

# What Works Clearinghouse



## Early Childhood Education Interventions for Children with Disabilities

April 2012

# Milieu Teaching

### Program Description<sup>1</sup>

*Milieu teaching* is a practice that involves manipulating or arranging stimuli in a preschool child’s natural environment to create a setting that encourages them to engage in a targeted behavior. For example, a teacher might place a desirable toy in a setting to encourage a student to request that toy (where requesting a toy is the desired target behavior). Typically, *milieu teaching* involves four strategies that a teacher will utilize to encourage a student to demonstrate a target behavior: modeling, mand-modeling, incidental teaching, and time-delay. Through adult modeling and functional consequences associated with child requests, targeted language behaviors can be improved in children who may have language delays or disabilities.

### Research<sup>2</sup>

One study of *milieu teaching* that falls within the scope of the Early Childhood Education Interventions for Children with Disabilities review protocol meets What Works Clearinghouse (WWC) evidence standards, and no studies meet WWC evidence standards with reservations. The one study included 40 preschool children with developmental delays (eligible for this topic area) attending two schools in Davidson County, Tennessee.

Based on this one study, the WWC considers the extent of evidence for *milieu teaching* on preschool children with disabilities to be small for communication/language competencies. Six other domains are not reported in this intervention report. (See the Effectiveness Summary for further description of all domains.)

### Effectiveness

*Milieu teaching* was found to have no discernible effects on communication/language competencies for preschool children with disabilities.

**Table 1. Summary of findings<sup>3</sup>**

Outcome domain	Rating of effectiveness	Improvement index (percentile points)		Number of studies	Number of students	Extent of evidence
		Average	Range			
Communication/language competencies	No discernible effects	+3	-1 to +18	1	40	Small

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### Program Information

#### Background

*Milieu teaching* was first described by Hart and Rogers-Warren (1978) as a collection of “naturalistic” instructional procedures that build on incidental teaching methods described by Hart and Risley (1975).<sup>4</sup> The *milieu teaching* practice does not have a single developer, though several groups of investigators have produced information and materials for this practice (see below). The one study that meets standards evaluated a *milieu teaching* program described by Kaiser, Hendrickson, and Alpert (1991) that was selected because it had a well-specified, written manual and was deemed a state-of-the-art language program (see p. 156 of Yoder, Kaiser, & Alpert, 1991). Readers interested in using *milieu teaching* practices in their classrooms can refer to sources available through Internet searches. A list of examples follows, although these sources have not been reviewed or endorsed by the WWC:

- Augmentative and Alternative Communication (AAC) Connecting Young Kids (YAACK): <http://aac.unl.edu/yaack/d3.html>
- Research Autism: [http://www.researchautism.net/autism\\_treatments\\_therapies\\_intervention.ikml?ra=91](http://www.researchautism.net/autism_treatments_therapies_intervention.ikml?ra=91)
- Hart, B. M., & Risley, T. R. (1975). Incidental teaching of language in the preschool. *Journal of Applied Behavior Analysis*, 8, 411–420.
- Hart, B., & Rogers-Warren, A. (1978). A milieu approach to teaching language. In R. L. Schiefelbusch (Ed.), *Language intervention strategies* (pp. 193–235). Baltimore, MD: University Park Press.

#### Program details

*Milieu teaching* instruction often occurs in a routine environment known to the child. Instructional episodes often begin by following a child’s attentional lead. By manipulating or arranging stimuli in the child’s natural environment, or milieu, adults create a setting that encourages children to initiate interactions and offers opportunities for adults to use prompting and modeling of communication behaviors in a natural manner. In this environment, children initiate communication by pointing to or requesting desirable items or activities and receive positive consequences for communication targets when adults respond to their request, which is intended to encourage future communication.

Four specific *milieu teaching* procedures are typically used to teach functional language to children with disabilities or developmental delays: modeling, mand-modeling, incidental teaching, and time-delay. Modeling refers to talking to the child and narrating activities, such as “Pick up the cup.” In mand-modeling, the teacher will encourage the child to request the target item verbally, by making requests (“mands”) such as “What do you want?” In incidental teaching, the teacher will follow a child’s attentional lead and look expectantly at the child in an effort to encourage the child to request the target item. Finally, time-delay is a procedure whereby the adult will wait a period of time for a child’s response before attempting another prompt or teaching strategy.

#### Cost

Some published *milieu teaching* procedures are available free to the public. Information is not available about the costs of training for and implementation of *milieu teaching*.

### Research Summary

One hundred sixty-one studies reviewed by the WWC investigated the effects of *milieu teaching* on preschool children with disabilities. One study (Yoder, Kaiser, & Alpert, 1991), is a randomized controlled trial that meets WWC evidence standards. That one study is summarized in this report. No studies meet WWC evidence standards with reservations. The remaining 160 studies do not meet either WWC eligibility screens or evidence standards. (See references beginning on p. 5 for citations for all 161 studies.)

Fourteen additional studies were reviewed against the pilot Single-Case Design standards. Two studies meet the pilot Single-Case Design standards, two studies meet the pilot Single-Case Design standards with reservations, and 10 did not meet pilot Single-Case Design standards. Studies reviewed against pilot Single-Case Design standards are listed in Appendix D and do not contribute to the intervention's rating of effectiveness.

**Table 2. Scope of reviewed research**

<b>Grade</b>	Prekindergarten
<b>Delivery method</b>	Small group
<b>Program type</b>	Practice
<b>Studies reviewed</b>	161
<b>Meets WWC standards</b>	1 study
<b>Meets WWC standards with reservations</b>	0 studies

### Summary of study meeting WWC evidence standards without reservations

Yoder et al. (1991) examined the effects of *milieu teaching* relative to a communication training program comparison group in a randomized controlled trial of 40 preschool students with developmental delays. This study took place in Davidson County, Tennessee. Approximately 60 ten-minute intervention sessions were conducted over the course of the study. This experiment utilized measurements on nine eligible outcomes, all in the communication/language competencies domain.<sup>5</sup>

### Summary of studies meeting WWC evidence standards with reservations

No studies of *milieu teaching* meet WWC evidence standards with reservations.

### Effectiveness Summary

The WWC review of interventions for Early Childhood Education Interventions for Children with Disabilities addresses child outcomes in seven domains: cognitive development, communication/language competencies, literacy, math competencies, social-emotional development/behavior, functional abilities, and physical well-being. The one study that contributes to the effectiveness rating in this report covers one domain: communication/language competencies. The findings below present the authors' estimates and WWC-calculated estimates of the size and the statistical significance of the effects of *milieu teaching* on preschool children with disabilities. For a more detailed description of the rating of effectiveness and extent of evidence criteria, see the WWC Rating Criteria on p. 26.

#### Summary of effectiveness for the communication/language competencies domain

One study reported findings in the communication/language competencies domain.

Yoder et al. (1991) did not report any statistically significant findings on any of the nine eligible outcomes assessed in this study, and the WWC confirmed those calculations. According to WWC criteria, the one study that meets evidence standards demonstrated an indeterminate effect of *milieu teaching* for the communication/language competencies domain.

Thus, for the communication/language competencies domain, one study showed an indeterminate effect. This results in a rating of no discernible effects, with a small extent of evidence.

**Table 3. Rating of effectiveness and extent of evidence for the communication/language competencies domain**

Rating of effectiveness	Criteria met
<b>No discernible effects</b> <i>No affirmative evidence of effects.</i>	The review of <i>milieu teaching</i> in the communication/language competencies domain had one study showing an indeterminate effect.
Extent of evidence	Criteria met
<b>Small</b>	The review of <i>milieu teaching</i> in the communication/language competencies domain was based on one study that included two schools and 40 students.

### References

#### Study that meets WWC evidence standards without reservations

Yoder, P. J., Kaiser, A. P., & Alpert, C. L. (1991). An exploratory study of the interaction between language teaching methods and child characteristics. *Journal of Speech and Hearing Research, 34*(1), 155–167.

#### Studies that do not meet WWC evidence standards

Yoder, P., Camarata, S., & Gardner, E. (2005). Treatment effects on speech intelligibility and length of utterance in children with specific language and intelligibility impairments. *Journal of Early Intervention, 28*(1), 34–49. The study does not meet WWC evidence standards because the measures of effectiveness cannot be attributed solely to the intervention—there was only one unit assigned to one or both conditions.

Yoder, P. J., Kaiser, A. P., Goldstein, H., & Alpert, C. (1995). An exploratory comparison of milieu teaching and responsive interaction in classroom applications. *Journal of Early Intervention, 19*(3), 218–242. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

#### Studies that are ineligible for review using the Early Childhood Education Interventions for Children with Disabilities Evidence Review Protocol

Abbeduto, L., & Boudreau, D. (2004). Theoretical influences on research on language development and intervention in individuals with mental retardation. *Mental Retardation and Developmental Disabilities Research Reviews, 10*(3), 184–192. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Abbeduto, L., Brady, N., & Kover, S. T. (2007). Language development and fragile X syndrome: Profiles, syndrome-specificity, and within-syndrome differences. *Mental Retardation and Developmental Disabilities Research Reviews, 13*(1), 36–46. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Abbeduto, L., Warren, S. F., & Conners, F. A. (2007). Language development in Down syndrome: From the pre-linguistic period to the acquisition of literacy. *Mental Retardation and Developmental Disabilities Research Reviews, 13*(3), 247–261. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Aman, M. G., McDougle, C. J., Scahill, L., Handen, B., Arnold, L. E. A., Johnson, C.,...Wagner, A. (2009). Medication and parent training in children with pervasive developmental disorders and serious behavior problems: Results from a randomized clinical trial. *Journal of the American Academy of Child & Adolescent Psychiatry, 48*(12), 1143–1154. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.

Barnett, D. W. (2002). Best practices in early intervention. In A. Thomas & J. Grimes (Eds.), *Best practices in school psychology IV* (Vol. 2, pp. 1247–1262). Bethesda, MD: National Association for School Psychologists. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Bono, K. E., Sheinberg, N., Scott, K. G., & Claussen, A. H. (2007). Early intervention for children prenatally exposed to cocaine. *Infants & Young Children, 20*(1), 26–37. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Boutot, E. A., Guenther, T., & Crozier, S. (2005). Let's play: Teaching play skills to young children with autism. *Education and Training in Developmental Disabilities, 40*(3), 285–292. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.

- Boyd, B. A., Odom, S. L., Humphreys, B. P., & Sam, A. M. (2010). Infants and toddlers with autism spectrum disorder: Early identification and early intervention. *Journal of Early Intervention, 32*(2), 75–98. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Brady, N. C. (2008). Augmentative and alternative communication for children with Down syndrome or fragile X syndrome. In J. E. Roberts, R. S. Chapman, & S. F. Warren (Eds.), *Speech and language development and intervention in Down syndrome and fragile X syndrome* (pp. 225–274). Baltimore, MD: Paul H. Brookes. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Brady, N. C., Bredin-Oja, S. L., & Warren, S. E. (2008). Prelinguistic and early language interventions for children with Down syndrome or fragile X syndrome. In J. E. Roberts, R. S. Chapman, & S. F. Warren (Eds.), *Speech and language development and intervention in Down syndrome and fragile X syndrome* (pp. 173–192). Baltimore, MD: Paul H. Brookes. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Brady, N. C., & Warren, S. F. (2003). Language interventions for children with mental retardation. *International Review of Research in Mental Retardation, 27*, 231–254. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Brookman-Frazee, L., Stahmer, A., Baker-Ericzen, M. J., & Tsai, K. (2006). Parenting interventions for children with autism spectrum and disruptive behavior disorders: Opportunities for cross-fertilization. *Clinical Child and Family Psychology Review, 9*(3–4), 181–200. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Brookman-Frazee, L., Vismara, L., Drahota, A., Stahmer, A., & Openden, D. (2009). Parent training interventions for children with autism spectrum disorders. In J. Matson (Ed.), *Applied behavior analysis for children with autism spectrum disorders: A handbook* (pp. 237–257). New York: Springer. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Brown, P. M., & Nott, P. (2006). Family-centered practice in early intervention for oral language development: Philosophy, methods, and results. In P. Spencer & M. Marschark (Eds.), *Advances in spoken language development and hard-of-hearing children* (pp. 136–165). Oxford, England: Oxford University Press. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Carta, J. J. (2002). *Building an evidence base for effective early intervention*. Austin, TX: Pro-Ed. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Carter, C. M. (2001). Using choice with game play to increase language skills and interactive behaviors in children with autism. *Journal of Positive Behavior Interventions, 3*(3), 131–151. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Christensen-Sandfort, R. J., & Whinnery, S. B. (2011). Impact of milieu teaching on communication skills of young children with autism spectrum disorder. *Topics in Early Childhood Special Education, 1*(31). Retrieved from <http://tec.sagepub.com/content/early/2011/04/13/0271121411404930/>. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Cirrin, F. M., & Gillam, R. B. (2008). Language intervention practices for school-age children with spoken language disorders: A systematic review. *Language, Speech, and Hearing Services in Schools, 39*(1), S110–S137. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.



- Cleave, P. L. (2001). Design issues in treatment efficacy research for child language intervention: A review of the literature. *Journal of Speech-Language Pathology and Audiology, 25*(1), 24–34. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Cook, R. S., Rule, S., & Mariger, H. (2003). Parents' evaluation of the usability of a web site on recommended practices. *Topics in Early Childhood Special Education, 23*(1), 19–27. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Desjardin, J. L. (2009). Empowering families of children with cochlear implants: Implications for early intervention and language development. In L. S. Eisenberg (Ed.), *Clinical management of children with cochlear implants* (pp. 513–553). San Diego, CA: Plural Publishing. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Dinehart, L. H. B., Kaiser, M. Y., & Hughes, C. R. (2009). Language delay and the effect of milieu teaching on children born cocaine exposed: A pilot study. *Journal of Developmental and Physical Disabilities, 21*(1), 9–22. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.
- DiPipi-Hoy, C., & Jitendra, A. (2004). A parent-delivered intervention to teach purchasing skills to young adults with disabilities. *The Journal of Special Education, 38*(3), 144–157. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.
- Dixon, M. R., Small, S. L., & Rosales, R. (2007). Extended analysis of empirical citations with Skinner's verbal behavior: 1984–2004. *The Behavior Analyst, 30*(2), 197–209. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Drasgow, E. (2007). Using enhanced milieu teaching and a voice-output communication aid to increase independent requesting by three children with autism. *Evidence-Based Communication Assessment and Intervention, 1*(3), 134–135. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Dymond, S., O'Hora, D., Whelan, R., & O'Donovan, A. (2006). Citation analysis of Skinner's verbal behavior: 1984–2004. *The Behavior Analyst, 29*(1), 75–88. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Eldevik, S., Jahr, E., Eikeseth, S., Hastings, R. P., & Hughes, C. J. (2010). Cognitive and adaptive behavior outcomes of behavioral intervention for young children with intellectual disability. *Behavior Modification, 34*(1), 16–34. The study is ineligible for review because it does not take place in the geographic area specified in the protocol.
- Farran, D. C. (2000). Another decade of intervention for children who are low income or disabled: What do we know now? In J. Shonkoff & S. Meisels (Eds.), *Handbook of early childhood intervention* (2nd ed., pp. 510–548). New York: Cambridge University Press. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Fey, M. E., Warren, S. F., Brady, N., Finestack, L. H., Bredin-Oja, S., Fairchild, M.,...Yoder, P. J. (2006). Early effects of responsivity education/prelinguistic milieu teaching for children with developmental delays and their parents. *Journal of Speech, Language and Hearing Research, 49*(3), 526–547. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.
- Fidler, D. J., & Nadel, L. (2007). Education and children with Down syndrome: Neuroscience, development, and intervention. *Mental Retardation and Developmental Disabilities Research Reviews, 13*(3), 262–271. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Finestack, L. H., Richmond, E. K., & Abbeduto, L. (2009). Language development in individuals with fragile X syndrome. *Topics in Language Disorders, 29*(2), 133–148. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

- Franco, J. H. (2008). Teaching prelinguistic communication skills to school age children with autism. *Dissertation Abstracts International*, 71(02A), 165-524. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Ganz, J. B., Lashley, E., & Rispoli, M. J. (2010). Non-responsiveness to intervention: Children with autism spectrum disorders who do not rapidly respond to communication interventions. *Developmental Neurorehabilitation*, 13(6), 399–407. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Gilbert, K. (2008). Milieu communication training for late talkers. *Perspectives on Language Learning and Education*, 15(3), 112–118. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Gillum, H., & Camarata, S. (2004). Importance of treatment efficacy research on language comprehension in MR/DD research. *Mental Retardation and Developmental Disabilities Research Reviews*, 10(3), 201–207. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Girolametto, L., Weitzman, E., & Greenberg, J. (2003). Training day care staff to facilitate children's language. *American Journal of Speech-Language Pathology*, 12(3), 299–311. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Glidden, L. M. (2002). Parenting children with developmental disabilities: A ladder of influence. In J. L. Borkowski, S. L. Ramey, & M. Bristol-Powers (Eds.), *Monographs in Parenting: Parenting and the child's world—Influences on academic, intellectual, and socio-emotional development* (pp. 329–344). Mahwah, NJ: Lawrence Erlbaum Associates. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Goldstein, H. (2002). Communication intervention for children with autism: A review of treatment efficacy. *Journal of Autism and Developmental Disorders*, 32(5), 373–396. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Goldstein, H. (2007). PECS and responsive prelinguistic milieu teaching in children with autism produce similar gains in requesting. *Evidence-Based Communication Assessment and Intervention*, 1(3), 121–123. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Gonzalez, L. I. (1998). Systematic commenting and its differential effects on acquisition of Spanish toy labels when children are engaged or not engaged with the toys (language acquisition). *Dissertation Abstracts International*, 59(08A), 158-2924. The study is ineligible for review because it does not examine an intervention conducted in English.
- Hancock, T., & Kaiser, A. (1996). Siblings use of milieu teaching at home. *Topics in Early Childhood Special Education*, 16(2), 168–190. The study is ineligible for review because it does not examine an intervention implemented in a way that falls within the scope of the review.
- Hancock, T. B., & Kaiser, A. P. (2002). The effects of trainer-implemented enhanced milieu teaching on the social communication of children with autism. *Topics in Early Childhood Special Education*, 22(1), 39. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Hancock, T. B., & Kaiser, A. P. (2006). Enhanced milieu teaching. In R. McCauley & M. Fey (Eds.), *Treatment of language disorders in children* (pp. 203–236). Baltimore, MD: Paul H. Brookes. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.



- Hancock, T. B., Kaiser, A. P., & Delaney, E. M. (2002). Teaching parents of preschoolers at high risk: Strategies to support language and positive behavior. *Topics in Early Childhood Special Education, 22*(4), 191–212. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Hepting, N. H., & Goldstein, H. (1996). What's natural about naturalistic language intervention? *Journal of Early Intervention, 20*(3), 249–264. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Ingersoll, B. (2011). The differential effect of three naturalistic language interventions on language use in children with autism. *Journal of Positive Behavior Interventions, 13*(2), 109–118. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Ingersoll, B., & Dvortcsak, A. (2006). Including parent training in the early childhood special education curriculum for children with autism spectrum disorders. *Topics in Early Childhood Special Education, 26*(3), 179–187. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Ingersoll, B., Dvortcsak, A., Whalen, C., & Sikora, D. (2005). The effects of a developmental, social-pragmatic language intervention on rate of expressive language production in young children with autistic spectrum disorders. *Focus on Autism and Other Developmental Disabilities, 20*(4), 213–222. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Ingersoll, B., & Gergans, S. (2007). The effect of a parent-implemented imitation intervention on spontaneous imitation skills in young children with autism. *Research in Developmental Disabilities, 28*(2), 163–175. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Ingersoll, B., & Schreibman, L. (2006). Teaching reciprocal imitation skills to young children with autism using a naturalistic behavioral approach: Effects on language, pretend play, and joint attention. *Journal of Autism and Developmental Disorders, 36*(4), 487–505. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Jackson, C. W. (2007). Facilitation of early communicative behaviors. In A. Kamhi, J. Masterson, & K. Apel (Eds.), *Clinical decision making in developmental language disorders* (pp. 121–142). Baltimore, MD: Paul H. Brooks. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Johnson, J. W., & McDonnell, J. (2004). An exploratory study of the implementation of embedded instruction by general educators with students with developmental disabilities. *Education & Treatment of Children, 27*(1), 46–63. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.
- Johnson, J. W., McDonnell, J., Holzwarth, V. N., & Hunter, K. (2004). The efficacy of embedded instruction for students with developmental disabilities enrolled in general education classes. *Journal of Positive Behavior Interventions, 6*(4), 214–227. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.
- Kaiser, A., Hancock, T., & Nietfeld, J. (2000). The effects of parent-implemented enhanced milieu teaching on the social communication of children who have autism. *Early Education and Development, 11*(4), 423–446. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.

- Kaiser, A. P., & Gray, D. B. (1993). *Enhancing children's communication: Research foundations for intervention*. Baltimore, MD: Paul H. Brookes. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Kaiser, A. P., Hancock, T. B., & Trent, J. A. (2007). Teaching parents communication strategies. *Early Childhood Services: An Interdisciplinary Journal of Effectiveness*, 1(2), 107–136. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Kaiser, A. P., Hendrickson, J. M., & Alpert, C. L. (1991). Milieu language teaching: A second look. In R. A. Gable (Ed.), *Advances in mental retardation and developmental disabilities* (Vol. 4, pp. 63–92). London, England: Jessica Kingsley Publishers. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Kaiser, A. P., & Hester, P. P. (1996). How everyday environments support children's communication. In L. K. Koegel, R. L. Koegel, and G. Dunlap (Eds.), *Positive behavioral support: Including people with difficult behavior in the community* (pp. 145–162). Baltimore, MD: Paul H. Brookes. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
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- Williams, A. L., McLeod, S., & McCauley, R. J. (2010). *Interventions for speech sound disorders in children*. Baltimore, MD: Paul H. Brookes. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.



- Wolery, M., Barton, E. E., & Hine, J. F. (2005). Evolution of applied behavior analysis in the treatment of individuals with autism. *Exceptionality, 13*(1), 11–23. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
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- Yoder, P., & Warren, S. (1999). Facilitating self-initiated proto-declaratives and proto-imperatives in prelinguistic children with developmental disabilities. *Journal of Early Intervention, 22*(4), 337–354. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.
- Yoder, P. J., & Lieberman, R. G. (2010). Brief report: Randomized test of the efficacy of picture exchange communication system on highly generalized picture exchanges in children with ASD. *Journal of Autism and Developmental Disorders, 40*(5), 629–632. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Yoder, P. J., & McDuffie, A. S. (2006). Treatment of responding to and initiating joint attention. In T. Charman & W. Stone (Eds.), *Social and communication development in autism spectrum disorders: Early identification, diagnosis, and intervention* (pp. 117–142). New York: Guilford Press. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Yoder, P. J., & Stone, W. L. (2006). A randomized comparison of the effect of two prelinguistic communication interventions on the acquisition of spoken communication in preschoolers with ASD. *Journal of Speech, Language, and Hearing Research, 49*(4), 698–711. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample either includes less than 50% students with identified disabilities or more than 50% students with autism.
- Additional source:**
- Yoder, P., & Stone, W. L. (2006). Randomized comparison of two communication interventions for preschoolers with autism spectrum disorders. *Journal of Consulting & Clinical Psychology, 74*(3), 426–435.
- Yoder, P. J., & Warren, S. F. (1998). Maternal responsivity predicts the prelinguistic communication intervention that facilitates generalized intentional communication. *Journal of Speech, Language, and Hearing Research, 41*(5), 1207–1219. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.
- Yoder, P. J., & Warren, S. F. (2001). Relative treatment effects of two prelinguistic communication interventions on language development in toddlers with developmental delays vary by maternal characteristics. *Journal of Speech, Language, and Hearing Research, 44*(1), 224–237. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.
- Yoder, P. J., & Warren, S. F. (2002). Effects of prelinguistic milieu teaching and parent responsivity education on dyads involving children with intellectual disabilities. *Journal of Speech, Language, and Hearing Research, 45*(6), 1158–1174. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.
- Yoder, P. J., & Warren, S. F. (2004). Early predictors of language in children with and without Down syndrome. *American Journal on Mental Retardation, 109*(4), 285–300. The study is ineligible for review because it does not examine the effectiveness of an intervention.



Yoder, P. J., Warren, S. F., Kim, K., & Gazdag, G. E. (1994). Facilitating prelinguistic communication skills in young children with developmental delay II: Systematic replication and extension. *Journal of Speech and Hearing Research, 37*(4), 841–851. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample is not within the specified age or grade range.

**Appendix A: Research details for Yoder, Kaiser, & Alpert (1991)**

Yoder, P. J., Kaiser, A. P., & Alpert, C. L. (1991). An exploratory study of the interaction between language teaching methods and child characteristics. *Journal of Speech and Hearing Research, 34*(1), 155–167.

**Table A. Summary of findings**

**Meets WWC evidence standards without reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Communication/language competencies	40 students	+3	No

**Setting** The study took place in Davidson County, Tennessee. The language sessions were administered in the children’s classrooms or a nearby therapy room.

**Study sample** Forty students with developmental delays participated in this study. The students were from two schools, a university-based preschool and a public school. The students from the university-based preschool had developmental delays of at least 20% of their chronological age in at least one developmental area on the Denver Developmental Screening Test. The students from the public school had scores more than one and one half standard deviations below the mean on four out of seven developmental areas. The 40 students were randomly assigned to two conditions: 20 received instruction with the *milieu teaching* method, and 20 received instruction with the communication training program.

**Intervention group** *Milieu teaching* is a naturalistic instruction method whereby the trainer follows the lead of the child in determining when to teach and what language form to elicit. In *milieu teaching*, the environment is arranged to include objects and activities that interest the child. Instructional strategies including incidental teaching and time-delay are utilized to encourage child communication. The goal of the *milieu teaching* method is that children learn to comprehend language structures from natural and informal adult modeling and active communication about the object or activity that is of interest to the child. When a child produces targeted language behavior during the activities, those utterances are consequted according to the child’s interest. For example, if a child requests a toy, giving the toy to the child serves as a functional consequence of the behavior. For students in both conditions, developmentally appropriate language targets were selected from the communication training program as the goals for the intervention. Children were separated into groups of two or three, and the sessions lasted 10 minutes per child. The treatment lasted for 60 sessions. The first half of each session consisted of a group activity (games, making collages, etc.); in the second half of the session, children could choose toys of interest to them from the variety of toys available.

### Comparison group

The comparison condition consisted of another treatment, called communication training. Communication training involves a more structured drill-and-practice approach than the naturalistic approach espoused by *milieu teaching* and uses a predetermined set of rules to select the trials and language targets. Comprehension of language targets was taught explicitly in this condition rather than implicitly in *milieu teaching*. The communication training group used consequences that included verbal feedback and tangible rewards to increase the likelihood of child response. For children with more significant disabilities, the rewards sometimes were not tied directly to a child's utterance. The sessions were conducted for similar amounts of time and with the same numbers of students in both the intervention and comparison conditions.

### Outcomes and measurement

Nine eligible outcomes were assessed in this study, and all fall within the communication/language competencies domain. For a more detailed description of these outcome measures, see Appendix B.

### Support for implementation

All language teachers received 12 hours of group training. They also received individual and small-group training (ranging from two to ten hours depending on their entry skills, abilities in executing their assigned method, and the children's specific needs). During the intervention period, the language teachers were observed on a weekly basis, and weekly group meetings were held to support teachers and solve training and behavioral management problems.

### Appendix B: Outcome measures for each domain

Communication/language competencies	
<i>Intelligibility (percentage of utterances intelligible)</i>	Intelligibility was measured as the proportion of utterances that were intelligible (partially or completely) relative to the total number of utterances during a 60-minute speech sample (as cited in Yoder et al., 1991).
<i>Mean length of utterances</i>	Student syntactic level was measured as the mean length of utterances (in morphemes) as derived from the 60-minute speech sample (as cited in Yoder et al., 1991).
<i>Percentage of self-initiated utterances</i>	The extent to which the child used language in a spontaneous fashion was measured as the number of self-initiated intelligible utterances divided by the total number of utterances during the 60-minute speech sample (as cited in Yoder et al., 1991).
<i>Rate of different words (per minute)</i>	Vocabulary was measured as the number of different words uttered during the 60-minute speech sample divided by 60 to obtain a per-minute rate (as cited in Yoder et al., 1991).
<i>Rate of intelligibility utterances (per minute)</i>	The rate of talking was measured as the number of intelligible utterances per minute (as cited in Yoder et al., 1991).
<i>Rate of utterances (per minute)</i>	The rate of talking also was measured as the total number of utterances (intelligible or not) during the 60-minute speech sample divided by 60 to obtain the rate per minute (as cited in Yoder et al., 1991).
<i>SICD-E age</i>	The Sequenced Inventory of Communication Development–Expressive (SICD-E) score indicates general expressive language level in age-equivalent units (months) (as cited in Yoder et al., 1991).
<i>SICD-R age</i>	The Sequenced Inventory of Communication Development–Receptive (SICD-R) score indicates general receptive language level in age-equivalent units (months) (as cited in Yoder et al., 1991).
<i>Type token ratio</i>	Vocabulary also was measured using the type token, the number of unique words in the first 50 intelligible and complete utterances from the 60-minute speech sample (as cited in Yoder et al., 1991).

Appendix C: Findings included in the rating for the communication/language competencies domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
<b>Yoder et al., 1991<sup>a</sup></b>								
<b>Milieu teaching vs. communication training program</b>								
<i>Intelligibility (percentage of utterances intelligible)</i>	Preschool students	40 students	0.9 (0.1)	0.9 (0.1)	0.0	0.00	0	> 0.05
<i>Mean length of utterances</i>	Preschool students	40 students	2.6 (1.1)	2.5 (1.1)	0.1	0.09	+4	> 0.05
<i>Percentage of self-initiated utterances</i>	Preschool students	40 students	0.6 (0.1)	0.4 (0.1)	0.2	0.48	+18	> 0.05
<i>Rate of different words (per minute)</i>	Preschool students	40 students	3.3 (1.2)	3.2 (1.7)	0.1	0.07	+3	> 0.05
<i>Rate of intelligibility utterances (per minute)</i>	Preschool students	40 students	8.1 (3.0)	8.1 (3.0)	0.0	0.00	0	> 0.05
<i>Rate of utterances (per minute)</i>	Preschool students	40 students	9.1 (3.0)	9.2 (3.1)	-0.1	-0.03	-1	> 0.05
<i>SICD-E age</i>	Preschool students	40 students	31.2 (7.8)	30.8 (7.1)	0.4	0.05	+2	> 0.05
<i>SICD-R age</i>	Preschool students	40 students	32.0 (5.2)	31.6 (5.0)	0.4	0.08	+3	> 0.05
<i>Type token ratio</i>	Preschool students	40 students	0.4 (0.1)	0.4 (0.1)	0.0	0.00	0	> 0.05
<b>Domain average for communication/language competencies (Yoder et al., 1991)</b>						<b>0.08</b>	<b>+3</b>	<b>Not statistically significant</b>
<b>Domain average for communication/language competencies across all studies</b>						<b>0.08</b>	<b>+3</b>	<b>na</b>

**Table Notes:** Positive results for mean difference, effect size, and improvement index favor the intervention group; negative results favor the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the change (measured in standard deviations) in an average student's outcome that can be expected if the student is given the intervention. The improvement index is an alternate presentation of the effect size, reflecting the change in an average student's percentile rank that can be expected if the student is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of the study's domain average was determined by the WWC. SICD-E = Sequenced Inventory of Communication Development-Expressive. SICD-R = Sequenced Inventory of Communication Development-Receptive. na = not applicable.

<sup>a</sup> For Yoder et al. (1991), a correction for multiple comparisons was needed, but this did not affect significance levels. The p-values presented here were reported in the original study. The WWC calculated the program group mean using a difference-in-differences approach (see the WWC Procedures and Standards Handbook, Appendix B) by adding the impact of the program (i.e., difference in mean gains between the intervention and comparison groups) to the unadjusted comparison group posttest means. For the *intelligibility (percentage of utterances intelligible)* and *percentage of self-initiated utterances* outcomes, the WWC calculated the effect size using the Cox effect size index, as these outcomes are dichotomous.



Appendix D: Single-case design studies reviewed for this intervention

Study citation	Study disposition
Kaiser, A. P., & Hester, P. P. (1994). Generalized effects of enhanced milieu teaching. <i>Journal of Speech and Hearing Research</i> , 37(6), 1320–1340.	Meets WWC pilot Single-Case Design standards.
Warren, S., & Gazdag, G. (1990). Facilitating early language development with milieu intervention procedures. <i>Journal of Early Intervention</i> , 14(1), 62–86.	Meets WWC pilot Single-Case Design standards.
Hawkins, S. R., & Schuster, J. W. (2007). Using a mand-model procedure to teach preschool children initial speech sounds. <i>Journal of Developmental and Physical Disabilities</i> , 19(1), 65–80.	Meets WWC pilot Single-Case Design standards with reservations.
Sheldon, K. M. (1997). Effects of a milieu teaching strategy in a storybook context on the acquisition, maintenance, and generalization of expressive language by young children with development disabilities. <i>Dissertation Abstracts International</i> , 58(07A), 233-2602.	Meets WWC pilot Single-Case Design standards with reservations.
Kaczmarek, L. A., Hepting, N. H., & Dzubak, M. (1996). Examining the generalization of milieu language objectives in situations requiring listener preparatory behaviors. <i>Topics in Early Childhood Special Education</i> , 16(2), 139–167.	Does not meet WWC pilot Single-Case Design standards because it is an ABAB or multiple baseline design with less than three data points in a phase.
Kaiser, A., & Whiteman, B. (1996). The generalized effects of training trainers to teach parents to implement milieu teaching. <i>Journal of Early Intervention</i> , 20(1), 30–51.	Does not meet WWC pilot Single-Case Design standards because it does not have at least three attempts to demonstrate an intervention effect at three different points in time.
Kaiser, A. P. (1990). <i>Toward a hybrid model of parent-implemented language intervention: Analysis of the effects of milieu and responsive-interaction teaching by parents</i> . Unpublished paper presented at the Annual Meeting of the American Association on Mental Retardation, Atlanta, GA.	Does not meet WWC pilot Single-Case Design standards because inter-assessor agreement was not measured at least once in each phase and on at least 20% of the data points in each condition.
Kaiser, A. P., Hemmeter, M., Ostrosky, M., Alpert, C., & Hancock, T. (1995). The effects of group training and individual feedback on parent use of milieu teaching. <i>Journal of Childhood Communication Disorders</i> , 16(2), 39–48.	Does not meet WWC pilot Single-Case Design standards because it is an ABAB or multiple baseline design with less than three data points in a phase.
Kaiser, A. P., Hester, P. P., Alpert, C. L., & Whiteman, B. C. (1995). Preparing parent trainers: An experimental analysis of effects on trainers, parents, and children. <i>Topics in Early Childhood Special Education</i> , 15(4), 385–414.	Does not meet WWC pilot Single-Case Design standards because it does not have at least three attempts to demonstrate an intervention effect at three different points in time.
Kaiser, A. P., & National Institute of Child Health and Human Development (U.S.). (1994). <i>Enhanced milieu teaching: An analysis of applications by interventionists and classroom teachers</i> . Bethesda, MD: National Institute of Child Health and Human Development.	Does not meet WWC pilot Single-Case Design standards because it is an ABAB or multiple baseline design with less than three data points in a phase.
Peterson, P. (2000). The effects of teaching milieu language teaching skills to parents of children prenatally exposed to drugs. <i>Dissertation Abstracts International</i> , 61(12B), 85-6739.	Does not meet WWC pilot Single-Case Design standards because it does not have at least three attempts to demonstrate an intervention effect at three different points in time.
Peterson, P., Carta, J. J., & Greenwood, C. (2005). Teaching enhanced milieu language teaching skills to parents in multiple risk families. <i>Journal of Early Intervention</i> , 27(2), 94–109.	Does not meet WWC pilot Single-Case Design standards because it does not have at least three attempts to demonstrate an intervention effect at three different points in time.
Warren, S. F. (1992). Facilitating basic vocabulary acquisition with milieu teaching procedures. <i>Journal of Early Intervention</i> , 16(3), 235–251.	Does not meet WWC pilot Single-Case Design standards because it does not have at least three attempts to demonstrate an intervention effect at three different points in time.
Warren, S. F., & Bambara, L. M. (1989). An experimental analysis of milieu language intervention: Teaching the action-object form. <i>Journal of Speech and Hearing Disorders</i> , 54(3), 448–461.	Does not meet WWC pilot Single-Case Design standards because it does not have at least three attempts to demonstrate an intervention effect at three different points in time.

**Table Notes:** The supplemental studies presented in this table do not factor into the determination of the intervention rating.

### Endnotes

<sup>1</sup> *Milieu teaching* does not have a single developer or official description. The descriptive information for this program was obtained from publicly available sources: descriptions of this practice (see the websites listed under Program Information) and research articles (i.e., Yoder, Kaiser, & Alpert, 1991; Yoder, Kaiser, Goldstein, & Alpert, 1995; Yoder, Camarata, & Gardner, 2005). Further verification of the accuracy of the descriptive information for this program is beyond the scope of this review. The literature search reflects documents publicly available by May 2011.

<sup>2</sup> The studies in this report were reviewed using WWC Evidence Standards, Version 2.1, as described in the Early Childhood Education Interventions for Children with Disabilities review protocol Version 2.0. The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.

<sup>3</sup> For criteria used in the determination of the rating of effectiveness and extent of evidence, see the WWC Rating Criteria on p. 26. These improvement index numbers show the average and range of student-level improvement indices for all findings across the studies. The WWC review of interventions for the Early Childhood Education Interventions for Children with Disabilities topic area addresses student outcomes in seven domains: cognitive development, communication/language competencies, literacy, math competencies, social-emotional development/behavior, functional abilities, and physical well-being. Table 1 includes results only for communication/language competencies, as this was the only domain for which outcomes were assessed in the one study that meets evidence standards.

<sup>4</sup> *Milieu teaching* strategies have been elaborated and evolved, where expanded models have been labeled *enhanced milieu teaching*, and modifications for prelinguistic children are labeled as *prelinguistic milieu teaching*. Given that the focal article of this review utilizes standard *milieu teaching*, we do not describe these variants here.

<sup>5</sup> Five outcomes assessed in this article were determined to be ineligible and, therefore, are not included in this report. Three assessments were selected from the communication training program (i.e., the program provided to the comparison group) and were judged to be too overaligned to be eligible. Two other outcomes that were deemed ineligible were the raw scores from the Sequenced Inventory of Communication Development Expressive and Receptive language levels, which were divided by the children's cognitive age. Because the raw scores (without the age standardization) were included in this report, the additional age-standardized outcome was considered a duplicated result and, therefore, ineligible.

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## WWC Rating Criteria

### Criteria used to determine the rating of a study

Study rating	Criteria
<b>Meets WWC evidence standards without reservations</b>	A study that provides strong evidence for an intervention's effectiveness, such as a well-implemented RCT.
<b>Meets WWC evidence standards with reservations</b>	A study that provides weaker evidence for an intervention's effectiveness, such as a QED or an RCT with high attrition that has established equivalence of the analytic samples.

### Criteria used to determine the rating of effectiveness for an intervention

Rating of effectiveness	Criteria
<b>Positive effects</b>	Two or more studies show statistically significant positive effects, at least one of which met WWC evidence standards for a strong design, AND No studies show statistically significant or substantively important negative effects.
<b>Potentially positive effects</b>	At least one study shows a statistically significant or substantively important positive effect, AND No studies show a statistically significant or substantively important negative effect AND fewer or the same number of studies show indeterminate effects than show statistically significant or substantively important positive effects.
<b>Mixed effects</b>	At least one study shows a statistically significant or substantively important positive effect AND at least one study shows a statistically significant or substantively important negative effect, but no more such studies than the number showing a statistically significant or substantively important positive effect, OR At least one study shows a statistically significant or substantively important effect AND more studies show an indeterminate effect than show a statistically significant or substantively important effect.
<b>Potentially negative effects</b>	One study shows a statistically significant or substantively important negative effect and no studies show a statistically significant or substantively important positive effect, OR Two or more studies show statistically significant or substantively important negative effects, at least one study shows a statistically significant or substantively important positive effect, and more studies show statistically significant or substantively important negative effects than show statistically significant or substantively important positive effects.
<b>Negative effects</b>	Two or more studies show statistically significant negative effects, at least one of which met WWC evidence standards for a strong design, AND No studies show statistically significant or substantively important positive effects.
<b>No discernible effects</b>	None of the studies shows a statistically significant or substantively important effect, either positive or negative.

### Criteria used to determine the extent of evidence for an intervention

Extent of evidence	Criteria
<b>Medium to large</b>	The domain includes more than one study, AND The domain includes more than one school, AND The domain findings are based on a total sample size of at least 350 students, OR, assuming 25 students in a class, a total of at least 14 classrooms across studies.
<b>Small</b>	The domain includes only one study, OR The domain includes only one school, OR The domain findings are based on a total sample size of fewer than 350 students, AND, assuming 25 students in a class, a total of fewer than 14 classrooms across studies.

### Glossary of Terms

<b>Attrition</b>	Attrition occurs when an outcome variable is not available for all participants initially assigned to the intervention and comparison groups. The WWC considers the total attrition rate and the difference in attrition rates across groups within a study.
<b>Clustering adjustment</b>	If treatment assignment is made at a cluster level and the analysis is conducted at the student level, the WWC will adjust the statistical significance to account for this mismatch, if necessary.
<b>Confounding factor</b>	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.
<b>Design</b>	The design of a study is the method by which intervention and comparison groups were assigned.
<b>Domain</b>	A domain is a group of closely related outcomes.
<b>Effect size</b>	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.
<b>Eligibility</b>	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.
<b>Equivalence</b>	A demonstration that the analysis sample groups are similar on observed characteristics defined in the review area protocol.
<b>Extent of evidence</b>	An indication of how much evidence supports the findings. The criteria for the extent of evidence levels are given in the WWC Rating Criteria on p. 26.
<b>Improvement index</b>	Along a percentile distribution of students, the improvement index represents the gain or loss of the average student due to the intervention. As the average student starts at the 50th percentile, the measure ranges from -50 to +50.
<b>Multiple comparison adjustment</b>	When a study includes multiple outcomes or comparison groups, the WWC will adjust the statistical significance to account for the multiple comparisons, if necessary.
<b>Quasi-experimental design (QED)</b>	A quasi-experimental design (QED) is a research design in which subjects are assigned to treatment and comparison groups through a process that is not random.
<b>Randomized controlled trial (RCT)</b>	A randomized controlled trial (RCT) is an experiment in which investigators randomly assign eligible participants into treatment and comparison groups.
<b>Rating of effectiveness</b>	The WWC rates the effects of an intervention in each domain based on the quality of the research design and the magnitude, statistical significance, and consistency in findings. The criteria for the ratings of effectiveness are given in the WWC Rating Criteria on p. 26.
<b>Single-case design</b>	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.
<b>Standard deviation</b>	The standard deviation of a measure shows how much variation exists across observations in the sample. A low standard deviation indicates that the observations in the sample tend to be very close to the mean; a high standard deviation indicates that the observations in the sample tend to be spread out over a large range of values.
<b>Statistical significance</b>	Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups. The WWC labels a finding statistically significant if the likelihood that the difference is due to chance is less than 5% ( $p < 0.05$ ).
<b>Substantively important</b>	A substantively important finding is one that has an effect size of 0.25 or greater, regardless of statistical significance.

Please see the [WWC Procedures and Standards Handbook \(version 2.1\)](#) for additional details.