWC Procedures and Standards Handbook \(version 3.0\)](#) for additional details.



An **intervention report** summarizes the findings of high-quality research on a given program, practice, or policy in education. The WWC searches for all research studies on an intervention, reviews each against evidence standards, and summarizes the findings of those that meet standards.

This intervention report was prepared for the WWC by Mathematica Policy Research under contract ED-IES-13-C-0010.